TANDBERG television

ST.RE.E10233.1
Issue 1

REFERENCE GUIDE

EN8000
MPEG-4 Part 10 (H.264/AVC)
Encoders

Software Version 1.0 (and later)

EN8030 Standard Definition Encoder

EN8090 High Definition Encoder

ENGLISH (UK)

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If you do not understand the contents of this manual
DO NOT OPERATE THIS EQUIPMENT.

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Se non si capisce il contenuto del presente manuale
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Podemos asimismo suministrarle una traducción de este manual al (idioma) previo pago de una cantidad adicional que deberá abonar usted mismo.

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TANDBERG TELEVISION LTD

REGISTERED ADDRESS:
UNIT 2 STRATEGIC PARK, COMINES WAY,
HEDGE END, SOUTHAMPTON,
HAMPSHIRE,
SO30 4DA
UNITED KINGDOM

Registered Company Number 03695535

List of Contents

About this Reference Guide

This Reference Guide provides instructions and information for the installation and operation of the EN8000 Encoder range.

This Reference Guide should be kept in a safe place for reference for the life of the equipment. It is not intended that this Reference Guide will be amended using the issue of individual pages. Any revision will be by a complete reissue. Further copies of this Reference Guide can be ordered from the address shown on *page viii*. If passing the equipment to a third party, also pass on the relevant documentation.

Issues of this Reference Guide are listed below:

Issue	Date	Software Version	Comments
1	Mar 2007	1.0	Initial release.

The following manuals are also associated with this equipment:

- ST.US.E10233: User Guide for EN8030
- ST.US.E10234: User Guide for EN8090
- ST.AN.E10074: Upgrade Wizard
- ST.AN.1094: Video Noise Reduction and Compression
- ST.AN.1097: VBI in TANDBERG Television Systems

Nomenclature

The terms RS-232 and RS-422 have been superseded by EIA-232 and EIA-422. However, because the original names are inscribed on the Encoder the original terms are used in the text of this Reference Guide.

Acknowledgements

General

All best endeavours have been made to acknowledge registered trademarks and trademarks used throughout this manual. Any notified omissions will be rectified in the next issue of this manual. Some trademarks may be registered in some jurisdictions but not in others.

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Heed Warnings

All warnings on the product and in the operating instructions should be adhered to. The manufacturer cannot be held responsible for injuries or damage where warnings and cautions have been ignored or taken lightly.

Read Instructions

All the safety and operating instructions should be read before this product is operated.

Follow Instructions

All operating and use instructions should be followed.

Retain Instructions

The safety and operating instructions should be retained for future reference.

WARNINGS...

WARNINGS GIVE INFORMATION WHICH, IF STRICTLY OBSERVED, WILL PREVENT PERSONAL INJURY OR DEATH, OR DAMAGE TO PERSONAL PROPERTY OR THE ENVIRONMENT. THEY ARE BOXED AND SHADED FOR EMPHASIS, AS IN THIS EXAMPLE, AND ARE PLACED IMMEDIATELY PRECEDING THE POINT AT WHICH THE READER REQUIRES THEM.

CAUTIONS...

Cautions give information which, if strictly followed, will prevent damage to equipment or other goods. They are boxed for emphasis, as in this example, and are placed immediately preceding the point at which the reader requires them.

NOTES...

Notes provide supplementary information. They are highlighted for emphasis, as in this example, and are placed immediately after the relevant text.

EMC Compliance

This equipment is certified to the EMC requirements detailed in *Annex B, Technical Specification*. To maintain this certification, only use the leads supplied or if in doubt contact Customer Services.

Contact Information

TANDBERG Television Customer Services

Support Services

Our primary objective is to provide first class customer care that is tailored to your specific business and operational requirements. All levels are supported by one or more service performance reviews to ensure the perfect partnership between TANDBERG Television and your business.

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All TANDBERG Products and Systems are designed and built to the highest standards and are covered under a comprehensive 12 month warranty.

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Where to Find Us

Europe, Middle East and Africa:	+44 (0) 23 8048 4455 Fax: +44 (0) 23 8048 4467 support@tandbergtv.com
Americas:	+888 671 1268 (US and Canada) +678 812 6255 (Outside of mainland US) noc@tandbergtv.com
China:	+86 10 6856 0260 (Beijing) +852 2530 3215 (Hong Kong) fieldservice-asia@tandbergtv.com
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TANDBERG Television provides a wide range of training courses on the operation and maintenance of our products and on their supporting technologies. TANDBERG can provide both regularly scheduled courses and training tailored to individual needs. Courses can be run either at your premises or at one of our dedicated training facilities.

Where to Find Us

For further information on TANDBERG Television's training programme please contact us:

International Telephone:	+44 23 8048 4229
International Facsimile	+44 23 8048 4467
E-mail Address:	training@tandbergtv.com
Internet Address	http://www.tandbergtv.com

Customer Services and Technical Training Postal Address

Tandberg Television
Unit 2
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Return of Equipment

If you need to return equipment for repair, please contact the Customer Services Helpdesk on +44 (0) 23 8048 4455. A Returns Authorisation Number (RAN) will be issued and full details of the unit will be logged. Please ensure the RAN number is clearly marked on the packaging of the unit. The unit should then be sent to the following address:

Tandberg Television – Customer Services
Unit 1
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Technical Publications

If you need to contact TANDBERG Television Technical Publications regarding this publication, e-mail: techpubs@tandbergtv.com.

Chapter 1

Introduction to the Basic Encoder

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1.1 Scope of this Reference Guide

1.1.1 Who Should Use This Reference Guide

This Reference Guide is written for operators/users of the EN8000 Range of Encoders to assist in the installation, operation and day-to-day care. The range currently consists of the EN8030 Standard Definition Encoder for MPEG-4 Part 10 and the EN8090 High Definition Encoder for MPEG-4 Part 10.

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TANDBERG TELEVISION TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Unauthorized maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This Reference Guide does not include any maintenance information or procedures that would require the removal of covers. This Guide focuses on operating the Encoder via the Web browser and highlights some specific aspects of the Front Panel control. It does not cover the Engineering menu or the use of a Telnet session.

1.1.2 Software Version

This version of the Reference Guide has been written to cover the functionality in **software version 1.0** for the EN8030 Encoder and **software version 1.0** for the EN8090 Encoder.

1.1.3 What Equipment is Covered by This Reference Guide

Figure 1.1: EN8030 Encoder Front View

Table 1.1: Equipment Model Descriptions

Model Number	Marketing Code	Description
EN8030 SD Encoder	EN8030/BAS	1RU Encoder implementing Standard Definition H.264/AVC Main Profile video and MPEG audio encoding. Includes transport stream output capability and IP/Ethernet output.
EN8030 SD Encoder (-48 Vdc version)	EN8030/BAS/48V	EN8030/BAS Encoder with –48 Vdc input
EN8090 HD Encoder	EN8090/BAS	1RU Encoder implementing High Definition H.264/AVC Main Profile video and MPEG audio encoding. Includes transport stream output capability and IP/Ethernet output.
EN8090 HD Encoder (-48 Vdc version)	EN8090/BAS/48V	EN8090/BAS Encoder with –48 Vdc input

Since this Reference Guide covers both the EN8030 and EN8090, it provides information covering both SD and HD operation.

1.1.4 Optional Features

This guide is intended to cover all features and functions of the unit. However some of these features may be purchasable options or features that have not been included in this release. If in doubt, please contact TANDBERG Television Customer Services for clarification.

1.1.5 Service Availability

The EN8030 Encoder is able to generate an MPEG-4 Standard Definition output and the EN8090 Encoder is able to generate an MPEG-4 High Definition output or an MPEG-4 Standard Definition output.

1.2 Modes of operation

1.2.1 MPEG-4/H.264 AVC over TS

The elementary streams from the EN8000 H.264/AVC encoding module are encapsulated into an MPEG TS (Transport Stream) system within the Encoder.

- Video: Main and High Profile of the ISO/IEC 14496-10 (H.264/AVC) technology are supported.
- Audio: There is a wide range of audio encoding standards that can be used including MPEG-1 Layer II and Dolby Digital.
- Output: The elementary streams from the Intelligent Compression Engine (ICE) card are multiplexed on the motherboard of the Encoder into a compliant single-program transport stream. Hence, the combined output of these streams is through the ASI outputs on the motherboard.
- Option: An IP/Ethernet output card (EN8000/HWO/IPTSDUAL) can be fitted to the EN8000 range of encoders to allow the transmission of TS over IP using RFC 2250.

The details of this are shown in *Table 1.2.*

Table 1.2: Encapsulation Mode

Mode	MPEG-4 AVC over TS
Where used	EN8030, EN8090
Video	H.264/AVC Main and High Profile
Audio	MPEG-1 Layer II audio, Dolby Digital, linear, MPEG-2 AAC, MPEG-4 HE-AAC, MPEG-4 HE-AAC v2
Output	TS outputs on the Encoder: the standard is ASI output but this can extend to IP using the IP/Ethernet output option card.

1.2.2 Picture-in-Picture

If the software option EN8000/SWO/PIP is purchased for the Encoder, there is the capability of generating a second, reduced resolution, video image. The Encoder produces a multiple program transport stream (MPTS) where one service is the broadcast stream and the other contains the reduced resolution video image. This is covered in more detail in *Chapter 3, Options and Upgrades* and *Chapter 6, Picture in Picture*.

1.3 Video Encoding

1.3.1 SD Video Inputs (EN8030 Encoder)

The standard video inputs are:

- **SDI** - Serial Digital Interface - ITU-R BT.656-4, part 3 (D1 serial format) – SMPTE 259 (component only)
- Composite Analogue (PAL/NTSC)

Video Input Types

The video input types, which are supported, are:

- 625-line composite PAL-B, -D, -G, -H or -I (ITU-R BT. 624-4)
- 525-line composite NTSC-M (with and without pedestal) or PAL-M (ITU-R BT. 624-4)
- Serial digital (ITU-R BT.656-4, part 3) input (D1 serial format) and (ANSI/SMPTE 259M) (component only)
- Internal test pattern function

Serial Digital Video Input Error Detection and Handling (EDH)

The serial digital video input supports error detection and handling (EDH) as defined by the specification SMPTE RP 165-1994, 'Error Detection Checkwords and Status Flags for Use in Bit Serial Digital Interfaces for Television'.

Video Pre-processing

The efficiency of the encoding can be enhanced through pre-processing of the incoming video using functions such as:

- Support for different resolutions including the standard set of video picture resolutions (720, 704, 640, 576, 544, 528, 480, 352) in both 625 and 525 line operation.
- An internal frame synchroniser.
- The aspect ratio for the incoming video feed as defined in the VBI, can be maintained in the output if desired.
- Generation of test patterns to allow the overall system to be tested.
- Replacement of the video stream when input is lost.
- Built-in patented adaptive noise reduction circuitry[1].
- When the SD-SDI input is used, a logo overlay facility is available whereby the Encoder is configured to overlay a broadcaster's trademark/logo onto the active video.

Internal Frame Synchroniser

An internal frame synchronizer is provided to accommodate slight differences between the incoming frame rate and that generated by the stable reference[2] used by the Encoder.

[1] Noise reduction is only available when software option EN5900/SWO/NR is purchased.
[2] To ensure broadcast quality it is recommended that the studio reference is fed to HYSNC.

Output on Video Loss

In the event of video input loss the Encoder can be software-configured to show either:

- A test pattern (with or without identification text).
- A freeze frame (with or without identification text).
- Cut to a black screen (with or without identification text).
- Drop the video PID if TS encapsulation is active.

1.3.2 HD Video Input (EN8090 Encoder)

The only operational video input is:

- **HD-SDI** (so named on the back panel) - High Definition Serial Digital Interface that is compliant to SMPTE 292M.

Video Input Types

The video input frame rate and resolution is user selectable and the available options are shown in *Table 1.3.*

Table 1.3: Supported High Definition Scanning Modes

Resolution (V x H)	P / I	Frame rate	Carried as:	Standard
720 x 1280	Progressive	50.00 frame/s	Native	SMPTE296M
720 x 1280	Progressive	59.94 frame/s	Native	SMPTE296M
1080 x 1920	Interlaced	25.00 frame/s	Native	SMPTE274M
1080 x 1920	Interlaced	29.97 frame/s	Native	SMPTE274M

Video Pre-processing

The efficiency of the encoding can be enhanced through pre-processing of the incoming video using functions such as:

- Support for reduced horizontal resolution on the encoded video relative to the input video to reduce the macro-block rate such as resizing from 1920 pixels to 960 pixels for 1080-line resolution and resizing from 1280 pixels to 640 pixels for 720-line resolution.
- A downsampler.
- An internal frame synchroniser.
- The aspect ratio for the incoming video feed as defined in the VBI, can be maintained in the output if desired.
- Generation of test patterns to allow the overall system to be tested.
- Replacement of the video stream when input is lost.
- Built-in patented adaptive noise reduction circuitry[3].

[3] Noise reduction is only available when software option EN8000/SWO/NR is purchased.

Downsampler

> NOTE...
> Availability of this option requires the EN8000/SWO/PIP licence.

A downsampler is implemented for the HD-SDI input. The output of the downsampler is either:

- 720 x 480 @ 29.97 frame/s for input frame rate of 29.97 or 59.94 frame/s
- 720 x 576 @ 25 frame/s for input frame rate of 25 or 50 frame/s.

Internal Frame Synchroniser

An internal frame synchronizer is provided to accommodate slight differences between the incoming frame rate and that generated by the stable reference[4] used by the Encoder.

Output on Video Loss

In the event of video input loss the Encoder can be software-configured to show either:

- A test pattern (with or without identification text).
- A freeze frame (with or without identification text).
- Cut to a black screen (with or without identification text).

1.3.3 Video Encoding

H.264/AVC Encoding

Both the EN8030 and EN8090 Encoders can generate a bitstream, from the input video, that is compliant with the MPEG-4 Part 10 (ISO/IEC 14496-10) specification with a maximum bitrate of 10.0 Mbit/s for SD operation and 20.0 Mbit/s for HD operation. The H.264/AVC video encoding functions include.

- Support for the following tools
  - ✧ Spatial Intra prediction: Intra macro-blocks are predicted from surrounding, previously coded macro-blocks.
  - ✧ Sub-pixel motion vectors: This allows motion to be more accurately represented.
  - ✧ CABAC: Context Adaptive Binary Arithmetic Coding – a more efficient form of entropy coding compared to traditional variable length codes.
  - ✧ Adaptive GOP structures of IP, IBP, IBBP and IBBBP where the encoder chooses whether to use B frames according to the video content.
- Selectable bitrate operation:
  - ✧ SD = 0.256 Mbit/s – 10.000 Mbit/s.
  - ✧ HD = 1.000 Mbit/s – 20.000 Mbit/s
- Support for horizontal resizing of the input image such as resizing from 1920 pixels to 960 pixels for 1080-line resolution and resizing from 1280 pixels to 640 pixels for 720-line resolution.
- Support for variable GOP lengths of up to 250 frames with I frame insertion at scene cuts to optimise encoding efficiency.
- The decoder buffer can be varied between 0.3 second for low delay applications to 3.0 seconds for premium quality.

[4] To ensure broadcast quality it is recommended that the studio reference is fed to HYSNC.

1.4 Audio Encoding

1.4.1 Audio Inputs (EN8090 HD Encoder)

The standard audio inputs are:

- **AUDIO IN 2** - This 15-way male D-type connector can be used for the input of up to four stereo pairs of AES/EBU digital audio when the optional audio encoding daughter card (EN8000/HDC/AUD) is fitted. Only the input sampling rate of 48 kHz is supported. A break-out cable is supplied which plugs into this connector and provides a more convenient means of connecting the audio inputs via five connectors. There are four XLR female connectors, with the fifth cable being a BNC, which provides an AES/EBU 75 Ω digital reference output.
- Audio can be de-embedded from the **HD-SDI** input on the HD encoding card as digital audio with a sampling rate of 48 kHz. Up to 8 stereo pairs can be extracted from this interface.
- **AUDIO IN** - This 15-way male D-type connector is used for the input of up to two stereo pairs of AES/EBU digital audio or four analogue audio channels. A break-out cable is supplied which plugs into this connector and provides a more convenient means of connecting the audio inputs via five connectors. There are four XLR female connectors, with the fifth cable being a BNC, which provides an AES/EBU 75 Ω digital reference output.

Audio Channels

The HD Encoder has the possibility of two separate audio encoding systems:

- **Audio A and B** - Audio inputted through AUDIO IN or HD-SDI can be routed to the audio encoder streams A and B, that can currently implement:
  - ✧ MPEG-1 Layer II (up to two stereo pairs)
  - ✧ Dolby Digital (up to two stereo pairs)
  - ✧ Pass-thru (Dolby Digital and Dolby E)
- **Audio 3A, 3B, 3C and 3D** - Alternatively if the optional audio encoding daughter card (EN8000/HDC/AUD) is fitted, audio inputted through AUDIO IN 2 or HD-SDI can be routed to audio streams 3A, 3B, 3C and 3D, that can currently implement:
  - ✧ MPEG-2 AAC (up to four stereo pairs, or one 5.1 and one stereo pair)
  - ✧ MPEG-4 HE-AAC (up to four stereo pairs, or one 5.1 and one stereo pair)
  - ✧ MPEG-4 HE-AAC v2 (Up to four Stereo Pairs)
  - ✧ Pass-thru (Dolby Digital and Dolby E)

Output on Digital Audio Loss

In the event of loss of digital audio input lock loss the Encoder can be software-configured to either:

- Code an audio stream of silence
- Remove the presence of the audio PID from the Transport Stream
- Turn off the ASI output of the Encoder

Test Tones

The equipment can be configured to generate a test tone for alignment purposes. Refer to *Annex B, Technical Specification* for level and frequency.

1.4.2 Audio Inputs (EN8030 SD Encoder)

The standard audio input is:

- **AUDIO IN 2** - This 15-way male D-type connector can be used for the input of up to four stereo pairs of AES/EBU digital audio when the optional audio encoding daughter card (EN8000/HDC/AUD) is fitted.

  Only the input sampling rate of 48 kHz is supported. A break-out cable is supplied which plugs into this connector and provides a more convenient means of connecting the audio inputs via five connectors. There are four XLR female connectors, with the fifth cable being a BNC, which provides an AES/EBU 75 Ω digital reference output.

- **AUDIO IN** – 15-way male D-type - software selectable balanced analogue or digital AES/EBU, with AES/EBU on left only. A break-out cable is supplied which plugs into this connector and provides a more convenient means of connecting the audio inputs via five connectors. There are four XLR female connectors, with the fifth cable being a BNC, which provides an AES/EBU 75 Ω digital reference output.
- Alternatively, audio can be input embedded as AES/EBU on the serial digital interface (**SDI** or **HD-SDI**). Audio may be converted to either of the standard output sampling frequencies, 32 kHz or 48 kHz, by use of the built-in asynchronous sample rate converters. This applies only to audio that is not pre-encoded.

Audio Channels

The SD Encoder also has the possibility of three separate audio encoding systems:

- **Audio A and B** – the audio encoder is capable of processing two stereo pairs inputted from either an SDI embedded source, a digital source AES/EBU or an analogue source, termination impedance 600 Ω or 20 kΩ. These are routed to audio encoder streams A and B that can currently implement:
  - ✧ MPEG-1 Layer II (up to two stereo pairs)
  - ✧ Dolby Digital (up to two stereo pairs)
  - ✧ Pass-thru (Dolby Digital and Dolby E)
- **Audio 3A, 3B, 3C and 3D** Alternatively, if the optional audio encoding daughter card (EN8000/HDC/AUD) is fitted, audio inputted through AUDIO IN 2, HD-SDI or SDI can be routed to audio streams 3A, 3B, 3C and 3D, that can currently implement:
  - ✧ MPEG-1 Layer II (up to four stereo pairs)
  - ✧ MPEG-2 AAC (up to four stereo pairs, or one 5.1 and one stereo pair)
  - ✧ MPEG-4 HE-AAC (up to 4 stereo pairs, or one 5.1 and one stereo pair)
  - ✧ MPEG-4 HE-AAC v2 (up to four stereo pairs)
  - ✧ Pass-thru (Dolby Digital and Dolby E)

Output on Digital Audio Loss

The Encoder can be software-configured, in the event of loss of digital audio input lock loss, to either:

- Code an audio stream of silence
- Remove the presence of the audio PID from the Transport Stream
- Turn off the ASI output of the Encoder

Test Tones

The equipment can be configured to generate a test tone for alignment purposes. Refer to *Annex B, Technical Specification* for level and frequency.

1.4.3 Audio Encoding

The available audio algorithms that can be used to encode the input audio are:

AAC (MPEG-2 and MPEG-4)

The encoder has the capability of encoding incoming audio using the highly efficient Advanced Audio Coding (AAC) algorithm. This is the standard WindowsMedia audio algorithm for WM9S and is commonly known as WMA in the public domain. The sampling rate is restricted to 48 kHz and the constant bitrate can be varied between 64 kbit/s and 128 kbit/s for a stereo pair of audio channels.

There is only a single encoding algorithm but there is a menu switches to allow one of main variants to be selected:

- **MPEG-2 AAC:** the actual AAC bitstream is compliant to the specification ISO/IEC 13818-7 and is encapsulated in ADTS (Audio Data Transport Stream), which is described in the same specification. Menu switches have been included to allow the operator to enable an ARIB-compliant mode.
- **MPEG-4 HE-AAC:** the actual AAC bitstream is compliant to the High-Efficiency (HE) AAC profile of MPEG-4 Part 3 as described in ISO/IEC 14496-3. This allows the use of the Spectral Band Replication (SBR) tool to achieve reasonable results for sub-64 kbit/s stereo encoding. The minimum bitrate has been restricted so that operation of the encoder does not use any of the extra tools associated with version 2 of the Profile. The bitstream is encapsulated in the Transport Stream using LATM/LOAS (Low-overhead Audio Transport Multiplex/Low-overhead Audio Stream). The implementation is compliant to ETSI TS 101 154 V1.7.1 Annex H.
- **MPEG-4 HE-AAC v2:** The actual AAC bitstream is compliant to the High Efficiency (HE) AAC v2 profile as described in ISO/IEC 14496-3. This allows both Spectral Band Replication (SBR) and Parametric Stereo (PS) tools to be used. Operation in this mode is currently restricted to Stereo at 32 kbit/s.

MPEG-1 Layer II

The Encoder can encode incoming audio at a sampling rate of 48 kHz to an MPEG-1 Layer II compliant bitstream for TS output only. The available coding modes are:

- **Single Mono:** either the left or the right channel is encoded - the signal is output to both XLR connectors at the receiving end. Not available in Linear PCM.
- **Dual Mono:** the left and right signals are encoded and carried in the transport stream as a single Packetised Elementary Stream (PES) data stream. The way that the left and right signals are output from the Receiver is dependent on how the routing is set up on the Receiver. Both the left and the right may be output, or the left only, or the right only. This is typically used for multilingual services.
- **Stereo:** A stereo pair is coded as two mono signals - the two signals are output as stereo at the receiving end.
- **Joint Stereo:** A stereo pair is coded taking advantage of the stereo nature of the channels - the two signals are output as stereo at the receiving end. Available in MPEG-1 Layer II only.
- **Audio Description Service:** Signals the presence of an Audio Description Service for the visually impaired in the PMT.

Dolby Digital

If licensed, the Encoder can encode incoming audio at a sampling rate of 48 kHz to a Dolby Digital compliant bitstream for the TS output only. Dolby Digital audio encoding incorporates digital normalization, pre-processing (filtering), dynamic range compression and the addition of bit-stream information. Dolby Pro Logic audio can be carried as stereo audio through the Encoder as long as a suitably high bitrate is selected (see *Annex B, Technical Specification*). The available coding modes are:

- **1/0:** centre
- **2/0:** left and right

Pass-thru

This is where an audio stream has already been encoded externally, prior to entering the Encoder. Currently the Encoder is certified to handle Dolby Digital and Dolby E pre-encoded streams for TS output only.

> NOTES...
> 1. See *Annex F, Audio Modes* for details of setting up the audio.
> 2. The sampling rate for all audio encoders is fixed at 48 kHz.

1.5 VBI Line Processing Modes

With analogue video, ancillary information associated with the video image is encoded within the vertical blanking interval (VBI) of the video image. However the VBI is not encoded as part of the active image by the video encoding module for efficiency reasons because the VBI is not visible to the viewer. So, this information, termed VBI data, must be carried separately in some other form within the bitstream.

Transport of VBI Data

There are two methods to achieve this:

- Embedding the VBI data within the video elementary stream: all video coding technologies allow the carriage of user data associated with a video frame with the video frame bitstream. The following data formats are handled with this method:
  - ✧ Closed Captions and V-chip information stored on Line 21 on top and bottom field of each frame according to EIA-608 and EIA-708B specifications.
  - ✧ Wide Screen Signalling (WSS) stored on Line 23 according to ETS 300 294 and signals the aspect ratio of the video image. For H.264/AVC bitstream, the aspect ratio is contained within the GOP header sequence. Frame accurate switching is enabled because a GOP header with an accompanying I frame is inserted whenever this value changes.
- Encapsulating the VBI data within its own elementary stream: the VBI data is contained separately from any of the other stream. The following data formats are handled with this method:
  - ✧ Neilson AMOL I and II.
  - ✧ 18 lines of Teletext from each field of the video frame can be extracted and packetised according to DVB specification EN 300 472.

This information is summarized in *Table 1.4.*

The Encoder has the ability to extract VBI data from line number ranges 10-22 and 272-285 for 525 lines and 6-23 and 318-335 for 625 lines. The specifications surrounding VBI data are covered in great detail in the Application Note ST.AN.1097 - VBI in TANDBERG Television Systems.

Table 1.4: Supported VBI Data Formats

Data Format	MPEG-4 AVC over TS
Closed Caption and V-chip	Included within SEI Message within the video ES.
Wide Screen Signaling	Contained within the GOP sequence header, inserted when this value changes
Neilson AMOL 1, Neilson AMOL 11	Included as a separate PID.
Different Teletext systems including System B (WST)	Included as a separate PID.

Teletext Extraction

Line filters can be invoked to selectively disable any individual lines in this range. The filters are provided to allow the user to ensure that non-Teletext lines (e.g. ITS lines) are not erroneously extracted. The extracted Teletext lines are formatted into PES packets according to the DVB specification. The Teletext PES packets are time stamped to allow correct alignment of subtitling captions with decoded video.

The following Teletext services are extractable:

- System B (WST) Teletext
- Video Programming Teletext (VPT)
- Programme Delivery Control (PDC)
- Inverted Teletext

1.6 Guided Tour

1.6.1 Enclosure

The enclosure is 1U height and can be freestanding or mounted in a 19-inch rack. All inputs and outputs are via rear panel connectors.

1.6.2 Front Panel Description

The Encoder provides navigation keys to access and input data. There are two LED indicators, located on the left of the front panel (see *Figure 1.2*).

The front panel display and navigation keys are used as a local control method to set up and configure the Encoder (see *Chapter 4, Operating the Equipment Locally*). They can also be used as a quick method for accessing the status of the equipment.

Table 1.5: Front Panel Indicators

Indicator	Colour	Description
Alarm	Red	This LED is lit when the Encoder has detected an alarm condition.
Power	Green	This LED is lit when the Encoder is receiving power.

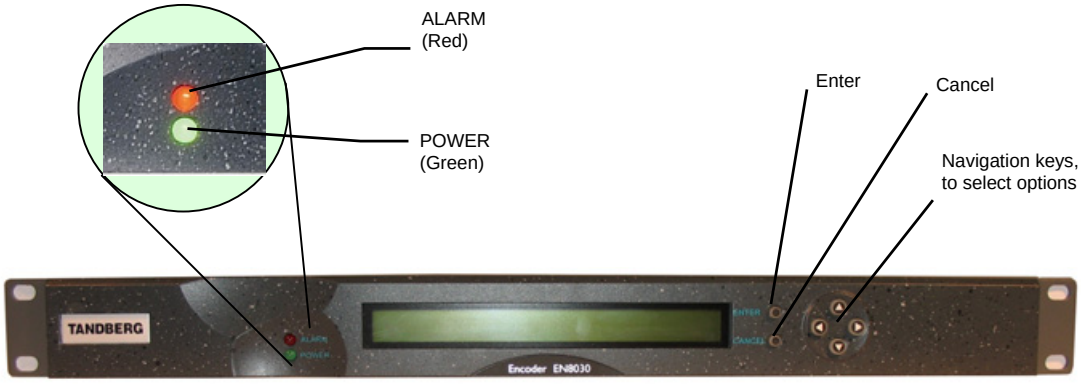


Figure 1.2: Front Panel Indicators

1.6.3 Rear Panel Description

The Encoder provides connectors at the rear panel (see *Chapter 2, Installing the Equipment*). All, except the power connector, are physically located on the separate modules that comprise the Encoder.

BLANK

Chapter 2

Installing the Equipment

Contents

List of Figures

List of Tables

2.1 Introduction

2.1.1 Read This First!

The Encoder must be handled carefully and thoughtfully to prevent safety hazards and damage. It is usually supplied as part of a system installed by TANDBERG Television engineers. In any case, ensure the personnel designated to install the unit have the appropriate skills and knowledge. If in any doubt, contact Customer Services.

Follow the instructions for installation and only use installation accessories recommended by the manufacturers.

2.1.2 Site Requirements

Power Supplies

Models EN8030/BAS SD Encoder and EN8090/BAS HD Encoder operate from a 100-120 Vac, 220-240 Vac supply.
Models EN8030/BAS/48V SD Encoder and EN8090/BAS/48V HD Encoder operate from a -48 Vdc supply.

See *Annex B, Technical Specification* for a full specification.

Environment

See *Annex B, Technical Specification* for a full specification.

Do not install this product in areas of high humidity or where there is danger of water ingress.

Lightning Protection

WARNING...

IF THE ENCODER HAS BEEN SUBJECT TO A LIGHTNING STRIKE OR POWER SURGE, WHICH HAS STOPPED IT WORKING, DISCONNECT THE POWER IMMEDIATELY. DO NOT REAPPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

Where appropriate, ensure this product has an adequate level of lightning protection. Alternatively, during a lightning storm or when it is left unattended and unused for long periods of time, unplug it from the supply outlet and disconnect the output equipment. This prevents damage to the product due to lightning and power line surges.

2.1.3 EMC Compliance Statements[1]

EN 55022 / AS/NZS 3548

This equipment is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

[1] The EMC information was correct at the time of manufacture. The EMC tests were performed with the Technical earth attached.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

2.2 Preliminary Checks

2.2.1 Mechanical Inspection

When taking delivery of an Encoder, check the equipment items delivered against the enclosed delivery note. Inspect the equipment for damage in transit. If in doubt, contact Customer Services (see *Preliminary Pages*).

> NOTE...
>
> Do not remove the covers of this equipment as doing so may invalidate any warranties, cause a safety hazard and/or affect the EMC performance. It may also invalidate any safety tests. Check with Customer Services beforehand.

2.2.2 Moving the Equipment Safely

Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury and serious damage to the product. Use only with a cart, stand, bracket or table recommended by TANDBERG Television.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

Do not move or carry the equipment whilst it is still connected to the supply or other leads, is live or is in operation.

2.3 Installing the Equipment

2.3.1 Fixing Method

The Encoder can be operated mounted in a 19-inch rack. Ensure that it is firmly and safely located and has an adequate through-flow of air.

Slide the Encoder onto the chassis supports and affix to the rack by means of an M6 x 18 mm panhead screw in each corner (see *Figure 2.1*).

CAUTIONS...

1. The unit must be supported by either a mounting-shelf or equipment beneath it and not suspended solely by the front-panel mounting screws.
2. Do not use this product as a support for any other equipment.

Figure 2.1: Fitting the Encoder into a Rack

2.3.2 Cable Routing

Power supply cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cables at plugs, convenience receptacles, and the point where they exit from the appliance.

Do not run a.c. power cables in the same duct as signal leads.

2.3.3 Equipment Access

WARNING...

BERYLLIUM COPPER FINGER STRIPS ARE USED IN THIS EQUIPMENT TO SEAL THE ENCLOSURE FOR EMI PROTECTION. THIS ARRANGEMENT IS PERFECTLY SAFE DURING NORMAL OPERATION. DO NOT FILE THE STRIPS OR OTHERWISE CAUSE THEM TO PRODUCE DUST OR PARTICLES. ANY CUTS CAUSED BY THE STRIP SHOULD BE TREATED APPROPRIATELY.

Ensure that the Encoder is installed in such a way as to allow access to the rear of the unit and the connectors.

2.3.4 Ventilation

WARNING...

NEVER PUSH OBJECTS OF ANY KIND INTO THIS EQUIPMENT THROUGH OPENINGS AS THEY MAY TOUCH DANGEROUS VOLTAGE POINTS OR SHORT-OUT PARTS THAT COULD RESULT IN A FIRE OR ELECTRIC SHOCK. NEVER SPILL LIQUID OF ANY KIND ON THE PRODUCT.

CAUTIONS...

1. Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a rack unless proper ventilation is provided or the instructions have been adhered to.
2. Do not install equipment so that the air intake of one aligns with the outlet on another. Provide baffles and adequate spacing.
3. The fans contained within this unit are not fitted with a dust/insect filter. Pay particular attention to the environment in which it is to be used.

The unit is designed for stationary or fixed use only. Ensure it is firmly and safely located and has an adequate through-flow of air. Allow at least 50 mm free air-space on each side of the equipment. Units in racks can be stacked without ventilation panels between. Racks containing stacked equipment may need to be forced-air cooled to reduce the operating ambient temperature. For stacking constraints contact Customer Services.

Figure 2.2: Air Path Through the Enclosure

2.4 A.C. Mains Operating Voltage and Earthing

2.4.1 A.C. Power Supply

CAUTION...

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your business, consult a qualified electrical engineer or your local power company.

See *Annex B, Technical Specification* for a full power supply specification. There are no links or switches to be altered for operation from different supplies.

2.4.2 Power Cable and Earthing

General

Check that the a.c. power cable is suitable for the country in which the Encoder is to be used.

WARNINGS...

1. IF THE MOULDED PLUG FITTED TO THE MAINS CABLE SUPPLIED WITH THIS UNIT IS NOT REQUIRED, PLEASE DISPOSE OF IT SAFELY. FAILURE TO DO THIS MAY ENDANGER LIFE AS LIVE ENDS MAY BE EXPOSED IF THE REMOVED PLUG IS INSERTED INTO A MAINS OUTLET.
2. POWER-SUPPLY CORDS SHOULD BE ROUTED SO THAT THEY ARE NOT LIKELY TO BE WALKED ON OR PINCHED BY ITEMS PLACED UPON OR AGAINST THEM, PAYING PARTICULAR ATTENTION TO CORDS AT PLUGS, CONVENIENCE RECEPTACLES, AND THE POINT WHERE THEY EXIT FROM THE APPLIANCE.

The unit is supplied with three, detachable mains-supply cables fitted with molded plugs suitable for the USA, UK or Europe.

The wires in the mains cable are colored in accordance with the wire color code shown in *Table 2.1*.

Table 2.1: Supply Cable Wiring Colors

	UK (BS 1363)	EUROPE (CEE 7/7)	USA (NEMA 5-15P)
Earth:	Green-and-yellow	Green-and-yellow	Green
Neutral:	Blue	Blue	White
Live:	Brown	Brown	Black

Protective Earth/Technical Earth

WARNINGS...

1. THIS UNIT MUST BE CORRECTLY EARTHED THROUGH THE MOULDED PLUG SUPPLIED. IF THE LOCAL MAINS SUPPLY DOES NOT HAVE AN EARTH CONDUCTOR DO NOT CONNECT THE UNIT. CONTACT CUSTOMER SERVICES FOR ADVICE.
2. BEFORE CONNECTING THE UNIT TO THE SUPPLY, CHECK THE SUPPLY REQUIREMENTS IN ANNEX B.

The unit has a Technical earth terminal (marked with ⏚) located at the rear panel. Its use is recommended. This is **NOT** a Protective earth for electric shock protection. The terminal is provided to:

1. Ensure all equipment chassis fixed within a rack are at the same Technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.
2. Eliminate the migration of stray charges when connecting between equipment.

WARNING...

IF THE TERMINAL SCREW HAS TO BE REPLACED, USE AN M3 X 6MM LONG POZIDRIV PANHEAD.

USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

Connecting the Encoder to the A.C. Power Supply

WARNINGS...

1. DO NOT OVERLOAD WALL OUTLETS AND EXTENSION CORDS AS THIS CAN RESULT IN A RISK OF FIRE OR ELECTRIC SHOCK.
2. AS NO MAINS SWITCH IS FITTED TO THIS UNIT, ENSURE THE LOCAL AC POWER SUPPLY IS SWITCHED OFF BEFORE CONNECTING THE SUPPLY CORD.
3. THE ENCODER IS NOT FITTED WITH AN ON/OFF SWITCH. ENSURE THAT THE SOCKET-OUTLET IS INSTALLED NEAR THE EQUIPMENT SO THAT IT IS EASILY ACCESSIBLE. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

To connect the unit to the local a.c. power supply:

1. Ensure the local a.c. supply is switched OFF.
2. Ensure the correct fuse type and rating has been fitted to both the equipment and the a.c. power cable.
3. Connect the a.c. power lead to the Encoder mains input connector and then to the local mains supply.

2.5 -48 Vdc Power Supply

2.5.1 D.C. Power Supply

Note...

Only model EN8030/BAS/48V and EN8090/BAS/48V use a d.c. power supply.

CAUTION...

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your business, consult a qualified electrical engineer.

This product uses a –48 Vdc power supply source (see *Annex B, Technical Specification* for a full power supply specification).

For wiring d.c. power a minimum wire size of 1.0mm^2 (17AWG) is recommended. This may need to be increased for longer cable runs. For protection of the d.c. wiring a circuit breaker of maximum 10A is recommended.

2.5.2 Location of the D.C. Input Connector

The connector is located at the right-hand rear of the equipment.

WARNING...

THE –48 VDC ENCODER IS NOT FITTED WITH AN ON/OFF SWITCH. ENSURE THAT THE SUPPLY HAS A SUITABLE MEANS OF ISOLATION THAT IS EASILY ACCESSIBLE. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

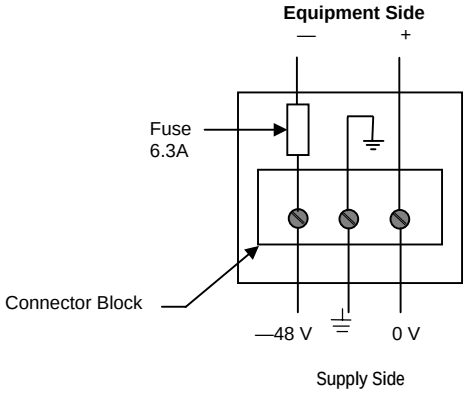


Figure 2.3: Connector Block for -48 Vdc Input

The equipment fuse is held in an integral fuse carrier at the d.c. power inlet at the rear of the Encoder. See *Annex B, Technical Specification* for d.c. fuse information.

2.5.3 Connecting the Equipment to the D.C. Power Supply

NOTE...

This equipment is not intended for direct connection to centralised d.c. power systems in the USA or Canada.

Connect the Encoder to the local d.c. power supply as follows.

1. **Local d.c. Power Supply**
   Ensure the local d.c. supply is isolated.
2. **Encoder**
   Ensure the correct fuse is fitted.
3. **Supply Cord**
   Connect the d.c. lead to the Encoder input connector and then to the local d.c. power supply. Switch on the d.c. power supply.

2.5.4 Protective Earth/Technical Earth

The unit has a Technical earth terminal (marked with ⏚) located at the rear panel (see *Figure 2.3*). Its use is recommended. This is **NOT** a Protective earth for electric shock protection. The terminal is provided to:

- Ensure all equipment chassis fixed within a rack are at the same Technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.
- Eliminate the migration of stray charges when connecting between equipment.

WARNING...

IF THE TERMINAL SCREW HAS TO BE REPLACED, USE AN M3 X 6MM LONG POZIDRIV PANHEAD. USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

2.6 Signal Connections For the Basic Unit

2.6.1 Introduction

All signal connectors are located at the rear panel of the Encoder. For a detailed interface specification see *Annex B, Technical Specification*.

Always use the specified cables supplied for signal integrity and compliance with EMC requirements (see *Annex B, Technical Specification*).

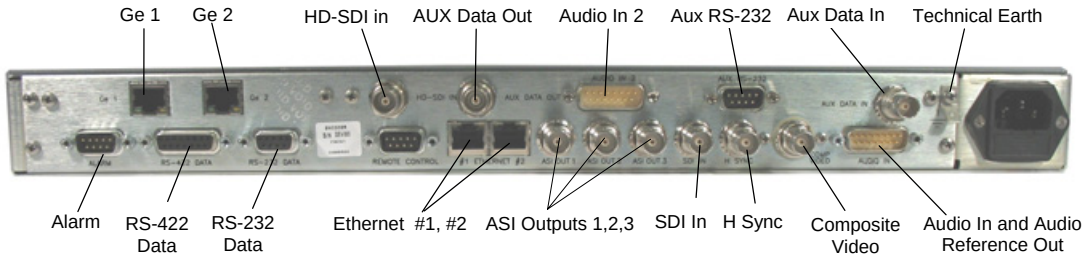


Figure 2.4: Typical Rear Panel Component Parts and Connectors

2.6.2 Connecting Up the Basic Encoder

Once the unit has been installed in its intended operating position, it is ready to be connected up to the rest of the system equipment (see *Figure 2.5*), providing it too has been installed (see *page 2-11* onwards for pin-out details of the connectors).

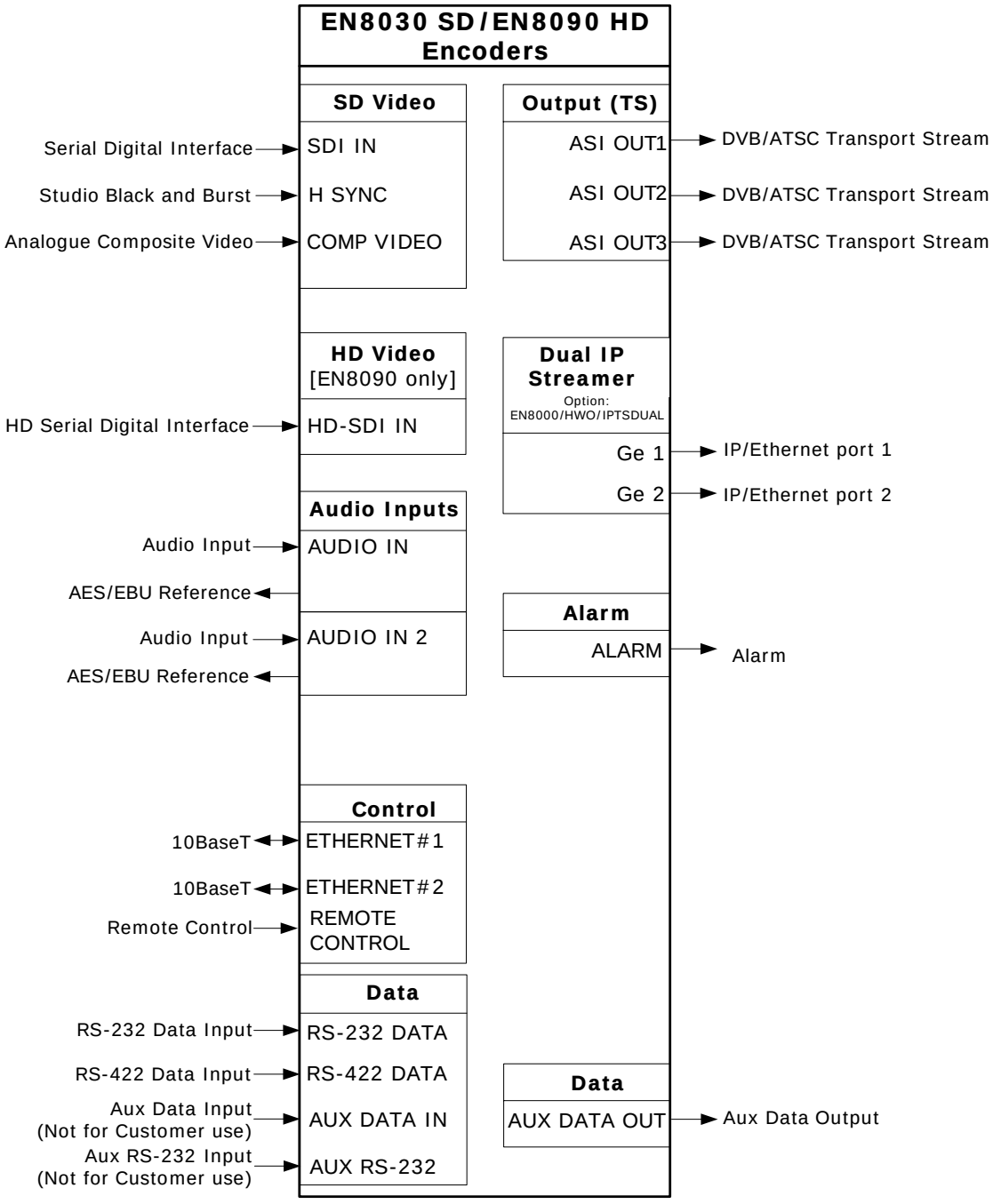


Figure 2.5: Equipment Connections for the Basic Unit

Do not move or install equipment whilst it is still attached to the mains supply. Ensure ESD precautions are observed whilst interconnecting equipment.

> NOTE...
> See *Chapter 3* for information relating to Options and Upgrades.

2.6.3 Power Supply

Section 2.4, A.C. Mains Operating Voltage and Earthing and Section 2.5, -48 Vdc Power Supply provides details of the a.c power supply connection, protective earthing and safety.

Read all the instructions carefully and take note of all warnings and cautions.

2.6.4 Technical Earth

Connect the Encoder's Technical earth to a suitable point.

2.6.5 Video Inputs

SDI IN

A 75 Ω BNC connector provides a serial digital video input to the unit. This input is terminated in 75 Ω.

The serial input supports error detection and handling (EDH) as defined by the specification SMPTE RP 165-1994, 'Error Detection Checkwords and Status Flags for Use in Bit Serial Digital Interfaces for Television'.

Table 2.2: SDI Connector

Pin	Signal
Centre	Video Input
Screen	Ground
Impedance	75 Ω

H SYNC

Studio Black and Burst should be fed to the 75 Ω BNC connector (H SYNC). This will then genlock the Encoder to the Studio system. This method may be required with some audio formats. For details on the genlocking system see *Annex F, Audio Modes*.

Table 2.3: H SYNC Connector

Pin	Signal
Centre	Video Input
Screen	Ground
Impedance	75 Ω

COMP VIDEO

A 75 Ω BNC connector provides a high quality analogue video input to the unit. See *Chapter 4, Operating the Equipment Locally, Video Input Option* for the types of video and selection method.

> NOTE...
> The input is differential to prevent 50 Hz/60 Hz hum.

Table 2.4: COMP VIDEO Connector

Pin	Signal
Centre	Video Input
Screen	Video Input Return
Impedance	75 Ω

HD-SDI IN

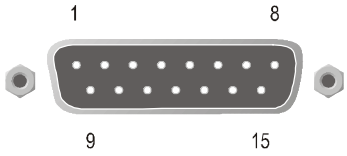
A 75 Ω BNC connector as described in *Table 2.5* provides a serial digital video input to the unit. This input is terminated in 75 Ω. Care must be taken over the selection of the cable type used because of the higher frequencies associated with HD-SDI.

Table 2.5: HD-SDI Connector

Pin	Signal
Centre	Signal
Screen	Ground
Impedance	75 Ω

2.6.6 Audio Inputs

AUDIO IN 2



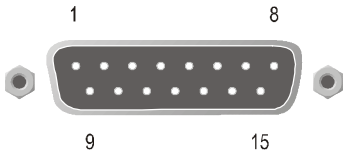
Connect the audio cable to the **AUDIO IN 2** connector. The 15-way, D-type male connector is used to provide four stereo pairs of AES/EBU digital audio.

The Encoder is supplied with a **break-out cable**, which plugs into this connector, and provides a more convenient means of connecting the audio signals via five connectors. There are four XLR female connectors, with the fifth cable being a BNC that provides an AES/EBU 75 Ω digital reference output.

Table 2.6: Audio In 2 Connector

Pin	Signal		Pin	Signal	
	Analogue	Digital		Analogue	Digital
1	Left Channel A (+)	AES/EBU (A) (+)	9	Left Channel A (-)	AES/EBU (A) (-)
3	Right Channel A (-)		10	Right Channel A (+)	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
6	Right Channel B (-)		13	Right Channel B (+)	
7		AES/EBU Reference (Signal)	15		AES/EBU Reference (Ground)
Pins 2, 5, 8, 11, 14: Not connected					

AUDIO IN



Connect the audio cable to the **AUDIO IN** connector. The 15-way, D-type male connector is used in different ways according to the audio input and the encoding configuration selected.

The connector provides two stereo pairs. They may be independently configured as either analogue or digital. The left channel is used to input digital audio.

The Encoder is supplied with a **break-out cable**, which plugs into this connector, and provides a more convenient means of connecting the audio signals via five connectors. There are four XLR female connectors, with the fifth cable being a BNC that provides an AES/EBU 75 Ω digital reference output.

Table 2.7: Audio In Connector

Pin	Signal		Pin	Signal	
	Analogue	Digital		Analogue	Digital
1	Left Channel A (+)	AES/EBU (A) (+)	9	Left Channel A (-)	AES/EBU (A) (-)
3	Right Channel A (-)		10	Right Channel A (+)	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
6	Right Channel B (-)		13	Right Channel B (+)	
7		AES/EBU Reference (Signal)	15		AES/EBU Reference (Ground)
Pins 2, 5, 8, 11, 14: Not connected					

NOTES...

1. In analogue mode termination is either 20 kΩ or 600 Ω.
2. In AES/EBU mode termination is 110 Ω.
3. When the Encoder is powered down the digital channel is selected with 110 Ω termination. The XLR cable for the digital input for Channel A is called “Left A” and the XLR cable for the digital input for Channel B is called “Left B”.
4. The digital audio input does not support SPDIF. If for test purposes, the output of consumer device such as a DVD player is used as the source, the voltage and current levels of the SPDIF output need to be changed to AES/EBU levels.
5. In order to comply with EMC regulations, use the audio break-out cable supplied with the unit.

2.6.7 ASI OUT 1, 2 and 3 Outputs

Connect the receiving equipment ASI cable to the appropriate ASI OUT connector, using good quality 75 Ω coaxial cable.

A 75 Ω BNC connector provides the ASI output from the Encoder.

Table 2.8: ASI OUT 1, 2 and 3 Connectors

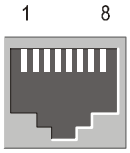
Pin	Signal
Centre	Signal
Screen	Ground

2.6.8 Control Interfaces

Connection

Operation of the Encoder from a TANDBERG Television control system is via the control Ethernet network running a web browser or nCompass Control on a remote PC. Local control is implemented through the front panel keypad and display. See *Chapter 4, Operating the Equipment Locally* for details of how to access the front panel menus and *Chapter 5, Web Browser Interface* for details of how to access the Encoder using a web browser.

Ethernet #1 and #2

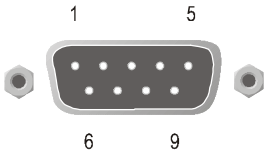


An eight-way, RJ-45 connector provides a 10BaseT Ethernet interface for communications with the nCompass Control or web browser for control and monitoring. The Encoder has a single switched Ethernet channel. Ethernet1 is selected as default at power up. If a carrier is not detected on Ethernet1 then the input switches to Ethernet2. This gives a redundant Ethernet control via two hubs.

Table 2.9: Ethernet #1 and #2 Connector

Pin	Signal	Pin	Signal
1	Tx Out (+)	4-5	Not connected
2	Tx Out (-)	6	Rx In (-)
3	Rx In (+)	7-8	Not connected

Alarm

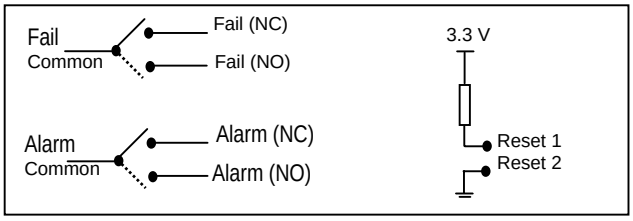


If required, connect an external status monitoring device to the **ALARM** connector.

A 9-way, D-type male connector provides an alarm relay interface that can be used to send a signal to remote equipment.

Table 2.10: Alarm Connector

Pin	Signal	Pin	Signal
1	Ground	6	Fail (NO)
2	Fail (common)	7	Fail (NC)
3	Alarm (NO)	8	Alarm (common)
4	Alarm (+) (NC)	9	Reset 2 (internally grounded)
5	Reset 1 (internally pulled to 3.3 V via 10 kΩ)		



NOTE...

NC = Normally Closed, NO = Normally Open, and refers to the relay contacts. Refer to *Annex B* for details of the relay contact rating.

2.6.9 Data

RS-232 Connector

A 9-way, D-type female connector provides an RS-232 asynchronous, serial communications data input interface.

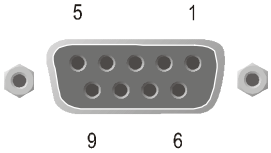


Table 2.11: RS-232 Data Connector (Base Board) - Asynchronous

Remote (DTE) Male			Encoder RS-232 (DTE) Female	
Signal Name	Pin	Signal Direction	Pin	Signal Name
Received Data	2	←	2	Received Data
Transmit Data	3	→	3	Transmit Data
Signal Ground	5	—	5	Signal Ground
Pins 1, 4, 6, 7, 8, 9: Not connected				

NOTES...

1. Signal names are with respect to a DTE in accordance with the RS-232 specification.
2. Remote pin numbers only apply to a 9-way D-type connector.
3. 25-way connectors have Received Data on pin 3 and Transmit Data on pin 2 (see *RS-232 specification*).
4. XON/OFF flow control may be used with this port.

RS-422 Connector

A 15-way, D-type female connector provides an RS-422 synchronous, serial communications data input interface.

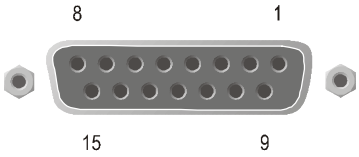


Table 2.12: RS-422 Data Connector (Base Board) - Synchronous

Remote (DTE)		Encoder RS-422 (DCE)	
Signal Name	Signal Direction	Pin	Signal Name
Transmit Data A	→	2	Transmit Data A
Transmit Clock A	→	7	Transmit Clock A
Signal Ground	—	8	Signal Ground
Transmit Data B	→	9	Transmit Data B
Transmit Clock B	→	14	Transmit Clock B
Pins 1, 3, 4, 5, 6, 10, 11, 12, 13, 15: Not connected			

NOTE...

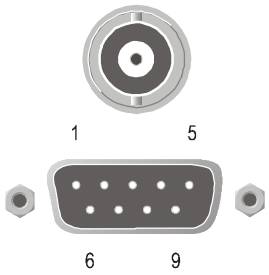
Signal names are with respect to a DTE in accordance with the RS-422 specification. A is positive and B is negative.

AUX DATA IN

A 75 Ω BNC connector provides an ASI input which is not for use by general end user.

AUX DATA OUT

HD-SDI output. This output is not guaranteed to meet the HD-SDI specification.



AUX RS-232

A 9-way, D-type male connector provides an RS232 connection for use by Tandberg Television engineers for unit diagnostics.

2.7 Powering Up/Down

2.7.1 Before Powering Up

Before powering up the Encoder, check that:

1. The unit has been installed in a suitable location.
2. The unit has been connected to external equipment and power supply, as required.
3. The power supply has been checked and a good earth provided.
4. The correct fuse type and rating has been fitted to the equipment and, for the a.c. supply version, the a.c. power cable.

2.7.2 Powering Up

To power up the Encoder:

1. Turn on the local power supply. The Encoder executes a series of power up initialisation and self-test routines.
2. Confirm that the green Power LED is lit and that the red Alarm LED is unlit.

After the boot period the Encoder start-up screen is displayed.

> NOTES...
>
> 1. The fans on the Encoder can be temperature controlled so may not be on if the ambient temperature is low. Refer to *Annex B, Technical Specification* for more information.
> 2. During initialisation invalid PIDs may appear momentarily in the transport stream.

2.7.3 Powering Down

To power down the Encoder remove the power supply connection at the rear of the unit.

2.7.4 Setting the Encoder Control IP Address

The IP address and network mask of the Encoder Control port should only be changed from the front-panel as all of the other control methods use the control port and hence need its address, to control the encoder.

The items reside as options in the Remote Control menu of the System menu. Using the keys on the front panel, select:

Setup->System->Remote Control.

The IP address is the first option, the network mask is the third option and the gateway address is the fourth option.

Chapter 3

Options and Upgrades

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3.1 What's Available

3.1.1 Hardware Options

The basic Encoder functionality can be enhanced with the inclusion of options, hardware and software.

A hardware option module consists of a horizontally mounted PCB with rear panel connector space. At reset, the software of the Encoder detects which modules are fitted and configures them as necessary. See *Table 3.1* for the hardware options.

Table 3.1: Hardware Option Module Positions

Marketing Code	Name	Slot No.	Max No. of Cards
Daughter Card Options			
EN8000/HDC/AUD	Extra Audio Encoding Daughter Card Provides 5.1 audio service and a stereo audio service [Part No: S14019+S14285]	0 (not a slot option - fits on the Motherboard)	1
Hardware Options			
EN8000/HWO/IPTSDUAL	Dual IP/Ethernet Output Card [Part No: S13600].	1	1

> NOTE...
> Empty option slots must be fitted with a blanking plate.

3.1.2 Limitations on Number of Option Modules

In all EN8000 Encoders Option Slot 2 is occupied by the Intelligent Compression Engine (ICE) that fills the ⅔-width from the right looking at the back of the unit. This leaves space for an optional single ⅓-width card in Option Slot 1. Currently the only option supported in this slot is the Dual IP/Ethernet card (if TS over IP is required).

<table>
<tr><td>SLOT 1</td><td colspan="2">SD H.264 VCM + EN8000/HDC/AUD</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

3.1.3 Software Options

When the appropriate software option has been purchased it is enabled in the Encoder, which resets and displays the appropriate menu items. See *Table 3.2* for the software options.

Table 3.2: Purchasable Software Options

Marketing Code	Name
EN8000/SWO/AC3	This enables the use of the Dolby Digital audio encoder. The associated menu includes a full set of informative parameters to allow the header bits for the frames to be correct. Contact Customer Services for more details. This license adds the option Dolby Digital to the menu item Coding Standard in the MPEG-2 Audio menu.
EN8000/SWO/AAC	Enables the option of MPEG-2 AAC audio encoding
EN8000/SWO/HEAAC	This enables the use of the MPEG-4 HE-AAC encoding profile in the Advanced Audio module. This produces AAC bitstream that is compliant to ISO/IEC 14496-3 encapsulated in LATM/LAOS and can produce reasonable stereo reproduction as low as 56 kbit/s. Contact Customer Services for more details. This license adds the option MPEG-4 HE-AAC to the menu item Coding Standard in the Advanced Audio menu.
EN8000/SWO/HEAACV2	Enables the option of MPEG-4 HE-AAC v2 audio encoding
EN8000/SWO/NR	This allows the operator to switch a noise reduction filter within the video pre-processing unit. This is used when the incoming video feed has unwanted noise. Contact Customer Services for more details. The purpose of this function is to remove noisy artifacts in the video image that are not considered integral to the image. Removing the noise improves the quality of the encoding by removing the artifacts that detract from the viewing experience and so allocate more bits for the encoding of the true image. This is a pre-processor function that applies directly to the input video. Hence, it is applicable to all video encoding within the unit. This license adds the option `Noise Reduction` to the `Video Source` menu.
EN8000/SWO/PIP	This enables the generation a reduced-resolution video image alongside the main fullscreen video and is commonly known as PiP (picture-in-picture) – see *Chapter 5* for options. The video is sourced from the selected video source. Contact Customer Services for more details.
EN8000/SWO/VBR	Allows Variable Bitrate operation.
EN8000/SWO/REFLEX	This allows the unit to be used within a Reflex multiplex group. A Reflex multiplex group is a set of encoders whose output is combined through a multiplexer for a single transmission group. Then the total bitrate rather than each bitrate is fixed by the transmission mechanism. The bitrate allocation can then be distributed among the different encoders on a timely basis according to the difficultly of encoding the individual streams. The TANDBERG Television encoders use a lookahead system to estimate the bits required and a controller uses this information to determine the instantaneous bitrate for each encoder. Contact Customer Services for more details. This license is also used to enhance the `Capped VBR` mode where the `Target Quality` menu item is added to the `H.264/AVC Encoding` menu to allow the quality to be reduced to increase spare bitrate capacity.

Enabled Options

These models have some software options enabled as part of their configuration as EN8030 and E8090 Encoders. These are listed in *Table 3.3*.

Table 3.3: E8030 and E8090 Enabled Software Options

Option	Description	Availability	
		E8030	E8090
M2/ES02/VBI	Advanced VBI	✓	✓
M2/ES02/PU	Performance upgrade	✓	✓
M2/ES02/DATA	RS-232 and RS-485 data input	✓	✓
M2/ES02/CVBS	Composite video input	✓	✓
M2/ES02/ACON	Auto Concatenation	✓	✓
M2/ES02/SDI	SDI INPUT License key	✓	✓
M2/ES02/AUDIO2	MPEG-1 audio	✓	✓
EN8000/SWO/MPEG4	MPEG-4 video encoding enabled	✓	✓
EN8000/SWO/HD	Enables High Definition operation	—	✓

3.1.4 How to See Which Options are Fitted/Enabled

The Encoder has a number of hardware and software options. To see which are fitted/enabled refer to the `Build Menu` in *Chapter 5*.

3.2 Audio Daughter Card Option (EN8000/HDC/AUD)

3.2.1 Overview

The Additional Audio option daughter is fitted to the ICE card and does not have a direct external interface. The card can take its input from either digital audio embedded on the SDI or HD-SDI inputs or digital AES/EBU inputs from the Audio In 2 connector. This option supports all the standard bitrates and encoding modes associated with each compression standard.

Alternatively, the module can be used to supplement the audio encoding functionality of the Encoder. This module supports audio standards Dolby Digital, Dolby Digital Pass-through and Dolby E Pass-through. EN8000/HDC/AUD supports 12 dB, 15 dB and 18 dB and 24 dB audio clip level.

3.2.2 Connections

Audio In 2 Connector

Connect the audio cable to the 15-way, D-type male connector **AUDIO IN 2.**

The connector provides four digital AES/EBU stereo pairs.

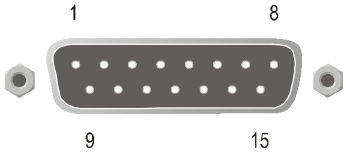

Table 3.4: Audio In Connector

Pin	Signal	Pin	Signal
1	AES/EBU (1A) (+)	9	AES/EBU (1A) (-)
3	AES/EBU (2A) (-)	10	AES/EBU (2A) (+)
4	AES/EBU (1B) (+)	12	AES/EBU (1B) (-)
6	AES/EBU (2B) (-)	13	AES/EBU (2B) (+)
7	AES/EBU Reference (Output Signal)	15	AES/EBU Reference (Ground)
2, 5, 8, 11, 14	Not connected		

NOTES...

1. In AES/EBU mode termination is 110 Ω.
2. When the Encoder is powered down the digital channel is selected with 110 Ω termination. The XLR cable for the digital input for Channel 1A is called “Left A” and the XLR cable for the digital input for Channel 1B is called “Left B”.
3. The digital audio input does not support SPDIF. If for test purposes, the output of consumer device such as a DVD player is used as the source, the voltage and current levels of the SPDIF output need to be changed to AES/EBU levels.
4. In order to comply with EMC regulations, use the audio break-out cable supplied with the unit.

CAUTION...

To ensure EMC compliance, use the audio connector supplied with the Encoder.

3.2.3 Configuring the Output

When the audio option card is fitted menu options Advanced Audio 3A, 3B, 3C and 3D become available to configure the streams.

3.3 Dual IP/Ethernet Output Card (EN8000/HWO/IPTSDUAL)

3.3.1 Overview

The Dual IP/Ethernet Output card provides two 100/1000BaseT Ethernet ports to allow direct connection to a redundant IP/Ethernet network.

The transport stream generated by the Encoder can be encapsulated in UDP packets, adding an RTP header if required, and output at up to 65 Mbit/s. Additionally it is capable of spitting the transport stream it receives from the encoder in to three separate transport streams each of which is transmitted on it's own multicast.

The mapping of MPEG-2 transport stream packets into IP data frames is done according to the protocol stack shown in *Figure 3.1*. Between one and seven MPEG-2 transport stream packets can be put in each UDP packet. The data link layer is Ethernet according to IEEE 802.3/802.3u (auto-sensing 100/1000 Mbit/s, twisted pair, via RJ-45 connector).

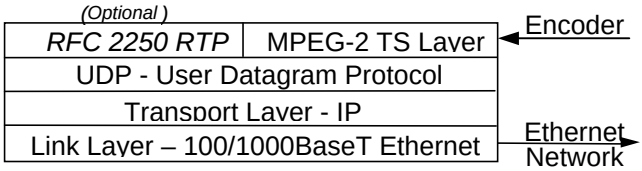

Figure 3.1: Encoder Protocol Stack

3.3.2 Assembly

The option card has 2 RJ-45 connectors called "Ge 1" and "Ge 2" as shown in *Figure 3.2*.

Rear Panel

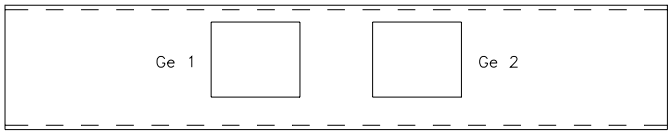

Figure 3.2: View from Back of Encoder

Ethernet Outputs

Two RJ-45 connectors provide 100/1000BaseT Ethernet ports.

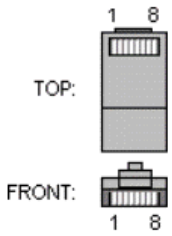

Table 3.5: RJ-45 Connector

Item		Specification
Connector Type		RJ-45
Connector designation		10/100 BT
Pin-out	1	Tx Out (+)
	2	Tx Out (-)
	3	Rx In (+)
	6	Rx In (-)
	4, 5, 7, 8	Not Connected

3.3.3 Dual IP Output Overview

Overview

This allows direct connection to a redundant IP/Ethernet network as it has two separate Ethernet connections. The menu structure is shown in *Figure 3.3*. The menu is in two parts and is described in *Section 3.3.4, Dual IPNIC Control* and *Section 3.3.5, IP Streamer Output*.

- Dual IPNIC Control: specifies the parameters associated with the card such as the IP address of the ports (see for details).
- IP Streamer Output: there is a menu associated with each Transport Stream output (see for details).

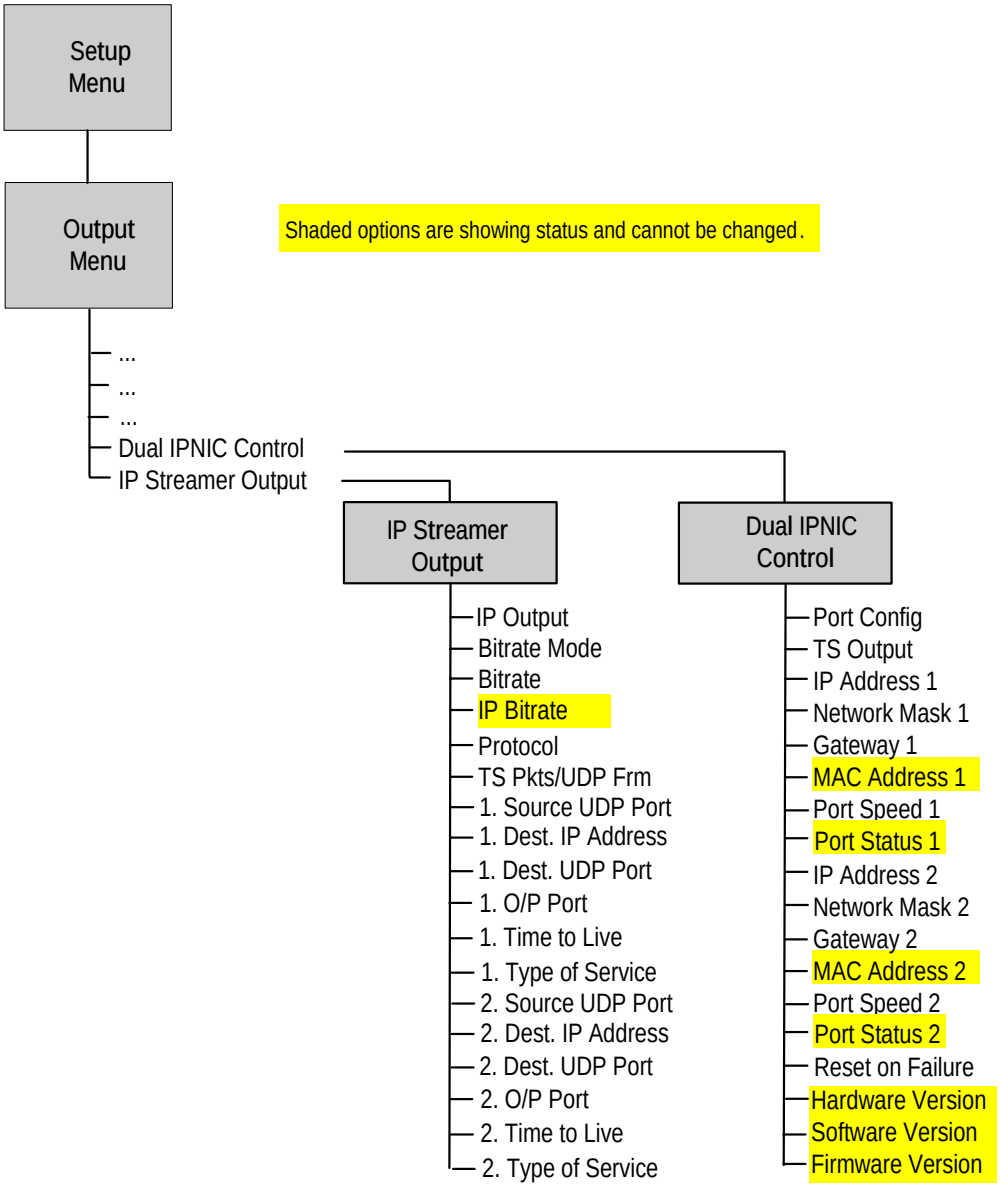

Figure 3.3: Dual IP Control and IP Streamer Output Menus

3.3.4 Dual IPNIC Control

The Dual IPNIC Control menu specifies the parameters associated with the card such as the IP address of the ports (see *Table 3.6* for details).

Table 3.6: Dual IPNIC Control Option Descriptions

Selected Item	Options	Description
Port Config: Allows the operator to select in what mode the card will operate.	Different Subnets	The two outputs have complete separate parameters to the extent that they must be on different subnets as defined by the netmask.
	Same Address	The IP address and netmask for the 2 outputs are identical so that the source address on the IP packets will be identical. However the MAC addresses remain at the factory default and are different.
	Mirrored MAC	All parameters for 2 outputs including MAC address are identical.
	The network topology and method for redundancy switching will define which is the correct option.	
TS Output: Allows the operator to determine how many different Transport Streams are generated.	Single TS	
	Multi TS	
IP Address [1][2]: Allows the operator to modify the source IP address associated with the IP/Ethernet output.		
Network Mask [1][2]: Allows the operator to modify the network mask setting associated with the IP address.		
Gateway [1][2]: Allows the operator to modify the address of the router for transmission of IP packets to other networks.		If the Destination IP Address setting indicates an IP address not residing on the local network segment, the video traffic is forwarded to this gateway address. If an address of 0.0.0.0 is used, then no video traffic is forwarded to another network. Hence, it is advisable that an address is included if possible.
MAC Address [1][2]: Displays the MAC address of the associated IP/Ethernet output. This value is set at production and cannot be changed.		This option is for status only and cannot be changed.
Port Speed [1][2]: Displays the connection status of the associated IP/Ethernet output.		
Port Status [1][2]:		This option is for status only and cannot be changed.
Reset on Failure:		
Hardware Version: Displays the hardware version of the option card.		This option is for status only and cannot be changed.
Software Version: Displays the version of the software code in the option card.		This option is for status only and cannot be changed.
Firmware Version: Displays the version of firmware code in the option card.		This option is for status only and cannot be changed.

3.3.5 IP Streamer Output

IP Streamer Output: there is a menu associated with each Transport Stream output (see *Table 3.7* for details).

Table 3.7: IP Streamer Option Descriptions

Selected Item	Options	Description
IP Output: Enables the output of the IP Streamer for the Transport Stream.		
Bitrate Mode: Determines the mode used for the bitrate control of this Transport Stream.	CBR	The bitrate of this Transport Stream is fixed at the Bitrate specified in the following option. This implies that the Transport Stream has null TS packets added to maintain the Constant Bitrate.
	VBR	All of the null TS packets are removed from the Transport Stream. This means that the output bitrate is not constant but variable dependent on the number and position of the null packets.
Bitrate: Specifies the bitrate for this service if the Bitrate Mode option is set to CBR.		If the Bitrate Mode is set to VBR, this option has no effect.
IP Bitrate:		This option is for status only and cannot be changed.
Protocol: Sets the protocol to be used for the IP/Ethernet Frame.	UDP	UDP payload contains no identifying header
	RTP	UDP payload contains an RTP header according to RFC 2250
TS Pkts/UDP Frm: Configures how many 188-byte MPEG-2 Transport Stream packets are mapped into each UDP frame.	1 - 7	For bitrates in excess of 15 Mbit/s it is recommended to use the maximum setting of 7.
[1][2].Source UDP Port: Modifies the source port of the IP packets.	0 - 65535	
[1][2]. Dest. IP Address: This is the IP address to which the video stream should be sent.		It can either be a unicast IP address or it can be a class D multicast address (224.0.0.1-239.255.255.255). Choosing a multicast IP address enables IGMPv2 support. Configuring a normal IP address turns off the IGMPv2 support again.
[1][2].Dest. UDP Port: Configures the UDP destination port field in the outgoing UDP frames and is the port upon which the receiver will receive the packets.		This can be set to any value between 0 and 65536 but it is recommended not to use values less than 1024 as these are reserved for other protocols.
[1][2].O/P Port: Defines which IP/Ethernet port is used to transmit the data.	Ge1 and Ge2	Both ports are used
	Ge1	Only Ge1 port is used
	Ge2	Only Ge2 port is used
[1][2].Time to Live: The Time-to-Live setting as specified in RFC-791.		The Time-to-Live setting is decremented by one for each device-to-device hop that the IP frame makes. When the setting reaches 0 (zero), the packet can be ignored by the network. A value greater than one is strongly recommended.
[1][2].Type of Service: The byte value of the Type-of-Service (TOS) field in the IP header as specified in RFC-791.		It is used for Class-of-service prioritization and contains precedence control, reliability, throughput and delay. Setting the value for this byte does not guarantee that the Router honoring this field.

Chapter 4

Operating the Equipment Locally

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4.1 Local Control

4.1.1 Read This First!

This Reference Guide has been written to give emphasis to control through the webpages. *Chapter 5* explains each of the options available.

4.1.2 Introduction

At switch-on the Encoder runs through a boot sequence (boot time without any option modules is approximately 85 seconds). The `Summary Screen` is displayed.

4.1.3 Navigating the Display Screens

The menu options on the display are selected and amended by one of the four navigation keys (shown as left, right, up and down arrows) and **Enter** and **Cancel** buttons (see *Figure 4.1*).

The function of the navigation keys depends where you are in the menu structure. See the following sections for details.

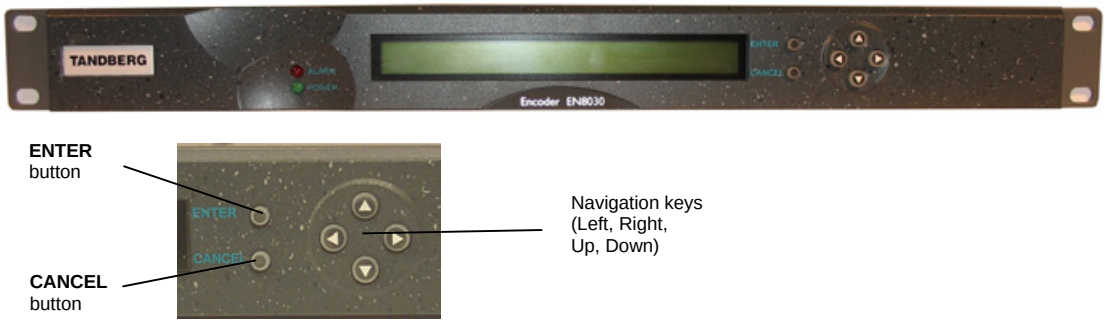

Figure 4.1: Navigation Keys and Buttons

From the `Summary Screen` select the `Main Menu` by pressing ENTER, RIGHT, UP or DOWN.

Return to the `Summary Screen` from the `Main Menu` by pressing LEFT.

4.1.4 Navigating the Menus

To navigate the menus, valid keys are:

- DOWN Scrolls down to next option in current menu
- UP Scrolls up to previous option in current menu
- RIGHT Advances to next menu level in hierarchy or selects an option for editing
- LEFT Reverts to previous menu level in hierarchy

4.1.5 Changing a Setting

For Multiple Choice Entry

Valid keys are:

- DOWN Scrolls down to next option
- UP Scrolls up to previous option
- ENTER Accepts new setting
- CANCEL Leaves setting unchanged

For Text or Numeric Entry

The character list for text entry contains the following characters:

space ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz 0123456789/+-=.,:;_!$%^&*(){}[]@'#<>?|

For numeric entry only 0-9 are displayed.

To edit the selected option press ENTER then use the keys as described below to set the required value.

- DOWN Scrolls down through character list
- UP Scrolls up through character list
- RIGHT Moves cursor one character right
- LEFT Moves cursor one character left
- ENTER Accepts new setting
- CANCEL Leaves setting unchanged
- Hold ENTER for two seconds to insert space for a character or digit
- Hold CANCEL for two seconds to delete a space, character or digit

> NOTE...
> If the number being entered can be negative then a minus sign can be inserted by pressing LEFT when the cursor is on the left-most digit. This can then be toggled between plus and minus by pressing the UP/DOWN keys.

4.2 A(udio)/V(ideo) Menu

The `A/V Menu` contains some basic video and audio options. They can all be changed with the exception of the audio input levels. These are only indicators of the current audio input level and are status only.

Only those video input selections compatible with the currently selected frame rate can be chosen from this menu. For example, if the current selection is PAL-B/G/H/I (frame rate 25 Hz) then any format except PAL-M or NTSC-M can be selected (29.97 Hz only).

4.3 Setting the Encoder Control IP Address

The Encoder can be controlled remotely via Ethernet using a web browser or XPO-compliant control software such as nCompass Control connected to Ethernet #1 or Ethernet #2. The `Remote Control Menu` provides options for configuring these interfaces. See *Chapter 2* for details.

4.4 Errors and Diagnostic Menus

The `Errors Menu` can be selected from the `Main Menu`. Active errors are updated approximately every 30 seconds. See *Chapter 8, Preventive Maintenance and Fault-finding* for information about the `Diagnostics Menu`.

4.5 Front Panel Set up Password

The set up menus (described in *Chapter 5*) can be accessed via the front panel. The menu can be protected by a password. This facility is found in the Advanced menu, which is selected from the `System Menu` by pressing the **Advanced** softkey.

Path: Summary Screen [More]> Setup> System> Advanced

If the **Set up Password** option is set to On then a password is required to change any parameters.

> CAUTION...
>
> Only set this option if you know the password! The default is: 0123456789

Another menu item, Current Password, is only available from the front panel when Set up Password = Off. When enabled, the password can be changed using this option.

For forgotten passwords, contact Customer Services.

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Chapter 5

Web Browser Interface

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5.1 Introduction

There is a range of configuration, diagnostic and other utilities that can be accessed via a web browser, such as Mozilla FireFox or Microsoft Internet Explorer.

Before these pages can be accessed it is important to ensure that the browser is correctly set up. The following procedures describe the set up using Internet Explorer, the steps are similar for FireFox.

> NOTE...
> Active Scripting must be enabled in Microsoft Internet Explorer to enable the menu functionality.

5.2 How to Set-up the Web Browser Interface

To set up Internet Explorer proceed as follows:

1. In Internet Explorer version 5, on the menu bar click **Tools, Internet Options**. This displays the **Internet Options** dialog box with tabs across the top.
2. In the **General** tab click **Settings** (see *Figure 5.1*)**.**

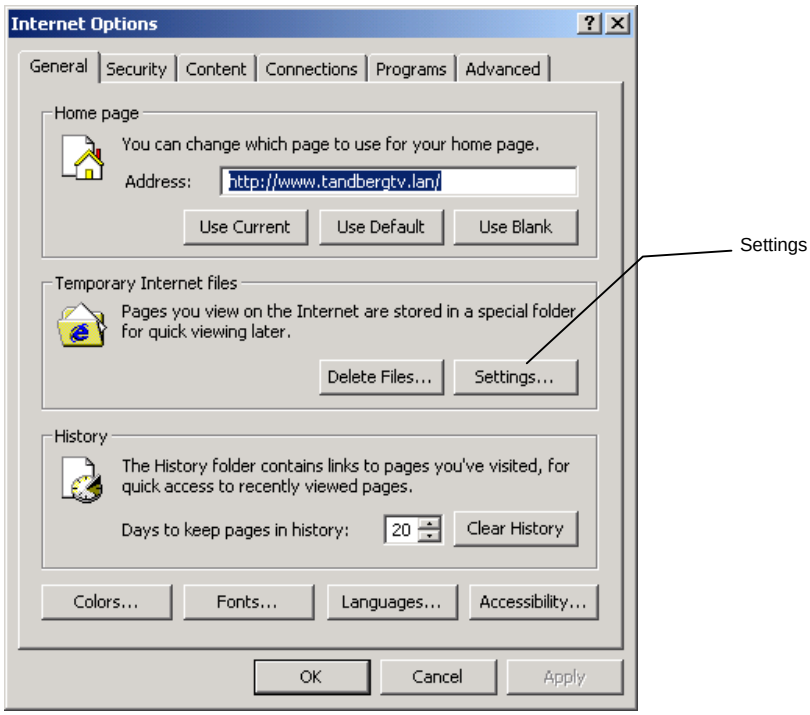


Figure 5.1: Internet Options Dialog Box

3. This opens the **Settings** dialog box (see *Figure 5.2*).

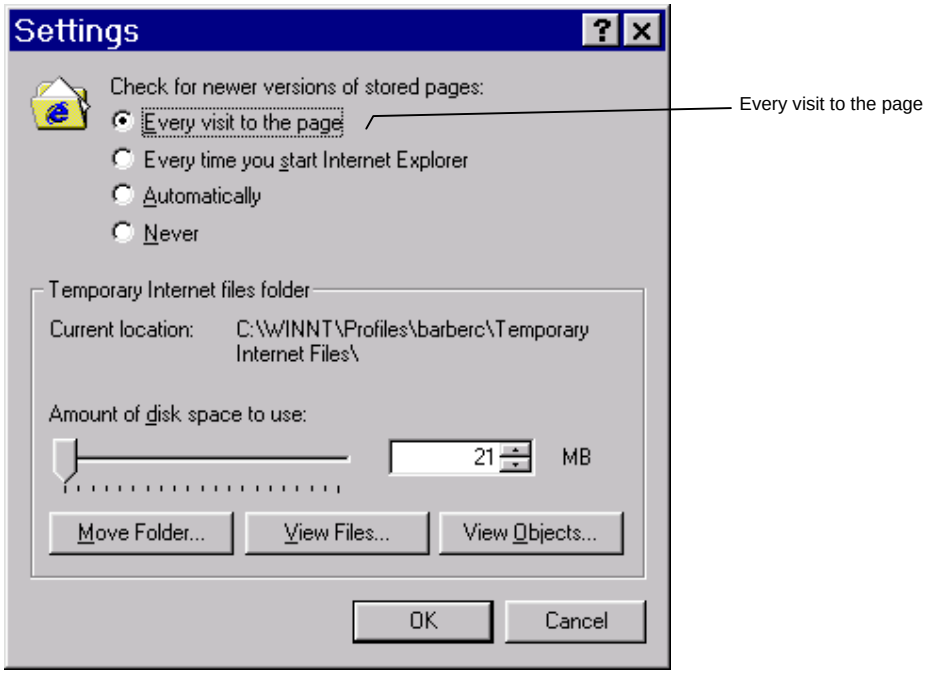


Figure 5.2: Settings Dialog Box

4. For **Check for newer versions of stored pages**, select **Every visit to the page** or any changes made to the pages will not be displayed. Click **OK** to save the changes and return to the **Internet Options** dialog box.
5. If Internet Explorer currently connects to the Internet via a proxy server then it must be reconfigured to connect directly to the Encoder, bypassing the proxy server. Click the **Connections** tab (see *Figure 5.3*).

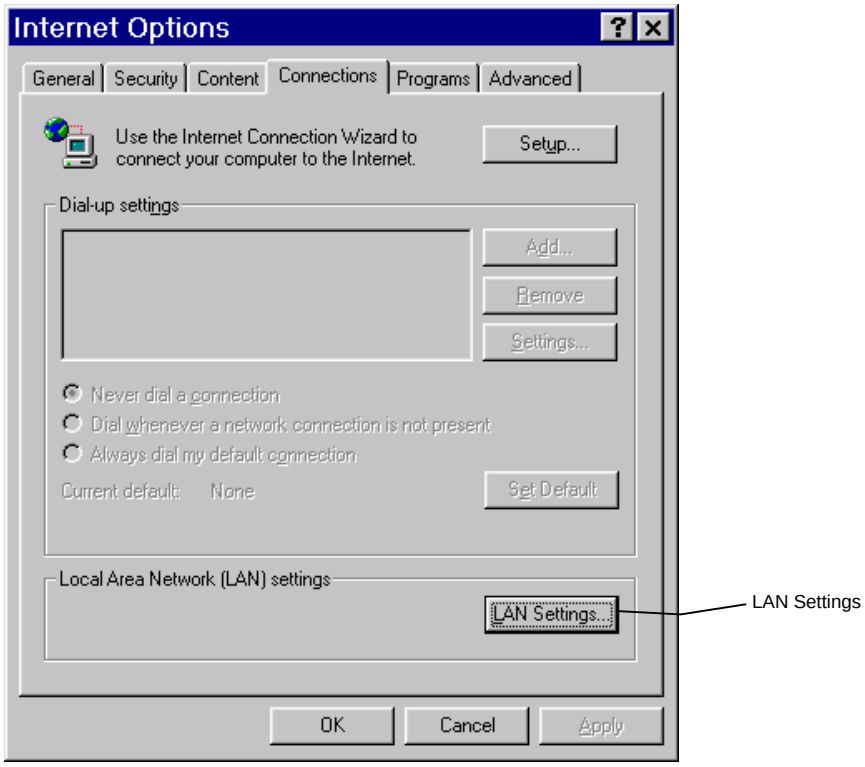


Figure 5.3: Connections Tab

6. Click **LAN Settings** to open the **Local Area Network (LAN) Settings** dialog box (see *Figure 5.4*).

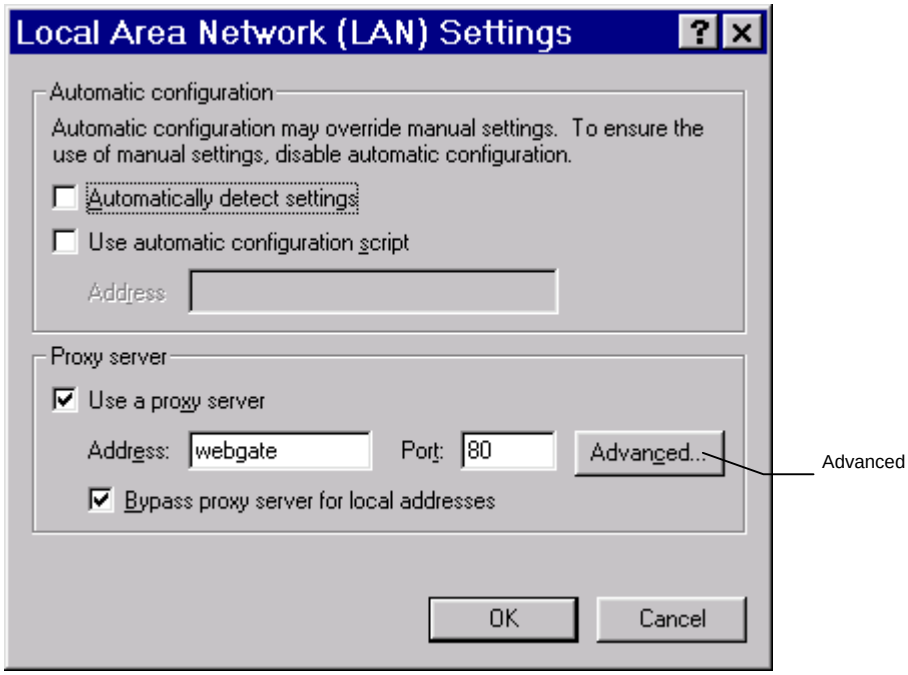


Figure 5.4: Local Area Network (LAN) Settings Dialog Box

7. Click **Advanced** to open the **Proxy Settings** dialog box (see *Figure 5.5*).

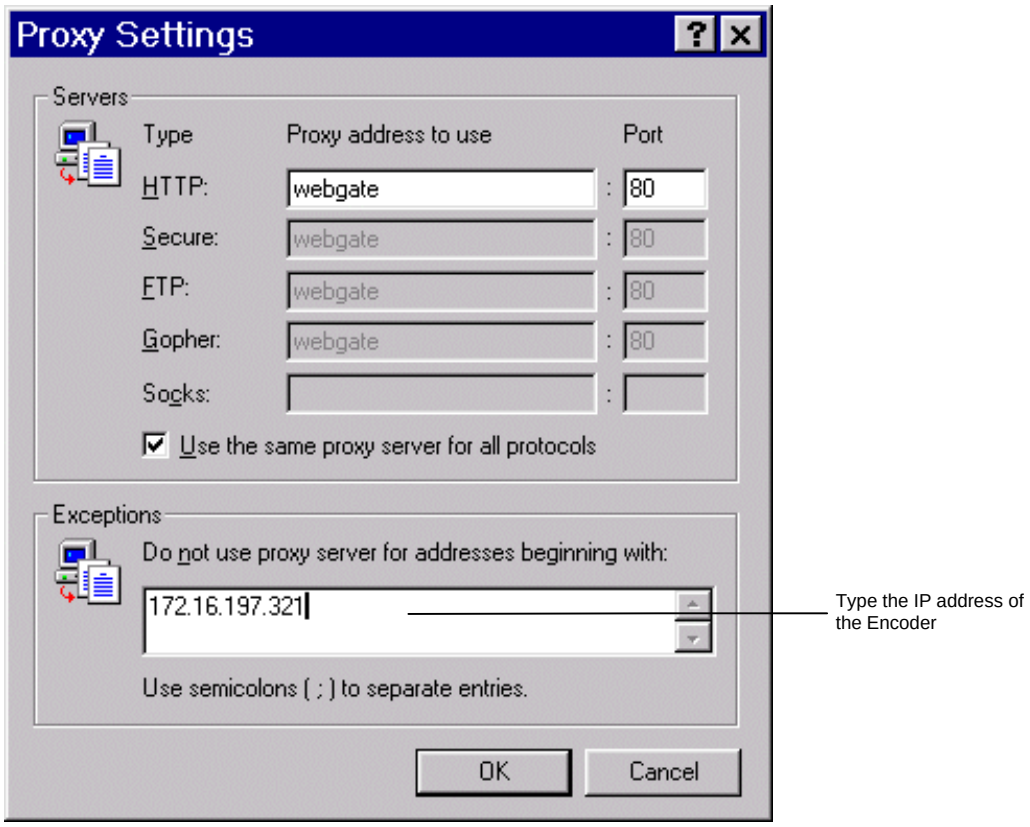


Figure 5.5: Proxy Settings Dialog Box

8. In the Exceptions area type the IP address of the Encoder.
9. Click **OK** as many times as necessary to close all dialog boxes until only the Internet Explorer window is open.

For Internet Explorer version 6 the same selections must be made, but the process starts from the **View** menu.

Once Explorer has been set up, type the IP address of the Encoder to be accessed in the address bar (e.g. http://172.16.197.245), press **Return** and a connection is established. After a few seconds, a window similar to that shown in *Figure 5.6* will be displayed.

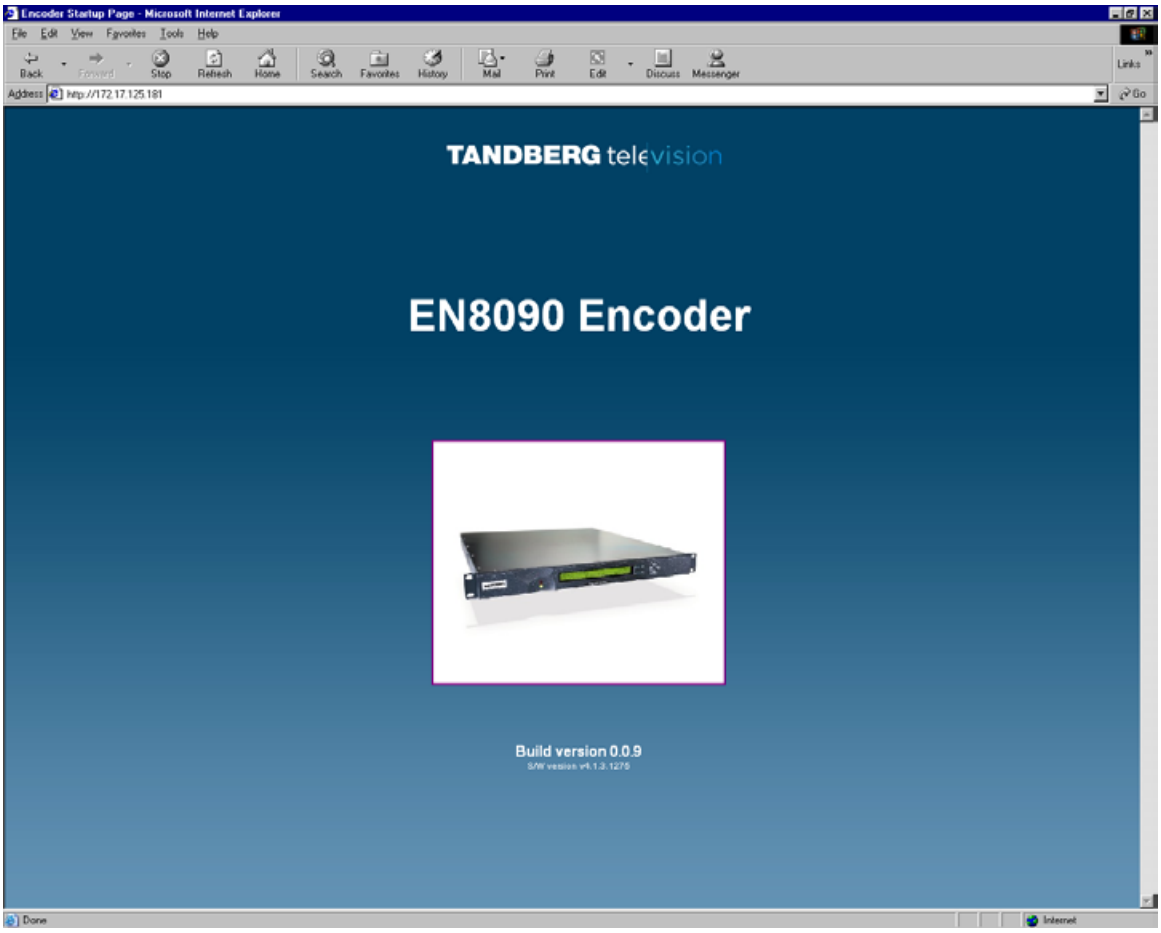


Figure 5.6: Welcome screen for Web Interface

Internet Explorer will then request a username and password to give access to the Menu system. The username is **Engineer** and the password is **password** unless this has been modified already within the Menu system.

5.3 Web Browser Interface Options

The web browser gives access to all functions available on the front panel. Status information is always displayed on the left panel along with a picture showing the video signal present at the encoder input.

The interface provides a page-based UI with a standard layout distributed across a number of tabbed dialogs. This arrangement gives access to various information and allows configuration of the Encoder. The tabbed dialogs are grouped into the following categories:

- **Status:** Detailed current status of Encoder including current active alarms.
- **Device Info**: Display and set various information. Allows alarm masks to be set and display of current, masked and latched alarms
- **Support**: Displays various information about the Encoder (useful when reporting a fault).
  - **Version Info**: Gives full information on the build status of the Encoder
  - **Backplane Modes**: The various backplane modes are shown. These indicate all the combinations of option modules allowed.
  - **Customer Support**: This page links to the TANDBERG Television Internet site.
  - **Licenced Features**: Shows a list of all the features that are and can be enabled when the appropriate licence is purchased.
  - **Installed Modules**: Gives details of which options are installed in the Encoder.
  - **Event Log**: Shows the events and tests that have been performed with the Encoder since the Encoder was last powered.
  - **NV Event Log**: Shows the actions that have been performed since the Encoder was last powered.
- **Engineering**: Utilities to help the operator of the Encoder
  - **Symbol Rate Calculator**: The Modulation Help allows you to see the difference that various parameters have upon the symbol rate and bandwidth.
  - **OFDM Bitrate Calculator**: The Bitrate Calculator allows you to enter various parameters and the optimal bitrate (Mbit/s) is automatically calculated for 204 bytes and 188 bytes.
  - **Encoder List**: Shows a list of the Encoders on the network together with various parameters.
  - **External Controller**: Gives the IP addresses of external equipment that can control the Encoder.
- **Configure**: Shows all the menus relevant to the Encoder and allows parameters relevant to encoding and the system to be set up.
  - **System Menu**
  - **Video Menu**
  - **Audio Menu**
  - **Data Menu**
  - **Mux**
  - **Output Selection**
  - **Dual IPNIC Control**
  - **IP Streamer Output**

- **Stored Configs**
  - **Load Config**: Gives a list of preconfigured settings.
  - **Save Config**: Saves the current setting to an existing prenamed configuration.
- **Save / Load**
  - **Save configuration to file**: This saves a file containing an XML description of the current Encoder settings. Forward this file to TANDBERG Television Technical Support in the event of a problem.
  - **Restore Configuration from File**: This allows a previously stored XML file to be loaded onto the encoder. This can be useful for quickly configuring units to the same settings or to restore a unit to a known state.
  - **OSD**: Download Utilities – This allows you to download an osd.zip file that consists of an OSD Creator (Creator.exe) and OSD Loader (OSD.exe). There is a logo overlay facility allowing broadcasters to trademark material whereby the Encoder is able to overlay broadcasters trademarks/logos onto the active video. See *Annex D, Creating and Downloading a Logo* for information on how to use the programs.
  - **SNMP MIB**: This option is password protected. It allows the Simple Network Management Protocol (SNMP) Management Information Base (MIB[1]) files to be downloaded from the Encoder to the PC. The password is available from TANDBERG Television Customer Services under a non-disclosure agreement (NDA).

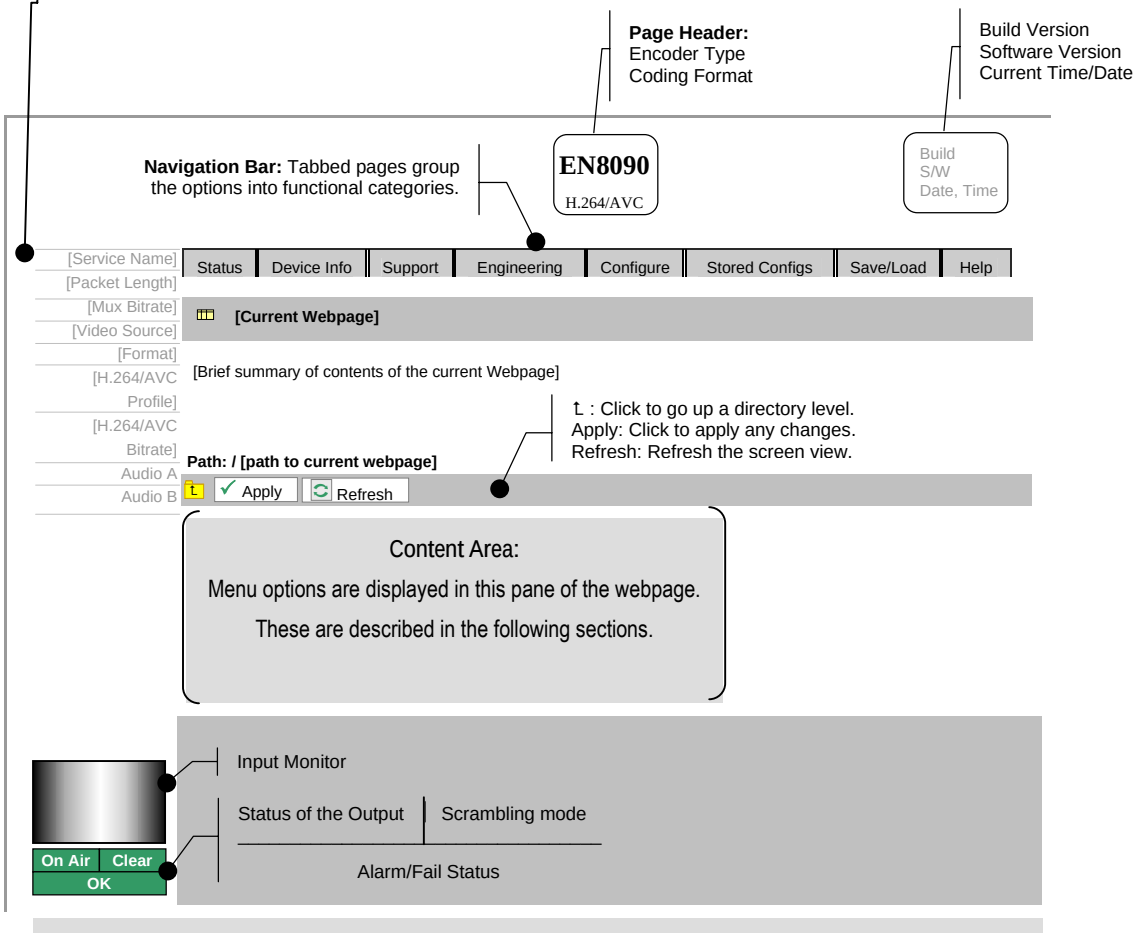
[1] A definition of management items for some network component that can be accessed by a network manager. A MIB includes the names of objects it contains and the type of information retained.

5.4 Using the Browser

5.4.1 Layout of Webpage Elements

Figure 5.7 illustrates the elements of the webpage.

Parameter	Menu Path	Source	DVB	ATSC
Service Name	Configure/System Menu/Service Info	Service Name Long Channel\ Name	✓	✓
Packet Length	Configure/Mux	Packet Length	✓	✓
Mux. Bitrate	Configure/Mux	Bitrate	✓	✓
Video Source	Configure/Video Menu/HD Video Source	HD Input	✓	✓
Frame Rate	Configure/Video Menu/SD Video Source	Frame Rate	✓	✓
Format	Configure/Video Menu/HD Video Source	HD Input Format	✓	✓
H.264/AVC Profile	Configure/Video Menu/H.264/AVC	Profile	✓	✓
H.264/AVC Bitrate	Configure/Video Menu/H.264/AVC	Bitrate	✓	✓
Audio A	Configure/Audio Menu/Audio A	Source, Audio Bitrate	✓	✓
Audio B	Configure/Audio Menu/Audio B	Source, Audio Bitrate	✓	✓



NOTE...

Additional parameters may be displayed depending upon which optional software licences are enabled.

Figure 5.7: Layout of Webpage Elements

5.4.2 Content Area

The user interface makes extensive use of Dialog Box elements. The layout and content of a particular dialog box may vary according to selections made elsewhere in the interface. These are indicated in the following sections.

A typical tabbed dialog page is shown in *Figure 5.8*.

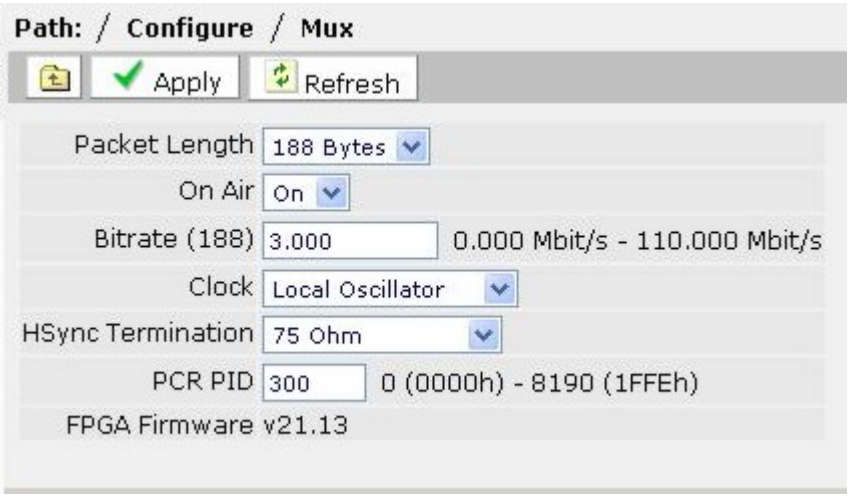


Figure 5.8: Typical Webpage Content Area

The interface provides the following types of field:

Read only text	provides contextual information such as firmware / software versions etc.
Text box	allows the entry of a single line of text, normally a pid, bitrate, service name etc.
Drop-down combo box	allows the selection of one of a number of alternatives from a constrained list of values.

To leave a selection page without operation, do not click **Apply**. Click to go to the previous directory or select another tab from the navigation bar.

5.4.3 Input Monitor

Located at the bottom left-hand corner of each webpage is a video monitor. This displays snapshots of the incoming video. The refresh rate can be adjusted using the **I/P Monitor Refresh** option under the **Video** menu.

5.4.4 Indicators

Three indicators are displayed under the input video monitor. These provide the following information:

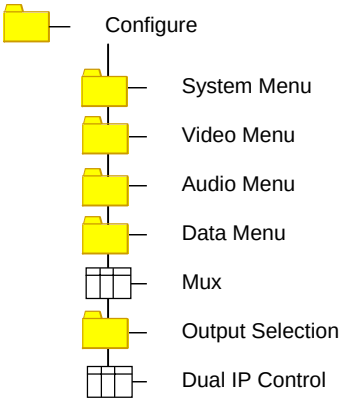
Encoder Output Status	Indicates the encoder output status (e.g. On-air).
Scrambling Mode	Indicates the output scrambling mode.
Alarm/Fail Status	Green: No alarms or fails; Red: Alarm or failure detected.

5.5 Configure Webpage

The Configure Webpage gives access to all the menus required to set up the Encoder.

Figure 5.9 shows the items under the Configure tab.

Path: / Configure



Item	Value	Description	Refer to...
System Menu	Folder	Displays the System Menu.	*Section 5.6*
Video Menu	Folder	Displays the Video Menu.	*Section 5.7*
Audio Menu	Folder	Displays the Audio Menu.	*Section 5.8*
Data Menu	Folder	Displays the Data Menu.	*Section 5.9*
Mux	Table	Displays the Mux Menu.	*Section 5.10*
Output Selection	Folder	Displays the Output Menu.	*Section 5.11*
Dual IPNIC Control	Table	Configure the IP Streamer O/P	*Chapter 3*

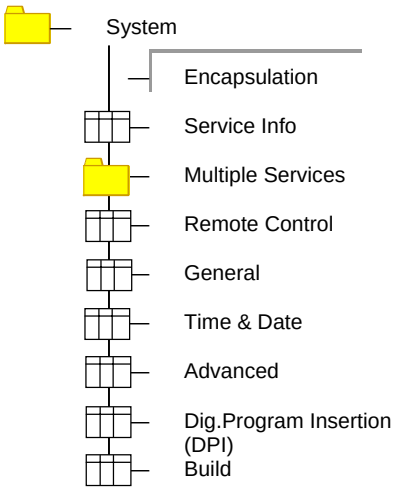
Figure 5.9: Configure Webpage

> NOTE...
> Dual IP/Ethernet Output Card (EN8000/HWO/IPTSDUAL) is a purchasable hardware option. It is described in *Chapter 3, Options and Upgrades*.

5.6 System Menu

5.6.1 Overview

Path: / Configure / System Menu



Item	Value	Description	Refer to...
Encapslation	Text	Set to H.264/AVC Video/Audio over TS	*Section 5.6.3*
Service Info	Table	Displays the Service Info Menu.	*Sections 5.6.4/5*
Multiple Services	Folder	Displays the Multiple Services Menu.	*Section 5.6.6*
Remote Control	Table	Displays the Data Menu.	*Section 5.6.7*
General	Table	Displays the General Menu.	*Section 5.6.8*
Time & Date	Table	Displays the Time and Date Menu.	*Section 5.6.9*
Advanced	Table	Displays the Advanced Menu.	*Section 5.6.10*
Dig.Program Insertion (DPI)	Table	Displays the Dig.Program Insertion (DPI) Menu.	*Section 5.6.11*
Build	Table	Displays the Build information.	*Section 5.6.12*

Figure 5.10: Configure / System Webpage

5.6.2 System Menu Hierarchy

Figure 5.11 shows the grouping of items under each webpage. In general, the front panel menus described in *Chapter 4* follow the structure shown.

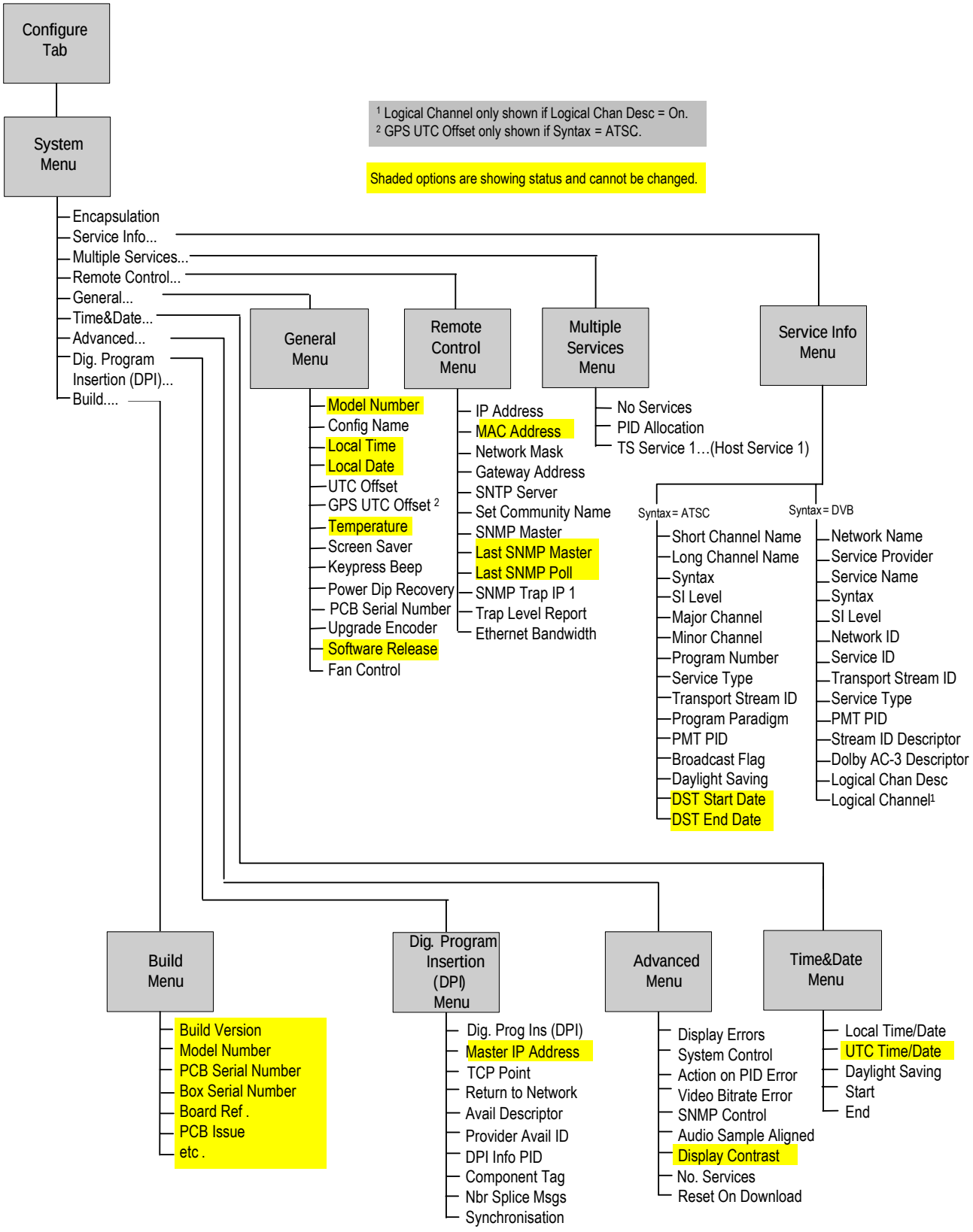


Figure 5.11: Menu Hierarchy – Configure/System Menu

5.6.3 System / Encapsulation

This is set to H.264/AVC Video/Audio over TS.

5.6.4 System / Service Info Menu (Output = TS, Syntax = ATSC[2])

The System Information Table provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream. It controls the DVB, ATSC and SI/PSI/PSIP configuration. See *Figure 5.11* for the menu structure when the Syntax option has been set to **ATSC**. For information regarding ATSC program and system information protocol refer to ATSC Standard Doc A/65A Program and System Information Protocol for Terrestrial Broadcast and Cable.

Table 5.1 describes the System Information items when the Encoder is set to operate in an ATSC environment. They are listed alphabetically to help with retrieving the information.

Path: / Configure / System Menu / System Information

Table 5.1: ATSC System Information Option Descriptions

Selected Item	Options	Description
Broadcast Flag: This option allows the redistribution control descriptor to be present or not.	Off On (no data) On (1 Byte) On (2 Byte) On (3 Byte) On (4 Byte)	This is used to show whether the encoded material can be redistributed.
Daylight Saving: Determines whether daylight saving is enabled.	Observed Not Observed	Enable daylight saving mode Disable daylight saving mode
DST Start Date DST End Date		These tell the Encoder the start and end dates for daylight saving. This information is used in conjunction with the Encoder's current date to calculate to the next change in daylight saving. This time is put in the System Time Table (STT). Changes can be made in the `Time and Date Menu`.
Long Channel Name:		This is associated with the field *extended_channel_name* and gives the full name of the channel.
Major Channel:	Range: 1 to 99.	This is associated with the field *major_channel_number* and is used to group all channels that are to be identified as belonging to a particular broadcast corporation.
Minor Channel:	Range: 0 to 999	This is associated with the field *minor_channel_number* and is used to identify a particular channel within the *major_channel_number* group of channels.
PMT PID: Shows the value of the Program Map Table (PMT) Packet Identifier (PID).	Allowed range of 0 to 8190	If the Program Paradigm is on, this option cannot be modified. NOTE... Some values are reserved by ATSC and should not be used.
Program Number: Enables the Program Number to be specified.	Allowed values are in the range 1 and 65535,	In ATSC this is used as the basis of the PMT PID (same as Service ID in DVB). The information is included in the Program Association Table (PAT), Program Map Table (PMT) and VCT. NOTE... Some of the possible numbers are reserved so should not be used.

[2] For further information refer to ATSC Standard Doc A/65 Program and System Information Protocol for Terrestrial Broadcast and Cable - Annex D.

Table 5.1: ATSC System Information Option Descriptions (continued)

Selected Item	Options	Description
Program Paradigm:		This option determines whether PID values are assigned in accordance with the ATSC Program Paradigm or not.
Service Type: The Service Type identifies the type of service carried in this virtual channel.	Analog TV	
	ATSC Digital TV	
	ATSC Audio only	
	ATSC Data Broadcast	
Short Channel Name:		This option is associated with the field short_name and is a seven-character name for the channel. The information is included in the Virtual Channel Table (VCT).
Syntax: Enables the syntax to be specified.	ATSC	Advanced Television Standards Committee.
	DVB	Digital Video Broadcasting. See *page 5-14.*
SI Level: Enables the service information level to be specified.	PAT/PMT/CAT only	Program Association Table/ Program Map Table/ Conditional Access Table.
	PAT/PMT only	Program Association Table/ Program Map Table.
	Off	Elementary streams only.
	On (PSIP)	PAT/PMT/CAT/STT/VCT/MGT/RRT/EIT – minimum ATSC
Transport Stream ID:	The number can be between 0 and 65535.	This sets the Transport Stream ID value for the transport stream output from the Encoder.

5.6.5 System / Service Info Menu (Output = TS, Syntax = DVB)

The `Service Info Menu` is selected from the `System Menu.` This menu provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream. It controls the DVB, ATSC and SI/PSI/PSIP configuration

See *Figure 5.11* for the menu structure when the Syntax option has been set to **DVB**.

For information regarding DVB Service Information refer to ETSI EN 300 468 Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB Systems.

Table 5.2 describes the System Information items when the Encoder is set to operate in a DVB environment. They are listed alphabetically to help with retrieving the information.

Path: / Configure / System Menu / System Information

Table 5.2: DVB System Information Option Descriptions

Selected Item	Options	Description
Dolby AC-3 Descriptor: This allows a user to specify only the DVB, only the ATSC, or both the ATSC and DVB descriptors for use with audio streams.	DVB and ATSC	Both the ATSC and DVB descriptors are used with the audio streams.
	DVB only	Only the DVB descriptors are used with the audio streams.
	ATSC only	Only the ATSC descriptors are used with the audio streams.
	This option is necessary because the ATSC descriptor existed prior to the DVB descriptor and some Decoders (e.g. early Alteia's) used the AC-3 descriptor for identifying Dolby Digital streams.	
Logical Chan Desc: Sets the Logical Channel Descriptor.	On	The information is included in the NIT (for Australia mainly).
	Off	
Logical Channel:	NOTE... This option is only shown if the Logical Chan Desc option is set to On.	

Table 5.2: DVB System Information Option Descriptions (continued)

Selected Item	Options	Description
Network ID: Specifies the Network Identity.	Range: 0 to 65535	The information is included in the NIT.
Network Name: Allows the network name to be changed.		The information is included in the Network Information Table (NIT).
PMT PID: Specifies the value of the Packet Identifier (PID) for the Program Map Table (PMT).	Range: 0 to 8190	NOTE... Some allowed values have been reserved by DVB and should not be used.
Service ID: This option ties the SDT to the PMT and is the same as the Program Number in ATSC.	Range: 1 to 65535.	The information is included in the PAT, PMT, SDT, EIT and NIT.
Service Name: This option allows the service name to be changed.		The information is included in the SDT.
Service Provider: This option allows the service provider name to be changed.		The information is included in the Service Description Table (SDT).
Service Type: The service type identifies the type of service carried.	Digital TV	The information is included in the SDT.
	Digital Radio	
	Teletext	
	Data Broadcast	
	AVC Digital Radio	
	DVB MHP	
	MPEG-2 HDTV	
	AVC SD TV	
	AVC HD TV	
SI Level: Specifies the Service Information (SI) level.	PAT/PMT/CAT only	Program Association Table/ Program Map Table/ Conditional Access Table.
	PAT/PMT only	Program Association Table/ Program Map Table.
	Off	
	On	
	On (No EIT)	
Stream ID Descriptor:		This option turns on or off the insertion of a stream identifier descriptor within the PMT.
Syntax: Specifies the syntax.	ATSC	Advanced Television Standards Committee.
	DVB	Digital Video Broadcasting.
Transport Stream ID: Sets the Transport Stream ID value for the transport stream output from the Encoder.	Range: 0 to 65536	

5.6.6 System / Multiple Services

This menu item allows the Elementary Streams to be divided across several services and can be used to create audio only services.

Path: / Configure / System Menu / Multiple Services

Also, **Path: / Configure / Video Menu / Multiple Services**

Table 5.3 describes the System Information items when the Encoder is set to operate with Multiple Services.

Table 5.3: Multiple Service Option Descriptions

Selected Item	Options	Description
No. Services: Specifies the number of Encoder services.	1 - 8	It is not possible to switch off individual services. Use this option to limit the number of services.
PID Allocation: Determines how the PIDs are allocated to the services.	Auto Values	Service 1: AVC Video, AVC Audio (if only two services, any audio from additional input modules). Service 2: MPEG-2 Video, Standard Audio. Extra Services: Audio from additional input modules (if fitted). If any PID uses Type 3 PCRs, then all services must use Type 3 PCRs.
	User Defined	PIDs can be freely allocated across services.
Host Service n: Each service has an associated host screen menu to allocate the required parameters. At the Multiple Services menu level, each Host Service menu is associated with the Service Name allocated in the System Info menu.	Name	As entered via the System Information menu.
	Service ID: 1 - 65535	
	Logical Channel: 1 - 1023	
	Service Type:	As entered via the System Information menu.
	PMT PID:	As entered via the System Information menu.
	PCR PID: 300 (012Ch)	Fixed value
	H.264/AVC Encoder (0065h): On; Off	
	Audio A: On; Off	
	Audio B: On; Off	

> NOTE...
> Additional items may appear depending upon options fitted and licences enabled.

5.6.7 System / Remote Control

The Encoder is controlled remotely via Ethernet using a web browser.

Path: / Configure / System Menu / Remote Control

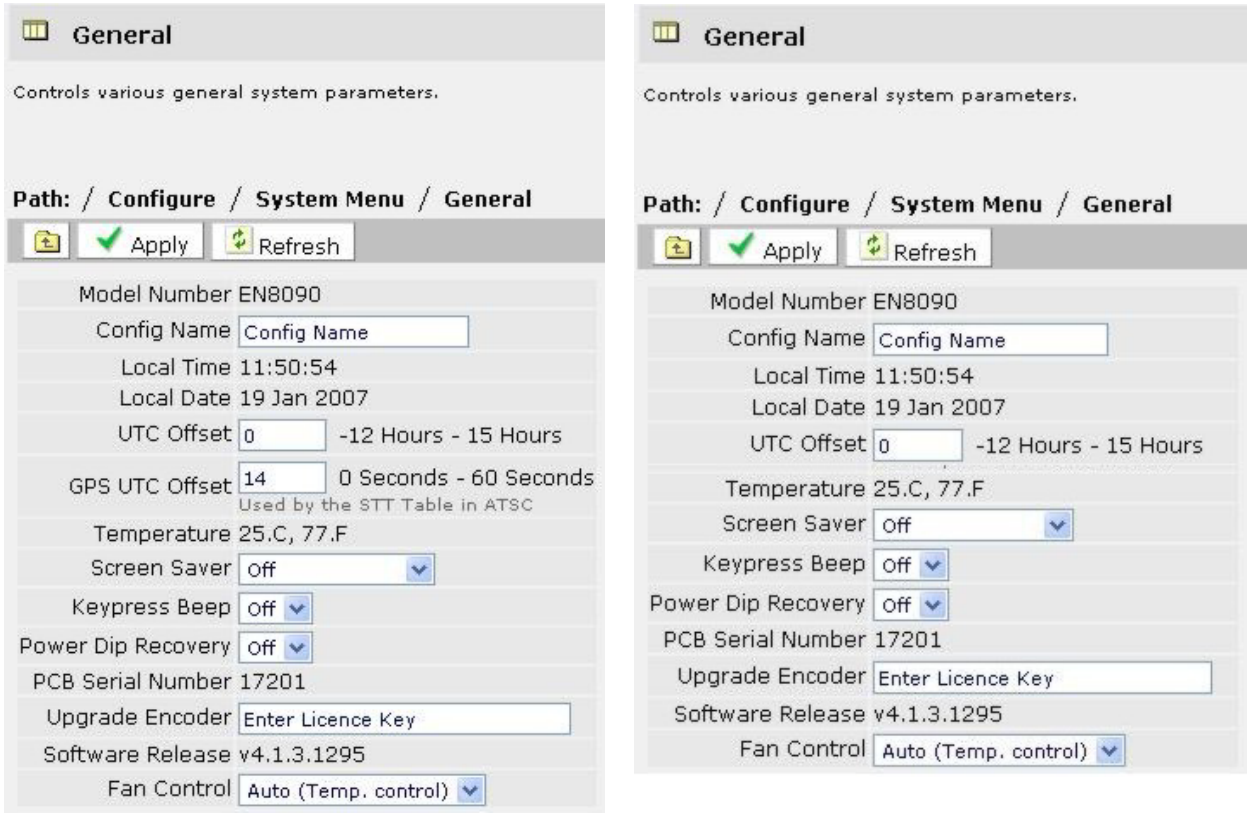
Table 5.4 describes the Remote Control options. They are listed alphabetically to help with retrieving the information.

Table 5.4: Remote Control Option Descriptions

Selected Item	Options	Description
Ethernet Bandwidth: Provides a low and a high network bandwidth setting.	Problems can be experienced with Ethernet control of the Encoder if the available network bandwidth is low. The low bandwidth setting limits the packet size, which can prevent problems with low bandwidth networks, but at the cost of speed of communications.	
Gateway Address: This gives the default gateway address used on the Ethernet network interface connected via the 10BaseT socket.		Any communications to network hosts not on the local IP/Ethernet network will be sent to this address.
IP Address: Allows the controller IP Address to be changed.		This needs to be set before the web browser or control solution can be connected to the Encoder.
Last SNMP Master: Displays the IP address of SNMP Master that was last connected to the Encoder.		This is for information only and cannot be changed.
Last SNMP Poll: The Last SNMP Poll option.		This is for information only and cannot be changed.
MAC Address: Displays the controller MAC Address.		It cannot be changed and is set in the factory.
Network Mask: Allows the Network Mask for the controller IP address to be changed.		
Set Community Name: This option allows the SNMP Community Name to be defined/changed		
SNMP Master: Defines the IP address of SNMP Master.		If this is set, only one SNMP controller will be allowed access to the Encoder. It can be set to 000.000.000.000 to allow any controller access.
SNTP Server: Defines the IP address of a Simple Network Time Protocol (SNTP) server to which the Encoder should try to synchronize.		If the SNTP Server is set to 000.000.000.000 the Encoder assumes that there is no SNTP server available and will not attempt to make connection.
SNMP Trap IP 1: SNMP Traps are a way of reporting status information to a control system, but not all control systems can handle them.		This option sets the IP address to which the trap messages will be sent. If it is set to 000.000.000.000 then the trap messages will be sent to the last SNMP master.
Trap Level Report: Enables the type of events reported via SNMP traps.	Start Msgs only	
	Fail and Start Msgs	
	All Traps	All failures, warnings and start messages will be reported.

5.6.8 System / General Menu

The `General Menu` provides options for configuring the general parameters of the Encoder such as the time and date, screen savers, and fan control.



General Menu (ATSC) General Menu (DVB)

Figure 5.12: General Menu Webpage

Table 5.5 describes the System Information items when the Encoder is set to operate with Multiple Services. They are listed alphabetically to help with retrieving the information.

Path: / Configure / System Menu / General

Table 5.5: General Menu Option Descriptions

Selected Item	Options	Description
Config Name: Allows a name to be assigned to the current Encoder configuration.		It is this name that is used if the configuration is stored.
Fan Control: Refer to *Annex B, Technical Specification* for more information about the temperatures at which fans activate and deactivate.	Auto (Temp. control)	The fans are activated automatically when a defined temperature is reached.
	On	The fans are activated all the time.
GPS UTC Offset (ATSC)	Range: 0 – 60 seconds	Used by the STT Table in ATSC. The factory default is 14 (which is the current offset as of 1st January 2006. The value changes at irregular intervals, a few times a decade).
Keypress Beep: Sets the Keypress Beep.	On	A beep sounds every time that a front panel key is pressed.
	Off	There is silence every time that a front panel key is pressed.

Table 5.5: General Menu Option Descriptions (continued)

Selected Item	Options	Description
Local Date: Displays the local date on the Encoder and cannot be changed.		NOTE ... This date represents the clock associated with the logging system and has no connection with the video clock.
Local Time: Displays the local time on the Encoder and cannot be changed.		NOTE... This time represents the clock associated with the logging system and has no connection with the video clock.
Model Number: The model number of the Encoder is reported and cannot be changed.		As the Encoder determines its model from what hardware cards have been inserted into the unit, this value may be incorrect during initialization because hardware may not have been identified yet.
PCB Serial Number: Displays the PCB serial number.		
Power Dip Recovery: Sets the Power Dip Recovery and determines the state of the satellite modulator outputs (if fitted).	On Off	The outputs are restored following a power dip. The outputs are not restored following a power dip.
Screen Saver: Sets the Screen Saver.	Top-Level Menu Off	If no changes have been made to the Encoder for five minutes the chosen screen saver appears on the front panel display.
Software Release: Shows the version number of the control software		The software release is for information only and cannot be changed.
Temperature:		The Temperature display indicates the current internal temperature.
Upgrade Encoder:	Range: 0 to 65535	There are a number of features that are not enabled by default. Refer to *Chapter 3, Options and Upgrades, Table 3.1* for details. A software licence key needs to be entered here to enable the required features. The serial number of the box (available from System> Build menu should be sent to TANDBERG Television Customer Services and they will return a software licence key to enable the features. NOTE... These software options must be purchased before the software licence key is sent.
UTC Offset: The Universal Time Co-ordinate (UTC) is effectively the same as Greenwich Mean Time (GMT).	Min: –12 Hours Max: 15 Hours Step Size: 1 Hour	UTC offset. A positive value indicates East of Greenwich, and a negative value indicates West of Greenwich. If the specified UTC offset is outside the valid input range, a confirmation screen is displayed which shows the minimum/maximum value allowed. When including SI in the output transport stream, the Encoder is required to output a Time and Date Table (TDT). This uses UTC. Therefore, as the local time is input, a UTC offset is needed so that the UTC time for the TDT table is generated.

5.6.9 System / Time & Date Menu

This menu is used to set the internal time and date for the Encoder. This time and date are used for the logging of information and alarms and are not used for the encoding process. If it is incorrect, only the time and date against each item in the log is incorrect.

Figure 5.13: Time & Date Menu Options

Path: / Configure / System Menu / Time&Date

Table 5.6: Time&Date Option Descriptions

Selected Item	Options	Description
Current Time/Date: Used to enter the current time and date for the Encoder's clock.		
Local Time/Date: Defines the time and date of the internal clock of the Encoder:	Hours:minutes:seconds	for the time of day
	Day:month:year	for today's date
	UTC offset	to allow the operator to enter the offset in hours from the Co-ordinated Universal Time or Greenwich Mean time.
UTC Time/Date: Displays the UTC time and date of the Encoder's internal clock.		This is calculated from the above parameters.
GPS UTC Offset	Range: 0 – 60 seconds	Used by the STT Table in ATSC.
	The Offset is the difference between GPS and UTC time. This required because GPS is not adjusted by leap seconds as is UTC time. As of 1st January 2006, GPS time is ahead of UTC time by 14 seconds.	
Daylight Saving Time (ATSC Only): Allows the operator to enter the dates for daylight saving.	Conventionally, DST, starts on the first Sunday in April and goes through to the last Sunday in October.	Daylight Saving Time is only used when generating the STT Table as defined by ATSC. If the DST Start and End dates are set to these dates, the values are automatically adjusted as the year changes. The year displayed when referring to Daylight Saving Time always refers to the current year and is for information only.
Daylight Saving: Defines whether the daylight saving is observed.	NOT observed	Daylight saving time is not observed.
	Observed	Daylight saving time is observed.
Start: Defines the date on which the daylight saving time starts.		The day and month is entered.
End: Defines the date on which the daylight saving time ends		The day, month and year are entered. It is assumed that the Start date is before but within a year of the End date.

5.6.10 System / Advanced Menu

The Advanced Menu is selected from the System Menu. This menu provides options for the advanced parameters of the Encoder. See *Figure 5.14* for the Advanced Menu structure and Table 5.7 for the option descriptions. They are listed alphabetically to help with retrieving the information.

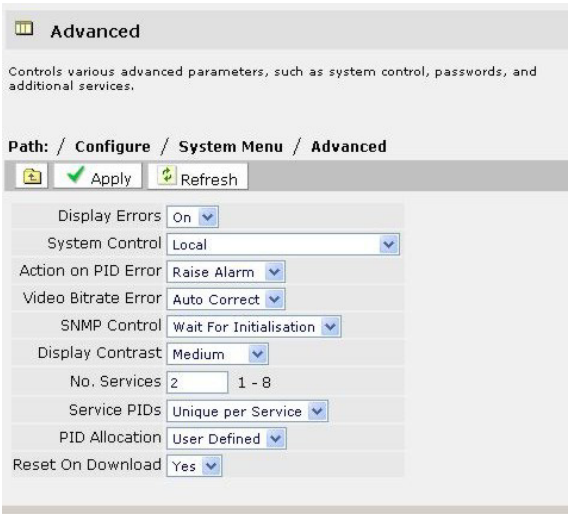


Figure 5.14: Advanced Menu Options

Path: / Configure / System Menu / Advanced

Table 5.7: Advanced Menu Option Descriptions

Selected Item	Options	Description
Action On PID Error: Sets the Action on PID Error.	Raise Alarm	An error message is displayed if a PID error is found.
	Auto Correct	If a PID error is found it is automatically corrected.
Display Contrast: Sets the LCD contrast ratio.	Light	The display changes as the selection is accepted.
	Medium	If the background is set to very dark or very light, the text may not be visible. In this instance, view the display at an acute angle, this should enable the text to be seen enough to change the contrast.
	Dark	
	Very Dark	
Display Errors:		This option either enables or disables the display of error or alarm messages on the front panel.
No. Services: Displays the number of services in the output Transport Stream.	1 - 8	
Reset On Download Option	Yes	The Encoder reboots following a download, keeping the current configuration.
	No	The Encoder keeps working normally.
SNMP Control: Sets the SNMP Control.	Wait for Initialization	No SNMP reply during initialization.
	From Power On	Reply as modules start to appear.
System Control: Sets the type of system control specified in the SI.	Local	Control of the video/audio delay (lip sync) is within the Encoder.
	External (SNMP)	Control of the video/audio delay (lip sync) is via the SNMP protocol.
	MEM/nCC	Control is via MEM/nCompass Control.
	If the control equipment is a TT7000 System Manager, ensure that the Auto Lip Sync option is turned on (see *Audio Delay Option*). The Encoder has to provide the lip sync function.	
Video Bitrate Error: Sets the action on error.	Raise Alarm	An error message is displayed if a video bitrate error is detected.
	Auto Correct	If a video bitrate error is found, it is automatically corrected.

5.6.11 System / Dig. Program Insertion (DPI)

Splicing is used to insert a Digital Program (e.g. advertisements) into an MPEG-2 transport stream. SCTE-35 has been written to support splicing information for Cable systems.

Figure 5.15 and Table 5.8 show the options available from the menu. In this mode, the Encoder responds to messages received via Ethernet adhering to the DVS 525 protocol.

Path: / Configure / System Menu / Dig.Program Insertion (DPI)

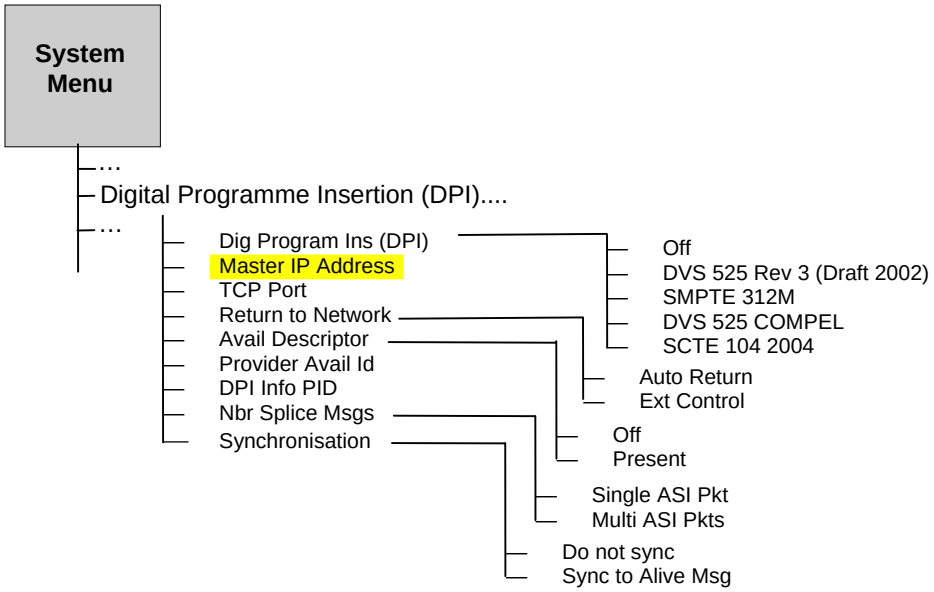


Figure 5.15: Menu Hierarchy – Digital Programme Insertion DPI Menu

NOTES...

1. Some of the options may be different or unavailable in other DPI modes.
2. The stream carrying the splice information is referenced in PMT as Private Data.

Table 5.8: Dig. Program Insertion (DPI) Option Descriptions

Menu Item	Options	Description
DPI Program Ins (DPI)	Off DVS525 Rev 3 (Draft 2002) SMPTE 312M DVS525 COMPEL SCTE 104 2004	
Master IP Address	—	
TCP Port	100 - 65535	Port number on which to receive DVS 525 messages.
Return to Network	Auto Return Ext Control	If set to Auto, no return messages are sent out and “Auto Return” flag in the message is set to 1.
Avail Descriptor	Present/Off	
Provider Avail ID	0 - 4294967295	
DPI info PID	0 - 8190	PID in which the splice messages are carried.
Nbr Splice Msg	Single ASI Pkt Multi ASI Pkt	
Synchronization	Do not sync. Sync to Alive	Most installations should choose “Sync to Alive” so that splice times are accurate.

5.6.12 System / Build Menu

The Build Menu is selected from the System Menu. The Build Menu shows the version numbers of different modules within the system. They cannot be changed and are used by qualified Technicians to determine the functionality of the Encoder.

Path: / Configure / System Menu / Build

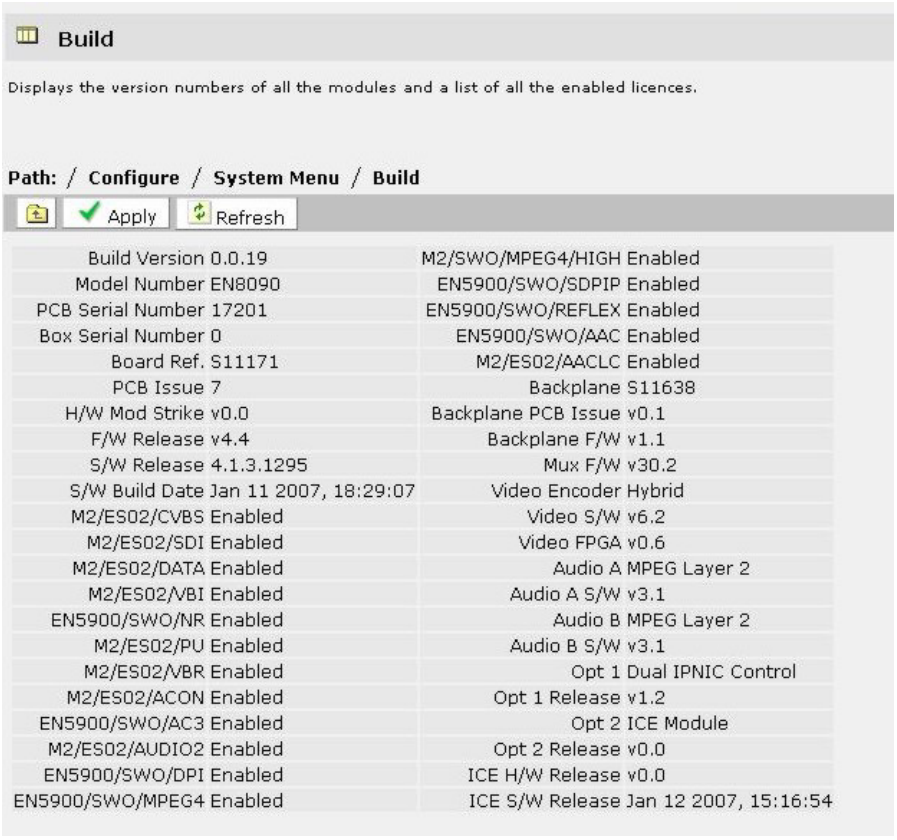


Figure 5.16: Build Menu

The important value is that of the Build Version and it will be this value that is requested from the qualified Technicians.

5.7 Video Menu

5.7.1 Introduction

The `Video Menu` is selected from the `Setup Menu`. This menu permits the selection of video parameters. Figure 5.17 *and Table 5.9* show the options available from the menu.

Path: / Configure / Video

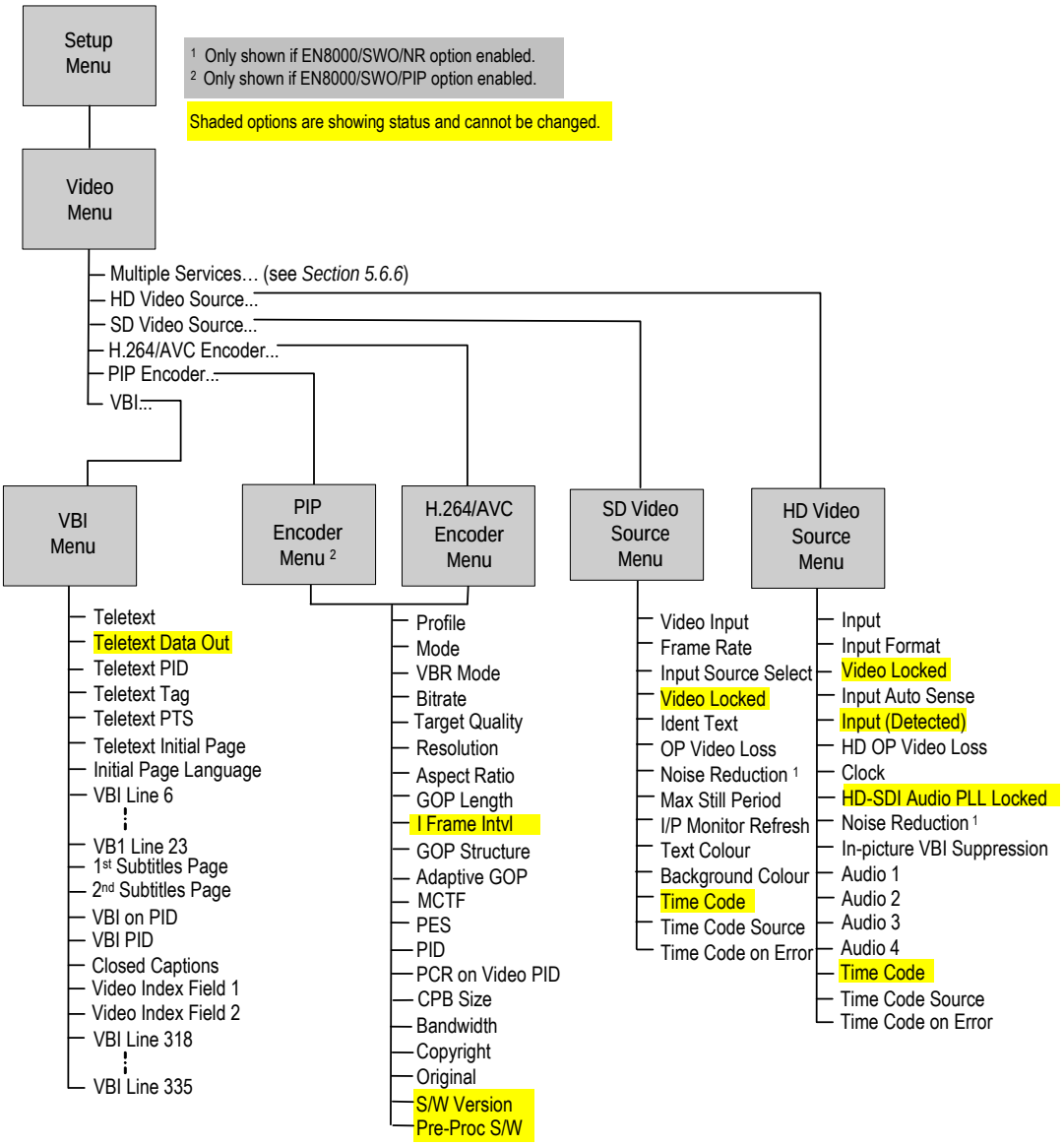


Figure 5.17: Menu Hierarchy – Setup/Video Menu

5.7.2 Video / Multiple Services Menu

This menu permits the selection of video source parameters. The screens vary according to the type of video source selected.

Path: / Configure / Video Menu / Multiple Services

See *Section 5.6.6, System / Multiple Services* for details.

5.7.3 Video / HD Video Source Menu

Table 5.9 describes the HD Video Source menu items, which permit the selection of video source parameters when operating in the High Definition video format.

They are listed alphabetically to help with retrieving the information.

Path: / Configure / Video Menu / HD Video Source

Table 5.9: HD Video Source Option Descriptions

Selected Item	Options	Description
Clock: Must be set to a video or external source before changing the value or it will default to Local Oscillator.	Local Oscillator	The system clock is derived from the local oscillator.
	Video	The system clock is locked to the video source.
	HSYNC (External)	The system clock is locked to the HSYNC input.
HD-SDI Audio PLL Locked: Indicates the state of the audio PLL with respect to the HD-SDI input.		This is for status only and cannot be changed.
Input: Enables the Video Input to be set.	HD-SDI	High Definition Serial digital video input on HD-SDI IN connector.
	Color Bars	Frames of color bars are passed into the video encoding module independent of the input.
	Black	Frames of black only are passed into the video encoding module independent of the input.
In-picture VBI Suppression:		Enables blanking of 16 VBI lines to remove VBI from upconverted active video.
Input Auto Sense: There are four modes of operation selectable.	Off	No action is performed with regards to the input format – it just passes the video on to be coded, even if it is not correctly aligned.
	Vert Res (29.97/59.94 Hz)	The Encoder adjusts the input setting with regards to the actual input. Any change is reflected back as status on the Encoder interfaces. The normal input selection is read-only.
	Vert Res (25 Hz/50 Hz)	
	Frame Rate and Vert Res	
Input Detected: Displays the incoming video format.		This option is for status only and cannot be changed.
Input Format:	720p/50	720 lines x 1280 pixels 50 Hz Progressive
	720p/59.94	720 lines x 1280 pixels 60/1.001 Hz Progressive
	1080i/25	1080 lines x 1920 pixels 25 Hz Interlaced
	1080i/29.97	1080 lines x 1920 pixels 30/1.001 Hz Interlaced

Table 5.9: HD Video Source Option Descriptions (continued)

Selected Item	Options	Description
Noise Reduction: This option enables the noise reduction feature to be switched on (at different levels) or off. The feature can be used when the incoming picture material is corrupted by high frequency noise (such as white noise). When noise reduction is enabled, the Encoder applies sophisticated edge preserving filters on the incoming material and removes the noise that can reduce the encoding difficulty considerably. Refer to *Application Note ST.AN.1094, Video Noise Reduction and Compression* for more information. Only available when licence key EN8000/SWO/NR enabled.	Off	Noise reduction off.
	Adaptive 1	Use noise reduction if necessary but don't introduce artifacts.
	Adaptive 2	Medium adaptive noise reduction, best compromise between Adaptive 1 and 3
	Adaptive 3	Very powerful adaptive noise reduction. May introduce some filter artifacts but will remove as much noise as is possible.
	Adaptive 4	Used for turn-around systems where the input video signal includes coding artifacts.
	Fixed 1	Weak non-adaptive noise reduction independent of input noise.
	Fixed 2	Medium non-adaptive noise reduction independent of input noise.
	Fixed 3	Strong non-adaptive noise reduction independent of input noise.
	The noise reduction module has two stages which are available for each frame: Estimation of the level and type of noise in the frame; and Application of the noise reduction filter at one of four levels of noise reduction capability dependent on the results of the estimation stage. The operator has a choice of four settings for the estimation (called Automatic) to be selected or for the estimation stage to be ignored and one of the fixed levels to be used independent of the noise level (called Manual).	
OP Video Loss: Gives the choice of what is displayed on the television screen in the event of losing video input.	Freeze Frame	The last video frame received is encoded if the video input is lost.
	Black	A black screen is encoded if the video input is lost.
	Bars	Bars test pattern is encoded if the video input is lost.
Time Code:		This is for status only and cannot be changed.
Time Code Source: Indicates the time given by the Vertical Interval Time Code (VITC) or generated by the Encoder. It is for status only and cannot be changed. The Encoder is able to extract the incoming time code irrespective of its type or location. Only one of the time codes is used and the order of preference as shown alongside:	Auto	The Encoder examines the incoming video stream and extracts any time code that it can find.
	VITC-1	The Encoder extracts the VI time code contained within Field 1 of the incoming video stream.
	VITC-2	The Encoder extracts the VI time code contained within Field 2 of the incoming video stream.
	LTC	The Encoder extracts the linear time code within the incoming video stream.
	Free-Wheel/Drop Frame	The time code increments by a frame period between each frame but some codes are repeated for the 29.97 Hz operation to match minute boundaries exactly. The time code starts at 00:00:00:0 at power up.
	Free-Wheel	The time code increments by a frame period between each frame and time codes are not repeated. The time code starts at 00:00:00:0 at power up.
Time Code on Error:	Set 00:00:00	The outgoing time code is fixed at 00:00:00:0.
	Free-Wheel/Drop Frame	The outgoing time code freewheels from the previous known value and repeats some codes for 29.97 Hz operation.
	Free-Wheel	The outgoing time code freewheels from the previous known value and each time code is unique.
Video Locked: Displays whether the video is locked.		This option is for status only and cannot be changed.

5.7.4 Video / SD Video Source Menu

Table 5.10 describes the SD Video Source menu items that permit the selection of video source parameters when operating in the Standard Definition video format.

They are listed alphabetically to help with retrieving the information.

Path: / Configure / Video Menu / SD Video Source

Table 5.10: SD Video Source Option Descriptions

Selected Item	Options	Description
Frame Rate: This option enables the Frame Rate to be set.	25 Hz	Used in 625 lines (most PAL systems except PAL-M).
	29.97 Hz	Used in 525 lines (NTSC and PAL-M systems).
	NOTE... The frame rate is only shown when the video input is Serial Digital, any Test Pattern or Off.	
Ident Text	Up to 20 characters.	This is the text that is displayed if the video output is lost (see OP Video Loss option).
Input Source Select: This allows the enabling or disabling of automatic frame rate detection.	Manual	The frame rate must be set via the Frame rate option.
	Auto Frame Rate	The frame rate is automatically detected.
	Auto Config Switch	The frame rate is automatically detected, and the Encoder loads the appropriate configuration defined by Default 525 Config and Default 625 Config.
I/P Monitor Refresh: Sets the update rate of the input video monitor on the front panel and the web browser monitor	Between 1 and 224 updates per minute.	
Max Still Period:	Allowed values: from 0 to 255 seconds.	
Noise Reduction: This option enables the noise reduction feature to be switched on (at different levels) or off. The feature can be used when the incoming picture material is corrupted by high frequency noise (such as white noise). When noise reduction is enabled, the Encoder applies sophisticated edge preserving filters on the incoming material and removes the noise that can reduce the encoding difficulty considerably. Refer to *Application Note ST.AN.1094, Video Noise Reduction and Compression* for more information. Only available when licence key EN8000/SWO/NR enabled.	Off	Noise reduction off
	Adaptive 1	Use noise reduction if necessary but don't introduce artifacts.
	Adaptive 2	Medium adaptive noise reduction, best compromise between Adaptive 1 and 3
	Adaptive 3	Very powerful adaptive noise reduction, may introduce some filter artifacts but will remove as much noise as is possible.
	Adaptive 4	For turn-around systems where the input video signal includes coding artifacts.
	Fixed 1	Weak non-adaptive noise reduction independent of input noise.
	Fixed 2	Medium non-adaptive noise reduction independent of input noise.
	Fixed 3	Strong non-adaptive noise reduction independent of input noise.
	The noise reduction module has two stages which are available for each frame: Estimation of the level and type of noise in the frame; and Application of the noise reduction filter at one of four levels of noise reduction capability dependent on the results of the estimation stage. The operator has a choice of four settings for the estimation (called Automatic) to be selected or for the estimation stage to be ignored and one of the fixed levels to be used independent of the noise level (called Manual).	

Table 5.10: SD Video Source Option Descriptions (continued)

Selected Item	Options	Description
OP Video Loss: Gives the choice of what is displayed on the television screen in the event of losing video input.	Freeze Frame	The last video frame received is encoded if the video input is lost.
	Black	A black screen is encoded if the video input is lost.
	Bars	Bars are encoded if the video input is lost.
	Freeze + Ident	The last video frame received is encoded if the video input is lost. Text message is superimposed.
	Black + Ident	A black screen is encoded if the video input is lost. Text message is superimposed.
	Bars and Red + Ident	Bars and red test pattern is encoded if the video input is lost. Text message is superimposed.
	Stored OSD	Displays the OSD if available.
	No Video PID	The video PID is no longer transmitted, but it is still referenced in the SI.
	No ASI O/P	The ASI output is turned off.
Stored OSD:		Only available if an OSD has been previously stored.
Text Color: This option defines the text color for any on-screen messages generated by the Encoder (e.g. by the Ident test pattern). Background Color: This option defines the background color for any on-screen messages generated by the Encoder (e.g. by the Ident test pattern).	White	
	Black	
	Blue	
	Red	
	Magenta	
	Orange	
	Yellow	
	Grey	
	Green	
	Cyan	
	Pink	
Time Code:		This is for status only and cannot be changed.
Time Code on Error:	Set 00:00:00	The outgoing time code is fixed at 00:00:00:0.
	Free-Wheel/Drop Frame	The outgoing time code freewheels from the previous known value and repeats some codes for 29.97 Hz operation.
	Free-Wheel	The outgoing time code freewheels from the previous known value and each time code is unique.
Time Code Source: Indicates the time given by the Vertical Interval Time Code (VITC) or generated by the Encoder. It is for status only and cannot be changed. The Encoder is able to extract the incoming time code irrespective of its type or location. Only one of the time codes is used and the order of preference as shown alongside:	Auto	The Encoder examines the incoming video stream and extracts any time code that it can find.
	VITC-1	The Encoder extracts the VI time code contained within Field 1 of the incoming video stream.
	VITC-2	The Encoder extracts the VI time code contained within Field 2 of the incoming video stream.
	LTC	The Encoder extracts the linear time code within the incoming video stream.
	Free-Wheel/Drop Frame	The time code increments by a frame period between each frame but some codes are repeated for the 29.97 Hz operation to match minute boundaries exactly. The time code starts at 00:00:00:0 at power up.
	Free-Wheel	The time code increments by a frame period between each frame and time codes are not repeated. The time code starts at 00:00:00:0 at power up.

Table 5.10: SD Video Source Option Descriptions (continued)

Selected Item		Options	Description
Video Input: This option enables the Video Input to be set.	Analogue Composite	PAL-B/G/H/I	PAL-B/G/H/I composite video input on COMP VIDEO connector.
		PAL-M	PAL-M composite video input on COMP VIDEO connector.
		PAL-N	PAL- N composite video input on COMP VIDEO connector.
		PAL-N (Jamaica)	PAL- N (Jamaica) composite video input on COMP VIDEO connector.
		PAL-D	PAL-D composite video input on COMP VIDEO connector.
	Ident, Digital and Internal Test Pattern Video Sources	NTSC No Pedestal	
		NTSC with Pedestal	
		Serial Digital	Serial digital video input on SDI IN connector.
		Bars	Color bars internal test pattern.
		Black	Black internal test pattern.
		Moving Pattern	Moving internal test pattern.
		Ident	Video Source that allows the user to superimpose identification text on the video. Mainly used for test purposes.
Video Locked: This displays whether the video is locked.			This option is for status only and cannot be changed.

5.7.5 Video / H.264/AVC Encoder Menu

Table 5.11 describes the `H.264/AVC Encoder Menu` as selected from the `Video Menu`. This menu permits the selection of H.264/AVC video encoding parameters.

They are listed alphabetically to help with retrieving the information.

Path: / Configure / Video Menu / H.264/AVC Encoder

Table 5.11: H.264/AVC Encoder Option Descriptions

Selected Item	Options	Description
Adaptive GOP:		This option is not valid in HD progressive modes. The GOP structure is adapted in regard to the number of B and P frames according to the motion detected in the video. It should be left ON unless there is a compatibility issue with the receiver population.
Aspect Ratio: Does not affect the video encoding but rather indicates what desired aspect ratio for the decoded image (but not the pixel).	4:3	Video image is encoded at 4:3 aspect ratio. Default (EN8030 Only).
	16:9	Video image is encoded at 16:9 aspect ratio.
	If no other mechanisms such as WSS (Wide Screen Signaling) in the VBI is used, the outputted video image will use this aspect ratio.	
Bandwidth: The Bandwidth Option controls the low pass filtering of the video before it is compressed.	Soft	As soft as could be required by the broadcaster
	Medium	Compromise between sharp and soft
	Sharp	Filter is at the maximum bandwidth possible for the resolution selected
	Auto	Automatically adjusts the bandwidth depending on the video bitrate and resolution settings.
	Reducing the bandwidth produces slightly less bits in the compressed bitstream for the same set of encoding parameters. Refer to *ST.AN.BW.E10074* for more information.	

Table 5.11: H.264/AVC Encoder Option Descriptions (continued)

Selected Item	Options	Description
Bitrate: Defines the maximum bitrate generated by the video encoding module.	This can be set to be between 0.256 Mbit/s and a maximum of 10.0 Mbit/s for SD. 1 Mbit/s to 20 Mbit/s for HD	The menu system could reduce this maximum if the MUX bitrate is lower than 5.0 Mbit/s. The bitrate is measured over a period of 1.0 second.
CPB Size:	0.08 Mbit/s to 10 Mbit/s (SD) 0.32 Mbit/s to 15 Mbit/s (HD)	
Copyright: Controls the Copyright flag in the bitstream.		If set to On the bitstream is shown to be protected by copyright.
GOP Length: Defines the maximum distance in steps of video frames between two consecutive I frames in the encoded bitstream.	12 to 250 frames	As the video encoding module inserts I frames when it will improve the encoding quality, the time between two I frames is often less.
GOP Structure: Sets the GOP structure.	IP	P frames are used between the intra-coded I frames.
	IBP	A single B frames can be inserted into the sequence.
	IBBP	Two B frames can be inserted into the sequence.
	IBBBP	Three B frames can be inserted into the sequence
	This sets what type of frames are present and the order of the frames in the stream.	
I Frame Intvl: Displays the maximum time in seconds between two consecutive I frames in seconds.		This is calculated from the video frame rate and the GOP length specified above.
MCTF:		Enables Motion Compensated Temporal Filtering. (SD Only)
Mode: Defines how the maximum decoder buffer size in terms of time.	Standard	The default mode should be used unless channel change is an issue.
	Low Delay	Standard mode but with a smaller video decoder buffer.
	Mega Low Delay	Standard mode but with a further reduced video decoder buffer.
	Seamless Var. Delay	VBR mode primarily for use in statmux system.
Original: Controls the setting of the Original flag in the bitstream.		If set to On the bitstream will be signaled as an original, if set to Off the bitstream will be signaled as a copy of an original bitstream.
PCR on Video PID: Defines whether PCR timestamps are included into the video elementary stream.		
PES: Defines where PES headers are placed.	per Sequence	Defines all random access point.
	per Frame	Defines each frame.
PID: Defines the PID used for the elementary stream in the transport stream.	PIDs 32 to 8190 are available for use.	This option will only be visible if the output has been selected to be TS. To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Pre-Proc Version: Shows the version of the code in the pre-processing software.		This is for status only and cannot be changed.

Table 5.11: H.264/AVC Encoder Option Descriptions (continued)

Selected Item	Options	Description
Profile: Defines the profile of to be used for the encoding.	Main Profile @ Level 3	Standard Definition operation
	Main Profile @ Level 4	High Definition operation
	High Profile @ Level 4	High Definition operation
Resolution: Defines both horizontal and vertical resolution. For example, 720x576 gives a horizontal resolution of 720 and a vertical resolution 576.	352x576	
	480x576	
	528x576	
	544x576	
	640x576	
	704x576	
	720x576	
S/W Version: Displays the version of the encoding module software.		This is for status only and cannot be changed.
Target Quality: Defines the maximum quality of the encoding as a percentage between 30% and 100%	30% - 100%	100% means that the encoder attempts to reach maximum quality while not exceeding the bitrate. Reducing the target quality means that a different compromise between bitrate and quality is chosen. NOTE... This option only appears if "VBR Mode" is ON and the licence EN8000/SWO/REFLEX is enabled.
VBR Mode: Defines whether the H.264/AVC component will be constant bitrate (CBR) or allowed to drop in bitrate if the video image is easy to encode	Off (Constant Bitrate)	The bitrate shall be constant over time.
	On (No stuffing)	The bitrate can drop below the specified level. NOTE... This option is only available in Seamless Variable Delay.

5.7.6 Video / PIP Encoder Menu

NOTE...
Not displayed unless EN8000/SWO/PIP option is enabled.

Table 5.12 describes PIP `Encoder Menu` as selected from the `Video Menu`.

The PiP is enabled by:

- Selecting more than 1 service in the `No. Services` menu option in the `System->Advanced` menu.
- Switching ON the option `Picture in Picture` in `Video->Encoder` menu.
- The PID assigned to the PiP is selected using the `PiP PID` option in the same menu.

This menu permits the selection of Picture-in-Picture video encoding parameters.

They are listed alphabetically to help with retrieving the information.

Path: / Configure / Video Menu / PIP Encoder

Table 5.12: PIP Encoder Option Descriptions

Selected Item	Options	Description
Adaptive GOP:		This option is not valid in HD progressive modes. The GOP structure is adapted in regard to the number of B and P frames according to the motion detected in the video. It should be left ON unless there is a compatibility issue with the receiver population.
Aspect Ratio: Does not affect the video encoding but rather indicates what desired aspect ratio for the decoded image (but not the pixel).	4:3	Video image is encoded at 4:3 aspect ratio. Default.
	16:9	Video image is encoded at 16:9 aspect ratio.
	If no other mechanisms such as WSS (Wide Screen Signaling) in the VBI are used, the outputted video image will use this aspect ratio.	
Bandwidth: The Bandwidth Option controls the low pass filtering of the video before it is compressed.	Soft	As soft as could be required by the broadcaster
	Medium	Compromise between sharp and soft
	Sharp	Filter is at the maximum bandwidth possible for the resolution selected
	Auto	Automatically adjusts the bandwidth depending on the video bitrate and resolution settings.
	Reducing the bandwidth produces slightly less bits in the compressed bitstream for the same set of encoding parameters. Refer to *ST.AN.BW.E10074* for more information.	
Bitrate: Defines the maximum bitrate generated by the video encoding module.	This can be set to be between 0.1 Mbit/s and a maximum of 1.0 Mbit/s.	
CPB Size:	0.08 Mbit/s to 10.0 Mbit/s	
Copyright: This option controls the Copyright flag in the bitstream.		If set to On the bitstream is shown to be protected by copyright.
GOP Length: Defines the maximum distance in steps of video frames between two consecutive I frames in the encoded bitstream.	12 to 250 frames	As the video encoding module inserts I frames when it will improve the encoding quality, the time between two I frames is often less.
GOP Structure: Sets the GOP structure.	IP	P frames are used between the intra-coded I frames.
I Frame Intvl: Displays the maximum time in seconds between two consecutive I frames in seconds.		This is calculated from the video frame rate and the GOP length specified above.
MCTF:		Enables Motion Compensated Temporal Filtering.
Mode: Defines how the maximum decoder buffer size in terms of time.	Standard	The default mode, should be used unless channel change is an issue.
	Low Delay	Standard mode but with a video decoder buffer.
	Mega Low Delay	Standard mode but with a video decoder buffer
	Seamless Var. Delay	This is a VBR mode primarily for use in statmux systems.

Table 5.12: PIP Encoder Option Descriptions (continued)

Selected Item	Options	Description
Original: Controls the setting of the Original flag in the bitstream.		If set to On the bitstream will be signaled as an original, if set to Off the bitstream will be signaled as a copy of an original bitstream.
PCR on Video PID: Defines whether PCR timestamps are included into the video elementary stream.		
PES: Defines where PES headers are placed.	per Sequence	Defines all random access point.
	per Frame	Defines each frame.
PID: Defines the PID used for the elementary stream in the transport stream.	PIDs 32 to 8190 are available for use.	This option will only be visible if the output has been selected to be TS. To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Pre-Proc Version: Shows the version of the code in the pre-processing software.		This is for status only and cannot be changed.
Profile: Defines the profile to be used for the encoding.	Main @ Level 3	
Resolution: Defines both horizontal and vertical resolution. For example, 720x576 gives a horizontal resolution of 720 and a vertical resolution 576. Available options depend on the input source selected (SD or HD).	SD / HD	
	96 X 96 / 96 X 96	
	128 X 96 / 128 X 96	
	192 X 144 / 192 X 144	
	192 X 192 / 192 X 192	
	352 x 240 / 352 x 240	(60 Hz)
	352 X 288 / 352 X 288	(50 Hz)
	352 x 480	(60 Hz)
	352 x 576	(50 Hz)
	480 x 480	(60 Hz)
	480 x 576	(50 Hz)
	528 x 480	(60 Hz)
	528 x 576	(50 Hz)
	544 x 480	(60 Hz)
	544 x 576	(50 Hz)
	640 x 480	(60 Hz)
	640 x 576	(50 Hz)
	704 x 480	(60 Hz)
	704 x 576	(50 Hz)
	720 x 480	(60 Hz)
	720 x 576	(50 Hz)
S/W Version:		Displays the version of the encoding module software. This is for status only and cannot be changed.

Table 5.12: PIP Encoder Option Descriptions (continued)

Selected Item	Options	Description
Target Quality: Defines the maximum quality of the encoding as a percentage between 30% and 100% .	30% - 100%	100% means that the encoder attempts to reach maximum quality while not exceeding the bitrate. Reducing the target quality means that a different compromise between bitrate and quality is chosen.
		NOTE... This option only appears if "VBR Mode" is ON and the licence EN8000/SWO/REFLEX is enabled
VBR Mode: Defines whether the H.264/AVC component will be constant bitrate (CBR) or allowed to drop in bitrate if the video image is easy to encode.	Off (Constant Bitrate)	The bitrate shall be constant over time.
	On (No stuffing)	The bitrate can drop below the specified level.
	This option is not valid when the selected Mode is "CBR Seamless 4" or "CBR Seamless 1".	

5.7.7 Vertical Blanking Interval (VBI) Menu

Table 5.13 describes VBI Menu as selected from the Video Menu. This Menu permits the selection of Vertical Blanking Interval (VBI) parameters. Available options are dependent on the frame rate of the video.

They are listed alphabetically to help with retrieving the information.

Path: / Configure / Video Menu / VBI

Table 5.13: VBI Option Descriptions

Selected Item	Options	Description
1st Subtitles Page:	0-899	
2nd Subtitles Page:	0-899	
CC Format:	ATSC	
Selects the format of Closed Captions.	ATSC Draft 2005	
Closed Captions:	Off	
Specifies the source of Closed Captions.	On (Video Line 18)	
	Test Data (EIA-608)	
	Test Data (EIA-708A)	
	On (HD-SDI/SMPTE 334M)	
Initial Page Language:	English / French	
	German / Dutch	
	Spanish / Portuguese	
	Italian / Danish	
	Norwegian / Swedish	
	Finnish / Undefined	
	User 1	
Teletext:	Off	
	On: 7-22/320-335	
Teletext Data Out:		This is for status only and cannot be changed.
Teletext Initial Page: Only displayed if Teletext = On: 7-22/320-335.	100 - 899	Teletext Pages comprise of the “Magazine Number” and the “Teletext Page”. The input range available is 0x100 to 0x8FE as specified in ETS 300 706. The msd is the magazine number and the two lsds are the page number e.g. 0x100 is magazine 1, page 00. The default is “0x100”.
Teletext Language: Only displayed if Teletext = On: 7-22/320-335.	ISO 639 language codes	The ISO 639 language codes used for audio is available as options (except for Main, Auxiliary, User Defined Language 1 and User Defined Language 2). The default is “eng”.
Teletext PTS:	In PES Header	
	Disabled	
Teletext PID:		
Teletext Tag:	0 - 255	

Table 5.13: VBI Option Descriptions (continued)

Selected Item	Options		Description
VBI Line n: Each VBI line can be individually configured as to the format of VBI data that should be extracted from that line. However, a maximum of eight VBI lines can be processed per field (this does not include Teletext lines).	Frame Rate = 29.97 Hz		
	Off		VBI data is not extracted from the line.
	Vertical Interval Time Code		VITC data extracted from the line.
	Video Index		
	Closed Caption		The setting cannot be selected on this screen, but is set by setting the Closed Caption option to On [SMPTE 333M], On [video 21 and 284] or On [video line 21]. It indicates that closed captioning data is extracted from the line. Setting Line 21 back to Off or VITC resets the Closed Caption option back to Off.
	Neilsen AMOL 1		Neilsen AMOL 1 data is extracted from the line.
	Neilsen AMOL11		Neilsen AMOL 11 data is extracted from the line.
	Monochrome 4:2:2		
	Frame Rate = 25 Hz		
	Off		VBI data is not extracted from the line.
	Vertical Interval Time Code		VITC data extracted from the line. Only the timecode part of VITC is extracted.
	Video Index		
	Wide Screen Signaling		The setting cannot be selected on this screen, but is set by setting the WSS (Line 23) option to On. It indicates that WSS data is extracted from the line. Setting Line 23 back to Off, VITC or Teletext System B resets the WSS (Line 23) option back to Off.
	Closed Caption		Closed Caption data is extracted from the line.
	Monochrome 4:2:2		
	Video Programming System		The setting cannot be selected on this screen, but is set by setting the VPS (Line 16) option to On. It indicates that VPS data is extracted from the line. Setting Line 16 back to Off, VITC or Teletext System B resets the VPS (Line 16) option back to Off.
	Teletext System B (World System Teletext)		Teletext System B data extracted from the line.
	Wide Screen Signaling		The setting cannot be selected on this screen, but is set by setting the WSS (Line 23) option to On. It indicates that WSS data is extracted from the line. Setting Line 23 back to Off, VITC or Teletext System B resets the WSS (Line 23) option back to Off.
	Inverted Teletext		Inverted Teletext is extracted from the line.
VBI on PID:			Enables VBI extraction from specified PID.
VBI PID: Defines a PID to be used for VBI data.	Range 0 (0000h) – 8190 (1FFEh)		
Video Index Field 1: Specifies the line in field 1 which will carry the Video Index.	25 Hz	29.97 Hz	
	Off	Off	
	Line 6 to Line 23	Line 10 to Line 22	
Video Index Field 2: Specifies the line in field 1 which will carry the Video Index.	25 Hz	29.97 Hz	
	Off	Off	
	Line 318 thru to Line 335	Line 272 thru to Line 285	

5.8 Audio Menu

5.8.1 Top-level Menu

Figure 5.18 and the following sections show the distribution of options for each coding standard. Use these as a guide to the information in this section. The descriptions are in the order shown in the table.

Audio A and B have the same menu options, depending upon the Coding Standard selected. `Audio A Menus` are shown as examples. This menu permits the selection of individual channel audio parameters.

Path: / Configure / Audio

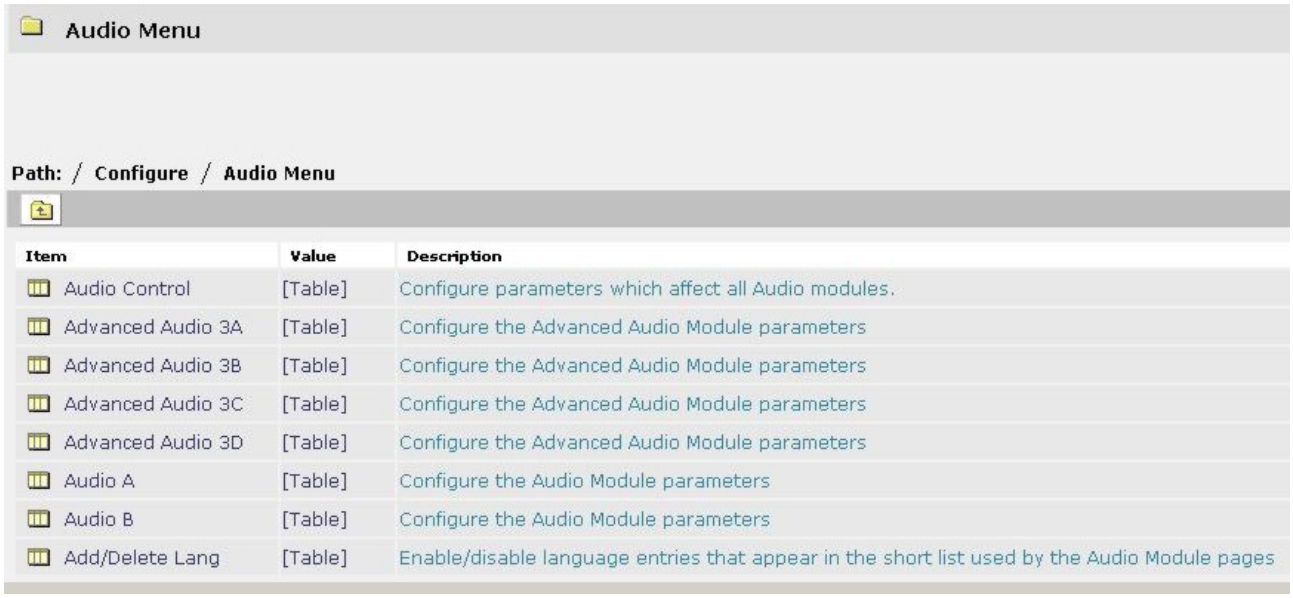


Figure 5.18: Configure/Audio Menu Webpage

5.8.2 Audio Control Menu

The audio control menu options are included as a separate menu because they operate at a system level rather than at an audio coding level.

Path: / Configure / Audio / Audio Control

Figure 5.19: Audio Control Webpage

Table 5.14: Audio Control Options

Selected Item	Options	Description
SD Embedded Audio Source	SD-SDI HD-SDI	Defines the video input that contains the embedded audio content if embedded audio is selected as the input source.
Embedded DID		Defines the DID number for embedded audio pair in the HD-SDI. It is recommended that the operator leaves the value at the Auto unless there is a good reason to change it.

5.8.3 Advanced Audio

Introduction

The Advanced Audio options define the parameters associated with the encoding of one of the audio components. These components can be encoded using one of the advanced audio encoding algorithms.

Path: / Configure / Audio / Advanced Audio

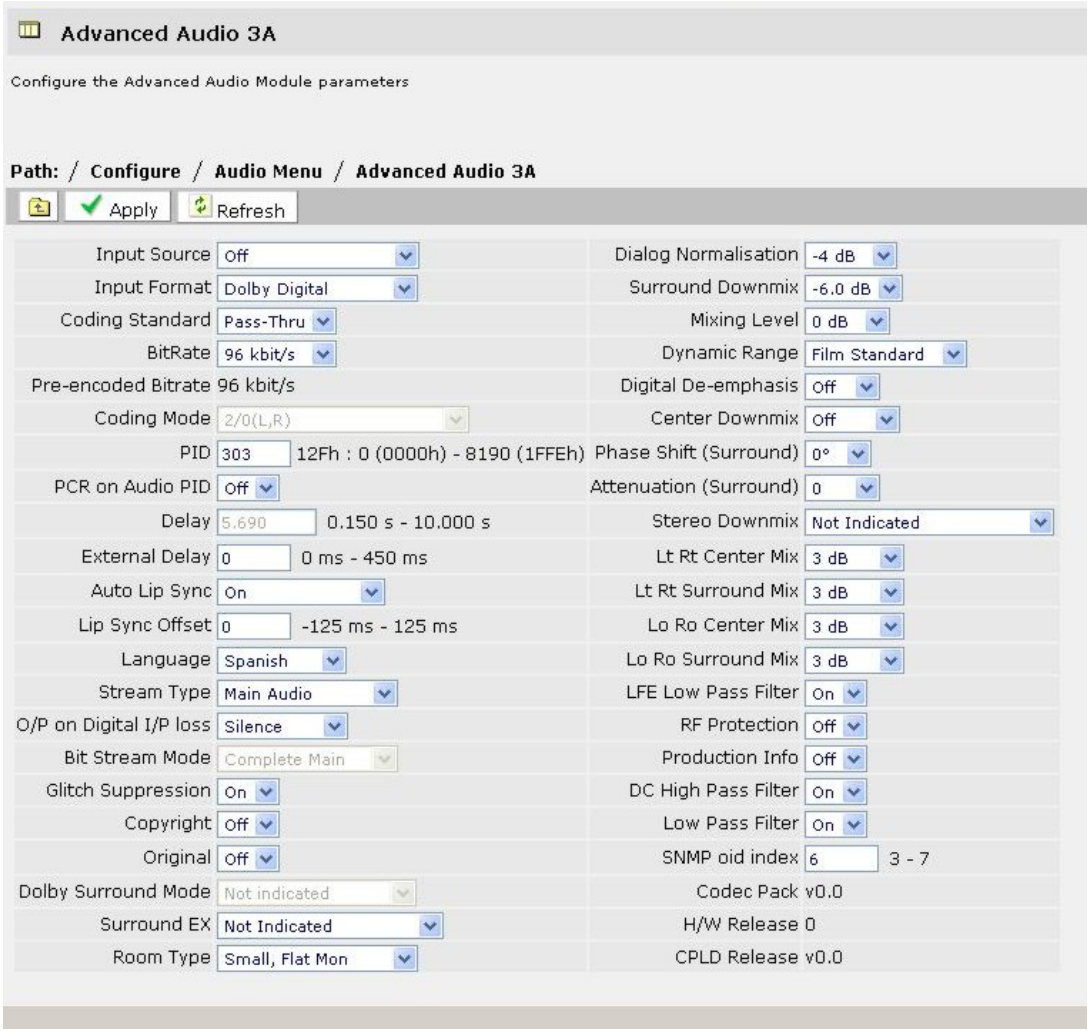


Figure 5.20: Advanced Audio Webpage

Advanced Audio Webpage Options

Table 5.15 lists the Advanced Audio options and associated descriptions in the order they appear on the webpage.

Table 5.15: Advanced Audio Webpage Option Descriptions

Selected Item	Options	Description
Input Source: Defines the source of the audio content that is to be encoded using this module. There is no capability for the input of the analogue audio content.	Off:	No data is generated from this module and this component does not exist on the SI tables.
	Embedded Source 1-8	The audio content is extracted from the DID of the embedded source input defined in the Audio Control menu.
	Digital	The audio content is routed from the Audio In 2 connector as described in *Section 2.6.6*.
	Test tone	The audio content for this module is artificially generated as a 1 kHz tone on both the left and right channel. This is used for system test purposes.
	Mute	The audio content for this module is artificially generated as silence on both the left and right channel. This is used for system test purposes.
Input Format: Describes the format of the incoming audio content. This is used to restrict the available coding standards to those that are available for the format.	Uncompressed/PCM	The audio content has not been compressed.
	Dolby Digital	The incoming audio content has been pre-encoded using the Dolby Digital algorithm.
Coding Standard: Defines the algorithm that is used to encode the input audio content. This list has been restricted by the selection made for the Input Format above. For Uncompressed/PCM input format, the available coding standard depends on licensing.	MPEG-2 AAC	This algorithm implements the low complexity profile of ISO/IEC 13818-7 using ADTS (Audio Data on Transport Stream) encapsulation of the audio data. More details are supplied in *Annex E*. NOTE... If MPEG-2 AAC is not licenced, the only available option for Input Format is “Dolby Digital” and the only available option for Coding Standard is “Passthru”.
	For Dolby Digital input format: Passthru:	This algorithm encapsulates the incoming Dolby Digital bitstream into the Transport Stream according to ETSI TS 102 366. As there is no encoding, there is no licence associated with this feature.
Bitrate (for MPEG-2 AAC): Specifies the bitrate for the encoding of the input audio content if the input format is uncompressed.	Stereo:	64, 80, 96, 112, 128, 160, 192 kbit/s
	5.1:	128, 160, 192 kbit/s
	For passthru operation, the encoding bitrate is assumed to 640 kbit/s to ensure that sufficient bit allocation is given to the audio component. The value specified in this option is ignored.	
Coding Mode: Specifies the number of audio channels to be included in the encoding.	Stereo:	For two uncompressed channels.
	Surround/5.1:	For six uncompressed channel encoding on Service 4A only NOTE... If Surround/5.1 is selected on Service 4A, then Service 4B and 4C are not available as they are used to aid in the implement the 5.1 bitstream.
	Pre-encoded Data:	For passthru operation

Table 5.15: Advanced Audio Webpage Option Descriptions (continued)

Selected Item	Options	Description
PID:		This option sets the PID to be used for the audio channel. In the event of a PID clash, one of the PIDs will be changed by the Encoder's internal checking algorithm. To be DVB compliant the audio PID should not be less than 32. However it is possible to set the PID to less than 32, but in the event of a PID clash the Encoder's internal checking algorithm will not resolve the conflict.
Component Tag:		This item defines the optional component tag to be assigned to this audio stream.
PCR on Audio PID: Specifies whether PCR timestamps are included with this audio component.	On	
	Off	
Delay: Specifies the delay that is applied to the audio component from input to ensure that it remains in synchronization with the video component.	The value is specified in seconds.	If the Auto Lip Sync is enabled, the delay value cannot be modified.
Auto Lip Sync: Defines whether the encoder ensures that the audio component is synchronized to the video component.	Off:	The amount that the audio component is delayed within the Encoder is specified as the delay value in seconds defined above.
	Off (Min. Delay):	The audio component is not delayed within the encoder and the data flow path is established such that latency thru the encoder is minimized.
	On:	The audio component is delayed according to the associated video delay.
Lip Sync Offset: Allows the operator to define a small change in the audio delay relative to the video component.	The available range is from -125 ms to 125 ms.	This gives the operator the ability to correct for errors in lipsync on input content.
Language:		This enables the language of the audio channel to be set.
Level (L/R):		Displays the level of the left/right audio channel to allow the operator to confirm that there is audio content being encoded.
O/P on Digital I/P loss: Defines the action of the encoder if there is no audio data present on the digital input when digital has been selected as the audio input. The available options are:	No PID:	The audio component is not present in the output.
	No ASI O/P:	There is no Transport Stream output from the ASI output.
TNS: Defines whether the Temporal Noise Shaping tool is used in the AAC encoding.	On	
	Off	
Copyright: This controls the Copyright flag in the bitstream.	On	The bitstream is shown to be protected by copyright.
	Off	The bitstream is shown not to be protected by copyright.
Original: This controls the setting of the Original flag in the bitstream.	On	The bitstream will be signaled as an original,
	Off	The bitstream will be signaled as a copy of an original bitstream.
SNMP oid index:	The available range is 3 to 7.	Defines the object identifier index that is used in the audio MIB for SNMP control.

Table 5.15: Advanced Audio Webpage Option Descriptions (continued)

Selected Item	Options	Description
Codec Pack: Specifies the unique version of the complete code block used on this module.		This version is independent of the selected coding standard and is the version to be used for reporting.
S/W Release:		Specifies the version of software code used.
H/W Release:		Specifies the hardware version of the Audio Option Module.
F/W Release:		Specifies the version of firmware used.
CPLD Release:		Specifies CPLD version on the module.
Boot S/W:		Specifies the version of the boot software on the module.

5.8.4 Audio A/B Menu

Audio A/B Menu Structure

Figure 5.21 shows the Audio menu options generally in the order they appear on the webpage.

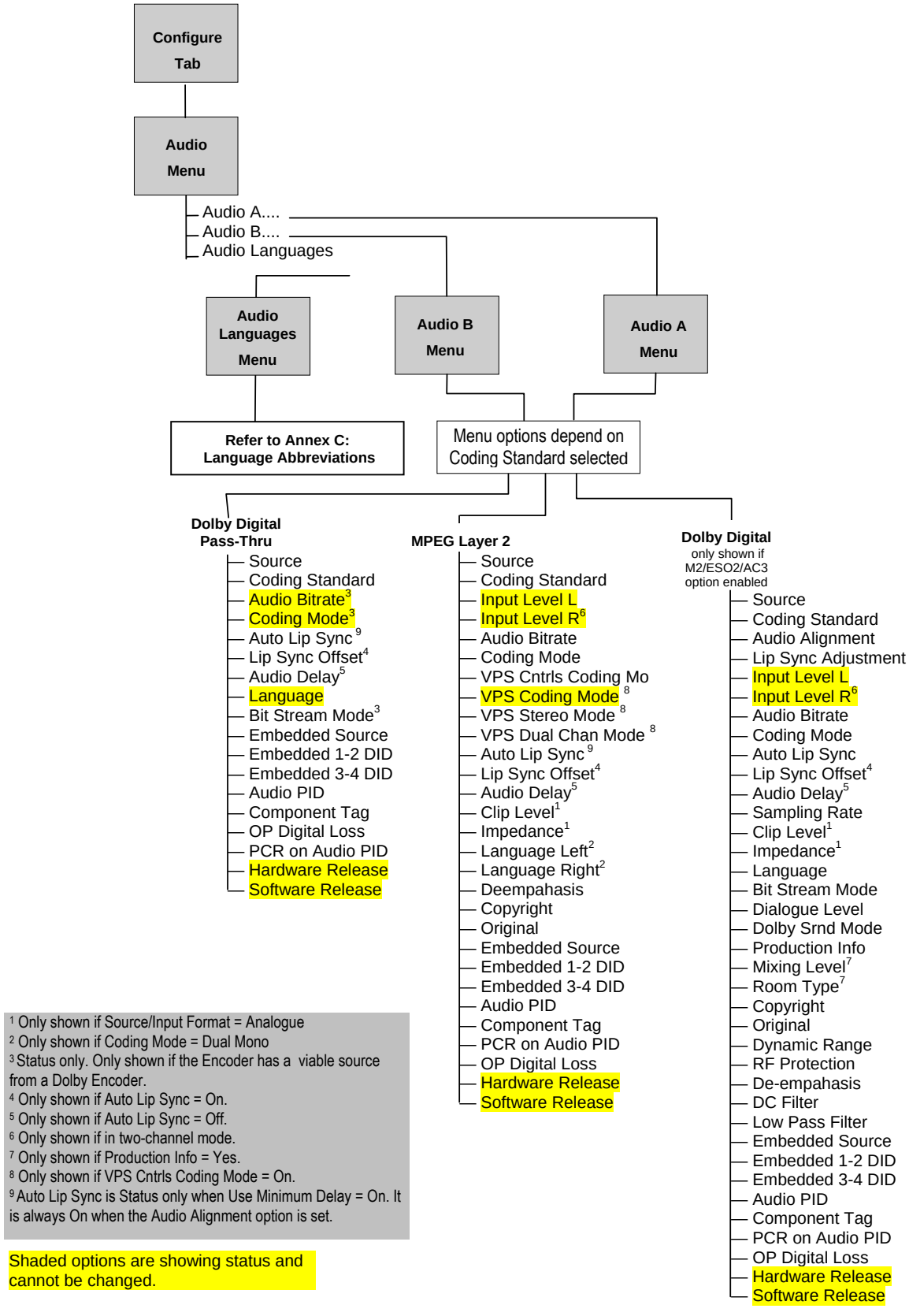


Figure 5.21: Menu Hierarchy – Configure/Audio Menu

Coding Standard Associated Options

Figure 5.21 shows the Audio menu options generally in the order they appear on the webpage.

Table 5.16 shows the options available for each standard in alphabetical order as are the option descriptions shown in *Table 5.17.* This will help easy access to information.

Table 5.16: Coding Standard Associated Options

Option	Coding Standard			Comments
	Dolby Digital Pass-Thru	MPEG Layer 2	Dolby Digital	
Audio Alignment			✓	
Audio Bitrate	✓	✓	✓	For Dolby Digital Pass-Thru only: Status only. Only shown if the Encoder has a viable source from a Dolby Encoder.
Audio Delay	✓	✓	✓	Only shown if Auto Lip Sync = Off.
Audio Description	✓	✓	✓	Only available if the input source is either digital or SDI embedded.
Audio PID	✓	✓	✓	
Auto Lip Sync	✓		✓	Auto Lip Sync is Status only when Use Minimum Delay = On. It is always On when the Audio Alignment option is set.
Bitstream Mode	✓		✓	
Clip Level		✓	✓	Only shown if Source/Input Format = Analogue
Coding Mode	✓	✓	✓	For Dolby Digital Pass-Thru only: Status only. Only shown if the Encoder has a viable source from a Dolby Encoder
Coding Standard	✓	✓	✓	
Component Tag	✓	✓	✓	
Copyright		✓	✓	
DC Filter			✓	
De-emphasis		✓	✓	
Dialogue Level			✓	
Dolby Srnd Sound			✓	This option is only available if the coding mode is 2/0(L,R)
Dynamic Range			✓	
Embedded 1-2 DID	✓		✓	
Embedded 3-4 DID	✓		✓	
Embedded Source	✓		✓	
Hardware Release	✓	✓	✓	
Impedance		✓	✓	(Only shown if Source/Input Format = Analogue)
Input Level L		✓	✓	
Input Level R		✓	✓	Only shown if in two-channel mode.
Language	✓		✓	
Language Left		✓		Only shown if Coding Mode = Dual Mono
Language Right		✓		Only shown if Coding Mode = Dual Mono
Lip Sync Adjustment			✓	Dolby only (not DTS Pass-Thru).
Lip Sync Offset	✓	✓	✓	Only shown if Auto Lip Sync = On.
Low Pass Filter			✓	
Mixing Level			✓	Only shown if Production Info = Yes.

Table 5.16: Coding Standard Associated Options (continued)

Option	Coding Standard			Comments
	Dolby Digital Pass-Thru	MPEG Layer 2	Dolby Digital	
OP Digital Loss	✓	✓	✓	
Original		✓	✓	
PCR on Audio PID	✓	✓	✓	
Production Info			✓	
RF Protection			✓	
Room Type			✓	Only shown if Production Info = Yes.
Sampling Rate			✓	This option controls the audio sampling rate.
Software Release	✓	✓	✓	
Source	✓	✓	✓	
VPS Cntrls Coding Mode		✓		
VPS Coding Mode		✓		Only shown if VPS Cntrls Coding Mode = On.
VPS Stereo Mode		✓		Only shown if VPS Cntrls Coding Mode = On.
VPS Dual Chan Mode		✓		Only shown if VPS Cntrls Coding Mode = On.

Table 5.17: Audio A/B Option Descriptions

Selected Item	Options	Description
Audio Alignment When set, each PES contains an integral number of audio access units (AU's) and the PTS shall be the same as the nearest video frame.		When checked, Auto Lip Sync is forced On, the delay can be 'nudged' using the Lip Sync Adjustment option. This is to support the SMPTE 302M-2002 specification for carriage of AES3 data in an MPEG transport stream. It provides one audio PES packet per video frame, such that the PES packet is aligned to that video frame and stamped with the same PTS. NOTE... Choose the **Audio Alignment** option to enable the SMPTE 302M 2002 standard. This disables the SMPTE 302M **Standard** option.
Audio Bitrate		This option sets the audio bitrate of this audio channel, see *Table 5.18*.
Audio Delay: Sets the audio delay.	Min: 111 Max: 9600	Audio Delay in milliseconds. This option is only available if the Auto Lip Sync option is set to Off. The maximum depends upon the coding standard.
Audio Description:		
Audio PID: This option sets the PID to be used for the audio channel. In the event of a PID clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.		To be DVB compliant the audio PID should not be less than 32. However it is possible to set the PID to less than 32, but in the event of a PID clash the Encoder's internal checking algorithm will not resolve the conflict.

Table 5.17: Audio A/B Option Descriptions (continued)

Selected Item	Options		Description
Auto Lip Sync: This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video.	Off		If the Encoder is being controlled via SNMP by a control system that has auto lip sync functionality, then this should be set to off.
	Off (min delay)		
	On (AVC 1)		
	On (AVC 2)		
	On (PIP)		
Bitstream Mode: This option sets the bitstream mode that is signaled in the bitstream. It is used to indicate the type of service the bitstream conveys.	Complete Main		
	Music and Effects		
	Visually impaired		
	Hearing impaired		
	Dialogue		
	Commentary		
	Emergency		
	Voice Over/Karaoke		In Dolby Digital when the coding mode is 1/0 this option appears as “Voice Over” otherwise as “Karaoke”.
Clip Level: This option is only displayed if the audio source is set to analogue. It enables the audio clip level to be set. That is the headroom above 0 dBu prior to the audio being clipped.	12 dB		12 dB audio clipping level.
	15 dB		15 dB is only available with PCB issue 4 and later.
	16 dB		16 dB audio clipping level.
	18 dB		18 dB audio clipping level.
	21 dB		21 dB audio clipping level.
	22 dB		22 dB audio clipping level.
	24 dB		24 dB audio clipping level.
	NOTE... The clip levels available depend on the hardware issue of the Encoder.		
Coding Mode: This option sets the audio coding mode. If the current audio bitrate is outside the bitrate range supported by the new coding mode, the bitrate is automatically changed to the lowest value within the supported range.	MPEG Layer 2	Mono Left	Single channel mono audio, encoding the left channel.
		Mono Right	Single channel mono audio, encoding the right channel.
		Dual Mono	Dual channel mono audio. Both mono channels are transmitted in the same PID.
		Stereo	Dual channel stereo audio.
		Joint Stereo	Dual channel joint (intensity) stereo audio.
		Audio Description	Only available if the source is digital or SDI embedded.
	Dolby Digital	1/0(C) (Left)	Single channel mono audio, encoding the left channel.
		1/0(C) (Right)	Single channel mono audio, encoding the right channel.
		2/0(L,R)	Dual channel stereo audio coding.
Coding Standard:			This option defines the standard that is used for the audio encoding operation associated with this menu. The available standards are shown in *Figure 5.21*.
Component Tag:			This item defines the optional component tag to be assigned to this audio stream.
Copyright: This controls the Copyright flag in the bitstream.			If set to On the bitstream is shown to be protected by copyright.
D.C. Filter: This option turns on or off a d.c. high pass filter in the input channel.			Removing the d.c. component can allow more efficient coding. However, there is a risk that signals that do not reach 100% PCM level before high pass filtering will exceed 100% level after filtering and therefore be clipped.

Table 5.17: Audio A/B Option Descriptions (continued)

Selected Item	Options	Description
De-emphasis: This option is turned on in order to de-emphasize pre-emphasized audio input into the Encoder. For a digital audio input, pre-emphasis detection is typically achieved by monitoring the pre-emphasis flags within the channel status data of the incoming digital audio signal. The de-emphasis is automatically adjusted when the Encoder is set to Auto. For an analogue audio signal, the user must manually select the appropriate de-emphasis filter.	MPEG Layer 2	To meet the MPEG Layer 2 audio encoding algorithm specification, the audio must not have pre-emphasis applied. If the input signal does have pre-emphasis applied, a de-emphasis filtering process must be applied prior to encoding.
	Dolby Digital	To meet the Dolby Digital audio encoding algorithm specification, the audio must not have pre-emphasis applied. If the input signal does have pre-emphasis applied, a de-emphasis filtering process must be applied prior to encoding.
Dialogue Level: This option sets the dialogue level that the Encoder will signal in the bitstream.	–1 dB to –31 dB	The dialogue level indicates how far the average dialogue level is below digital 100%. It is not used by the Dolby Digital decoder, but may be used by other parts of the sound reproduction system.
Dolby Srnd Mode: This option determines whether the bitstream is signaled as conveying a Dolby Surround encoded program or not.	Not indicated	It is not known if the bitstream is conveying a Dolby Surround encoded program.
	Not Dolby Surround	The bitstream is not conveying a Dolby Surround encoded program.
	Dolby Surround	The bitstream is conveying a Dolby Surround encoded program.
	This option is only available if the coding mode is 2/0(L,R). This information is not used by the Dolby Digital Decoder, but may be used by other parts of the sound reproduction system.	
Dynamic Range: This option determines which compression profile is applied to the encoding process.	None	Program reproduction with the original dynamic range.
	Film Standard	The dynamic range of audio material can vary according to its origin. The dynamic range compression profile determines the characteristic curve of the dynamic range compression algorithm (each profile has its own boost, null-band and cut parameters).
	Film Light	
	Music Standard	
	Music Light	
	Speech	
Embedded 1-2 DID: This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2.	Min: 0	Off
	Max: 1024	Select DID
	Other: >1024	Default DID
		If this is set to 1024, then the default DID will be used. Refer to *Annex E, Audio Modes* for information about DIDs.
Embedded 3-4 DID: This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4.	Min: 0	Off
	Max: 1024	Select DID
	Other: >1024	Default DID
	If this is set to 1024, then the default DID will be used. Refer to *Annex E, Audio Modes* for information about DIDs.	
Embedded Source: This option defines the embedded source.	Select HD-SDI or SD-SDI.	
Hardware Release: This option indicates the hardware version of this audio encoder channel.		It is for status only and cannot be changed.

Table 5.17: Audio A/B Option Descriptions (continued)

Selected Item	Options	Description
Impedance: It enables the input impedance of the analogue audio input to be set to either 600 Ω or 20 kΩ.		This option is only displayed if the audio source is set to analogue.
Input L/R Input Level L Input Level R		This displays the input level of the left or right audio channel for the Service. It is for status only and cannot be changed.
Language/Left/Right: This enables the language of the audio channel to be set.		This enables the language of the audio channel to be set. If the coding mode is dual mono, then a different language can be set for the left and right channels.
Lip Sync Adjustment		
Lip Sync Offset: This option is only available if the Auto Lip Sync option is set to On.	Min: -50 Max: 50	Lip Sync Offset in milliseconds. This option allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.
Low Pass Filter: This option is used to enable or disable a low pass filter in the audio input.		The low pass filter has a cut-off near the specified bandwidth of the audio channel.
Mixing Level: This parameter indicates the acoustic sound pressure level of the dialogue level during the final audio mixing session.	0 dB to 31 dB This option is only available if the Production Info option is set to On. This makes it possible for the program to be replayed at the same loudness, or at a known difference from the original. Refer to ATSC Doc. A52 for further details.	Mixing levels between 0 dB to 31 dB.
OP Digital Loss: This option controls behavior digital audio is not locked.	Silence No PID No ASI O/P	Valid PES stream containing silence No Audio PES stream (though stream is still referenced in SI) The ASI output of the Encoder is turned off
Original: This controls the setting of the Original flag in the bitstream.		If set to On the bitstream will be signaled as an original, if set to Off the bitstream will be signaled as a copy of an original bitstream.
PCR On Audio PID: This option controls whether PCR should be signaled on the audio PID.		This may be necessary if an audio only service is being generated. The default setting is Off.
Production Info:		This option indicates whether the Mixing Level and Room Type parameters exist within the bitstream.
RF Protection: This option enables or disables RF Overmodulation Protection.		It is used in situations where the audio signal of a decoded Dolby Digital bitstream is delivered via a link with very restricted dynamic range. One example is the case of a television broadcast, where sound is modulated onto an RF channel and delivered to a low cost television Receiver. In this situation it is necessary to restrict the maximum peak output level to a known value with respect to dialogue level, in order to prevent overmodulation.
Room Type: This parameter indicates the type and calibration of the mixing room used for the final audio mixing session.	Not Indicated Small, Flat Mon Large, X Curve Mon This option is only available if the Production Info option is set to On. Refer to ATSC Doc. A52 for further details.	Type and calibration of the mixing room used for the final audio mixing session.

Table 5.17: Audio A/B Option Descriptions (continued)

Selected Item	Options	Description
Sampling Rate: This option defines the audio sampling rate for the encoding operation.	32 kHz	Sets the sampling frequency to 32 kHz.
	48 kHz	Sets the sampling frequency to 48 kHz
	NOTE... 44.1 kHz is not an available as it cannot be generated from the 27 MHz video clock.	
Software Release: This option indicates the software version of this audio encoder channel.		It is for status only and cannot be changed.
Source This option defines what audio source is used the encoding operation associated with this menu.	Off	No audio associated with this menu is produced
	Mute	Audio is produced but it is silence (all samples are zero).
	Test Tone	Audio input is a 1 kHz test tone.
	Analogue	Audio source is from the analogue input system.
	Digital	Audio source is from the digital audio input
	HD-SDI Embedded 1	Audio source is de-embedded audio from the HD-SDI video input [DID 0x2FF]
	HD-SDI Embedded 2	Audio source is de-embedded audio from the HD-SDI video input [DID 0x2FF]
	HD-SDI Embedded 3	Audio source is de-embedded audio from the HD-SDI video input [DID 0x1FD]
	HD-SDI Embedded 4	Audio source is de-embedded audio from the HD-SDI video input [DID 0x1FD]
VPS Cntrls Coding Mode: Allows the extraction of the Audio Coding Mode from Video Programming System (VPS).		The VBI line must be set in the Video\VBI menu for extraction of VPS.
VPS Coding Mode: This menu displays what the motherboard has been able to extract from the VPS. Only available if VPS Controls Coding Mode is set to On.	Not detected	Not able to extract any information. In this case, the coding mode signaled shall revert to that set in the existing “Coding Mode” menu.
	Undefined	
	Single Chan (Mono)	
	Stereo	
	Dual Chan	
VPS Stereo Mode: Only available if VPS Controls Coding Mode is set to On.	Auto-Bit5	In auto modes, the corresponding bit in VPS Word5 controls whether stereo or joint stereo is coded.
	Auto-Bit6	
	Auto-Bit7	
	Auto-Bit8	
	Stereo	If either of these options is selected, Bit6 is ignored and coding is forced when Bit1/2 is 1 0.
	Joint Stereo	
VPS Dual Chan Mode	Auto-Bit5	In auto modes, the corresponding bit in VPS Word5 controls whether the dual or single channel is coded.
	Auto-Bit6	
	Auto-Bit7	
	Auto-Bit8	
	Dual	If either of these options is selected, the coding mode is forced to this when Dual channel is signaled in bits 1 and 2 (i.e. Bit1/2 is 1 1).
	Single	

Table 5.18: Audio Bitrate Options

Available Settings	MPEG Layer 2 Coding				Dolby Digital	
	Mono	Dual Mono	Stereo	Joint Stereo	1/0(C)	2/0(L,R)
32 kbit/s	✓	×	×	×	×	×
48 kbit/s	✓	×	×	×	×	×
56 kbit/s	✓	×	×	×	✓	×
64 kbit/s	✓	✓	✓	✓	✓	×
80 kbit/s	✓	×	×	×	✓	×
96 kbit/s	✓	✓	✓	✓	✓	✓
112 kbit/s	✓	✓	✓	✓	✓	✓
128 kbit/s	✓	✓	✓	✓	✓	✓
160 kbit/s	✓	✓	✓	✓	✓	✓
192 kbit/s	✓	✓	✓	✓	✓	✓
224 kbit/s	×	✓	✓	✓	✓	✓
256 kbit/s	×	✓	✓	✓	✓	✓
320 kbit/s	×	✓	✓	✓	✓	✓
384 kbit/s	×	✓	✓	✓	✓	✓
448 kbit/s	×	×	×	×	✓	✓
512 kbit/s	×	×	×	×	✓	✓
576 kbit/s	×	×	×	×	✓	✓
640 kbit/s	×	×	×	×	✓	✓

5.9 Data Menu

5.9.1 Overview

The `Data Menu` is selected from the `Setup Menu`. This menu permits the selection of RS-232 asynchronous data and RS-422 synchronous data channel parameters.

Path: / Configure / Data

See *Figure 5.22* for the menu structure.

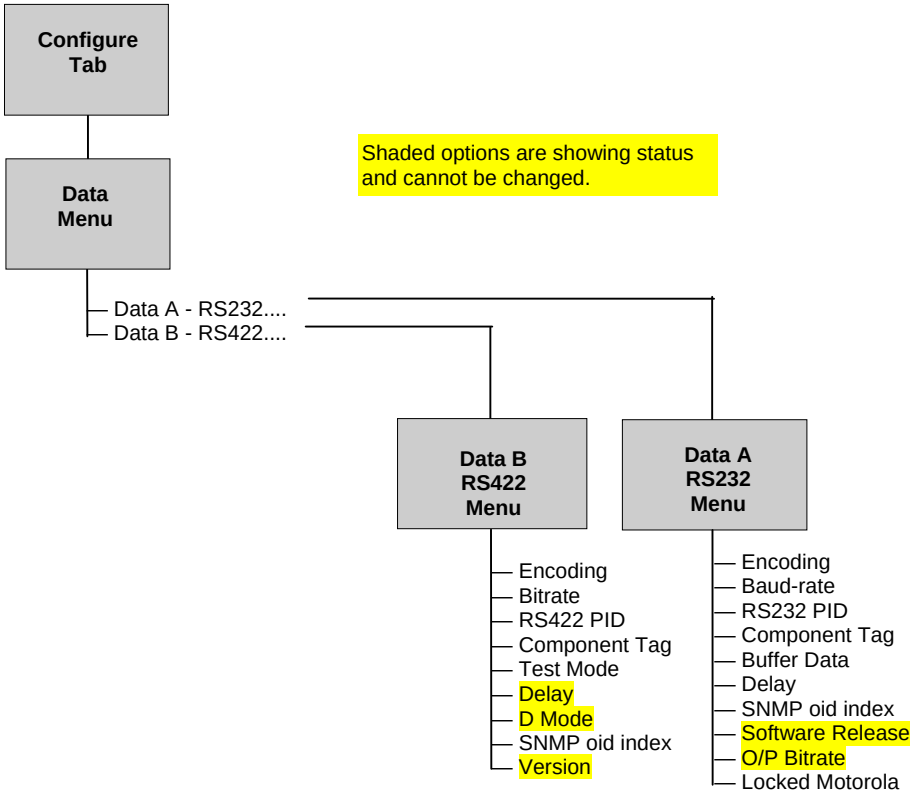


Figure 5.22: Data Options

5.9.2 Data A – RS232 Menu

Table 5.19 shows the Data A, RS232 Options.

Table 5.19: Data A, RS232 Option Descriptions

Selected Item	Options	Description
Encoding:	Off	
Switches the RS-232 asynchronous data channel On or Off.	On(Wegener)	If On (Wegener) is selected, the stream is identified in the PMT as a component of type 0xC1 with no descriptors. Wegener ASYNC data are transmitted as private stream 2 type data. This stream conforms to ISO13818. The adaptation field is used to add stuffing bytes if needed to complete a TS packet. Stuffing bytes are set to a value of 0xFF. Payload data bytes follow the packet length field and do not include a CRC field.

Table 5.19: Data A, RS232 Option Descriptions (continued)

Selected Item	Options	Description
	On(Motorola)	If On (Motorola) is selected, the stream is identified in the PMT as a component of type 0xC0 with no descriptors. The RS-232 data is encapsulated directly into the full 184 payload bytes of the transport packets (i.e. no PES layer). The RS-232 data-stream is expected to contain complete DCIIText packets. These packets must be preceded by the sequence (0x7F, 0xFE, 0x7F, 0Xfe) followed by 2-bytes which contain the length of the DCIIText packet. Once this sequence is detected, the option Locked Motorola indicates Yes.
	On(DVB)	This is the format specified by DVB
	On(Tandberg)	This is a proprietary format
	NOTE... If Ethernet data is turned on it is not possible to turn RS-232 data on.	
Baud Rate: This option enables the baud rate of the RS-232 asynchronous data channel to be set.	1200	1200 Baud rate.
	2400	2400 Baud rate.
	4800	4800 Baud rate.
	9600	9600 Baud rate.
	19200	19200 Baud rate.
	38400	38400 Baud rate.
RS-232 PID: This option is used for entering or updating data PIDs.	PIDs 32 to 8191 are available for use.	To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Buffer Data:	Send immediately	Whenever data is available at the RS-232 port it is sent in the output transport stream. NOTES... 1. This option is only available in TANDBERG mode. 2. This can result in wasted bandwidth due to low packet occupancy. Also results in a higher packet rate which may cause some receivers to overflow.
	Wait 1 Second	Data is buffered until enough has arrived to fill a transport packet or 1 second elapses, whichever occurs first.
Delay Option		This option shows the delay on the data and cannot be changed.
SNMP oid index:	Min: 1	Oid index
	Max: 7	
	All option modules have the same SNMP oid (object identifier) with the exception of one byte which identifies which slot the module is in. An MEM expects the data module to be in slot two or three in the previous version of the Encoder. Therefore, slots one and two in this Encoder have been allocated to correspond directly to slots two and three in the previous Encoder. In this Encoder the data module can be allocated to slot one, making it inaccessible to an MEM. This variable allows the on-board data module to be apparently moved around - to a slot in which it may be referenced by the MEM.	
Software Release		This displays the version of the data. It is for status only and cannot be changed.
O/P Bitrate		This option is for status only and indicates the output bitrate.

5.9.3 Data B - RS422 Menu

Table 5.20 shows the Data B, RS422 Options.

Table 5.20: Data B, RS422 Options

Selected Item	Options		Description
Encoding: Switches the RS-422 synchronous data channel On or Off.			
Bitrate: Sets the bitrate of the RS-422 synchronous data channel.	Settings cycle from 56 to 1792 in steps of 56 then from 64 to 2048 in steps of 64, then back to 56		RS-422 synchronous data channel bitrate.
RS-422 PID: Enters or updates data PIDs.	PIDs 32 to 8190 are available for use.		To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Component Tag: Assigns the optional component tag to this data stream.			
Test Mode Option: Turns the test mode On and Off.			
Delay:			The Delay option cannot be changed.
D Mode			The D Mode entry cannot be changed.
SNMP oid index:	Min:	1	Oid index
	Max:	7	
	All option modules have the same SNMP oid (object identifier) with the exception of one byte which identifies which slot the module is in. An MEM expects the data module to be in slot two or three in the previous version of the Encoder. Therefore, slots one and two in this Encoder have been allocated to correspond directly to slots two and three in the previous Encoder. In this Encoder the data module can be allocated to slot one, making it inaccessible to an MEM. This variable allows the on-board data module to be apparently moved around - to a slot in which it may be referenced by the MEM.		
Version:			This indicates the version of the data and is for status only and cannot be changed.

5.10 Mux Menu

Access the Mux Menu from the Configure Menu. This menu permits the selection of Multiplexer output parameters.

Path: / Configure / Mux

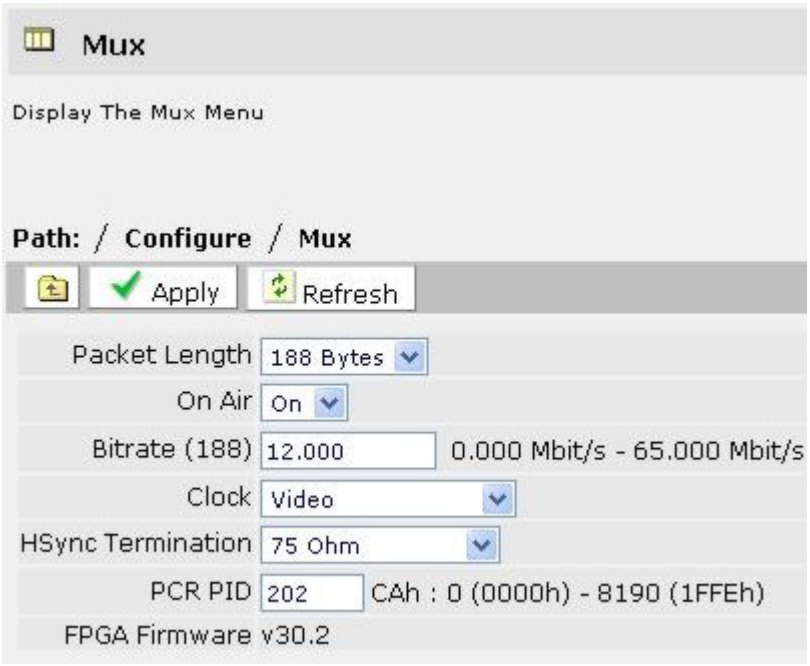


Figure 5.23: Configure> Mux Webpage

Table 5.21: Mux Options

Selected Item	Options	Description
Packet Length: This option enables the Packet Length to be set.	188 bytes	Uses 188 byte packet format.
	204 bytes	Uses 204 byte packet format.
On-Air: This option determines whether the output of the Encoder is sent to the Multiplexer.	On	Multiplexer output is switched on.
	Off	Multiplexer output is switched off.
Bitrate (188) and Bitrate (204): If the specified bitrate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.	Min 0.0000 Mbit/s Max 65.0000 Mbit/s Step Size 0.0001 Mbit/s	Multiplexer output bitrate when in baseband output format and ASI output mode. The maximum bitrate is 65 Mbit/s irrespective of packet size. To obtain 69 Mbit/s modulated output rate, set the packet size to 188 and bitrate to 65 Mbit/s. The modulator automatically adds 16 Reed-Solomon bytes per packet.

> NOTE...
> If the Packet Length option is set to 188 bytes then only the Bitrate (188) option is displayed. If the Packet Length option is set to 204 bytes then both the Bitrate (188) and Bitrate (204) options are displayed.

Selected Item	Options	Description
Clock: This option enables the Clock to be set.	Local Oscillator	The system clock is derived from the local oscillator.
	HSYNC (External)	The system clock is locked to the HSYNC input.
	Video	The system clock is locked to the video source.
	NOTE... This option indicates the origin of the clock. It must be set to a video or external source before attempting to change the clock value or it will default to Local Oscillator.	
HSync Termination	Selectable between 75 Ω and high impedance.	When powered off, the HSYNC input is high impedance.
PCR PID: This option shows the Program Clock Reference Packet Identifier.	Min: 1	
	Max: 8190 (1FFEh)	
	Step Size: 1	
FPGA Firmware: This indicates the version of the FPGA Firmware.		This option is for status only and cannot be changed.

5.11 Output Selection

5.11.1 Overview

Figure 5.24 shows the Output Selection options for the EN80x0 Encoder.

Path: / Configure / Output

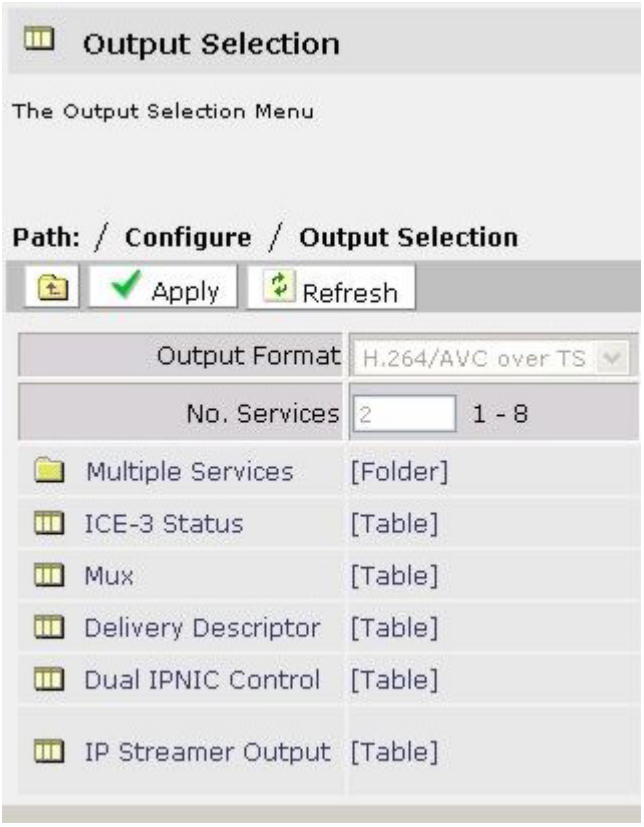


Figure 5.24: Output Selection Items

5.11.2 Multiple Services

See *Section 5.6.6* for details.

5.11.3 ICE-3 Status

Displays the Software and FPGA versions of the modules which make up the HD Intelligent Compression Engine.

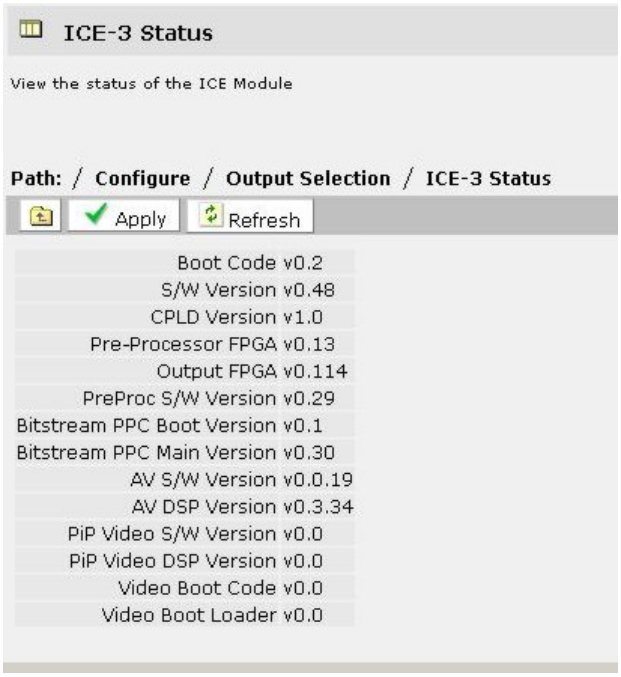


Figure 5.25: Typical ICE-3 Display

> NOTE...
> Some version numbers are not reported (shown as v0.0 on the display).

5.11.4 Mux Menu

The options associated with this menu are described in *Section 5.10*.

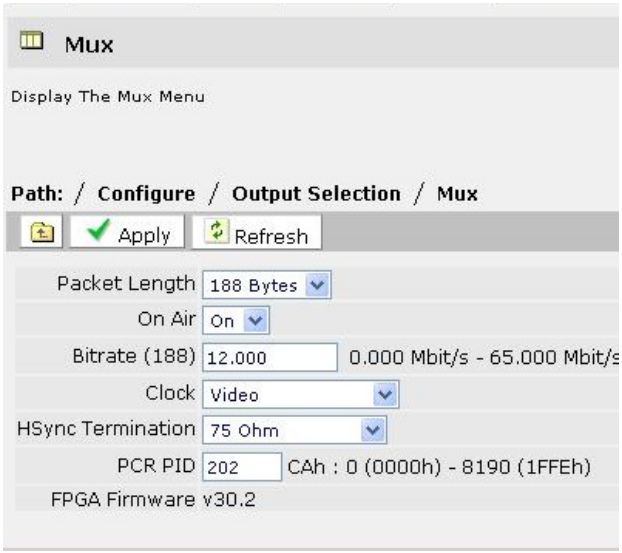


Figure 5.26: Configure> Output Selection> Mux Webpage

5.11.5 Delivery Descriptor

Overview

The screens in this menu vary according to the **Descriptor Type** selected.

Table 5.22: Descriptor Type Options

Selected Option	Description	Comments
Terrestrial	Descriptor type set to Terrestrial.	The type of delivery descriptor selected affects the remaining options shown on the Delivery Descriptor Menu.
Cable	Descriptor type set to Cable.	

Descriptor Type = Terrestrial

Table 5.23 shows the options for the Terrestrial Descriptor Type.

Table 5.23: Options for Terrestrial Descriptor Type

Selected Item	Options	Description
Frequency: This option enables the carrier frequency of the transmitter to be specified.	Min: 0.0000 MHz Max: 999.9999 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.
	NOTES... 1. This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control. 2. This option is status only unless Manual has been selected in the Band Plan option.	
Modulation Type: This option enables the type of modulation used to be specified.	Analog ATSC (8VSB) ATSC (16VSB) Private	

Descriptor Type = Cable

Table 5.24 shows the options for the Cable Descriptor Type

Table 5.24: Cable Descriptor Type Options

Selected Item	Options	Description
Frequency: This option enables the carrier frequency of the transmitter to be specified.	Min: 0.000 MHz Max: 999.999999 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.
	NOTES... 1. This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control. 2. This option is status only unless Manual has been selected in the Band Plan option.	
Modulation Type: This option enables the type of modulation used by the cable channel to be specified.	Analog SCTE mode 1 SCTE mode 2 Private	

5.12 Stored Configurations Tab

5.12.1 Overview

The Encoder has a set of 16 default configurations for both 525 and 625 line standards. These configurations provide the basis for quick and easy configuration of the operating parameters for common set ups, without having to enter all parameters individually. The default configurations can be used as they are, or loaded as the active configuration and edited as required.

The Encoder normally holds the following configurations:

- One Active Configuration (running on the Encoder)
- Sixteen user configurations (in the User FLASH)
- Sixteen backup configurations (in Backup FLASH)
- Sixteen 525 factory default configurations
- Sixteen 625 factory default configurations

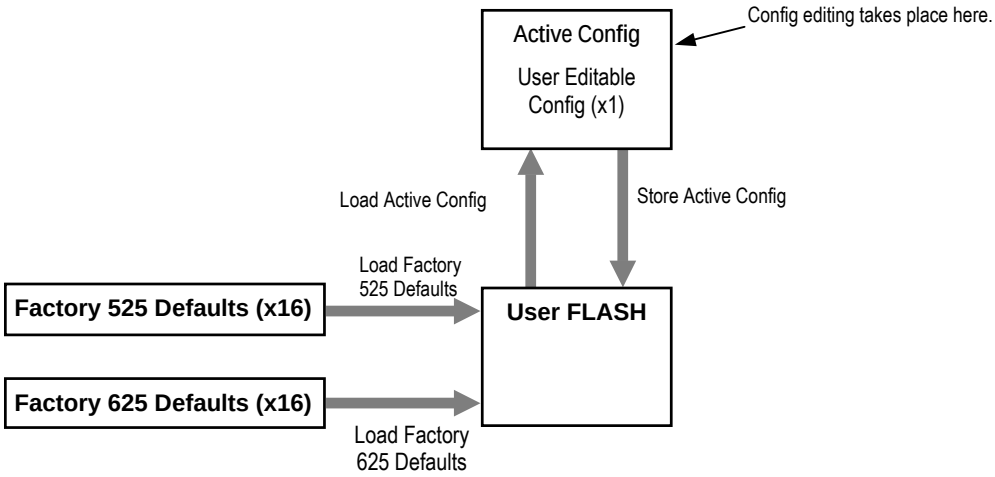


Figure 5.27: Configuration, Graphical Explanation.

Active Configuration

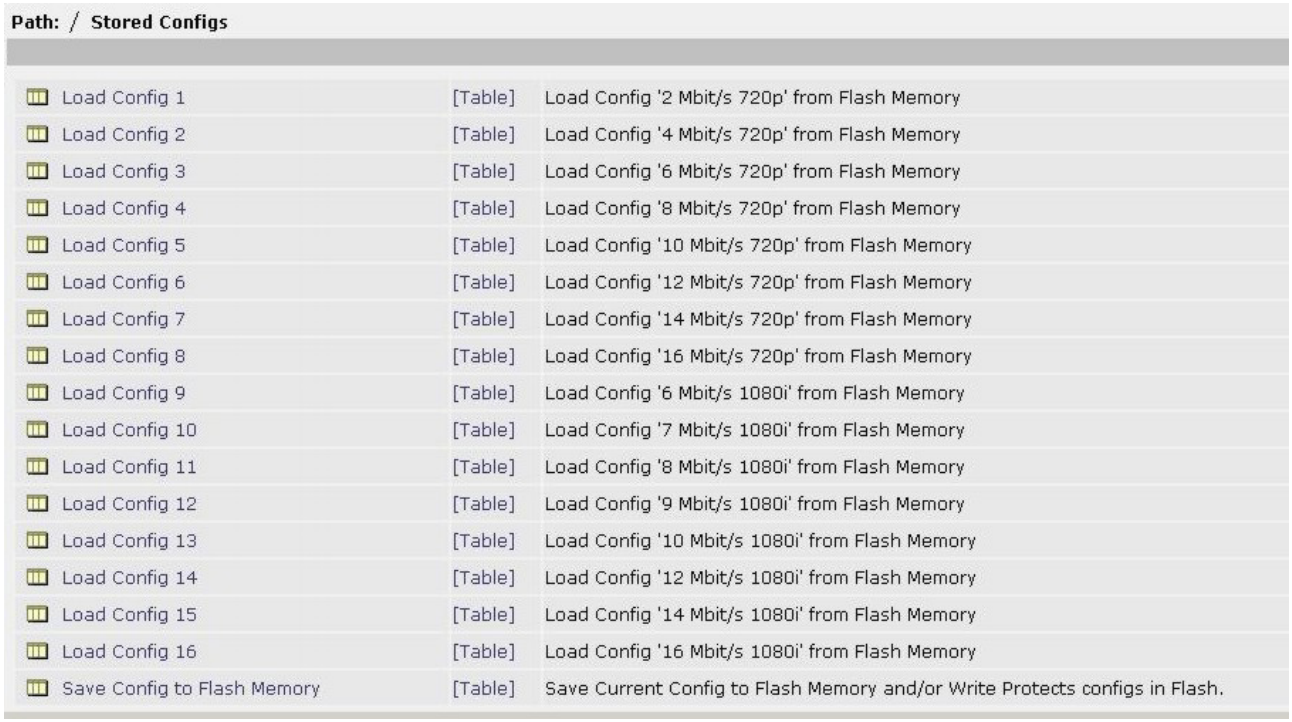
This is the configuration that the Encoder is currently using.

Factory Default Configurations

There are 16 default configurations for both 525 and 625 line standards. They are provided as examples and can be used as they are, if their settings suit your needs. They are non-editable. The 16 default configurations (525 or 625) can be loaded to the user FLASH at any time by selecting **Factory 525 (or 625) Defaults**. This will overwrite all user configurations that are not write-protected. Individual configurations cannot be selected for loading to the User FLASH.

5.12.2 Load Config n (From Flash Memory) Option

This options loads the parameters from one of the configuration files into the operational set for the Encoder.



Path: / Stored Configs

Load Config 1	[Table]	Load Config '2 Mbit/s 720p' from Flash Memory
Load Config 2	[Table]	Load Config '4 Mbit/s 720p' from Flash Memory
Load Config 3	[Table]	Load Config '6 Mbit/s 720p' from Flash Memory
Load Config 4	[Table]	Load Config '8 Mbit/s 720p' from Flash Memory
Load Config 5	[Table]	Load Config '10 Mbit/s 720p' from Flash Memory
Load Config 6	[Table]	Load Config '12 Mbit/s 720p' from Flash Memory
Load Config 7	[Table]	Load Config '14 Mbit/s 720p' from Flash Memory
Load Config 8	[Table]	Load Config '16 Mbit/s 720p' from Flash Memory
Load Config 9	[Table]	Load Config '6 Mbit/s 1080i' from Flash Memory
Load Config 10	[Table]	Load Config '7 Mbit/s 1080i' from Flash Memory
Load Config 11	[Table]	Load Config '8 Mbit/s 1080i' from Flash Memory
Load Config 12	[Table]	Load Config '9 Mbit/s 1080i' from Flash Memory
Load Config 13	[Table]	Load Config '10 Mbit/s 1080i' from Flash Memory
Load Config 14	[Table]	Load Config '12 Mbit/s 1080i' from Flash Memory
Load Config 15	[Table]	Load Config '14 Mbit/s 1080i' from Flash Memory
Load Config 16	[Table]	Load Config '16 Mbit/s 1080i' from Flash Memory
Save Config to Flash Memory	[Table]	Save Current Config to Flash Memory and/or Write Protects configs in Flash.

Figure 5.28: Typical Stored Configurations Tabbed Page

5.12.3 Save Config to Flash Memory Option

This option saves the parameters from the operational set for the Encoder into one of the configuration files.

5.13 Load/Save

The instructions shown on the screen should be followed to perform the required operation.

> NOTE...
>
> The facility to save/load XML configurations is currently intended to be used under the direction of TANDBERG Television support staff.

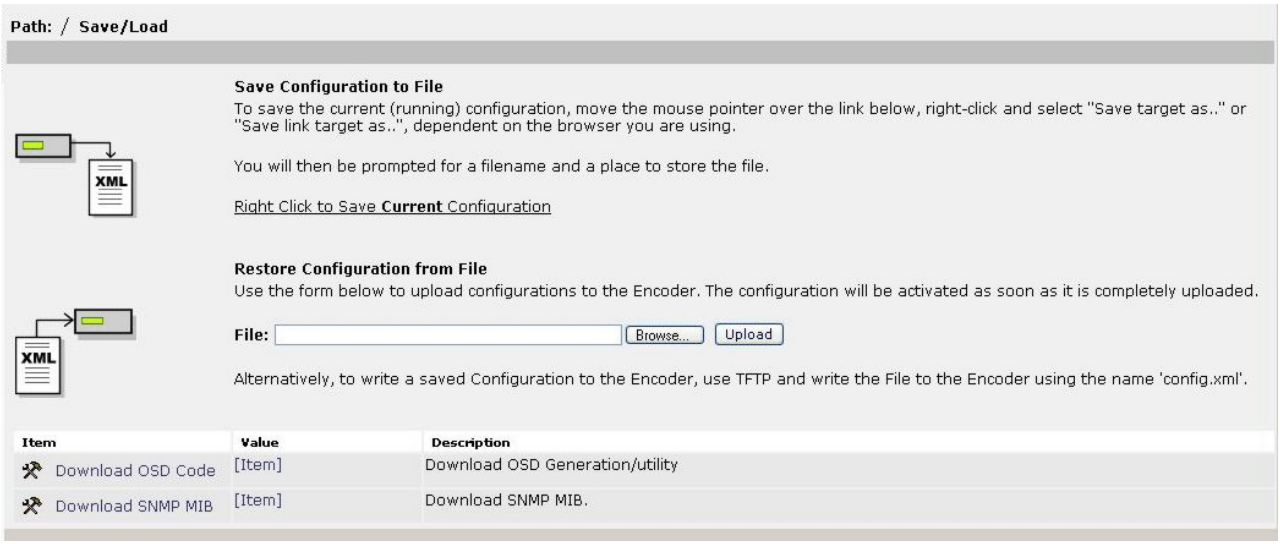


Figure 5.29: Save/Load Configurations

5.14 Fault Reporting

There is significant information that can be extracted from the menu system on the Encoder that should be included with any fault reporting as this will aid and speed the diagnostic process.

The following textual information is important and should be sent as part of the fault report:

- **Version Info**
- **Event Log**
- **NV Event Log**

To save the information in a readable form, when the text is displayed in the web browser:

- Select the **Edit** menu on Explorer
- Click **Select All** and then **Copy**.
- Open Notepad and paste this in.
- Save the Notepad file.

Also the XML configuration file of the Encoder should be included. This is downloaded from the unit by following the instructions on the **Save/Load** tab in the menu system.

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Chapter 6

Picture in Picture

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6.1 Introduction

Picture in Picture (PiP) functionality is only available in the Encoder after the purchase of the EN8000/SWO/PIP license (please refer to Customer Services for details).

When PiP is enabled, the unit supports the simultaneous generation of a second lower-resolution H.264 encoded video stream for use as picture in picture in a second service. There is no audio currently associated with the PiP service.

The sequence of actions required to enable PiP operation is:

1. Enable the video elementary streams
2. Ensure each video stream is allocated to a separate service
3. Source each service separately from the dual IP Network Interface Card (dIPNIC).

6.2 Setting up PiP on the EN8000 Encoder

6.2.1 Allocate Streams to a Service

1. Go to either the System/Multiple Services or the Video/Multiple Services menu.
2. Select the appropriate number of services.

Table 6.1: Number of Services

Number of Services	Output	Comments
1	Main Only	Single service (standard operation for the Encoder).
2	Main + PiP	

3. If the incoming configuration is incorrect, select User Defined for PID allocation and edit each service independently from this menu.

> NOTE...
> A summary of the services at the output is displayed on the Web Status screen.

6.2.2 Enable the Video Elementary Streams

1. Select the Video Source menu and enable the required input source. This automatically enables encoding of the appropriate video streams.
2. Encoding is disabled/enabled using the Advanced menus.
3. The main High Definition (HD) or Standard Definition (SD) video is controlled via the Video/H.264/AVC Encoder menu.
4. The PiP is controlled via the Video / PiP Encoder menu.

The resolutions and bitrate range settings for the PIP video is shown in *Table 6.2*. Availability of the options depends on the selected source.

Table 6.2: Resolutions and Bitrates

Resolution (V x H)	Min Bitrate	Max Bitrate	Available from Selected input
720 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
720 x 480 (60Hz)			
704 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
704 x 480 (60Hz)			
640 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
640 x 480 (60Hz)			
544 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
544 x 480 (60Hz)			
528 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
528 x 480 (60Hz)			
480 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
480 x 480 (60Hz)			
352 x 576 (50 Hz)	256 kbit/s	10 Mbit/s	HD
352 x 480 (60Hz)			
352 x 288 (50Hz)	350 kbit/s	10 Mbit/s	HD or SD
352 x 240 (60Hz)	300 kbit/s	10 Mbit/s	HD or SD
192 x 192	200 kbit/s	2 Mbit/s	HD or SD
192 x 144	150 kbit/s	2 Mbit/s	HD or SD
128 x 96	130 kbit/s	1 Mbit/s	HD or SD
96 x 96	100 kbit/s	1 Mbit/s	HD or SD

NOTE...

The menu names are not fully constructed until each module has fully booted. Default names may be shown for a short while following boot-up.

6.2.3 Output Services through the Dual IP/Ethernet Option Card

Overview

The Encoder ASI outputs present the services as a single multi-program transport stream (MPTS). Additionally, the services can be split into three services and transmitted over an IP network using the output from the dual IP/Ethernet option card (EN8000/HWO/IPTSDUAL).

CAUTION...

Ensure that the IP Output is enabled and all other parameters (such as Protocol and Time to Live) are correct.

IP Output

The dual IP/Ethernet option card is configured in one of two ways:

1. Output all the services as one multi-service stream.
2. Output each service individually or as up to three separate streams. The number of streams is set using the Multi TS option from the TS output.

Each service has an associated menu to allow its multicast address and port details to be entered. These are normally set differently to allow them to be routed to different decoders.

Chapter 7

Preventive Maintenance and Fault-finding

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7.1 Introduction

This chapter provides the schedules and instructions, where applicable, for routine inspection, cleaning and maintenance of the equipment that should be performed by an operator. There are also some basic fault-finding procedures to follow in the event of a suspected Encoder failure.

7.2 Preventive Maintenance

7.2.1 Routine Inspection - Cooling Fans

The fans on the Encoder can be temperature controlled so may not be on if the ambient temperature is low. Refer to *Annex B, Technical Specification* for more information.

> NOTE...
>
> Failure to ensure a free flow of air around the unit may cause overheating. This condition is detected by a temperature sensor on the Base Board that causes the alarm relay to be energized.

7.2.2 Cleaning

Unplug the Encoder from the wall outlet before cleaning the exterior with a damp cloth. Do not use liquid cleaners or aerosol cleaners.

> NOTE...
>
> Only the exterior of the case should be cleaned.

7.2.3 Servicing

Damage Requiring Service

WARNING...

DO NOT ATTEMPT TO SERVICE THIS PRODUCT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

1. When the power supply cord or plug is damaged
2. If liquid has been spilled, or objects have fallen into the product
3. If the product has been exposed to rain or water
4. If the product does not operate normally by following the operating instructions
5. If the product has been dropped or the case has been damaged
6. When the product exhibits a distinct change in performance

Replacement Parts

When replacement parts are required, be sure the service technician has used parts specified by the manufacturer or which have the same characteristics as the original part. Unauthorised substitutions may result in fire, electric shock or other hazards.

Checks on Completion of Servicing

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in a safe operating condition. Also, performance and EMC checks may be required.

7.3 Maintenance and Support Services

7.3.1 Introduction

TANDBERG Television is a leader in the design, integration and implementation of digital broadcasting products and systems. It has a large team dedicated to keeping our customers on-air 24 hours a day, 365 days a year.

With regional offices worldwide, and ultra-modern specialist service facilities in the US, UK, Hong Kong and Australia, TANDBERG Television covers the world. There is a customer service centre open round the clock, every day of the year, in your time zone.

TANDBERG's years of design and support experience enable it to offer a range of service options that will meet your needs at a price that makes sense.

It's called the **TANDBERG Advantage**.

7.3.2 Warranty

All TANDBERG Products and Systems are designed and built to the highest standards and are covered under a comprehensive 12 month warranty.

7.3.3 Levels of Continuing TANDBERG Television Service Support

For stand-alone equipment, then TANDBERG Television **BASIC Advantage** is the value for money choice for you. BASIC provides you with year-by-year Service long after the warranty has expired.

For systems support you can choose either **Gold** or **Silver Advantage**. These packages are designed to save you costs and protect your income through enlisting the help of TANDBERG Television support specialists.

Call TANDBERG Sales for more details.

7.4 Front Panel Display Errors and Diagnostics Menus

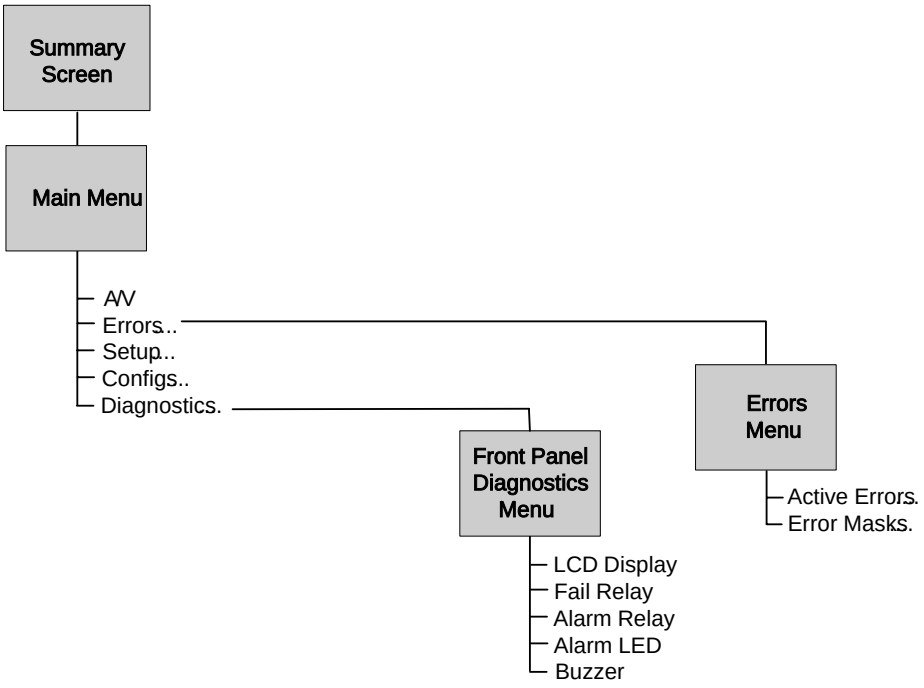

Figure 7.1: Errors and Diagnostic Menu Tree

7.4.1 Display Errors Option

It is possible to enable or disable the display of error or alarm messages on the front panel. To set this the `Front Panel Display Option` is selected from the `Advanced Menu` from the `System Menu`. This menu provides options for the advanced parameters of the Encoder. See Chapter 5 for the `Advanced Menu` structure.

7.4.2 Error Masks Menu

This option allows any of the error messages to be masked. There are three states for the error message: Alm, Fail or Off.

- Alm (Alarm) shows the error message and triggers the alarm relay
- Fail shows the error message and triggers both the alarm and fail relays
- Off does not show the error message and does not trigger any relays

Press the navigation (arrow) key next to a message. The status of the message changes as the front panel key is pressed.

Restore Defaults

This option sets alarm, fail and error messages to the factory defaults.

7.4.3 Active Errors

Investigate any run-time errors by selecting the `Active Errors` in the `Errors Menu` (see *Figure 7.1*). This gives a list of any current active errors. Active errors are updated approximately every 30 seconds.

CAUTION...

It does not mean that the Encoder is fully functional if the Error option does not produce any results. Some processes cannot be tested on-line.

NOTE...

This function can be used with the Encoder still in service.

7.4.4 Diagnostics Menu

Introduction

This menu has a selection of diagnostic tests, which allow the operator to test the individual component parts of the equipment.

LCD Display Test

Press the **LCD Display** softkey to access the option and then press any key to cycle through the test patterns and to return to the menu.

Fail Relay Test

Press the **Fail Relay** softkey to access the option and then press any key to toggle the fail relay on and off. The relay can usually be heard clicking as it changes state. The relay is connected to the rear panel **ALARM** connector – see *Chapter 2*, *Installing the Equipment* for the connector pin-out details.

Alarm Relay Test

Press the **Alarm Relay** softkey to access the option and then press any key to toggle the alarm relay on and off. The relay can usually be heard clicking as it changes state. The relay is connected to the rear panel **ALARM** connector – see *Chapter 2*, *Installing the Equipment* for the connector pin-out details.

Alarm LED Test

Press the **Alarm LED** softkey to access the option and then press any key to toggle the front panel Alarm LED on and off.

Buzzer Test

Press the **Buzzer** softkey to access the option, which immediately causes a buzzer to sound. Press any key to turn the buzzer off.

7.5 Web Browser Support

7.5.1 Support Tabbed Page

Figure 7.2 shows the items available on the Support tabbed page available through the Web Browser. Use this page to interrogate the Event Logs and to check the Hardware and Software configuration of the Encoder

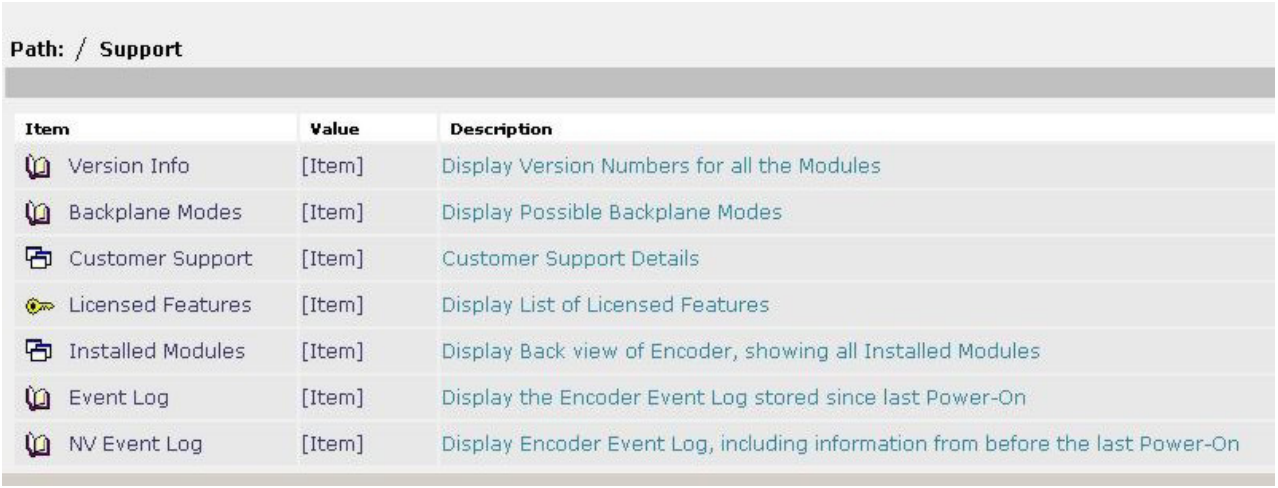

Figure 7.2: Support Tabbed Page

7.5.2 Device Information Tabbed Page

Addresses and times are set through the Device Information Tabbed Page.

Use this page to access the current Alarms and Errors.

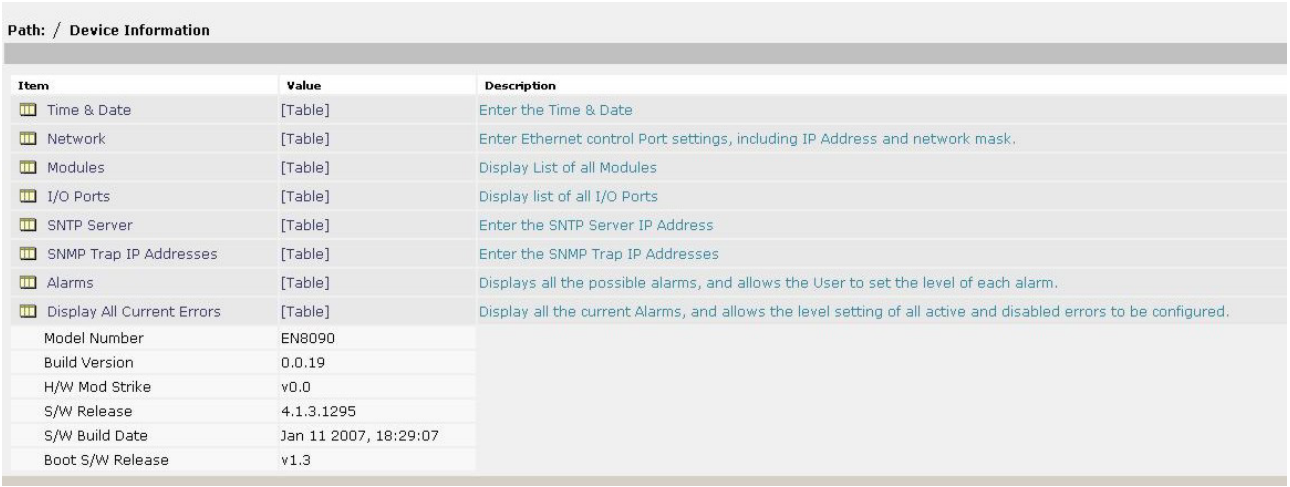

Figure 7.3: Device Information Tabbed Page

7.5.3 Alarms Page

This page displays all the possible alarms and allows the User to set the level of each alarm.

A list of alarms is given in *Annex L*.

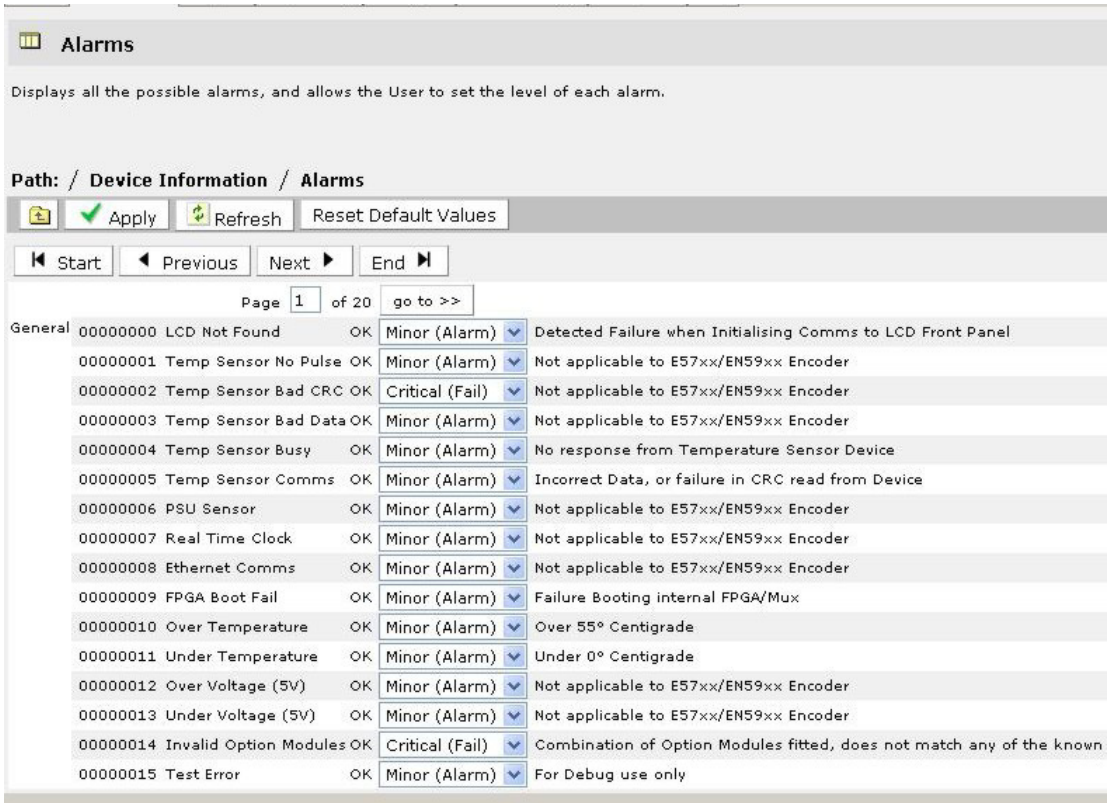

Figure 7.4: Typical Alarm Page

Items can be masked or level assigned from this page. The same function is available through the front panel controls and display (see *Section 7.4.2*).

Table 7.1: Alarm/Fail Masking

Level Displayed		Description
on Webpage	on Front Panel	
Minor	Alm (Alarm)	The equipment has not failed and the service has not been interrupted but requires attention.
Critical	Fail	The equipment has failed and the service has been interrupted.
Off	Off	The condition is masked and does not light the front panel LED or operate the relay

7.6 Fault-finding

7.6.1 Fault-finding Philosophy

It is the objective of this chapter to provide sufficient information to enable the operator to rectify apparent faults or else to identify the suspect module, where possible. Some basic procedures are provided to follow in the event of a suspected Encoder failure. It is assumed that fault-finding has already been performed at a system level and that other equipment units have been eliminated as the possible cause of the failure (see relevant *System Manual*).

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TANDBERG TELEVISION TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Do not remove the covers of this equipment. Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This manual does not include any maintenance information or procedures that would require the removal of covers.

If the following information fails to clear the abnormal condition, call a Service Engineer or contact Customer Services using the information given in the preliminary pages of this manual.

7.6.2 Preliminary Checks

Always investigate the failure symptoms fully, prior to taking remedial action. Fault diagnosis for the equipment operator is limited to the following tasks, since the operator should **NOT** remove the covers of the equipment:

1. Check the front panel Power LED. If this is not lit:
   a) Replace the fuse in the power connector at the rear panel (see *Section 7.6.3, A.C. User Accessible Fuse* Replacement).

NOTE...

Only replace the fuse once. If it blows again, please contact Customer Services.

   b) Replace external equipment, power source and cables by substitution to check their performance.
2. Confirm that the equipment hardware configuration is suitable for the purpose and has been correctly installed and connected (see *Chapter 2, Installing the Equipment*).
3. Confirm that inappropriate operator action is not causing the problem, and that the equipment software set-up is capable of performing the task being asked of it. If the validity of the configuration, set-up or operation is in doubt, check it (see *Chapter 5, Web Browser Interface*).
4. Check that the fans are unobstructed and working correctly.

When the failure condition has been fully investigated, and the symptoms are known, proceed with fault-finding according to the observed symptoms. If the fault persists, and cannot be rectified using the instructions given in this manual, contact Customer Services. Switch off the equipment if it becomes unusable, or to protect it from further damage.

7.6.3 A.C. User Accessible Fuse Replacement

A fuse is held in an integral fuse carrier at the a.c. power inlet at the rear panel.

> NOTE...
> Refer to *Annex B, Technical Specification* for information about the fuse.

To replace the a.c. power fuse:

> WARNING...
> BEFORE REPLACING THE REAR PANEL FUSE, DISCONNECT THE UNIT FROM THE SUPPLY. FAILURE TO DO THIS MAY EXPOSE HAZARDOUS VOLTAGES. UNPLUG THE UNIT FROM THE LOCAL SUPPLY SOCKET.

1. Ensure that power is turned off and the power cable is disconnected from the a.c. power inlet.
2. Ease out the fuse carrier by placing a small, flat-bladed screwdriver in the notch at the top of the carrier.

> CAUTION...
> When replacing the power input fuse, always ensure that a fuse of the correct type and rating is fitted. Failure to do so results in inadequate protection.

3. Replace the fuse in the carrier.
4. Insert the fuse carrier back in the a.c. power inlet.

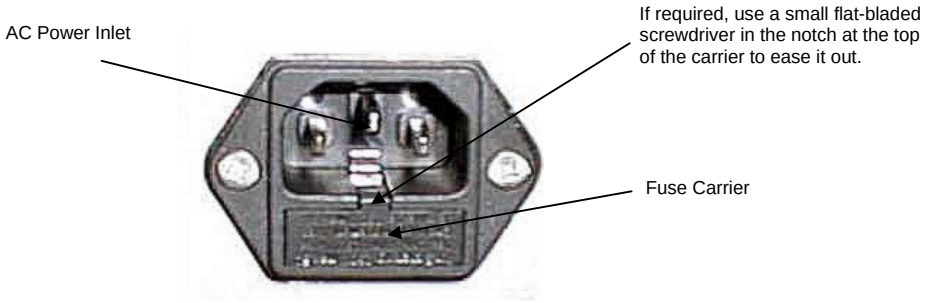

Figure 7.5: Position of A.C. Fuse Carrier

If the replacement fuse also blows, do not continue. Disconnect the equipment and contact Customer Services for advice.

7.6.4 D.C. User Accessible Fuse Replacement

> WARNING...
> BEFORE REPLACING THE REAR PANEL FUSE, ISOLATE THE UNIT FROM THE SUPPLY. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

> NOTE...
> Refer to *Annex B, Section B.4.2, D.C. Supply Input (-48 V Version)* for information about the d.c. fuse.

To replace the D.C. power fuse:

1. Ensure that d.c. power is turned off or the power cable is disconnected from the power inlet.
2. Unscrew the fuse carrier and remove the old fuse.

> CAUTION...
>
> When replacing the power input fuse, always ensure that a fuse of the correct type and rating is fitted. Failure to do so results in inadequate protection.

3. Insert the new fuse in the carrier.
4. Insert the fuse carrier back in the d.c. power inlet.

7.6.5 Video Fault-finding

Fault Symptoms

Table 7.2: Video Fault-finding

Problem	What to do
Video input lock error	Check video input.
Video - wrong line standard	Check which video format is selected.
VCM stopped	Reboot Encoder.
Processor failed	Reboot Encoder.
No video packets being generated	Reboot Encoder.
Bad parameters	Check set-up.

Breaks in Transmission

If a transitory break in transmission occurs then check the encoding mode option of the Encoder (see *Chapter 5, Web Browser Interface*). The state of the video input to the Encoder can be defined in the Menus when there is no input.

Noise Reduction

Where incoming picture material is corrupted by high frequency noise (such as white noise) it is advisable to make use of the noise reduction process. Noise reduction can be selected at either the front panel or by nCompass Control.

7.6.6 Audio Fault-finding

The audio levels are displayed in the audio input menus. This shows whether an audio signal is reaching the audio encoder. If a transitory break in transmission occurs then check the encoding mode option of the Encoder (see *Chapter 5, Web Browser Interface*).

If having problems when using the Dolby E Pass-thru coding mode then refer to *Annex F, Audio Modes*, for information about using this mode.

7.6.7 Mux Fault-finding

If there is no output from the ASI connectors, check the following:

1. The bit-rate - if it is too low then the video etc. is automatically switched off.
2. The packet length - should be 188 or 204 bytes depending upon configuration.

7.7 Power Supply Problems/Green LED on Front Panel Unlit

7.7.1 Symptoms

WARNING...

DO NOT ATTEMPT TO SERVICE THE POWER SUPPLY UNIT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

Use the following techniques to fault-find the Encoder according to the observed symptom(s) when a power supply failure is suspected.

7.7.2 Power LED Unlit

If the Encoder Power LED is unlit, fault-find the problem as detailed in *Table 7.3*.

Table 7.3: Power LED Unlit Fault-finding

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	**Check Power LED**. Is the Encoder still working?	If the Encoder is clearly working normally then the **Power LED** itself is probably at fault. Call a Service Engineer.	Proceed to next step.
2	**Check Power Source**. Connect a known-working piece of equipment to the power source outlet. Does it work?	The problem lies within the Encoder or power cable. Proceed to next step.	The problem lies with the power source. Check building circuit breakers, fuse boxes, etc. If problem persists, contact the electricity supplier.
3	**Check Power Cable and Fuse**. Unplug the power connector from the Encoder and try it in another piece of equipment. Does it work?	The problem lies within the Encoder. Proceed to next step.	The problem lies with either the cable itself, or with the fuse in the plug. Replace the fuse or try to substitute another cable.
4	**Check PSU Module and Fuse**. Ensure the power connector is unplugged. Remove the fuse from the rear panel connector and inspect it. Has the fuse blown?	Replace the fuse with one of the correct type and rating (see *Annex B Technical Specification)*. If the PSU still does not work, unplug the power cable and call a Service Engineer.	Possible problem with the PSU module. Call a Service Engineer.

7.7.3 Fan(s) Not Working/Overheating

The fans can be disabled at low temperatures to allow the unit to quickly attain operational temperature. In the event of overheating problems, refer to *Table 7.4*.

NOTE...

Failure to ensure a free airflow around the unit may cause overheating. This condition is detected by a temperature sensor on the Base Board that may be used to trigger an automatic alarm.

Table 7.4: Fans Not Working/Overheating

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	Check Fan Rotation. Inspect the fans located at the sides of the enclosure. Are the fans rotating? Check Base Board temperature and fan (see the `Build Menu`).	Check that the Encoder has been installed with sufficient space allowed for airflow (see *Chapter 2, Installing the Equipment*). If the ambient air is too hot, additional cooling may be required.	Possible break in the dc supply from the PSU module to the suspect fan(s). Call a Service Engineer.

7.8 Disposing of This Equipment

7.8.1 General

Dispose of this equipment safely at the end of its life. Local codes and/or environmental restrictions may affect its disposal. Regulations, policies and/or environmental restrictions differ throughout the world. Contact your local jurisdiction or local authority for specific advice on disposal.

7.8.2 Lithium Batteries

The equipment uses the Dallas Semiconductor NVRAM DS1746WP that contains a Dallas DS9034PCX Power Cap Lithium battery. This cell is not a USA Environmental Protection Agency listed hazardous waste. It is fully encapsulated and should not be tampered with.

BLANK

Annex A

Glossary

The following list covers most of the abbreviations, acronyms and terms as used in TANDBERG Television Limited Manuals, User and Reference Guides. All terms may not be included in this Reference Guide.

µm	**Micrometre** (former name - micron)**:** a unit of length equal to one millionth (10^{-6}) of a metre.
3:2 pulldown	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
422P@ML	**422 Profile at Main Level:** A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 50 Mbit/s over various mediums. Used for Contribution and Distribution applications.
5B6B	**5 Binary Bits Encoded to 6 Binary Bits:** Block code.
AAC	Advanced Audio Compression algorithm that has been ratified for both MPEG-2 (ISO/IEC 11818-7) andMPEG-4 (ISO/IEC 14496-3)
AACplus	This is the trademark name for the version of MPEG-4 AAC which includes Spectral Band Replication (SBR) to achieve extremely low bitrate encoding.
AC-3	Audio Coding algorithm number 3 (See Dolby Digital).
ACC	**Authorisation Control Computer.**
ADPCM	**Adaptive Differential Pulse Code Modulation:** An advanced PCM technique that reduces the bit-rate by coding the difference values between successive samples rather than the absolute value of each sample.
ADT	**Audio, Data And Teletext.**
ADTS	**Audio Data Transport Stream** is the method of encapsulation MPEG-2 AAC bitstream into transport stream.
AFC	**Automatic Frequency Control.**
AFS	**Automation File Server.**
AGC	**Automatic Gain Control.**

AMOL I and II	**Automatic Measure of Line-ups I and II:** Used by automated equipment to measure programme-viewing ratings.
ARIB	**Association of Radio Industries and Businesses** is a Japanese organisation for the promotion of the efficient use of the radio spectrum and defines the broadcast standards for Japan.
ASF	**Advanced Stream Format** is the file format used by Microsoft for real-time streaming of multimedia data. It has been publicly released in Summer 2002.
ASI	**Asynchronous Serial Interface.**
ASIC	**Application-Specific Integrated Circuit:** A customised chip designed to perform a specific function.
Async	**Asynchronous.**
ATM	**Asynchronous Transfer Mode:** A connection orientated, cell based, data transport technology designed for Broadband ISDN (B-ISDN). It provides a circuit-switched bandwidth-on-demand carrier system, with the flexibility of packet switching. It offers low end-to-end delays and (negotiable on call set-up) Quality of Service guarantees. Asynchronous refers to the sporadic nature of the data being transmitted. Cells are transmitted only when data is to be sent; therefore the time interval between cells varies according to the availability of data.
ATSC	**Advanced Television Standards Committee:** An organisation founded in 1983 to research and develop a digital TV standard for the U.S.A. In late 1996, the FCC adopted the ATSC standard, the digital counterpart of the NTSC standard.
B3ZS	**Bipolar with Three Zero Substitution:** A method of eliminating long zero strings in a transmission. It is used to ensure a sufficient number of transitions to maintain system synchronisation when the user data stream contains an insufficient number of 1s to do so. B3ZS is the North American equivalent of the European HDB3.
Backward Compatibility	Refers to hardware or software that is compatible with earlier versions.
BAT	**Bouquet Association Table:** Part of the service information data. The BAT provides information about bouquets. It gives the name of the bouquet and a list of associated services.
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bit-rate when the symbols only have two states (1 and 0). Measured in Baud.
BDU	**Bitstream Data Unit** is a section of Vc-1 bitstream that is self-contained.
BER	**Bit Error Rate:** A measure of transmission quality. The rate at which errors occur in the transmission of data bits over a link. It is generally shown as a negative exponent, (e.g. 10^{-7} means that 1 in 10,000,000 bits are in error).
BISS	**Basic Interoperable Scrambling System:** Non-proprietary encryption from EBU (Tech3290).
Bit-rate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.
Block; Pixel Block	An 8-row by 8-column matrix of luminance sample values, or 64 DCT coefficients (source, quantised, or dequantised).
Bouquet	A collection of services (TV, radio, and data, or any combination of the three) grouped and sold together, and identified in the SI as a group. A single service may be in several bouquets.
B-Picture; B-Frame	**Bi-directionally Predictive Coded Picture/Frame:** A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backward prediction). B frames are not used in any prediction.
BPSK	**Binary Phase Shift Keying:** A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.

BW	**Bandwidth:** The transmission capacity of an electronic line such as (among others) a communications network, computer bus, or broadcast link. It is expressed in bits per second, bytes per second or in Hertz (cycles per second). When expressed in Hertz, the frequency may be a greater number than the actual bits per second, because the bandwidth is the difference between the lowest and highest frequencies transmitted. High bandwidth allows fast transmission or high-volume transmission.
Byte-mode	Each byte is delivered separately in the ASI Transport Stream, with stuffing data added between the Bytes to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
CA	**Conditional Access:** The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
CABAC	**Context Adaptive Binary Arithmetic Coding** is a form of entropy coding used in H.264 that has greater coding efficiency than CAVLC but is more computationally expensive.
CAT	**Conditional Access Table:** Part of the MPEG-2 Program Specific Information (PSI) data. Mandatory for MPEG-2 compliance if CA is in use.
CAVLC	**Context Adaptive Variable Length Coding** is a form of entropy coding used in H.264 that has lower coding efficiency than CABAC but is less computationally expensive.
C-Band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 4 GHz to 6 GHz. Used by communications satellites. Preferred in tropical climates because it is not susceptible to fading.
CBR	**Constant Bit-rate** where the bit-rate of the bit-stream out of the encoder remains constant over an extended period of time within the buffer limits of the decoder.
CCIR	*See:* ITU-R.
CCITT	*See:* ITU-T.
Channel	A narrow range of frequencies, part of a frequency band, for the transmission of radio and television signals without interference from other channels. In the case of OFDM, a large number of carriers spaced apart at precise frequencies are allocated to a channel.
Channel Coding	A way of encoding data in a communications channel that adds patterns of redundancy into the transmission path in order to improve the error rate. Such methods are widely used in wireless communications.
Chrominance	The colour part of a TV picture signal, relating to the hue and saturation but not to the luminance (brightness) of the signal. In a **composite-coded** colour system, the colour information (chrominance, often referred to as chroma) is modulated onto a high frequency carrier and added to the monochrome-format video signal carrying the luminance (Y). In a **component-coded** colour system, the two colour-difference signals (R-Y)(B-Y) usually referred to as C_RC_B (digital) or P_RP_B (analogue), are used to convey colour information. When C_RC_B (P_RP_B) is added to the luminance (Y), the complete picture information is conveyed as YC_RC_B (YP_RP_B).
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
CODE	Create Once Distribute Everywhere.
Codec	The combination of an En**co**der and a complementary **Dec**oder located respectively at the input and output of a transmission path.
COFDM	**Coded OFDM:** COFDM adds forward error correction to the OFDM transmission consisting of Reed-Solomon (RS) coding followed by convolutional coding to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.

Compression	Reduction in the number of bits used to represent the same information. For the purposes of a broadcast system, it is the process of reducing digital picture information by discarding redundant portions of information that are not required when reconstituting the picture to produce viewing clarity. Compression allows a higher bite-rate to be transmitted through a given bandwidth.
Compression System	Responsible for compressing and multiplexing the video / audio / data bit-streams, together with the authorisation stream. The multiplexed data stream is then ready for transmission.
C_RC_B	Digital Colour difference signals. These signals, in combination with the luminance signal (Y), define the colour and brightness of each picture element (pixel) on a TV line. *See:* Chrominance
CRC	**Cyclic Redundancy Check:** A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to ensure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.
CVCT	**Cable Virtual Channel Table** (ATSC).
dB	**Decibels:** A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 600 . 0 dBmV is 1 mV terminated in 75 .
DCE	**Data Communications Equipment:** Typically a modem. It establishes, maintains and terminates a session on a network but in itself is not the source (originator) or destination (end receiving unit) of signals (e.g. a computer, see DTE). A DCE device may also convert signals to comply with the transmission path (network) format.
DCT	**Discrete Cosine Transform:** A technique for expressing a waveform as a weighted sum of cosines. Raw video data is not readily compressible. DCT is not in itself a compression technique but is used to process the video data so that it is compressible by an encoder. DCT processes the picture on an 8x8-pixel block basis, converting the data from an uncompressible X Y form (as displayed by an oscilloscope) to a compressible frequency domain form (as displayed by a spectrum analyser). Can be forward DCT or inverse DCT.
DDS	**Direct Digital Synthesiser.**
De-blocking Filter	An in-loop deblocking filter is designed to smooth out artefacts introduced by the compression process in the reconstructed image in both the encoder and decoder. Then the motion estimation and compensation should produce better quality for the same bitrate.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
Decoding Time-stamp	A field that may be present in a PES packet header that indicates the time that an access unit is to be decoded in the system target Decoder.
DID	**Data Identifier** for embedded audio within the HD-SDI signal**.**
Differential Coding	Method of coding using the difference between the value of a sample and a predicted value.
DIL	**Dual In Line:** The most common type of package for small and medium scale integrated circuits. The pins hang vertically from the two long sides of the rectangular package, spaced at intervals of 0.1 inch.
DIN	**Deutsches Institut für Normung:** German Standards Institute.
Dolby Digital	Formerly AC-3**.** An audio coding system based on transform coding techniques and psychoacoustic principles.
Downlink	The part of the satellite communications circuit that extends from the satellite to an Earth station.

Downconvert	The process by which the frequency of a broadcast transport stream is shifted to a lower frequency range.
DPCM	**Differential Pulse Code Modulation:** An audio digitisation technique that codes the difference between samples rather than coding an absolute measurement at each sample point.
DRM	**Digital Rights Management** where the rights to view or copy the material is defined and enforced. This is similar to Controlled Access (CA) but in general, no smartcards are used
DSNG	**Digital Satellite News-Gathering.**
DSP	**Digital Signal Processor.**
DTE	**Data circuit Terminating Equipment:** A communications device that originates (is the source) or is the end receiving unit (destination) of signals on a network. It is typically a terminal or computer.
DTH	**Direct To Home.** The term used to describe uninterrupted transmission from the satellite directly to the subscriber, that is, no intermediary cable or terrestrial network utilised.
DTS	**Digital Theater Systems:** A motion picture digital sound system.
DVB	**Digital Video Broadcasting:** A European project that has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) medium, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
DVB SI	**Digital Video Broadcasting Service Information.**
DVB-PI	**DVB-Physical Interfaces**
Earth	**Technical Earth:** Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth. Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.
EBDU	**Encapsulated Bitstream Data Unit** is a section of VC-1 bitstream that is self-contained and has been encapsulated with a start code.
EBU	**European Broadcast Union.**
ECM	**Entitlement Control Message.**
EDI	Ethernet Data Input
EIA	**Electronics Industries Association** (USA)**.**
EIDU	**Encapsulated IDU** that is an IDU with a start code and, in some cases, an end code to define the IDU within a continuous bitstream.
EIT	**Event Information Table:** Equipment: A component of the DVB-Service Information (SI) stream generated within an Encoder, containing information about events or programmes such as event name, start time, duration, etc. System: EIT (Present/Following) contains the name of the current and next event. It may include an optional descriptor (synopsis) giving brief details of content. EIT (Schedule) is used to produce a full EPG. The EIT is the only DVB-SI table, which can be encrypted.
Elementary Stream	A generic term for a coded bit-stream, be it video, audio or other.
EMC	**Electromagnetic Compatibility.**
EMM	**Entitlement Management Message.**
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.

EPG	**Electronic Programme Guide:** On-screen programme listing using thumbnail pictures and/or text.
Ethernet	The most widely used local area network (LAN) defined by the IEEE as the 802.3 standard. Transmission speeds vary according to the configuration. Ethernet uses copper or fibre-optic cables.
ETS	**European Telecommunications Standard.**
ETSI	**European Telecommunications Standards Institute.**
FCC	**Federal Communications Commission.**
FDM	**Frequency Division Multiplex:** A common communication channel for a number of signals, each with its own allotted frequency.
FEC	**Forward Error Correction:** A method of catching errors in a transmission. The data is processed through an algorithm that adds extra bits and sends these with the transmitted data. The extra bits are then used at the receiving end to check the accuracy of the transmission and correct any errors.
FFT	**Fast Fourier Transformation:** A fast algorithm for performing a discrete Fourier transform.
FIFO	**First In, First Out:** A data structure or hardware buffer from which items are taken out in the same order they were put in. Also known as a shelf from the analogy with pushing items onto one end of a shelf so that they fall off the other. A FIFO is useful for buffering a stream of data between a sender and receiver that are not synchronised - i.e. they not sending and receiving at exactly the same rate.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	**File Transfer Protocol:** A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
G.703	The ITU-T standard that defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP	**Group of Pictures:** MPEG video compression works more effectively by processing a number of video frames as a block. The TANDBERG Television Encoder normally uses a 12 frame GOP; every twelfth frame is an I frame.
GUI	**Graphical User Interface:** The use of pictures rather than just words to represent the input and output of a program. A program with a GUI runs under a windowing system and has a screen interface capable of displaying graphics in the form of icons, drop-down menus and a movable pointer. The on-screen information is usually controlled / manipulated by a mouse or keyboard.
H.264	ITU/ETSI name for MPEG-4 Part-10 (ISO/IEC 14496-10).
HD-SDI	**High-Definition Serial Digital Interface** which is used for the input of HDTV signals
HDTV	**High Definition Television.**
HE-AAC	**High-Efficiency AAC** is the broadcast profile for MPEG-4 and is specified in ISO/IEC 14496.3.
HPA	**High Power Amplifier:** Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
HSYNC	**Horizontal (line) SYNCs.**
Hub	A device in a multipoint network at which branch nodes interconnect.
ICAM	**Integrated Conditional Access Module:** Embedded in the IRD and responsible for descrambling, plus packet filtering and reception. It also contains the physical interface to the subscriber's viewing card.

ICE	**Intelligent Compression Engine:** the module on which the advanced coding of video and audio is performed.
IDU	**Independent data unit** that is a portion of elementary stream that can be decoded independently of any other portion.
IEC	**International Electrotechnical Committee.**
IF	**Intermediate Frequency:** Usually refers to the 70 MHz or 140 MHz output of the Modulator in cable, satellite and terrestrial transmission applications.
Interframe Coding	Compression coding involving consecutive frames. When consecutive frames are compared, temporal redundancy is used to remove common elements (information) and arrive at difference information. MPEG-2 uses B and P frames, but since they are individually incomplete and relate to other adjacent frames, they cannot be edited independently.
Intraframe Coding	Compression coding involving a single frame. Redundant information is removed on a per frame basis. All other frames are ignored. Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I frames; these are independent frames and can be edited.
IP	**Internet Protocol:** The IP part of TCP/IP. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or sub-network. IP accepts packets from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a datagram to the layer 2 data link protocol. It may also break the packet into fragments to support the Maximum Transmission / Transfer Unit (MTU) of the network.
I-picture; I-frame	**Intracoded Picture/Frame:** A picture / frame, which is coded using purely intracoding with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IPPV	**Impulse Pay Per View:** One-time events, purchased at home (on impulse) using a prearranged SMS credit line.
IRD	**Integrated Receiver Decoder:** The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
IRE	**Institute of Radio Engineers:** No longer in existence but the name lives on as a unit of video amplitude measurement. This unit is 1% of the range between blanking a peak white for a standard amplitude signal.
ISDN	**Integrated Services Digital Network:** The basic ISDN service is BRI (Basic Rate Interface), which is made up of two 64 kbit/s B channels and one 16 kbit/s D channel (2B+D). If both channels are combined into one, called **bonding**, the total data rate becomes 128 kbit/s and is four and a half times the bandwidth of a V.34 modem (28.8 kbit/s). The ISDN high-speed service is PRI (Primary Rate Interface). It provides 23 B channels and one 64 kbit/s D channel (23B+D), which is equivalent to the 24 channels of a T1 line. When several channels are bonded together, high data rates can be achieved. For example, it is common to bond six channels for quality videoconferencing at 384 kbit/s. In Europe, PRI includes 30 B channels and one D channel, equivalent to an E1 line.
ISO	**International Standards Organisation.**
ISOG	**Inter-union Satellite Operations Group.**
ITS	**Insertion Test Signal:** A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	**Invitation To Tender.**
ITU-R	**International Telecommunications Union - Radiocommunications Study Groups** (was CCIR).

ITU-T	**International Telecommunications Union - Telecommunications Standardisation Sector** (was CCITT).
JPEG	**Joint Photographic Experts Group:** ISO/ITU standard for compressing still images. It has a high compression capability. Using discrete cosine transform, it provides user specified compression ratios up to around 100:1 (there is a trade-off between image quality and file size).
JVT	The **Joint Video Team (JVT**) is a partnership between ISO/IEC and ITU to develop the new video compression standard MPEG-4 Part 10 from the original ITU-T H.26L project.
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
Ku-band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 12 GHz to 14 GHz. Used by communications satellites. Preferred for DTH applications because this range of frequency is less susceptible to interference.
LAN	**Local Area Network:** A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
LATM	**Low-overhead Audio Transport Multiplex** is part of the method to encapsulate MPEG-4 HE-AAC into transport stream. It is used in conjunction with LOAS.
L-band	The frequency band from 950 MHz to 2150 MHz, which is the normal input-frequency-range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.
LED	**Light Emitting Diode.**
LNB	**Low Noise Block Down-Converter:** The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
LO	**Local Oscillator.**
LOAS	**Low-overhead Audio Stream** is part of the method to encapsulate MPEG-4 HE-AAC into transport stream. It is used in conjunction with LATM.
LSB	**Least significant bit.**
Luminance	The television signal representing brightness, or the amount of light at any point in a picture. The Y in YC_RC_B.
LVDS	**Low Voltage Differential Signal:** LVDS is a generic multi-purpose Interface standard for high speed / low power data transmission. It was standardised in ANSI/TIA/EIA-644-1995 Standard (aka RS-644).
Macroblock	A 16x16-pixel area of the TV picture. Most processing within the MPEG domain takes place with macro blocks. These are converted to four 8x8 blocks using either frame DCT or field DCT. Four 8 x 8 blocks of luminance data and two (4:2:0 chrominance format), four (4:2:2) or eight (4:4:4) corresponding 8 x 8 blocks of chrominance data coming from a 16 x 16 section of the luminance component of the picture. Macroblock can be used to refer to the sample data and to the coded representation of the sample values and other data elements.
Mbit/s	**Million bits per second.**
MCC	**Multiplex Control Computer:** A component of a System 3000 compression system. The MCC sets up the configuration for the System 3000 Multiplexers under its control. The MCC controls both the main and backup Multiplexer for each transport stream.
MCPC	**Multiple Channels Per Carrier.**
MEM	**Multiplex Element Manager:** A GUI based control system, part of the range of TANDBERG Television compression system control element products. The evolution 5000 MEM holds a model of the system hardware. Using this model, it controls the individual system elements to configure the output multiplexes from the incoming elementary streams. The MEM monitors the equipment status and controls any redundancy switching.

MMDS	**Multichannel Microwave Distribution System:** A terrestrial microwave direct-to-home broadcast transmission system.
Motion Compensation	The use of motion vectors to improve the efficiency of the prediction of sample values. The prediction uses motion vectors to provide offsets into the past and/or future reference frames or fields containing previously decoded sample values that are used to form the prediction error signal.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML	**Main Profile at Main Level:** A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MP@HL	**Main Profile at High Level:** A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 80 Mbit/s over various mediums.
MPEG	**Moving Pictures Experts Group:** The name of the ISO/IEC working group, which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bit-rates and picture resolutions.
MPEG-4	New industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 14496. Part 2 of this standard defines the original MPEG-4 video compression whereas Part 10 is the new algorithm also known as H.264.
MPEG-4 PT 10	Advanced Video Coding (AVC) standard designed to provide increased coding efficiency over MPEG-2. Specified in ISO/IEC 14496-10 and as ITU-T Recommendation H.264. The standard is split into profiles which define which tools can be used and levels which define the allowed bit-rates and resolutions **.**
MSB	**Most significant bit.**
Msymbol/s	(Msym/s) **Mega** (million) **Symbols per second** (10^6 Symbols per second).
Multiplex	A number of discrete data streams (typically 8 to 12), from encoders, that are compressed together in a single DVB compliant transport stream for delivery to a Modulator.
MUSICAM	**Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing:** An audio bit-rate reduction system relying on sub-band coding and psychoacoustic masking.
Mux	**Multiplexer:** Transmission Multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation. The Multiplexer also contains the cipher card, which scrambles the services according to the control words supplied by the BCC.
Network	In the context of broadcasting: a collection of MPEG-2 transport stream multiplexes transmitted on a single delivery system, for example, all digital channels on a specific cable system.
NICAM	**Near Instantaneously Companded Audio Multiplex:** Official name is NICAM 728. Used for digital stereo sound broadcasting in the UK employing compression techniques to deliver very near CD quality audio. 728 refers to the bit-rate in kbit/s.
NIT	**Network Information Table:** Part of the service information data. The NIT provides information about the physical organisation of each transport stream multiplex, and the characteristics of the network itself (such as the actual frequencies and modulation being used).

nm	**Nanometre:** a unit of length equal to one thousand millionth (10^{-9}) of a metre.
NTSC	**National Television Systems Committee:** The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.
NVOD	**Near Video On Demand:** Method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
NVRAM	**Non-volatile Random Access Memory:** Memory devices (permitting random read / write access) that do not lose their information when power is removed. Stores the default configuration parameters set by the user.
OFDM	**Orthogonal FDM:** A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.
OID	**Object Identifier** is the part of the SNMP message that defines which module should receive the command.
OPPV	**Order ahead Pay Per View:** An advance purchase of encrypted one-time events with an expiry date.
OSD	**On-screen display:** Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.
PAL	**Phase Alternating Line:** A colour TV broadcasting system where the phase of the R-Y colour-difference signal is inverted on every alternate line to average out errors providing consistent colour reproduction.
PAT	**Program Association Table:** Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. The PAT points (maps) to the PMT.
PCM	**Pulse Code Modulation:** A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR	**Program Clock Reference:** A time-stamp in the transport stream from which the Decoder timing is derived.
PDC	**Programme Delivery Control** (VBI)**:** A Teletext service allowing simple programming (i.e. VideoPlus) of VCR recording times. If the desired program is rescheduled, PDC updates the programming information in the VCR.
Pel	**Picture Element:** Also known as a pixel. The smallest resolvable rectangular area of an image either on a screen or stored in memory. On screen, pixels are made up of one or more dots of colour. Monochrome and grey-scale systems use one dot per pixel. For grey-scale, the pixel is energised with different intensities, creating a range from dark to light (a scale of 0-255 for an eight-bit pixel). Colour systems use a red, green and blue dot per pixel, each of which is energised to different intensities, creating a range of colours perceived as the mixture of these dots. If all three dots are dark, the result is black. If all three dots are bright, the result is white.
PES	**Packetised Elementary Stream:** A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 Kbytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	**Packet Identifier:** The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.

PIN	**Personal Identification Number:** A password used to control access to programming and to set purchase limits. Each subscriber household can activate several PINs and may use them to set individual parental rating or spending limits for each family member.
Pixel	**PIX** (picture) **El**ement: The digital representation of the smallest area of a television picture capable of being delineated by the bit-stream. See **Pel** for more information.
pk-pk	**peak to peak:** Measurement of a signal or waveform from its most negative point to its most positive point.
PLL	**Phase-Locked Loop.** A phase-locked loop is a control system which controls the rotation of an object by comparing its rotational position (phase) with another rotating object as in the case of a sine wave or other repeating signal. This type of control system can synchronise not only the speed, but also the angular position of two waveforms that are not derived from the same source.
PMT	**Program Map Table:** Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. Each service has a PMT, which lists the component parts (elementary streams of video, audio, etc.) for the various services being transmitted.
P-picture/P-frame	A picture / frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
ppm	**Parts per million** and is the number of times the event occurs for every million.
PPV	**Pay Per View:** A system of payment for viewing services based on a usage / event basis rather than on on-going subscription. Subscribers must purchase viewing rights for each PPV event that they wish to view. PPV events may be purchased as IPPV or OPPV.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
P_RP_B	Analogue Colour difference signals. Refer to C_RC_B for an explanation.
PROM	**Programmable Read-Only Memory:** A device, which may be written once with data for permanent storage, and then read whenever required. Special types of PROM permit the erasure of all data by Ultraviolet light (EPROM) or by application of an electronic signal (EEPROM).
PS	**Program Stream:** A combination of one or more PESs with a common timebase.
PSI	**Program Specific Information:** Consists of normative data, which is necessary for the demultiplexing of transport streams and the successful regeneration of programs. (*See also:* SI).
PSIP	**Program System Information Protocol:** The ATSC equivalent of SI for DVB.
PSK	**Phase Shift Keying:** A method of modulating digital signals particularly suited to satellite transmission.
PSR	**Professional Satellite Receiver:** *See also:* IRD.
PSU	**Power Supply Unit.**
PTS	**Presentation Time Stamp** (ATSC).
QAM	**Quadrature Amplitude Modulation:** A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK	**Quadrature Phase Shift Keying:** A form of phase shift keying modulation using four states.

QSIF	**Quarter Screen Image Format.**
Quantise	A process of converting analogue waveforms to digital information. 8-bit quantisation as set out in ITU-R Rec. 601. uses 256 levels in the range 0 – 255 to determine the analogue waveform value at any given point. The value is then converted to a digital number for processing in the digital domain.
RAM	**Random Access Memory:** A volatile storage device for digital data. Data may be written to, or read from, the device as often as required. When power is removed, the data it contains is lost.
RAS	**Remote Authorization System:** A TANDBERG TV proprietary public-key encryption system used to prevent unauthorized viewing of a TV programme or programmes.
RF	**Radio Frequency.**
RFC	The **Requests for Comments (RFC)** document series is a set of technical and organizational notes about the Internet (originally the ARPANET), beginning in 1969. Memos in the RFC series discuss many aspects of computer networking, including streaming protocols, procedures, programs, and concepts but are taken as the Standard.
ROM	**Read Only Memory:** A non-volatile storage device for digital data. Data has been stored permanently in this device. No further information may be stored (written) there and the data it holds cannot be erased. Data may be read as often as required.
RS	**Reed-Solomon coding:** An error detection and correction, coding system. 16 bytes of Reed-Solomon Forward Error Correction code are appended to the packet before transmission, bringing the packet length to 204 bytes. The 16 bytes are used at the receiving end to correct any errors. Up to eight corrupted bytes can be corrected.
RLC	**Run Length Coding:** Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character *x y* times'.
SCPC	**Single Channel Per Carrier.**
Spectral Scrambling	A process (in digital transmission) used to combine a digital signal with a pseudo-random sequence, producing a randomised digital signal that conveys the original information in a form optimised for a broadcast channel.
Scrambling	Alteration of the characteristics of a television signal in order to prevent unauthorised reception of the information in clear form.
SBR	**Spectral Band Replication** is a tool used in MPEG-4 AAC to allow sub-64kbit/s stereo encoding for broadcast transmissions.
SDI	**Serial Digital Interface.**
SDT	**Service Description Table:** Provides information in the SI stream about the services in the system; for example, the name of the service, the service provider, etc.
SELV	**Safety Extra Low Voltage (EN 60950).**
SNMP	**Simple Network Management Protocol** is an application layer protocol that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite and is defined in RFC1155.
STB	**Set-Top Box:** A box that sits on top of a television set and is the interface between the home television and the cable TV company. New technologies evolving for set-top boxes are video-on-demand, video games, educational services, database searches, and home shopping. The cable equivalent of the IRD.
STT	**System Time Table** (ATSC).
SFN	**Single Frequency Network:** The SFN technique allows large geographic areas to be served with a common transmission multiplex. All transmitters in the network are synchronously modulated with the same signal and they all radiate on the same frequency. Due to the multi-path capability of the multi-carrier transmission system (COFDM), signals from several transmitters arriving at a receiving antenna may contribute constructively to the total wanted signal. The SFN technique is not only frequency efficient but also power efficient because fades in the field strength of one transmitter may be filled by another transmitter.

SI	**Service Information:** Digital information describing the delivery system, content and scheduling (timing) of broadcast data streams. DVB-SI data provides information to enable the IRD to automatically demultiplex and decode the various streams of programmes within the multiplex. Specified in ISO/IEC 13818[1]. (DVB)
Single Packet Burst Mode	A burst of ASI bytes (either 188 or 204, depending on packet length) is contiguously grouped into an MPEG-2 Transport Stream packet. Stuffing data is added between the packets to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
Smart Card	A plastic card with a built-in microprocessor and memory used for identification, financial transactions or other authorising data transfer. When inserted into a reader, data is transferred to and from the host machine or a central computer. It is more secure than a magnetic stripe card and it can be disabled if the wrong password is entered too many times. As a financial transaction card, it can be loaded with digital money and used in the same way as cash until the balance reaches zero. The file protocol is specific to its intended application.
SMATV	**Satellite Mast Antenna Television:** A distribution system, which provides sound and television signals to the households of a building or group of buildings, typically used to refer to an apartment block.
SMPTE	**Society of Motion Picture and Television Engineers.**
SMS	**Subscriber Management System:** A system which handles the maintenance, billing, control and general supervision of subscribers to conditional access technology viewing services provided through cable and satellite broadcasting. An SMS can be an automatic (e.g. Syntellect) system where subscribers order entitlements by entering information via a telephone. Alternatively, an SMS can be a manual system, which requires subscribers to speak with an operator who then manually enters their entitlement requests. Some systems support multiple SMSs.
SNG	**Satellite News-Gathering.**
SNMP	**Simple Network Management Protocol.**
Spatial Redundancy	Information repetition due to areas of similar luminance and/or chrominance characteristics within a single frame. Removed using DCT and Quantisation (Intra-Frame Coding).
SPI	**Synchronous Parallel Interface.**
Statistical Redundancy	Data tables are used to assign fewer bits to the most commonly occurring events, thereby reducing the overall bit-rate. Removed using Run Length Coding and Variable Length Coding.
TAXI	**Transparent Asynchronous Tx / Rx Interface:** A proprietary high-speed data interface.
TCP / IP	**Transmission Control Protocol/Internet Protocol:** A set of communications protocols that may be used to connect different types of computers over networks.
TDM	**Time Division Multiplex:** One common, communications channel carrying a number of signals, each with its own allotted time slot.
TDT	**Time and Date Table:** Part of the DVB Service Information. The TDT gives information relating to the present time and date.
Temporal Redundancy	Information repetition due to areas of little or no movement between successive frames. Removed using motion estimation and compensation (Inter-Frame Coding).
Time-stamp	A term that indicates the time of a specific action such as the arrival of a byte or the presentation of a presentation unit.
TOT	**Time Offset Table:** This optional SI table supports the use of local offsets as well as the UTC time/date combination. The purpose of the table is to list by country the current offset from UTC and the next expected change to that offset (to track when daylight saving occurs). The offset resolution is to within 1 minute over a range of ±12 hours from UTC.

Transport Stream	A set of packetised elementary data streams and SI streams, which may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Transport Stream Packet Header	A data structure used to convey information about the transport stream payload.
TS	**Transport Stream.**
TSDT	**Transport Stream Descriptor Table:** A component of the MPEG-2 PSI data. This table describes which type of Transport stream it is in (i.e. DVB, ATSC etc.). It may also contain other descriptors.
TSP	**Transport Stream Processor.**
TVCT	Terrestrial Virtual Channel Table (ATSC).
U	44.45 mm (rack height standard).
UART	**Universal Asynchronous Receiver Transmitter:** A device providing a serial interface for transmitting and receiving data.
UHF	**Ultra High Frequency:** A portion of the electromagnetic spectrum covering 300 MHz to 3000 MHz (3 GHz).
Upconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher frequency range.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS	**Uninterruptable Power Supply:** A method of supplying backup power when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide battery power for a few minutes; enough to power down the computer in an orderly manner. This is particularly important where **write back cache** is used. Write back cache is where modified data intended for the disk, is temporarily stored in RAM and can be lost in the event of a power failure. Sophisticated systems are tied to electrical generators that can provide power for days. UPS systems typically provide surge suppression and may provide voltage regulation.
UTC	**Universal Time Co-ordinate:** An internationally agreed basis for timekeeping introduced in 1972 and based on international atomic time (corresponds to Greenwich Mean Time or GMT).
VBR	**Variable Bit-rate** where the quality of the compression is kept constant independently of the source material so that the bit-rate of the bit-stream normally varies with time.
VCT	**Virtual Channel Table** (ATSC).
VHF	**Very High Frequency:** A portion of the electromagnetic spectrum covering 30 MHz to 300 MHz.
VITC	Vertical Interval Time Code.
VITS	**Vertical Interval Test Signal:** *See:* ITS.
VPS	**Video Programming System:** A German precursor to PDC that exists on line 16 of the VBI
WM9S	**Windows Media 9 Series** is the complete collection of algorithms and protocols that have been released by Microsoft.
WMA	**Windows Media Audio** which is the set of audio compression algorithms used in Windows Media 9 Series to achieve optimal quality at different bit-rates.
WMV	**Windows Media Video** which is the set of video compression algorithms used in Windows Media 9 Series.
WSS	**Wide Screen Switching Signalling:** Data used in wide-screen analogue services, which enables a receiver to select the appropriate picture display mode.
WST	**World System Teletext:** System B Teletext. Used in 625 line / 50 Hz television systems (ITU-R 653).

XILINX	A type of programmable Integrated Circuit.
Y (Luminance)	Defines the brightness of a particular point on a TV line. The only signal required for black and white pictures.

BLANK

Annex B

Technical Specification

Contents

List of Tables

B.1 Inputs

B.1.1 Video

HD-SDI (EN8090 Only)

Table B.1: High Definition Serial Digital Video Specification

Item	Specification
Safety status	SELV
Connector designation	HD SDI IN
Connector type	75 Ω BNC female socket
Input standard	SMPTE 292M Bit serial Digital Interface for High Definition Television Systems
Cable length	100 m, maximum
Recommended cable type	PSF 1/2
Input level	800 mV pk-pk nominal ±10%
Return loss	Better than 15 dB, 5 MHz – 1.5 GHz
Input impedance	75 Ω (powered-down impedance = 75 Ω)

SDI

Table B.2: Serial Digital Video Specification

Item	Specification
Safety status	SELV
Connector designation	SDI IN
Connector type	75 Ω BNC female socket
Input standard (UK/EC)	ITU-R RECMN BT.656-3 Interfaces for Digital Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601 (Part A).
Input standard (USA)	ANSI / SMPTE 259M Television 10-Bit 4:2:2 Component and 4 fsc Composite Digital Signals -Serial Digital Interface. (Encoder only supports Component). Level C - 270 Mbit/s, 525/625 component.
Cable length	250 m, maximum
Recommended cable type	PSF 1/3
Input level	800 mV pk-pk nominal ±10%
Return loss	Better than 15 dB, 10 MHz - 270 MHz
Input impedance	75 Ω (powered-down impedance = 75 Ω)

H SYNC

Table B.3: H SYNC Specification

Item	Specification
Safety status	SELV
Connector designation	H SYNC
Connector type	75 Ω BNC female socket
Input standard	625-line PAL, 525-line PAL-M or 525-line NTSC, chrominance not required.
Input level	1 V pk-pk nominal ±5%
Cable length	250 m, maximum
Return loss	Better than 30 dB up to 6 MHz
Input impedance	75 Ω (powered-down impedance = 75 Ω)

Analogue Video Specification

Table B.4: Analogue Video Specification

Item	Specification
Safety status	SELV
Analogue input	625 line composite PAL-B, -D, -G, -H, -I 525 line composite NTSC-M, PAL-M as specified in ITU-R report 624-4, Characteristics of Television Systems (NTSC with and without set up of 7.5 IRE)
Connector designation	COMP VIDEO
Connector type	75 Ω BNC socket
Input level	1 V pk-pk nominal ±5%
Return loss	Better than 30 dB up to 6 MHz (when impedance is set to 75 Ω)
Input impedance	75 Ω/High Z switchable (powered-down impedance = 75 Ω)
Sampling	Sampled with a 10 bit ADC

> NOTE...
> The inputs are isolated from the chassis to prevent 50 Hz/60 Hz hum.

PAL/NTSC Video Performance Figures

These figures have not been tested because a professional receiver/decoder does not yet exist for the formats covered in this manual.

Teletext Extraction

Teletext is extracted from the Vertical Blanking Interval (VBI).

International Television Standards

Table B.5 shows television standards appropriate to the Encoder.

Table B.5: International Television Standards

As indicated in Menus	M	M	B	G	H	I	D
Region	USA/Japan		----- Europe / Asia ----			UK	
Standard	NTSC	---------- PAL ----------					
Lines / frame	525	525	625	625	625	625	625
Fields / second	60	60	50	50	50	50	50
Interlace	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Frames / second	30 (29.97)	30 (29.97)	25	25	25	25	25
Lines / second	15 750	15 750	15 625	15 625	15 625	15 625	15 625
Aspect ratio	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3	4/3
Video band (MHz)	4.2	4.2	5.0	5.0	5.0	5.5	6

Output Video Coding Resolutions for Advanced Coding (EN8090)

Table B.6: Output Video Coding Resolutions (HD)

Resolution (V x H)	25 Hz/29.97 Hz	50 Hz/59.97 Hz
1920 x 1080	Interlaced	N/A
1440 x 1080	Interlaced	N/A
1280 x 1080	Interlaced	N/A
960 x 1080	Interlaced	N/A
1280 x 720	N/A	Progressive
960 x 720	N/A	Progressive
640 x 720	N/A	Progressive

Output Video Coding Resolutions for Advanced Coding (EN8030)

The available coding resolution depends on the scan format that has been selected where the progressive set is a superset of the interlaced set. This is because the progressive nature of the frame allows the use of a vertical down-sampling filter.

Table B.7: Interlaced Coding Resolutions (SD)

625 Line Modes	525 Line Modes
720 pixels x 576 lines	720 pixels x 480 lines
704 pixels x 576 lines	704 pixels x 480 lines
640 pixels x 576 lines	640 pixels x 480 lines
576 pixels x 576 lines	576 pixels x 480 lines
544 pixels x 576 lines	544 pixels x 480 lines
480 pixels x 576 lines	480 pixels x 480 lines
352 pixels x 576 lines	352 pixels x 480 lines

Table B.8: Progressive Coding Resolutions (SD)

625 Line Modes	525 Line Modes
720 pixels x 576 lines	720 pixels x 480 lines
704 pixels x 576 lines	704 pixels x 480 lines
640 pixels x 576 lines	640 pixels x 480 lines
576 pixels x 576 lines	576 pixels x 480 lines
544 pixels x 576 lines	544 pixels x 480 lines
480 pixels x 576 lines	480 pixels x 480 lines
352 pixels x 576 lines	352 pixels x 480 lines
640 pixels x 480 lines	544 pixels x 352 lines
576 pixels x 480 lines	480 pixels x 352 lines
544 pixels x 432 lines	
480 pixels x 432 lines	

ISO/IEC 14496-10 H.264/AVC Encoding (HD)

The H.264/AVC encoder implements:

- Main Profile at Level 4 (MP@L4). This implementation of the profile/level allows up to the following:
  - ✧ 244,800 Macro-blocks per second which includes resolution modes of up to 1920 pixels x 1080 lines @ 29.97 frame/s.
  - ✧ Bitrate of 20.0 Mbit/s.
  - ✧ Buffer size of 3.3 seconds.

The video encoder includes the following tools:

- Spatial Intra prediction: Intra macro-blocks are predicted from surrounding, previously coded macro-blocks.
- Sub-pixel motion vectors: This allows motion to be more accurately represented.
- CABAC (Context Adaptive Binary Arithmetic Coding), a more efficient form of entropy coding compared to traditional variable length codes, is used as the entropy coder.

ISO/IEC 14496-10 H.264/AVC Encoding (SD)

The H.264/AVC encoder implements:

- Main Profile at Level 3 (MP@L3). This implementation of the profile/level allows up to the following:
  - ✧ 40,500 Macro-blocks per second which includes 720 pixels x 576 lines @ 25 fps or 720 pixels x 480 @ 29.97 frame/s.
  - ✧ Bitrate of 5.0 Mbit/s.

The video encoder includes the following tools:

- Spatial Intra prediction: Intra macro-blocks are predicted from surrounding, previously coded macro-blocks.
- Sub-pixel motion vectors: This allows motion to be more accurately represented.
- CABAC (Context Adaptive Binary Arithmetic Coding), a more efficient form of entropy coding compared to traditional variable length codes, is used as the entropy coder.

B.1.2 Audio

Analogue and Digital Audio

Table B.9: Analogue and Digital Audio Specification

Item	Specification
Safety status	SELV
Connector designation	AUDIO IN
Connector type	15-way, D-type male connector
Input standard (analogue)	Balanced analogue
Clip level	12 dB, 15 dB, 18 dB, 21dB, 22 dB and 24 dB (15 dB available with PCB issue 4 and later)
Sampling rate	48 kHz
Input impedance	600 Ω or 20 kΩ (selectable). 20 kΩ = default
Input standard (digital)	AES/EBU digital
Termination	110 Ω
Sampling rate	48 kHz
Input rate	32, 48 kHz
Output (digital) ref	AES/EBU digital
Impedance	75 Ω
Sampling rate	48 kHz
Coding Standards	
Coding standard (1)	MPEG-2 AAC
Supported coding modes	Stereo only
Supported coded data rate	64 kbit/s - 128 kbit/s
Coding standard (2)	MPEG-4 HE-AAC
Supported coding modes	Stereo only
Supported coded data rate	48 kbit/s - 128 kbit/s
Coding standard (3)	MPEG-4 HE-AAC V2
Supported coding modes	Stereo only
Supported coded data rate	32 kbit/s - 128 kbit/s
Coding standard (4)	MPEG-1 Layer 2 (ISO/IEC 13818)
Supported coding modes	Single Mono, Dual Mono, Joint Stereo, Stereo
Supported coded data rate	32 kbit/s - 384 kbit/s
Coding standard (5)	Dolby Digital (ATSC A/52, DVB TR 102 154)
Supported coding modes	1/0, 2/0
Supported coded data rate	56 k - 640 kbit/s
Coding standard (6)	Dolby Digital Pass-through (ATSC A/52, DVB TR 102 154) (see *Note 1*, after this Table)

NOTES...

1. Refer to *Annex F, Audio Modes* when using this coding standard.
2. Problems may be experienced with some Receivers if the Encoder and Decoder are not using the same version of SMPTE 302M specification, e.g. either 1998 or 2000. The Encoder can be set up to work in either standard.
3. The digital audio input does not support SPDIF.

CAUTION...

When the unit is not powered the audio input defaults to digital with 110 Ω termination.

Table B.10: MUSICAM (MPEG 1 Layer 2) Analogue Test Specification

Item		Specification
Set up of Alteia Receiver		
Audio Format		MPEG
Output		Analogue
Clip Level		18 dB
Set up of Audio Encoder		
Input		Analogue
Clip Level		18 dB
Sampling Frequency		48 kHz
Coding Standard		MPEG 1 Layer II
Coding Mode		Stereo
Bitrate		384 kbit/s
Set up of Lindos Audio Oscillator		
Sequence		TPBDLKZ
Test		Tolerance for Left and Right Legs for Channel (A) and Channel (B)
Test Level	T	
1 kHz @ 0 dB		± 0.2 dB
Sweep 20 Hz - 20 kHz ***@ -20 dB***	P	
20 Hz – 63 Hz		+0.0 to - 0.5 dB
100 Hz – 10 kHz		+0.2 to - 0.3 dB
12.5 Hz – 18 kHz		+0.2 to - 0.5 dB
20 kHz		0 to -1.5 dB
Crosstalk @ 0 dBs	B	
100 Hz		72 dB
1 kHz		74 dB
6.3 kHz		67.5 dB
10 kHz		63 dB
Distortion + noise @ +8 dB	D	
100 Hz		68 dB
1 kHz		70 dB
Noise RMS	L	
A-weighted		70 dB
Unweighted		70 dB
User Levels @ 1 kHz (0 to 50 dB)	K	
+10 dB		±0.2 dB
-10 dB		±0.2 dB
-20 dB		±0.2 dB
-30 dB		±0.2 dB
-40 dB		±0.3 dB

Table B.10: MUSICAM (MPEG 1 Layer 2) Analogue Test Specification (continued)

Item		Specification
Phase @ 0 dBs	Z	
40 Hz		±2°
100 Hz		±2°
315 Hz		±2°
1 kHz		±2°
6.3 kHz		±2°
10 kHz		±2°
15 kHz		±2°

Embedded Audio (Via HD-SDI) EN8090

Audio embedded on the serial digital interface can also be extracted. Up to two stereo pairs of audio can be extracted from the SDI.

Table B.11: Embedded Audio Specification

Item	Specification
Serial Digital Interface	
Safety status	SELV
Connector designation	HD SDI IN
Connector type	BNC female connector
Input standard	SMPTE 292M-A

Embedded Audio (Via SDI)

Audio embedded on the serial digital interface can also be extracted. Up to two stereo pairs of audio can be extracted from the SDI.

Table B.12: Embedded Audio Specification

Item	Specification
Serial Digital Interface	
Safety status	SELV
Connector designation	SDI IN
Connector type	BNC female connector
Input standard	ITU-R RECMN BT.656-3 SMPTE 272M-A

MPEG-2 AAC Encoding Bitrates

Table B.13: MPEG-2 AAC Audio Encoding Bitrates

Bitrate (kbit/s)	Stereo	Dual-mono
64	✓	✓
80	✓	✓
96	✓	✓
128	✓	✓

MPEG-4 HE-AAC Encoding Bitrates

Table B.14: MPEG-4 HE-AAC Audio Encoding Bitrates

Bitrate (kbit/s)	Stereo	Dual-mono
64	✓	✓
80	✓	✓
96	✓	✓
128	✓	✓

MPEG-4 HE-AAC V2 Encoding Bitrates

Table B.15: MPEG-4 HE-AAC V2 Audio Encoding Bitrates

Bitrate (kbit/s)	Stereo
32	✓

MPEG-1 Audio Encoding Bitrates

Table B.16: MPEG-1 Audio Encoding Bitrates

Bitrate (kbit/s)	Single Channel Mono	Dual Mono	Stereo	Joint Stereo
32	✓	-	-	-
48	✓	-	-	-
56	✓	-	-	-
64	✓	✓	✓	✓
80	✓	-	-	-
96	✓	✓	✓	✓
112	✓	✓	✓	✓
128	✓	✓	✓	✓
160	✓	✓	✓	✓
192	✓	✓	✓	✓
224	-	✓	✓	✓
256	-	✓	✓	✓
320	-	✓	✓	✓
384	-	✓	✓	✓

Dolby Digital Audio Encoding Bitrates

Table B.17: Dolby Digital Audio Encoding Bitrates

Bitrate (kbit/s)	Single Channel Mono (1/0)	Dual Channel Stereo (2/0)
56	✓	✓
64	✓	✓
80	✓	✓
96	✓	✓
112	✓	✓
128	✓	✓
160	✓	✓
192	✓	✓
224	✓	✓
256	✓	✓
320	✓	✓
384	✓	✓
448	✓	✓
512	✓	✓
576	✓	✓
640	✓	✓

B.1.3 RS-232 Data

A 9-way, D-type female connector provides an RS-232 asynchronous, serial communications data input interface.

Table B.18: RS-232 Asynchronous Data Input Specification

Item	Specification
Safety status	SELV
Type	ITU-T V.24/V.28 (RS-232D) asynchronous serial data
Connector designation	RS-232 DATA
Connector type	9-way D-type female
Supported baud rates	1200, 2400, 4800, 9600, 19200, 38400 baud
Control mechanism	XON/XOFF
Time stamp	Not supported

B.1.4 RS-422 Data

This provides an RS-422 synchronous, serial communications data input interface.

Table B.19: RS-422 Data Specification

Item	Specification
Safety status	SELV
Type	ITU-T V.11 (RS-422), synchronous serial data and external clock
Connector designation	RS-422 DATA
Connector type	15-way D-type female
Clock frequencies	n x 64 kbit/s from 64 kbit/s to 2048 kbit/s (selectable) or n x 56 kbit/s from 56 kbit/s to 1792 kbit/s (selectable)
Time stamp	Not supported
Operation modes	Bit-pipe - Transport packet alignment and byte alignment relative to the incoming bitstream are arbitrary.

B.1.5 AUX RS232

CAUTION...
This is for use by TANDBERG Television engineers for unit diagnostics.

The Video Coding Module has an RS-232 connection called Aux Rs-232, to allow the flow of diagnostic information. This is available via the rear panel using a 9-way male D-type connector. The pin-out for this is shown in *Table B.20*.

Table B.20: Aux RS232 Data Out

Pin Number	Function	Direction (wrt to equipment)
2	Rx	In
3	Tx	Out
5	Gnd	N/A
Pins 1, 4, 6, 7, 8, 9: Not connected		

B.1.6 Test Tones

Table B.21: Test Tones Specification

Item	Specification
Level	0 dB relative to FSR 18 dB
Frequency	1 kHz at 48 kHz sampling frequency
Bitrate	96 kbit/s

B.2 ASI Outputs

Table B.22: ASI Out Specification

Item	Specification
Standard	CENELEC EN50083-9: 2002
Safety status	SELV
Connector type	BNC 75 Ω
Connector designation	ASI OUT 1, ASI OUT 2, ASI OUT 3

B.3 Control and Monitoring

B.3.1 Remote Control - Ethernet #1 and #2

Table B.23: Ethernet Specification

Item	Specification
Safety status	SELV
Connector designation	ETHERNET #1 and ETHERNET #2
Connector type	8-way RJ-45 socket, 10BaseT (ISO 882/3)

B.3.2 Local Control

Local control is by means of the front panel keypad and LCD display.

B.3.3 Alarm

Table B.24: Alarm Specification

Item	Specification
Safety status	SELV
Connector designation	ALARM
Connector type	9-way D-type male
Alarm contacts	Change-over contacts (5 Ω in common)
Fail contacts	Change-over contacts (5 Ω in common)
Reset contacts	Short pins 9 and 5 (resets the Encoder)
Relay Contact Rating	
Maximum switching power	30 W
Maximum switching voltage	110 V
Maximum switching current	1 A

B.4 Power Supply

B.4.1 A.C. Mains Input

This equipment is fitted with an wide-ranging power supply. It is suitable for supply voltages of 100-120 Vac -10% +6% or 220-240 Vac -10% +6% at 50/60 Hz nominal.

Table B.25: A.C. Power Supply Specification

Item	Specification
Power distribution system	Type TN ONLY (EN 60950 para 1.2.12.1): Power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. This equipment must NOT be used with single-phase three-wire and PE, TT or IT Type Power distribution systems.
Connection to supply	Pluggable Equipment Type A (EN 60950 para 1.2.5): Equipment that is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance Coupler or both. Correct mains polarity must always be observed. Do not use reversible plugs with this equipment.
Class of equipment	Class I Equipment (EN 60950 para 1.2.4): electric shock protection by basic insulation and protective earth.
Rated voltage	100-120/220-240 Vac (single phase)
Rated frequency	50/60 Hz
Voltage selection	Wide-ranging
Rated current	2 A (100-120 Vac range) 1 A (220-240 Vac range)
Input connector	CEE 22/IEC 3-pin male receptacle
Fuse	Fuse in live conductor in power input filter at rear of unit. Do not use reversible plugs with this equipment.
Fuse type	Bussmann S505 Littelfuse 215 5x20 mm time delay (T) 1500 A breaking capacity (HBC) IEC/EN 60127-2 Sheet 5
Fuse current rating	5 A 250 V T HBC
Power consumption	85 W maximum (NO options fitted) 150 W maximum (WITH options fitted)
Stand-by power	6 W typically

B.4.2 D.C. Supply Input (-48 Vdc Version)

NOTES...

1. Only model EN8030/BAS/48V and EN8090/BAS/48V use a d.c. power supply.
2. Ensure correct polarity is maintained.
3. The unit must have a protective earth.

Table B.26: D.C. Power Supply Specification

Item	Specification
Rated voltage:	For connection to –48 Vdc supplies only. (PSU input tolerance –40 to –60 Vdc). Correct polarity must always be observed.
Rated current:	5 A
Input connector:	Terminal block
Fuse:	Fuse in –48 Vdc connector at rear of unit.
Fuse type:	Bussmann S505 Littelfuse 215 5x20mm time delay (T) 1500A breaking capacity (HBC) IEC/EN 60127-2 Sheet 5
Fuse current rating:	6.3 A 250 V T HBC
Power consumption	100 W maximum (with no options fitted)

B.5 Physical Details

Table B.27: Physical Details

Item	Specification
Height	44.5 mm chassis
Width	442.5 mm excluding fixing brackets
Overall width	482.6 mm including fixing brackets
Depth	545 mm excluding rear connector clearance
Mounting	19-inch rack standard
Approximate weight	8.5 kg (19 lbs)

B.6 Environmental Conditions

Table B.28: Environmental Specification

Item	Specification
Operational	
Temperature	-10°C to +50°C (14°F to 122°F) ambient with free air-flow
Over temperature alarm generated at	>= 55°C
Under temperature alarm generated at	< 0°C
Temperature checked	Once every 30 seconds
All fans switched off at	< 10°C (when set to auto)
Half the fans switched off at	< 20°C (when set to auto)
All fans on at	>= 20°C (when set to auto)
Relative humidity	0% to 90% (non-condensing)
Cooling requirements	Cool air input from left side of unit, exhaust from right side of unit See *Chapter 2, Installing the Equipment, Figure 2.2*
Handling/movement	Designed for stationary or fixed use when in operation
Storage/Transportation	
Temperature	0°C to +70°C (32°F to 158°F)
Relative humidity	0% to 90% (non-condensing)

B.7 Compliance[1]

B.7.1 Safety

This equipment has been designed and tested to meet the requirements of the following:

EN 60950-1	European	Information technology equipment - Safety.
IEC 60950-1	International	Information technology equipment - Safety.

In addition, the equipment has been designed to meet the following:

UL 60950-1	USA	Information Technology Equipment - Safety.

[1] The version of the standards shown is that applicable at the time of manufacture.

B.7.2 EMC[2]

The equipment has been designed and tested to meet the following:

EN 55022 and CISPR22	European International	Emission Standard Limits and methods of measurement of radio frequency interference characteristics of information technology equipment - Class A.
EN 61000-3-2[3]	European	Electromagnetic Compatibility (EMC), Part 3 Limits; Section 2. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
EN 61000-3-3[3]	European	Electromagnetic Compatibility (EMC), Part 3. Limits; Section 3. Limitation of voltage fluctuations and flicker in low voltage supply systems for equipment with rated current ≤ 16 A.
EN 55024	European	Information technology equipment - Immunity characteristics - Limits and methods of measurement.
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47-Telecommunications, Part 15: Radio frequency devices, subpart B - Unintentional Radiators.

B.7.3 CE Marking

The CE mark is affixed to indicate compliance with the following directives:

89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

73/23/EEC of 19 February 1973 on the harmonisation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits.

1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.
(If fitted with telecom type interface modules).

> NOTE...
> The CE mark was first affixed to this product in 2006.

B.7.4 C-Tick Mark

The C-Tick mark is affixed to denote compliance with the Australian Radiocommunications (Compliance and Labelling – Incidental Emissions) Notice made under s.182 of Radiocommunications Act 1992.

> NOTE...
> The C-Tick mark was first affixed to this product in 2006.

[2] The EMC tests were performed with the Technical Earth attached, and configured using recommended cables (see *Table B.29*).
[3] Applies only to models of the Encoder using AC power sources.

B.7.5 Packaging Statement

The outer carton and any cardboard inserts are made from 82% recycled material and are fully recyclable.

The Stratocell™ or Ethafoam 220™ polyethylene foam inserts can be easily recycled with other low density polyethylene (LDPE) materials.

B.7.6 Packaging Markings

The symbols printed on the outer carton are described below:

Handle with care

This way up

Fragile

Protect from moisture

See *Section B.7.3*

See *Section B.7.4*

Defines country of origin.

The packaging is reusable per GB 18455-2001

This symbol guarantees that packaging with this symbol is recyclable and will be accepted by cardboard recyclers

Recyclable per GB 18455-2001

.

B.7.7 Materials Declarations

TANDBERG Television products are designed and manufactured in keeping with good environmental practise. Our component and materials selection policy prohibits the use of a range of potentially hazardous materials. In addition, we comply with relevant environmental legislation.

For the European Union

For product sold into the EU after 1st July 2006, we comply with the EU RoHS Directive. We also comply with the WEEE Directive.

For China

For product sold into China after 1st March 2007, we comply with the “Administrative Measure on the Control of Pollution by Electronic Information Products”. In the first stage of this legislation, content of six hazardous materials has to be declared together with a statement of the “Environmentally Friendly Use Period (EFUP)”: the time the product can be used in normal service life without leaking the hazardous materials. TANDBERG Television expects the normal use environment to be in an equipment room at controlled temperatures (around 22°C) with moderate humidity (around 60%) and clean air, near sea level, not subject to vibration or shock.

Where TANDBERG Television product contains potentially hazardous materials, this is indicated on the product by the appropriate symbol containing the EFUP. For TANDBERG Television products, the hazardous material content is limited to lead (Pb) in some solders. This is extremely stable in normal use and the EFUP is taken as 50 years, by comparison with the EFUP given for Digital Exchange/Switching Platform in equipment in Appendix A of “General Rule of Environment-Friendly Use Period of Electronic Information Products”. This is indicated by the product marking:

It is assumed that while the product is in normal use, any batteries associated with real-time clocks or battery-backed RAM will be replaced at the regular intervals.

The EFUP relates only to the environmental impact of the product in normal use, it does not imply that the product will continue to be supported for 50 years.

B.7.8 Equipment Disposal

"This product is subject to the EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) and should not be disposed of as unsorted municipal waste."

B.7.9 Recycling

TANDBERG Television provides assistance to customers and recyclers through our web site http://www.tandbergtv.com/ProductRecycling.ink Please contact TANDBERG Television's customer services for assistance with recycling if this site does not show the information you require.

Where it is not possible to return the product to TANDBERG Television or its agents for recycling, the following general information may be of assistance:

- Before attempting disassembly, ensure the product is completely disconnected from power and signal connections.
- All major parts are marked or labelled to show their material content.
- Depending on the date of manufacture, this product may contain lead in solder.
- Some circuit boards may contain battery-backed memory devices.

B.8 Cable Types

The signal cable types (or similar) in *Table B.29* are those recommended by TANDBERG Television in order to maintain product EMC compliance.

Table B.29: Suitable Signal Cable Types

Signal Type	Connector	Cable
Ethernet	RJ-45	Belden Datatwist (S-FTP)
ASI Outputs	BNC	Canford Audio BBC 1/3 PSF (type 2 Video cable)
HD-SDI In (Video Input)	BNC	Canford Audio BBC ½ PSF or Belden 1694A
SDI In (Video Input)	BNC	Canford Audio BBC 1/3 PSF
H SYNC	BNC	Canford Audio BBC 1/3 PSF
Composite Video (Input)	BNC	Canford Audio BBC 1/3 PSF
Audio (Input)	15-way D-type Male	Canford Audio DFT 110 Ω

B.9 Option Module - Dual GigE IP Output Card Option, EN8000/HWO/IPTSDUAL

Table B.30: Ethernet Port (Dual GigE IP Output Card)

Item	Specification
Safety Status:	SELV
Connector Type:	8-way RJ-45
Connector Designation:	Ge 1, Ge 2
Signal Type:	100/1000BaseT Ethernet (IEEE 802.3/802.3u)
Transport Stream Rate:	1.5 – 80 Mbit/s

Annex C

Language Abbreviations

Languages are shown in alphabetical order.

LANGUAGE	ABBREVIATION
Danish	dan
Dutch	dut
English	eng
Finnish	fin
French	fre
German	ger
Italian	ita
Norwegian	nor
Portugese	por
Spanish	spa
Undefined	
User 1	

There is the facility to enter a User specified abbreviation. This is performed by entering a 3 letter code for the User Defined Language 1 entry in the menu. Once this has been carried out, the code appears against the User Defined 1 option and it is this entry that is used for language code insertion.

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Annex D

Creating and Downloading a Logo

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D.1 Introduction

The Encoder includes a logo overlay facility whereby an image can be overlaid onto the active video prior to encoding. This enables broadcasters to trademark or brand their material with a logo.

To overlay the material with a logo, the logo must first be downloaded into the equipment using the Ethernet TFTP protocol. Once this has been done the logo can be enabled or disabled. Contact TANDBERG Television for further details.

D.2 Summary of Features

Up to 13 logos can be overlaid onto the active video. The space each logo occupies is referred to as a region. If two logo regions share a horizontal line they may interfere with each other, so this should be avoided, (see *Section D.7.5*), i.e. logos may be placed adjacent vertically, but not horizontally. Logos cannot be overlapped.

One logo can be downloaded into Flash memory and will still be present after the Encoder has been powered OFF. All other logos are stored in volatile memory and will be lost when the Encoder is powered OFF.

To create and download logos to the Encoder, two Windows applications are required, *Osd Creator* and *Osd Loader*. Once a logo has been downloaded to Flash it can be enabled/disabled from the front panel menu: `Setup/Video/Video source/Stored OSD`. Logos downloaded to volatile memory can only be controlled by the OSD Loader application running from a PC.

Logos are defined at pixel resolution and include a red, green, blue and transparency component. Logos can be positioned anywhere in the active video and can be any size from 1x1 pixel to the full size of the active picture (720x576 or 720x480 pixels). Logos are limited to a maximum of 256 colours, including different levels of transparency.

The logo is overlaid onto the active picture prior to horizontal and vertical down-sampling, noise reduction and video bandwidth filtering, if these are used.

D.3 OSD Programs Built Into the Encoder

Two Windows applications are required for creating and downloading logos to the Encoder, namely *Osd Creator* and *Osd Loader*. These programs are stored permanently in the Encoder where they can be downloaded via the Web Browser Interface. Further information is available in *Chapter 5, Web Browser Interface*. These applications must be unzipped and saved to a PC prior to use. This requires WinZip to be installed on the PC.

Using the Web Browser interface, see *Figure D.1*, select **Option 2 Tools, OSD Toolkit**.

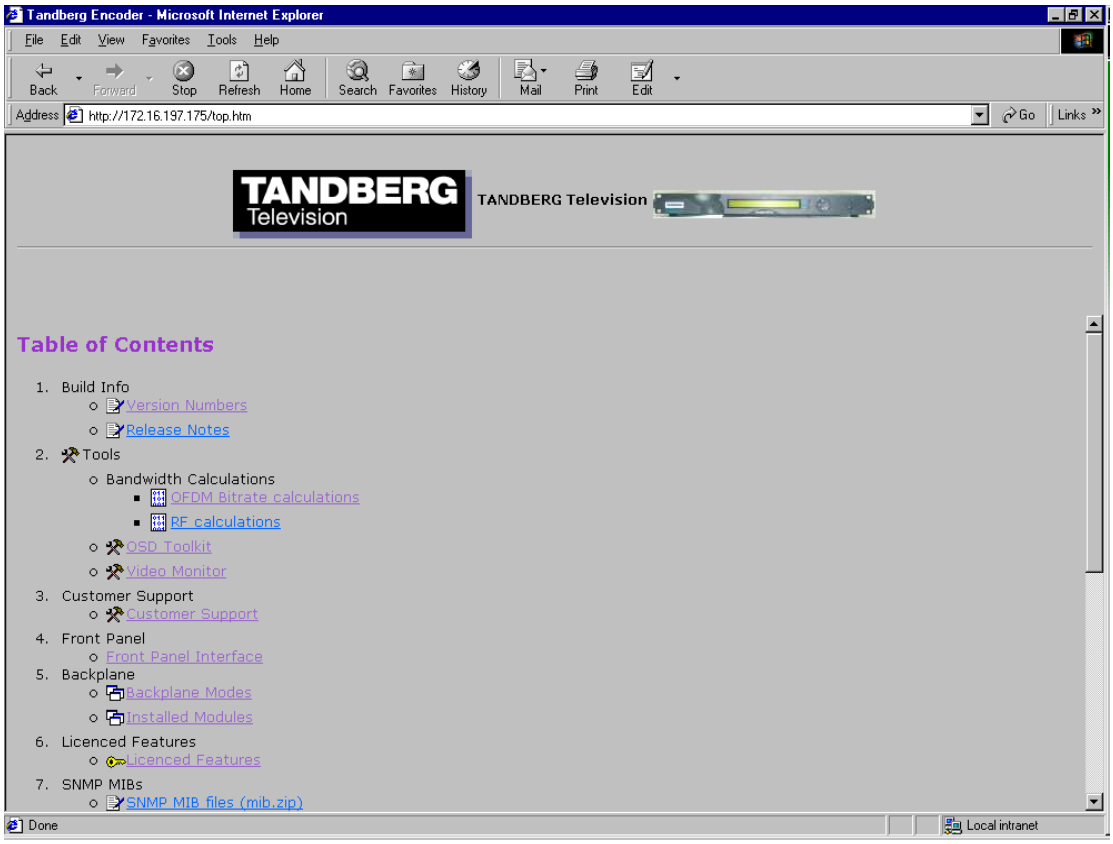

Figure D.1: Web Browser Interface

The dialogue box, see *Figure D.2*, will be displayed.

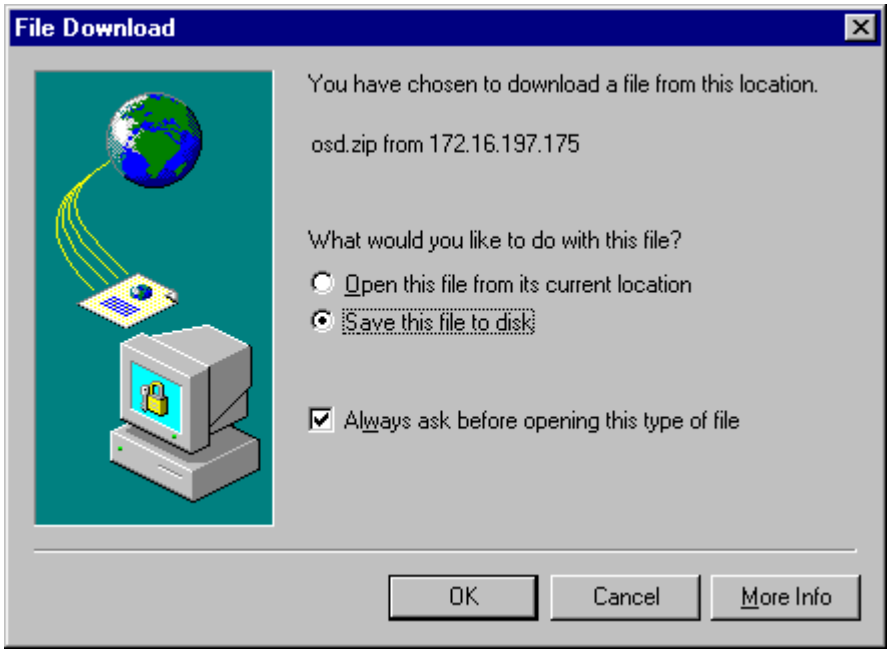

Figure D.2: File Download Dialogue Box

Clicking on option **Open this file from its current location** and Clicking **OK** will open the .zip file, see *Figure D.3*. Clicking on option **Save this file to disk** will allow the user to install the files on their local drive and then open the .zip file as in *Figure D.3*.

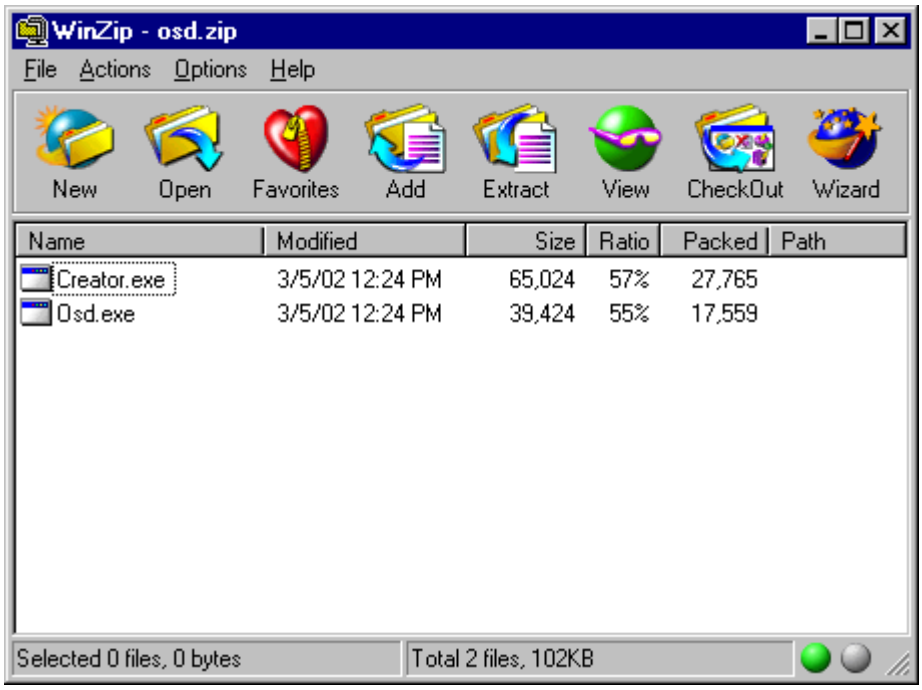

Figure D.3: Files for OSD Creator and Loader

D.4 Creating a Logo Using OSD Creator

Osd Creator (*creator.exe*) is an application for creating logo files (.osd format) for use with the *Osd Loader* application (*osd.exe*) to download them to the Encoder. It accepts Windows Bitmap (.bmp) format files as input. It includes the facility to introduce a **mix** component into the image, so that when the image is superimposed onto video, some areas appear to be transparent.

The application also includes the facility to downsample the image to the desired size.

The application runs under Windows 95 or Windows NT.

> NOTE...
>
> The *OSD Creator* program only has limited features for the manipulation of images. It is wise to carry out any complex image editing using dedicated graphics software prior to importing the .bmp image file into the *OSD Creator*.

D.5 Using OSD Creator

D.5.1 Overview

To create a logo (.osd) file:

1. Load a Bitmap (.bmp) file.
2. Add transparency in the desired areas.
3. Downsample to the desired size.
4. Save as an .osd file.

An example of a logo is shown in *Figure D.4*

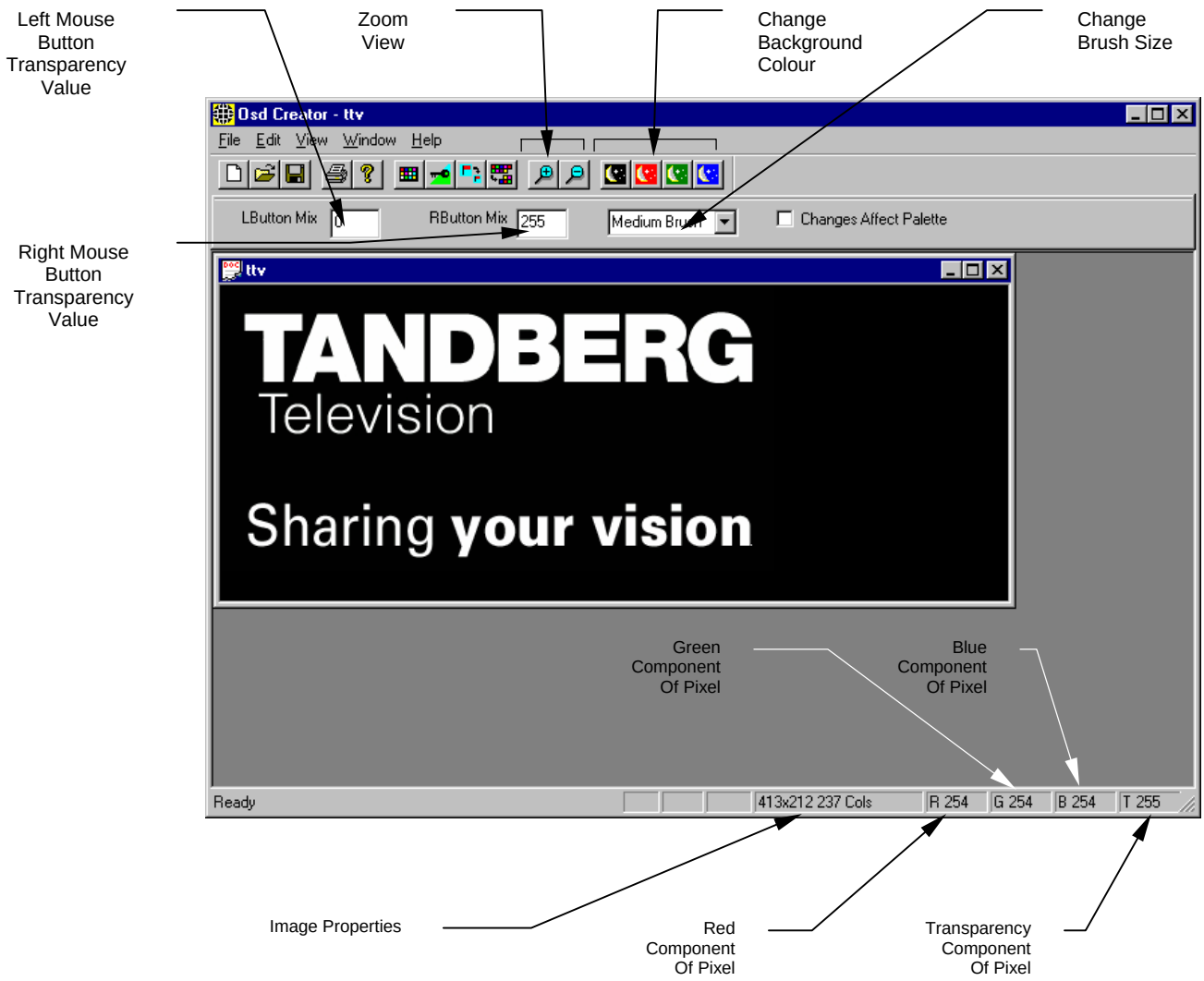

Figure D.4: OSD Creator Screen Showing Example Logo

D.5.2 Loading a .bmp File

Select **File/Open** from the menu, and choose a file with a .bmp extension. The image is displayed in its own window. The application does not accept compressed bitmaps or multi-planed bitmaps. If a 24-bit colour bitmap image is loaded into *Osd Creator* it will be automatically converted down to a 256-colour palette.

D.5.3 Creating Transparency

Overview

Each pixel in a .bmp file is represented by a red, green and blue component, each with a value 0 to 255. *Osd Creator* adds a fourth component for the transparency of the pixel. This is referred to as a **mix** or transparency (T) value and is displayed in the bottom right status panel. The transparency component also has a range of 0 to 255, where 0 is fully transparent and 255 is fully opaque.

Osd Creator uses a colour palette with a maximum of 256 entries. Each pixel in the image is mapped to an entry in the palette, which holds a value for the red, green and blue and transparency component. The transparency (or **mix**) is treated as a colour component, so for two colours with identical red, green and blue values, but different transparency levels, two entries will be generated in the palette.

When a bitmap image is loaded, all colours have a transparency value of 255 (opaque).

The area of the image that is to remain opaque is referred to as the **active area**. The area of the image that is to be made transparent is called the **inactive area**. Transparency can added manually, with a brush, or by using a **key file**.

Adding Transparency Manually

The background colour within *Osd Creator* can be changed with the black, red, green and blue buttons on the toolbar. This changes the background colour of the editor window on which the logo is overlaid and not the logo itself, which remains unaffected. This facility is useful to show the transparency of different colours. It is best to start with a background colour that contrasts sharply with the whole of the source image.

Using the options immediately below the toolbar, the mouse pointer can be used as a brush to add transparency to an area. The left mouse button will apply the transparency value set for the **LButtonMix** and the right mouse button will apply the transparency value set for the **RbuttonMix**. At start-up these are set so **LButtonMix** is 0, to make an area transparent, and **RButtonMix** is 255, to make it opaque.

Different mix levels can be entered for intermediate levels of transparency. Selecting a brush size from the drop-down list determines the size of the area that is changed.

If the **Changes Affect Palette** box is checked, changing the transparency of a pixel on the image also changes the palette entry on which the pixel is based, and all the pixels that share that palette entry.

If the inactive area is mainly one colour, check the **Changes Affect Palette** box, and left-click in the inactive area. All pixels of that colour should become background-coloured. Repeat until the whole of the inactive area is transparent. If parts of the active area have become transparent, uncheck the **Changes Affect Palette** box, and paint with the right button to correct these areas. Zoom in if necessary.

If there is no general colour for the inactive area, uncheck the **Changes Affect Palette** box and paint the inactive area manually with the left mouse button. Use the right button to correct mistakes. Trace around the edge of the area with a medium brush, then use the large brush for wide areas. Zoom in to do the fine corrections.

Adding Transparency Using a Key File

A **key file** is a Bitmap (.bmp) file of the same size as the source file, with the active area of the image coloured white, the inactive area coloured black, and intermediate levels of transparency coloured grey.

Create the **key file** using a drawing package. Colour the active area white, and the inactive area black. Save as a .bmp file.

Click the **Key File** toolbar button. Select the **key file**. The inactive area of the image should now be transparent (background-coloured). Change the background colour to verify that the correct area is transparent.

Editing the Palette

The palette may be displayed alongside the image by clicking the **Show/Hide Palette** toolbar button. The transparency of each palette entry may be altered in the same way as the image itself, using the left and right mouse buttons. Changes to the palette are shown immediately on the image.

The Red, Green, Blue and Mix component of the pixel or palette entry under the cursor can be seen on the status bar at the bottom of the screen.

Palette Reallocation

When the level of transparency of a pixel in the image is changed, a new colour is effectively created. Whenever the image is downsampled or saved, the palette is rebuilt to reflect the actual colours in the image. As part of this process, pixels which have a mix value of zero are mapped to palette entry zero, which is defined as Red = Green = Blue = Mix = 0. The original colour information is lost and the right mouse button will not change the pixel back to its original colour.

To rebuild the palette during editing, click the **Reallocate Palette** toolbar button.

D.5.4 Downsampling

Click the **Downsample** toolbar button. A dialog box appears asking for a downsampling ratio. This can be specified directly, or by entering the desired image size. Click OK to downsample the image. The downsampling algorithm includes a filter, so the boundary between the active and inactive areas softens slightly. Zoom in and check that the correct areas are transparent, and make corrections if necessary.

> NOTE...
>
> Once the image has been downsampled, the process cannot be reversed to change the image back to its original size.

D.5.5 Saving the .osd File

Select **File/Save As/OSD file** from the menu. Saving is possible at any time, and it is advisable to save the image often while editing is in progress. The file may also be saved in .bmp format, but this file will not contain transparency information.

D.6 Downloading a Logo Using OSD Loader

The *Osd Loader* application (osd.exe) is used for downloading logo (.osd) files to the Encoder and controlling which are displayed.

The application runs on a PC with Windows 95 or Windows NT. A network connection is required. It is imperative that the target Encoder's IP address must be accessible from the host PC.

The application uses the .osd file format for images. These can be derived from Windows .bmp files using the ***OSD Creator*** application (see *Section D.4, Creating a Logo Using OSD Creator*).

An example of an OSD Loader screen is shown in *Figure D.5*.

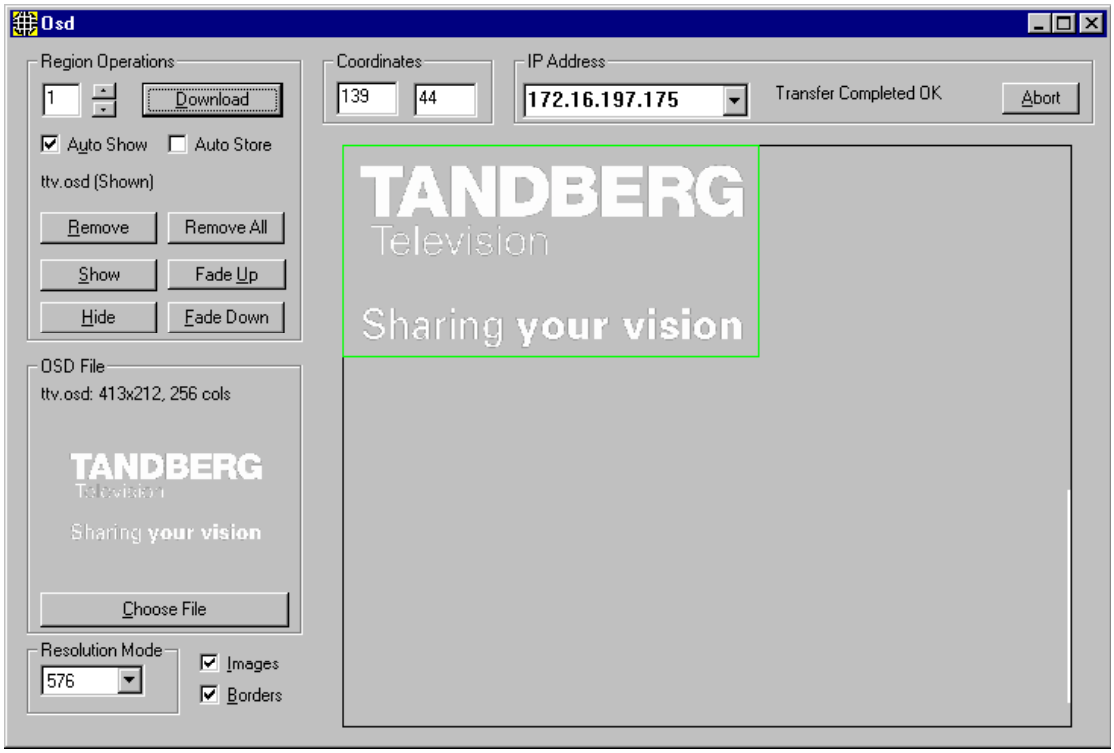

Figure D.5: OSD Loader Screen Showing Example Logo

D.7 Using the OSD Loader

D.7.1 Start-up

Activate the application (*osd.exe*). The application attempts to connect to the last known Encoder address. If the address is not correct, click the **Abort** button and enter the IP address of the target Encoder. This can be found on the Encoder front panel by selecting **Setup/System/Remote Control**. To test the connection, click the **Remove All** button (you will be prompted for confirmation – **Remove all OSD Regions Yes/No**). The communications box (at the top of the screen) should read **Transfer Completed OK**.

The **Resolution Mode** must be set to match the video resolution being used. This adjusts the preview screen to the dimensions of the active video.

Table D.1: Resolution Modes

Resolution Mode	Video Standard
576	Standard Definition 625 line
480	Standard Definition 525 line
480p	Not Supported
576p	Not Supported
720p	Not Supported
1080i	Not Supported

D.7.2 Download an .osd File

Choose an On-screen Display file with the **Choose File** button. You will be prompted for a file with an .osd extension. The image will be displayed in the **OSD File** box.

Position the image on the screen by dragging the white cursor box around the main placement window. The position can also be adjusted by editing the co-ordinates boxes.

A logo can be overlaid anywhere in the digital active picture. When a logo is positioned in the main placement window, the co-ordinates are shown for the top left corner of the logo. The co-ordinates that the *Osd Loader* uses include an offset. *Figure D.6* and *Figure D.7* illustrate how these co-ordinates relate to the active picture.

When the logo is correctly positioned, click the **Download** button. **Transferring Data…** appears in the communications box. The image will be displayed in the main window. Wait for **Transfer Completed OK** to appear in the communications box. After a short delay, the image should appear on the output from the Receiver.

If the **Auto Store** box is checked, when the logo is downloaded to the Encoder, it will be stored in Flash memory and will still be present after the Encoder has been powered off. Only one logo can be stored in Flash at any time. The maximum logo file size that can be stored in Flash is 65 279 bytes. The file size will be affected by the size of the logo and its complexity (number of colours and levels of transparency). For example this is roughly equivalent to a logo 200 x 145 pixels with 256 colours (62 567 bytes).

If the **Auto Store** box is left unchecked, the downloaded logo will be stored in volatile memory and will be lost when power is removed from the Encoder.

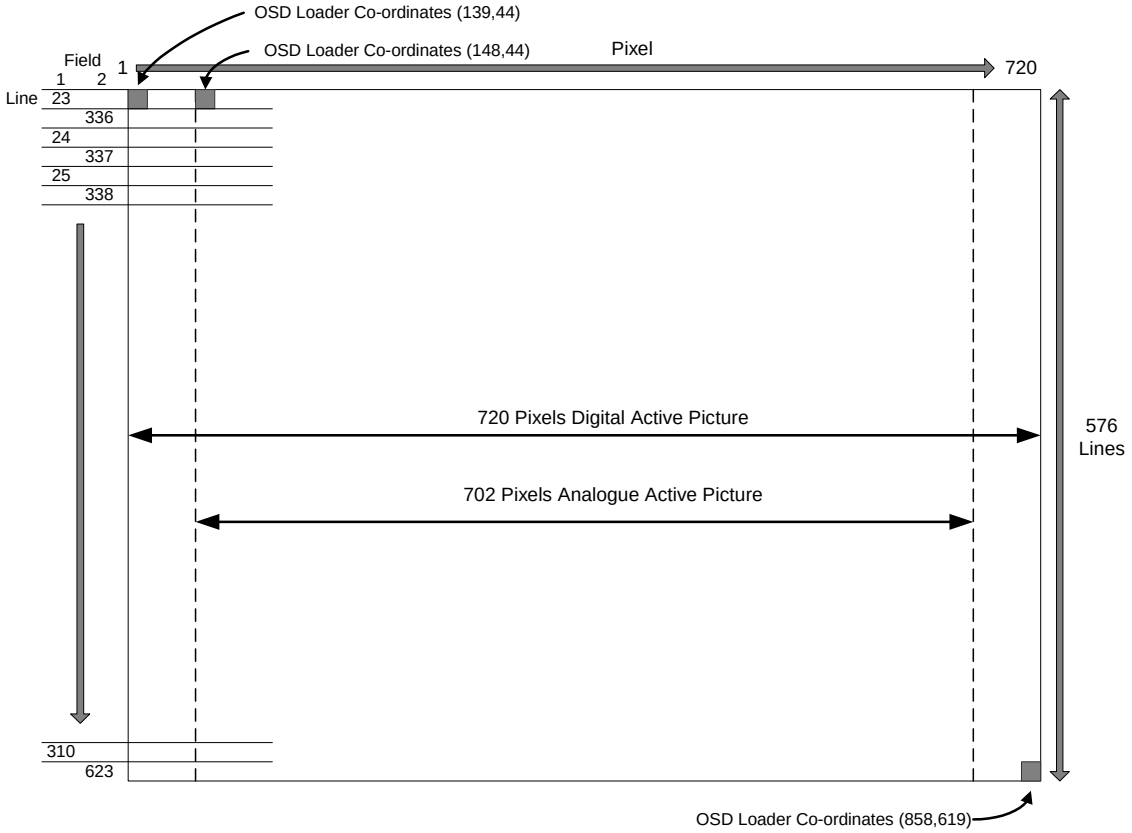

Figure D.6: 625 Line, OSD Co-ordinates in Active Picture

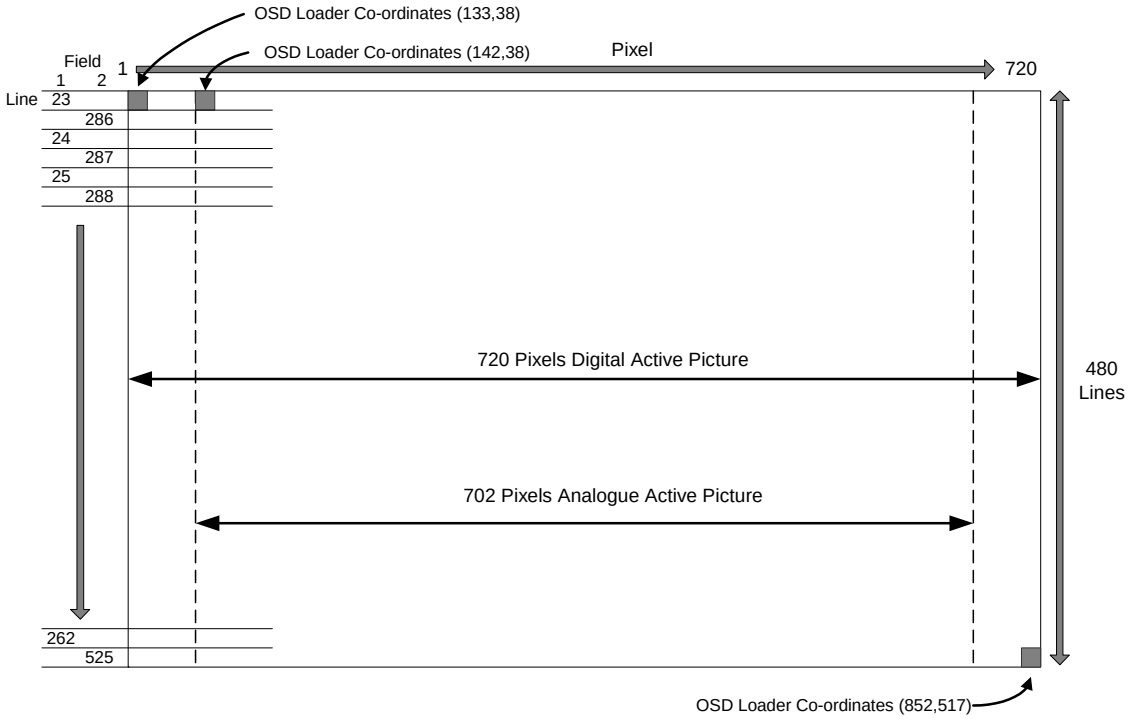

Figure D.7: 525 Line, OSD Co-ordinates in Active Picture

D.7.3 Show and Hide Regions

The **Download** button defines a Region in the Encoder, which remains until the Encoder is turned off, the **Remove** button is clicked, or the Region is **Download**ed again. The Region may be in the Shown or Hidden state, which determines whether it appears in the video stream. If the **Auto Show** box is checked, the initial state is Shown. Use the **Show, Hide, Fade Up** and **Fade Down** buttons to change the state of the region. Shown regions have a green border in the main window, Hidden regions have a red border.

> NOTE...
>
> Remove or Remove all does not erase a logo that has been stored in Flash memory. It will be removed from the video picture, but will still be available from the front panel Stored OSD On/Off menu option.

D.7.4 Multiple Regions

Multiple Regions may be displayed. To define an additional Region, change the Region Number at the top of the **Region Operations** box, and repeat the **Download** procedure. Buttons in the **Region Operations** box only affect the current Region number (with the exception of **Remove All**). The current Region can also be changed by double-clicking on the image in the main window. The current region has a brighter border in the main window. Uncheck the **Images** box to display the Region number in the main window instead of the image.

D.7.5 Region Interference

If two Regions share a horizontal line, they may interfere. This means that when both Regions are Shown, only one actually appears in the video stream. The application warns if this is the case. When one of the Regions is Hidden, the other may be Shown as normal.

D.8 Fault-finding

If there appears to be a problem creating or downloading a logo check the following:

- If the Communications box reads "Error Creating Socket", there may be a problem with the PC's network set up, or another application may be using the TFTP socket number.
- If the Communications box reads "Waiting For Response" for a long time, the target Encoder is either busy or not visible on the network. Abort the transfer before changing the IP address.
- Large images take time to appear due to network transfer rates and image processing.
- If the download completes, but the OSD image does not appear on video, the image may be too near the edge of the screen – try moving it towards the centre. Make sure the correct line standard is selected.
- Make sure the image is visible on a typical domestic television. Make a note of the co-ordinates where the image is required.
- If precise timing is required, **Download** the image in advance with **Auto Show** off, then click **Show** when display is required.
- To move the current Region, reposition the white cursor, check that the **OSD File** box has the correct image, and click **Download**.

Annex E

Audio Modes

Contents

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E.1 A Brief Introduction to Coding Standards

Where appropriate, the output transport stream can be made compliant with ATSC A53(E) ATSC Digital Television Standard and DVB 101-154 v1.7.7.

E.1.1 MPEG Standards

Background

The Moving Pictures Experts Group (MPEG) was formed in 1988 to generate compression techniques for audio and video. Since then various flavours of MPEG audio have emerged. For present broadcast purposes MPEG-1 layers II, and III are deemed suitable for broadcast.

MPEG-1 Layer II

This perceptual encoder is almost identical to MUSICAM, apart from headers. It differs from Layer I by splitting the signal into 3 parts, and then filters each group as Layer I. This means that each subband contains 3 groups of 12 samples, so a frame is split into 1,152 samples, a few more than Layer I. The coder takes advantage of the three groups by comparing the values and if found to be similar, or if temporal masking occurs the number of bits can be reduced accordingly.

This is selectable from the Audio A and B menu.

MPEG-2 AAC–LC (Advanced Audio Coding)

It was designed to be non-backwards compatible to be able to achieve high audio quality at a rate of 64 kbit/s/channel for 5.1 systems.

AAC consists of several tools other than those shown in the basic model:

Pre-processing – Signal split into 4 equally sized frequency bands and their level adjusted.

Filter bank – MDCT filter is used.

Temporal Noise Shaping (TNS) – pre-echo removal

Intensity stereo coding / coupling stereo coding -

Prediction – intensity difference between the previous and current frames coding.

There are 3 profiles available main(MP), low complexity(LC), and scalable sampling rate (SSR).

The low complexity profile is used for broadcast, which allows the pre-processing and prediction tools to be discarded and the TNS complexity to be reduced.

There are 3 profiles or versions available:

- Main (MP): includes all of the tools that improve encoding efficiency.
- Low complexity (LC): some tools are not allowed and others are restricted to enable this algorithm to fit into the broadcast space.
- Scalable Sample Rate (SSR): maximises temporal resolution (getting the high frequency sounds at the right time) at the expense of coding efficiency. This is similar to Sony's ATRAC.

AAC has specifically been designed to leave behind the baggage of Layers I and II so that it can be more efficient. The time it takes to encode audio differs between the profiles, main being the most intensive and SSR the least.

If licensed, this is selectable from Advanced Audio 4A – 4D menus. The minimum allowable delay is 100ms.

MPEG-4 HE AAC

This standard builds on the MPEG-2 AAC. Some of the existing tools have been improved and new ones added. All AAC objects (including the error robust modes) contain the Perceptual Noise Substitution (PNS) tool. PNS detects noise in the signal and in the final bitstream a noise flag is raised and the power level of the noise stored. The decoder generates a random noise of the level indicated, and inserts this into the audio signal.

At lower bitrates this standard also includes a tool called Spectral Band Replication (SBR). HE AAC is based around the aacPlus Codec, and *Figure E.1* shows Coding Technology's aacPlus coding system as used in Digital Radio Mondiale (DRM).

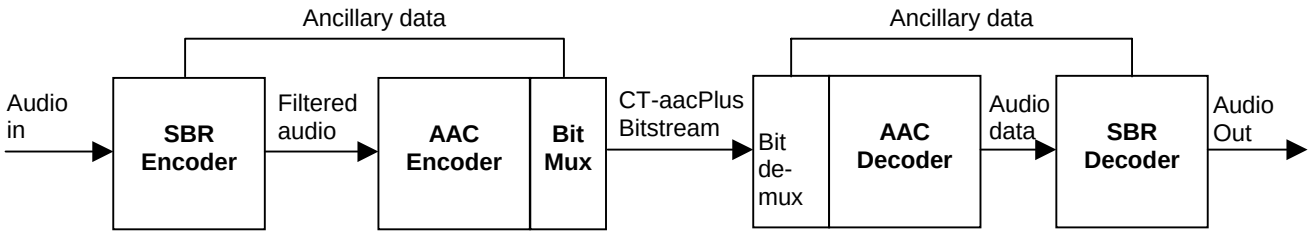

Figure E.1: CT-aacPlus Encoder for DRM

To enable the decoder to reproduce the high frequency content some additional information is added to the bitstream, shown here as ancillary data. Using SBR can reduce the number of bits by 30%.

The following quote comes from VIA licensing web-site.
'HE AAC enables the delivery of 5.1 surround sound at 128 kbps, consumer-grade stereo at 48 kbit/s, and excellent quality stereo at 32 kbit/s or below.'

Any codec that uses SBR is going to be about 30% better than its base codec. This places HE AAC very high on the agenda. The low complexity codec is still the one to consider for broadcast purposes, as with today's technology this is may be coded real-time and achieve the required quality.

E.1.2 MPEG-4 Formats

MPEG-4 audio may be stored and streamed in many formats, which are described in the standard. These include:

- **ADTS**: This format places a header at the start of every audio frame, and provides enough information for each frame to be independently decoded. It contains a fixed and a variable header.
- **LATM/LOAS**: As for ADTS this also places a header at the front of each audio frame in such a way that each audio frame can be independently decoded. This is the required format for compliant DVB streams (ETSI TS 101-154 v1.7.7), and is available on the Encoder.

E.1.3 Dolby Digital

Dolby Digital is a proprietary algorithm from Dolby that forms part of both the ATSC and DVB standard for digital broadcasting.

The encoder includes a psychoacoustic model to improve the quality. The signal is divided into 32 multiple sub-bands, which correspond to the critical bands of the human ear. The basic number of bits are set for each sub-band, but there is also a pool of additional bits that can be allocated as required.

Dolby recommends stereo signals may be coded at 192 kbit/s, and 5.1 at 448 kbit/s, but other rates are available if required.

E.2 Audio Coding Modes

E.2.1 Mono

This mode has a single audio channel that is encoded independently. It is seldom used in broadcast as most viewing devices now have stereo speakers or headphones.

E.2.2 Stereo

This treats the incoming signal as separate left and right signals. Some coding algorithms will look at the left and right signals and, depending on the correlation of these will combine the signal into a mid and side channel to save on bits.

E.2.3 Joint Stereo

This option is available for MPEG 1 layer 2 only. This applies a technique called intensity coding. The human ear is not as good at locating higher frequencies as it is lower ones. The use of this mode may introduce more artefacts than stereo.

E.2.4 Dual Mono

Used if the left and right channels are carrying separate services. The encoder knows that it must treat the two channels independently. The main use for this mode is for multilingual transmission where decoder selects which language to decode on left or right.

E.2.5 Surround Sound/5.1

A stereo signal produces a very focused audio field so unless the viewer is sitting in the correct position, the audio reproduction suffers. More audio channels are required to generate a larger audio field in which the viewer can listen.

The encoder expects the signal to arrive as:

- AES 0: Left, Right (coded as a stereo pair)
- AES 1: Centre, Low frequency Effect (coded as a mono channel with restricted frequency on the LFE channel)
- AES 2: Left surround, Right Surround.

E.2.6 Auto Detect

This feature looks at the AES stream to determine if the stream is dual mono or other. If other is indicated then the encoder assumes a stereo source.

E.3 Audio Coding Modules in Encoder

The EN8000 Standard Definition Encoder has two separate audio encoding modules:

- Standard MPEG stereo audio encoding including MPEG-1 Layer II and Dolby Digital. This module will be denoted as SA [Standard Audio] in the Figures.
- Advanced audio encoding, which is currently restricted to the AAC algorithms. This module will be denoted as AA [Advanced Audio] in the Figures.
- Two sets of stereo audio services, A and B, can be sent to both modules independent of the source whether it is analogue, digital or embedded on SDI.

E.3.1 Analogue Audio

On the encoder there are two channels of analogue audio available. *Figure E.2* shows the coding methods that may be used with the analogue audio inputs.

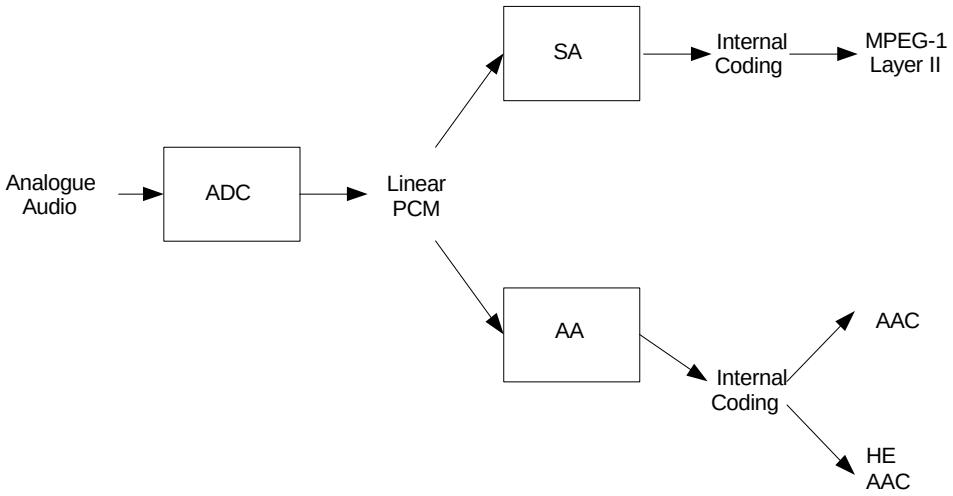

Figure E.2: Analogue Audio Route

The Encoder digitises analogue audio to linear PCM at a sampling rate of 48 kHz. This audio can then be routed to both audio-encoding modules.

Input Impedance

The encoders have the option of two different input impedances for different types of audio sources:

- 600 Ω to minimise the noise figure associated with the energy transfer from the source to the encoder but does require the source to be able to generate significant amounts of current. The operator should only select this when using professional equipment.
- 20 kΩ to minimise the amount of current that the audio source needs to generate at the expense of increased noise in the digitisation process. The operator should select this when it is not clear that the source can source sufficient current.

Clip Levels

When analogue audio is selected then it is possible to set a clip level between 12 and 24 dB inclusive, which is used in the A/D conversion. It refers to the maximum audio level that is expected on the input, and if the detected level goes above this, then the audio clip alarm will be raised.

The values below give an indication of how this clip level relates to voltages (dBu is referenced to 0.775 V).

12 dBu = 3.08 Vrms = 4.36 Vpeak

18 dBu = 6.16 Vrms = 8.71 Vpeak

24 dBu = 12.28 Vrms = 17.37 Vpeak

NOTES...

1. The analogue input is balanced, so, connecting an unbalanced output causes the level to drop by 6 dB.
2. If impedance is incorrectly set this could lead to an unexpected audio level.

E.3.2 Digital Audio

On the encoder there are two input channels of audio available.

When a digital audio source is used, consideration must be given to the choice of clock source used by the Encoder. To ensure correct operation the Encoder and the audio may need to be genlocked to the studio source. *Figure E.3* shows the coding methods that may be used with the digital audio inputs.

Table E.1 and *Table E.2* show the coding methods that may be used with the digital audio inputs.

Table E.1: Codecs with Audio In 2: Linear PCM audio input

Connection	Module	Coder
Audio In 2	Advanced Audio 4A – 4D	AAC (ADTS)
Audio In	Audio A and B	Dolby Digital
		MPEG 1 Layer II

Table E.2: Codecs with Audio In 2: Pre-encoded audio input

Connection	Module	Coder
Audio In 2	Advanced	Dolby Digital passthru
Audio In	Standard	Dolby Digital passthru

Digital Audio on AUDIO IN 2

AUDIO IN 2 connector. This input method is selected as “Digital” in the Advanced Audio 4A – 4D menus. The input format for this input is linear PCM or Dolby Digital bitstreams.

When the digital audio source is used with the **AUDIO IN 2** connector, consideration must be given to the choice of clock source used by the Encoder. To ensure correct operation, both the Encoder and the audio source may need to be genlocked to the studio source by selecting the video clock as external. Then the encoding clock is derived from the signal at the H SYNC input.

Digital Audio on AUDIO IN

The Encoder can receive up to 2 sets of digital audio stereo pairs on the **AUDIO IN** connector. This input method is selected as “Digital” in the Audio A and B menus. The input format for this input can be either per-encoded Dolby Digital bitstreams or linear PCM.

When the digital audio source is used with the **AUDIO IN** connector, consideration must be given to the choice of clock source used by the Encoder. To ensure correct operation, both the Encoder and the audio source may need to be genlocked to the studio source by selecting the video clock as external. Then the encoding clock is derived from the H SYNC input.

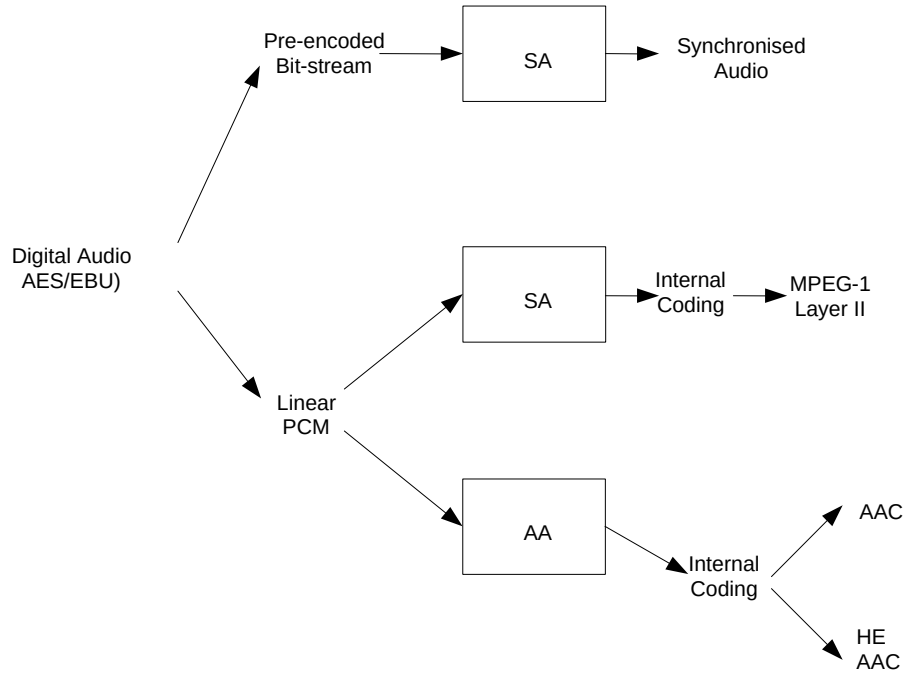

Figure E.3: Digital / SDI Embedded Audio Route

Serial Digital Interface Embedded Audio

Audio can be embedded on a serial digital interface (SDI) feed within 4 groups. Each group contains two stereo pairs. Hence each SDI can carry a maximum of 2 x 4 = 8 stereo pairs, or 16 mono channels.

Each group has an associated Data Identifier (DID). The standard DIDs are typically:

- Group 1 = 0x2FF
- Group 2 = 0x1FD
- Group 3 = 0x1FB
- Group 4 = 0x2F9

The DIDs are located in ancillary packets in the data stream. Other DIDs are possible. DID 1F4 is reserved for EDH error packets. Refer to the SMPTE 272M specification for more details.

Input Selection

Figure E.4 shows how the encoder routes the embedded audio, in conjunction with the chosen DID.

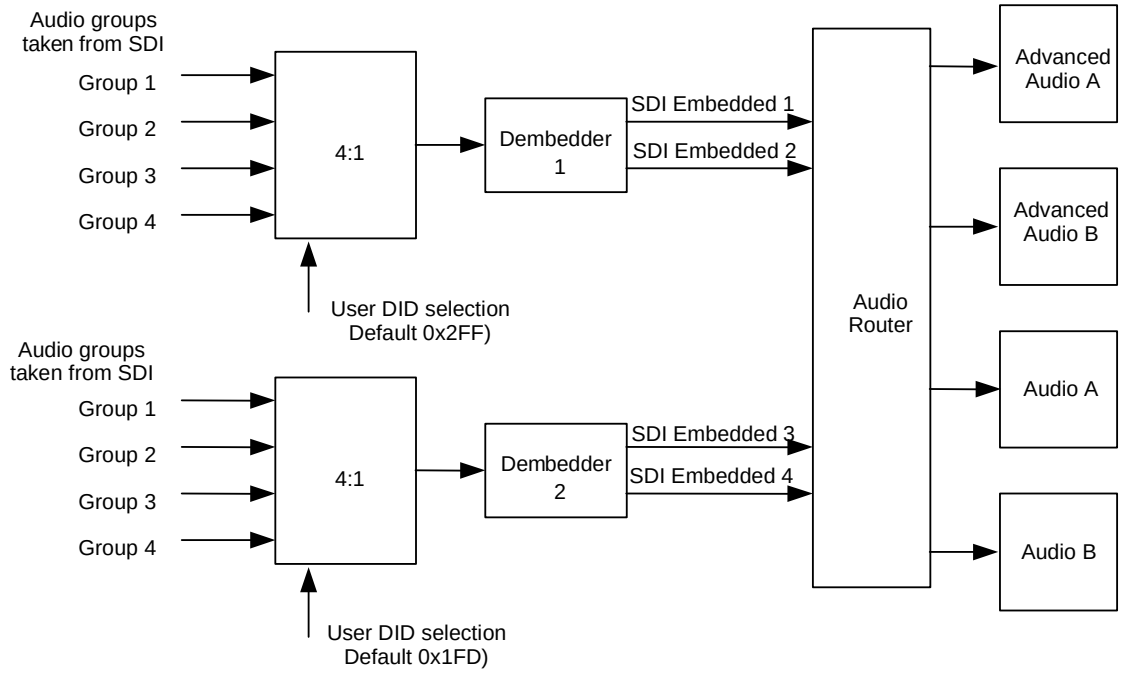

Figure E.4: Embedded Audio (SDI) Signal Flow

The Encoder can de-embed any two DID's at any one time, thus giving a total of four embedded audio sources: embedded audio 1-4.

The default DID for embedded audio 1-2 is 2FFh (Group 1).
The default DID for embedded audio 3-4 is 1FDh (Group 2).

> NOTE...
> Default DIDs are selected when a DID value ≥1024 is set.

While there are a possible eight stereo pairs available both the standard and advanced audio encoding modules can process up to two stereo pairs each.

HD SDI Embedded Audio

The Encoder has the capability of de-embedding up to 4 groups of audio data from 4 different Data Identifier (DID) in the HD-SDI video input. Each group contains two stereo pairs.

- Up to 4 sets of pre-encoded Dolby Digital bitstreams or linear PCM as controlled as Advanced Audio 4A – 4D.

The standard DIDs that are used for the extraction are:

- Group 1 = 0x2E7
- Group 2 = 0x1E6
- Group 3 = 0x1E5
- Group 4 = 0x2E4

Other DIDs can be selected and valid values are described in the SMPTE 299 specification.

HD SDI Input Selection

There are 8 audio de-embedders in the HD-SDI module. Each can de-embedded one AES/EBU stream that contains 2 audio streams, left and right or Dolby Digital pre-encoded stream. The maximum number of audio services that the encoder can handle is dependant on the coding mode and audio standard required (see *Table E.3)*.

Table E.3: HD SDI Audio Input and Available Coding Modes

Coding standard	Coding Modes
Dolby Digital	1 x 5.1, 1 x stereo or
	4 x stereo
Dolby Digital passthru	4 x 5.1 or
	4 x stereo or equivalent
	4 x mono

The Encoder can de-embed any four two DID's at any one time, thus giving a total of eight embedded audio sources: embedded audio 1-8. The default DIDs are shown in *Table E.4: HD SDI Default DID's*.

Table E.4: HD SDI Default DID's

Embedded Audio	Default DID	
1-2	0x2E7 (Group 1)	Default DIDs are selected when a DID value ≥1024 is set.
3-4	0x1E6 (Group 2).	
5-6	0x1E5 (Group 3)	
6-8	0x2E4 (Group 4)	

E.4 Summary

Table E.5 summarises the available coding standards and modes for the audio modules.

Table E.5: Summary of Audio Coding Modes and Standards.

Coding Standard	Module	Connector	Coding Mode
AAC	Advanced Audio 4A – 4D	HD SDI	Stereo
		Audio Input 2 (digital)	Multichannel (5.1)
MPEG 1 Layer II	Audio A - B	HD SDI	Mono {Left/Right)
		Audio Input (Digital/Analog)	Dual Mono
		Audio Input (Analog)	Joint Stereo/Stereo
Dolby Digital	Audio A - B	HD SDI	Strereo
		Audio Input (Digital/Analog)	1/0 (Left/Right)
Dolby Digital passthru	Audio A - B	HD SDI	As pre-encoded
		Audio Input (Digital/Analog)	
Dolby Digital passthru	Advanced Audio 4A – 4D	HD SDI	As pre-encoded but with glitch suppression
		Audio Input 2 (Digital)	

Annex F

Accuracy of Frequency Sources

This equipment is based around ISO/IEC 13818 specifications (commonly known as MPEG-2) and within these specifications all timing is derived from a 27 MHz system clock. The system clock is required to have an accuracy of better than ±30 ppm.

An oven-controlled crystal oscillator (OCXO) within this equipment achieves the ±30 ppm accuracy within five minutes of applying power. This accuracy is maintained over the specified operating temperature range for the life of the product without further adjustment.

Composite television systems such as PAL and NTSC have traditionally used high precision oscillators for colour subcarrier. Many different specifications are in common use and a required accuracy in the range ±0.2 ppm to ±2 ppm is common. Typically an entire TV studio runs from a central frequency standard, with all equipment being fed with a Black and Burst reference signal.

Generally, individual items of equipment are not capable of the required accuracy in the absence of this reference. Where a suitable reference is not available (e.g. outside broadcast or intercontinental programme exchange) the specifications allow a relaxed accuracy.

When this equipment is used to source a timing reference which is used to generate a composite video output (for instance the PAL or NTSC output of a TANDBERG Television Receiver/Decoder) the accuracy of the resultant subcarrier is directly traceable to the 27 MHz system clock in this equipment.

To ensure continuing accuracy, the system clock in this equipment can be locked to an appropriate frequency reference by feeding a Black and Burst signal to the H SYNC input. Alternatively, the system clock can be locked to the video input. In either case, the system clock is frequency-locked to the source sync pulses, and hence the composite video subcarrier is as accurate as the frequency reference.

Where an accurate reference signal is not available, the OCXO in this equipment must be used. The OCXO is adjusted to better than ±0.2 ppm during manufacture, but due to natural ageing of the OCXO, regular calibration is required to keep the OXCO within ±0.2 ppm if composite video accuracy is to be maintained. Calibration intervals depend on the requirements of the particular composite video specification in force. Please contact TANDBERG Television Customer Services for advice.

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