

## REFERENCE GUIDE

Voyager E5784 and E5788  
HD DSNG Encoder

Software Version 3.9.0



E5784/E5788 Encoder

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# List of Contents

## Chapter 1: Introduction to the Basic Encoder

Gives a general description of the equipment and its main features and functions. Identifies the controls, indicators and connectors on the front and rear panels.

## Chapter 2: Installing the Equipment

Provides a guide to the suitability of an installation and gives detailed procedures for the preparation and installation of the equipment. Also details the external connectors and provides **important safety information**.

## Chapter 3: Options and Upgrades

This chapter describes the options and upgrades available for the E57xx series of Encoder models.

## Chapter 4: Operating the Equipment Locally

Describes local control in detail. Provides the power-up/power-down procedures and other general operating/control/set-up procedures.

## Chapter 5: Web Browser Interface

Details how to access and use the Web Browser Interface for a range of diagnostic and other utilities.

## Chapter 6: Preventive Maintenance and Fault-finding

Details routine maintenance tasks to be performed by the operator and provides general servicing advice and fault-finding information. Provides information regarding warranty and maintenance available from Customer Services. Gives relevant disposal information.

## Annex A: Glossary

## Annex B: Technical Specification

## Annex C: Language Abbreviations

## Annex D: Creating and Downloading a Logo

## Annex E: Band Plans

## Annex F: Audio Modes

## Annex G: Accuracy of Frequency Sources

## Annex H: Use of Remux Card in ATSC

## Annex I: EDH Capability for E57xx Encoders

## Annex J: Setting of the Remux Card for Data/PSIP and DVB-Subtitles Input

## Annex K: PRO MPEG FEC Support for IP Streaming in E57xx Encoders

## Annex L: Alarm List

## About this Reference Guide

This Reference Guide provides instructions and information for the installation and operation of the Voyager E5784 and E5788 HD DSNG Encoder.

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 by 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 the relevant documentation.

Issues of this Reference Guide are listed below:

Issue	Date	Software Version	Comments
1	Apr 2004	3.3.0	Initial release.
2	Mar 2005	3.6.0	Up-issue for new functionality and options
3	Jan 2006	3.9.0	Includes functionality of SVs 3.7.0, 3.8.0 and 3.9.0. New option modules.

The following documents are also associated with this equipment:

- ST.TS.SNMP.E10074: Simple Network Management Protocol
- ST.TS.E10074 Remote Control Protocol
- ST.AN.1094: Video Noise Reduction and Compression
- ST.AN.1110: Near Loss-less MPEG Concatenation Without Helper Signals
- ST.AN.BW.E10074: Variable Bandwidth Feature of E57xx Encoders

## 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.

---

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## 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...**

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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.

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International Facsimile	+44 23 8048 4467
E-mail Address:	training@tandbergtv.com
Internet Address	<a href="http://www.tandbergtv.com">http://www.tandbergtv.com</a>

### 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](mailto:techpubs@tandbergtv.com).



# Chapter 1

## Introduction to the Basic Encoder

### Contents

1.1	Scope of This Reference Guide .....	1-3		
1.1.1	Who Should Use This Reference Guide.....	1-3		
1.1.2	Build Version .....	1-3		
1.1.3	What Equipment is Covered by This Reference Guide .....	1-3		
1.2	Role of the Encoder in a System .....	1-4		
1.2.1	Typical System .....	1-4		
1.2.2	DSNG Systems .....	1-5		
1.3	Summary of Features.....	1-5		
1.3.1	Video Encoding .....	1-5		
	MPEG-2 Encoding .....	1-5		
	Multi-pass Encoding .....	1-5		
	Video Encoding Modes.....	1-6		
	Video Inputs.....	1-6		
	Video Input Types.....	1-6		
	Serial Digital Video Input Error Detection and Handling (EDH) (SD Only).....	1-6		
	Video Encoding Functions.....	1-6		
	Motion Estimation .....	1-7		
	Variable Video Bit-rate.....	1-7		
	Coding Resolutions .....	1-8		
	Internal Frame Synchroniser .....	1-8		
	Output on Video Loss .....	1-8		
1.3.2	Audio Encoding .....	1-9		
	General.....	1-9		
	Audio Inputs.....	1-9		
	Audio Channels .....	1-9		
	MPEG Encoding Modes .....	1-10		
	Dolby Digital (AC-3) Encoding Modes .....	1-10		
	Test Tones.....	1-10		
	Audio Variable Bit-rate.....	1-10		
	Dolby Digital (AC-3).....	1-10		
1.3.3	Vertical Blanking Interval (VBI) Line Processing Modes (SD) .....	1-10		
	Introduction .....	1-10		
	VBI in Picture .....	1-11		
	VBI User Data .....	1-11		
	VBI in PID.....	1-11		
	Teletext Extraction .....	1-11		
1.3.4	High Definition (HD) Closed Captions and Teletext .....	1-12		
1.3.5	Data Channels .....	1-12		
1.3.6	Outputs .....	1-12		
1.3.7	IF/L-band Modulation .....	1-12		
1.3.8	Control and Monitoring.....	1-12		
1.3.9	Options and Upgrades .....	1-12		
1.4	Guided Tour.....	1-13		
1.4.1	Enclosure .....	1-13		
1.4.2	Front Panel Description .....	1-13		
	Front Panel Display, Navigation Keys, Softkeys, Keyboard.....	1-13		
	Power Supply Stand-by Switch.....	1-13		
1.4.3	Rear Panel Description .....	1-14		
	Introduction .....	1-14		

**List of Figures**

Figure 1.1: Encoder Front View..... 1-4  
Figure 1.2: Typical DSNG Encoder Configuration ..... 1-5  
Figure 1.3: Stand-by Switch ..... 1-13  
Figure 1.4: Encoder Front Panel Indicators ..... 1-14

**List of Tables**

Table 1.1: Build Version ..... 1-3  
Table 1.2: Equipment Model Descriptions..... 1-4  
Table 1.3: Video Bit-rate Range ..... 1-7  
Table 1.4: Front Panel Indicators ..... 1-13

## 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 E5784 and E5788 HD DSNG Encoders to assist in the installation, operation and day-to-day care. These Encoders are referred to throughout this Reference Guide as 'Encoder(s)' unless there is a specific difference, where they will be referred to by the model number.

The Encoders can operate with Standard Definition (SD) and High Definition (HD) modes. Where only one is applicable to an option then the relevant SD or HD is indicated.

**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...**

Unauthorised 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 which would require the removal of covers.

### 1.1.2 Build Version

This Reference Guide has been written to cover the functionality in *Table 1.1*.

*Table 1.1: Build Version*

E5784, E5788	
Build Version	3.9.0 and later

The Build version indicates the status of the Encoder and refers to an overall number that encompasses all the various software/firmware versions of video, audio, etc. in the Base Board.

The current Build version can be found in the Build Menu (see *Chapter 4, Operating the Equipment Locally, Figure 4.9*). This number should be quoted in all correspondence with TANDBERG Television.

### 1.1.3 What Equipment is Covered by This Reference Guide

Each model of Encoder comprises an enclosure with a Base Board and Modulator fitted as standard. The E5784-IF and E5788-IF are fitted with a IF Satellite Modulator; the E5784-LBAND and E5788-LBAND is fitted with an L-Band Modulator.



Figure 1.1: Encoder Front View

There are four vacant slots for option modules. These slots can be occupied by any combinations of modules shown in *Chapter 3, Options and Upgrades*.

Table 1.2: Equipment Model Descriptions

Model Number	Marketing Code	Description
E5784 Encoder	M2/VOY/E5784-IF	MPEG-2 HD DSNG Encoder with 4:2:0 video encoding and IF output satellite modulator.
E5784 Encoder	M2/VOY/E5784-LBAND	MPEG-2 HD DSNG Encoder with 4:2:0 video encoding and L-Band output satellite modulator.
E5788 Encoder	M2/VOY/E5788-IF	MPEG-2 HD DSNG Encoder with 4:2:0/4:2:2 video encoding and IF output satellite modulator.
E5788 Encoder	M2/VOY/E5788-LBAND	MPEG-2 HD DSNG Encoder with 4:2:0/4:2:2 video encoding and L-Band output satellite modulator.

## 1.2 Role of the Encoder in a System

### 1.2.1 Typical System

The Encoder is a transportable digital exciter designed specifically for mobile contribution applications. It is compact and lightweight, fully MPEG-2 and DVB or ATSC compliant and has high performance for the transmission of studio-quality video material. The equipment is designed to be suitable for both flyaway use (within an appropriate flight case) and truck installation.

The Encoder has two video encoders (HD and SD), two stereo audio encoders (dual standard MPEG-1 (layer 2)/Dolby Digital (AC-3)<sup>1</sup>), composite video decoder, CA<sup>2</sup>, data input and general purpose VBI extraction and encoding circuitry. It also contains a satellite modulator.

High quality 4:2:0 or 4:2:2<sup>3</sup> video encoding is ensured by the inclusion of digital noise reduction techniques<sup>4</sup> and many other proprietary algorithms as well as standard MPEG compression techniques.

Video can be input to the unit in serial digital component (SDI) format or composite analogue (PAL/NTSC). There is also a logo overlay facility allowing broadcasters to trademark material.

<sup>1</sup> Dolby Digital (AC-3) is only available when software option M2/ESO2/AC3 is purchased.

<sup>2</sup> CA relates to RAS and BISS. RAS and BISS are only available when software options M2/ESO2/RAS and M2/EDCOM2/BISS are purchased. A E57xx Encoder may be fitted with both RAS and BISS options but only one scrambling format can be used at any one time.

<sup>3</sup> 4:2:2 is only available when software option M2/ESO2/422 and M2/ESO2/HD422 is purchased.

<sup>4</sup> Noise reduction is only available when software option M2/ESO2/NR and M2/ESO2/HDNR is purchased.

The audio functionality supports multiple sampling frequencies, bit-rates and coding modes. Audio can be input in balanced analogue, digital AES/EBU input as a discrete channel or embedded on serial digital video. Various coding standards are supported, including Linear PCM. Additional audio channels can be accommodated by purchasing an option module.

Unit functionality can be further extended with option modules (see *Chapter 3, Options and Upgrades*).

## 1.2.2 DSNG Systems

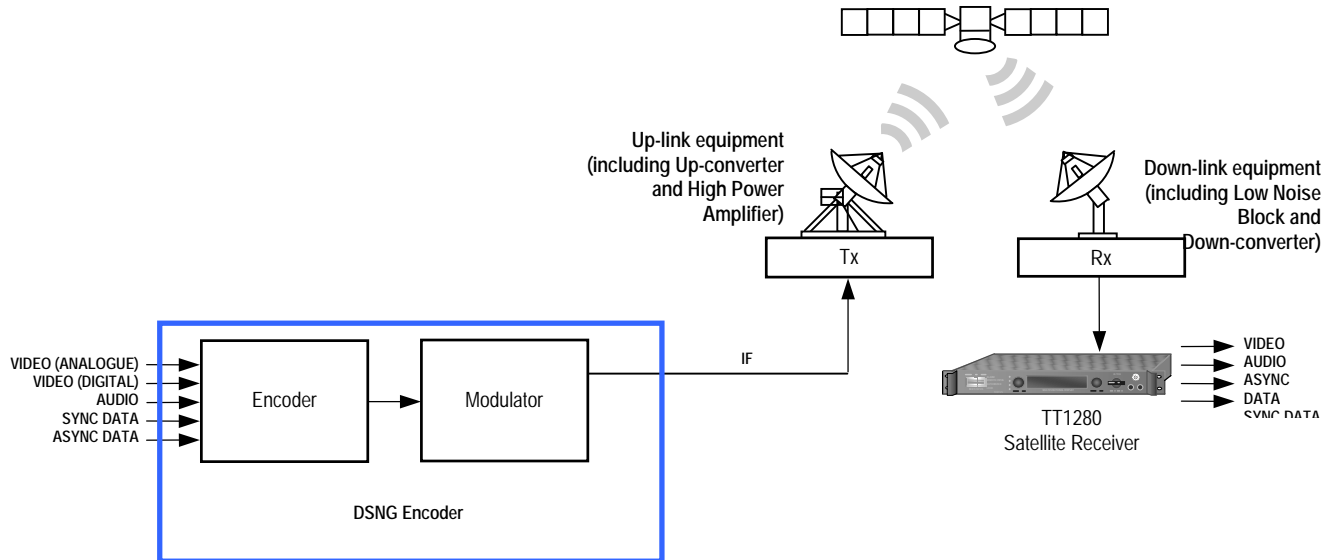


Figure 1.2: Typical DSNG Encoder Configuration

## 1.3 Summary of Features

### 1.3.1 Video Encoding

#### MPEG-2 Encoding

The Encoder processes a broadcast-standard video signal into a compressed encoded bit-stream in accordance with:

- The MPEG-2 Main profile @ Main level (MP@ML) specification (ISO/IEC 13818)
- The MPEG-2 4:2:2<sup>5</sup> profile @ Main Level (422P@ML) specification (ISO/IEC 13818)
- The MPEG-2 levels Main profile @ High Level (MP@HL) and 422P@HL<sup>5</sup>

#### Multi-pass Encoding

Encoders having software option M2/ESO2/HD-MPASS enabled are capable of multi-pass encoding.

<sup>5</sup> 4:2:2 is only available in HD in the E5788 Encoder when an HD licence is purchased and in SD when software option M2/ESO2/422 is purchased.

An improvement in performance is achieved by using additional video compression hardware at the front end of the video encoder. A pre-processor analyses the incoming video signal 'ahead of time'. This enables important statistical parameters to be derived about the video signal before the 'final' encoding takes place. This additional analysis is used to generate more accurate bit-rate predictions and so further increase the efficiency gains achieved by Reflex.

The video signal in a Multi-pass Encoder is analysed and compressed at several pre-processing stages before the actual encoding takes place.

### **Video Encoding Modes**

Either the 4:2:0 or 4:2:2<sup>5</sup> video encoding modes can be selected. The coding mode selected affects the compression techniques, encoder delay and rate control.

### **Video Inputs**

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)
- **HD SDI** – High definition serial digital interface (SMPTE 292M)

### **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
- 480p59/60, 576p50, 720p50, 720p59/60 (SMPTE 296M), 1080i25, 1080i29/30 (SMPTE 274M), 1080pSF/25, 1080pSF/24 and 1080pSF/23.976.

### **Serial Digital Video Input Error Detection and Handling (EDH) (SD Only)**

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 Encoding Functions**

The standard video encoding functions include:

- Support for all MP@ML and 422P@ML<sup>5</sup> standard coding modes
- Support for some MP@HL and 422P@HL standard coding modes
- Selectable bit-rate operation, < 1.5 Mbit/s - 90 Mbit/s (see *Table 1.3*)
- Support for various video picture resolutions (HD and SD)

- An internal frame synchroniser (see *Internal Frame Synchroniser* on Page 1-8)
- Support for Active Format Descriptor (AFD)
- Support for a variety of Group of Pictures (GOP) structures with a variable number of B frames
- Built-in patented adaptive noise reduction circuitry<sup>6</sup>
- A logo overlay facility whereby the Encoder is able to overlay broadcasters trademarks/logos onto the active video
- The ability to generate internal video test patterns. These can be moving, with the ability to load two frames (SD only)
- With software option M2/ESO2/HD-MPASS enabled, a multi-pass encoding mode is available which results in more efficient use of bandwidth
- Support for ZigZag scan which statistically produces the same or more efficient coding on most slow moving material

### Motion Estimation

For SD fully Exhaustive motion estimation is used. It takes a macro block of 16 pixels x 16 pixels and then performs an exhaustive search without subsampling.

For HD a hierarchical motion estimation scheme is used. It creates a hierarchical set of pictures, each layer containing a vertically and horizontally sub-sampled version of the picture in the layer above. The motion estimation search begins in the lowest layer that contains the coarsest image. An exhaustive search of this layer produces an initial location for the best match.

This location is then used as the start point for an exhaustive search in the next layer up in the hierarchy. This higher layer image is more detailed, so the new search acts to refine the previous search to produce a more accurate location for the best match.

This process of locating the best match, then exhaustively re-searching about this location in a higher layer is repeated until all the available layers have been searched. The final search is in the original full resolution image and is at ½ picture element (pel) accuracy.

### Variable Video Bit-rate

The MPEG-2 compression algorithm uses adaptive field/frame coding, forward and backward predictive processing with motion estimation and compensation to reduce the bit-rate to the range shown in *Table 1.3*.

*Table 1.3: Video Bit-rate Range*<sup>7</sup>

Video Encoding Mode			
4:2:0 (SD)	4:2:0 (HD)	4:2:2 (SD)	4:2:2 (HD)
0.256 Mbit/s - 15 Mbit/s	6 Mbit/s - 90 Mbit/s For 480 and 576 the minimum is 2 Mbit/s	2 Mbit/s - 50 Mbit/s	6 Mbit/s - 90 Mbit/s For 480 and 576 the minimum is 2 Mbit/s

<sup>6</sup> Noise reduction is only available when software option M2/ESO2/NR or M2/ESO2/HDNR is purchased.

<sup>7</sup> The video bit-rate depends on the Multiplexer bit-rate which is set.

**NOTE...**

Lower bit-rates can be achieved, in HD mode, when used in Statistical Multiplexing equipment.

## **Coding Resolutions**

To provide optimum picture quality over the full range of supported bit-rates, the encoded picture resolution is controlled automatically according to the video bit-rate. Alternatively, the user can override this and select manual control, if desired. Coding resolutions are shown in *Annex B, Technical Specification*.

## **Internal Frame Synchroniser**

An internal frame synchroniser is provided to accommodate slight differences between the incoming frame rate and that generated by the stable reference<sup>8</sup> used by the Encoder.

## **Output on Video Loss**

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

- A test pattern (with or without ident text) (SD only)
- A freeze frame (with or without ident text) (SD only)
- Display Stored OSD (Only available if the Encoder has an OSD loaded).
- Cut to a black screen (HD default)

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<sup>8</sup> To ensure broadcast quality it is recommended that the studio reference is fed to HYSNC.



## 1.3.2 Audio Encoding

### General

Audio can be encoded to:

- MPEG-1 Audio (layer 2) standard (sampling rate 32 kHz or 48 kHz).
- Dolby Digital (AC-3)<sup>9</sup> (sampling rate 32 kHz or 48 kHz)<sup>10</sup>.

Output bit-rate is selectable in the range 32 kbit/s - 384 kbit/s (dependent on configuration) for MPEG-1 Audio (layer 2) and 56 kbit/s - 640 kbit/s (dependent on configuration) for Dolby Digital (AC-3) coding mode selectable between 1/0 and 2/0.

- Dolby Digital (AC-3) pre-encoded audio (IEC 61937 specification) in pass-through mode is also available (it only operates at 48 kHz). This is where an audio stream has already been encoded externally, prior to entering the Encoder.
- Linear PCM (Direct)<sup>10</sup> [SMPTE 302M].
- Linear PCM (Via SRC) [sample rate converter]
- Dolby E Pass-through<sup>10</sup>.
- DTS Pass-through<sup>10</sup>.

#### NOTES...

1. See *Annex F, Audio Modes* for details of setting up the audio.
2. MPEG-1 audio sampling rate is fixed at 48 kHz when controlled from the front panel.

### Audio Inputs

The standard audio input is:

- **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  $\Omega$  digital reference output.
- Alternatively, audio can be input embedded as AES/EBU on the serial digital interface (**SDI** – HD or SD). In this mode a maximum of four stereo pairs can be extracted from any two Data Identifiers (DIDs). 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 which is not pre-encoded.

### Audio Channels

The Encoder Base Board is capable of processing two stereo pairs, from any of the following<sup>11</sup>:

- SDI Embedded source (HD or SD)
- Digital source AES/EBU
- Analogue source, termination impedance 600  $\Omega$  or 20 k $\Omega$

<sup>9</sup> Dolby Digital (AC-3) is only available when software option M2/ES02/AC3 is purchased.

<sup>10</sup> To achieve lip sync in all modes the audio option M2/EOM2/AUDLIN2 must be used.

<sup>11</sup> See *Annex F, Audio Modes* for details of setting up the audio.

These signals may be processed using the encoding modes in the following section.

### MPEG Encoding Modes

The two stereo pairs may be configured in various encoding modes:

- **Single mono:** either the left or the right channel is encoded.
- **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. Available in MPEG-1 (layer 2) and Linear PCM.
- **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 2) only.
- **Audio Description Service**

### Dolby Digital (AC-3) Encoding Modes

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

### 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.

### Audio Variable Bit-rate

MPEG-1 audio output bit-rate (see *Annex B, Technical Specification*) is selectable in the range 32 kbit/s -384 kbit/s (dependent on configuration).

### Dolby Digital (AC-3)

Dolby Digital (AC-3) audio encoding incorporates digital normalisation, preprocessing (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 bit-rate is selected (see *Annex B, Technical Specification*).

## 1.3.3 Vertical Blanking Interval (VBI) Line Processing Modes (SD)

### Introduction

The Encoder has three modes for processing VBI lines.

#### NOTE...

A maximum of eight VBI lines per field may be extracted. This limit does not apply to Teletext.

## VBI in Picture

By selecting the VBI in Picture extended active picture format available in the MPEG 4:2:2 specification the Encoder compresses and transmits the VBI data as part of the active picture. This mode requires up to 3 Mbit/s of extra bit-rate, depending on the amount and complexity of the VBI present.

### NOTES...

1. VBI in Picture transmits the VBI waveform as part of the picture and as such will be subject to some distortion. Most analogue VBI types are robust against this type of distortion but others, e.g. video index, are intended for SDI transmission and will not survive MPEG coding/decoding in VBI in Picture mode. VITS test signal and ghost cancellation signal will become corrupted.
2. VBI in Picture is not supported when 3:2 Pulldown is active.

## VBI User Data

Closed Caption data, together with other formats such as VITC and AFD, can be transmitted in the user data field of the video or relevant part of the video stream.

## VBI in PID

The Encoder has the ability to extract and transmit a wide variety of VBI line formats. Circuitry on the front end of the equipment incorporates a number of general purpose line grabbers so that known formats of VBI data can be extracted.

The following VBI data formats are supported:

- Line 21 (field 1 and field 2) data Services EIA-608 (Closed Caption and V-chip)
- Neilson AMOL 1, Neilson AMOL 11
- VITC<sup>12</sup> (EBU and SMPTE)  
VITC extraction from line 16 or 22 for 625-line systems (EBU definitions), or line 14 for 525-line systems is supported.
- Programme Delivery Control (PDC), via ITU-R system B Teletext extension data packets of type 8/30, format 2 and Line 16 Video Programme System (VPS). Video Programming Teletext (VPT) and VPS are trade names
- Wide Screen Signalling (WSS) (line 23) ETS 300 294
- Video Index (for Pan Scan, Aspect Ratio and Active Format Descriptor)
- The supported VBI line number range is 10-22 and 272-285 for 525 lines and 6-22 and 318-334 for 625 lines

## Teletext Extraction

The Encoder supports internal Teletext data extraction (Teletext drop) from the VBI of a video input and formats this data into a transport packet, as specified in the DVB specification EN300-472. The Encoder can extract up to 18 lines of Teletext from each field of the video frame.

<sup>12</sup> VITC: Only timecode is extracted.

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), PDC (Packet 8/30 format 2)
- Inverted Teletext

### **1.3.4 High Definition (HD) Closed Captions and Teletext**

High Definition mode only supports Closed Caption and Teletext insertion. AFD information can also be signalled in the video user data – signalled by contact closure.

### **1.3.5 Data Channels**

The basic Encoder supports two data channels, an asynchronous RS-232 and a synchronous RS-442. These are provided as data pipes only, they are not time-stamped.

A menu entry is available which ensures transport stream formatting conforms to the Wegener RS232 data format for carriage of general data.

The Encoder supports, via a menu option, the carriage of DCIIText packets and ensures transport stream formatting is in accordance with the Motorola specification.

### **1.3.6 Outputs**

Three ASI-C (copper) outputs supplying a DVB and ATSC MPEG-2 transport stream are supplied as standard.

### **1.3.7 IF/L-band Modulation**

The satellite modulator fitted within the E5784/E5788 is capable of QPSK modulation in accordance with EN 300 421 (DVB-S), and is also capable of 8PSK and 16QAM modulation in accordance with EN 301 210 (DVB-DSNG).

The Encoder is available with either IF outputs, or L-band outputs. The IF output frequency can be tuned between 50 MHz and 180 MHz in 1 kHz steps. The L-band output frequency can be tuned between 950 MHz and 1750 MHz in 1 kHz steps. The maximum symbol rate is 66 Msym/s.

### **1.3.8 Control and Monitoring**

Remote control of the Encoder is via the Ethernet network running the Simple Network Management Protocol (SNMP) protocol or via the RS-232/RS-485 remote control port.

Alternatively, Local control is implemented through the front panel keypad and display.

### **1.3.9 Options and Upgrades**

Options and Upgrades are described in *Chapter 3, Options and Upgrades*.

## 1.4 Guided Tour

### 1.4.1 Enclosure

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

### 1.4.2 Front Panel Description

#### Front Panel Display, Navigation Keys, Softkeys, Keyboard

The Encoder provides a keypad and softkeys to access and input data. There are two LED indicators, located on the left of the front panel (see *Figure 1.4*).

The front panel display and navigation keys/softkeys/keyboard 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 1.4: Front Panel Indicators*

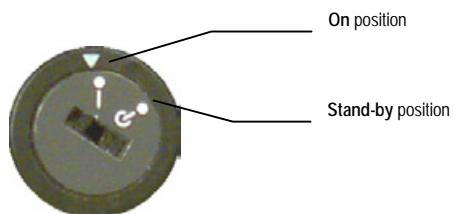
Indicator	Colour	Description
Alarm	Red	This LED is lit when an alarm condition has been detected by the Encoder.
Power	Green	This LED is lit when power is being received by the Encoder.

#### Power Supply Stand-by Switch

The use of this switch puts the Encoder into stand-by mode. It powers down the supply rails of the display and internal circuits within the unit. The switch type avoids accidental powering-down of the Encoder. For normal use ensure that the **I** is always at the top (see *Figure 1.3*).

**WARNING...**

**THIS IS NOT A MAINS SWITCH AND DOES NOT ISOLATE THE ENCODER FROM THE POWER SUPPLY.**



*Figure 1.3: Stand-by Switch*

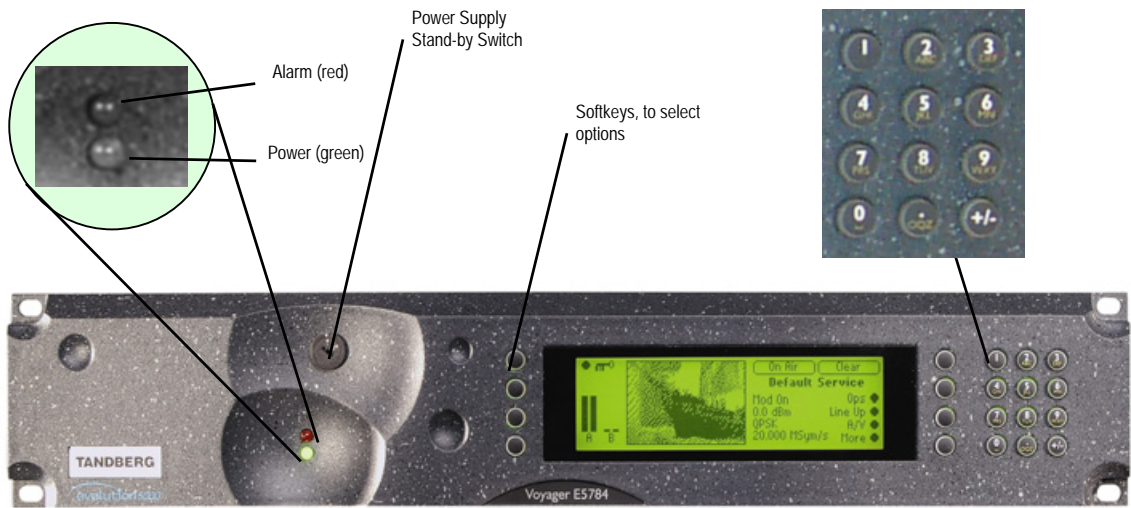


Figure 1.4: Encoder Front Panel Indicators

### 1.4.3 Rear Panel Description

#### Introduction

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 which comprise the Encoder.

# Chapter 2

## Installing the Equipment

### Contents

2.1	Introduction .....	2-3	SDI IN (Standard Definition).....	2-11
2.1.1	Read This First! .....	2-3	HD SDI INPUT (High Definition) .....	2-11
2.1.2	General.....	2-3	H SYNC.....	2-12
2.1.3	Site Requirements.....	2-3	COMP VIDEO .....	2-12
	Power Supplies.....	2-3	2.5.6 Audio Inputs .....	2-12
	Environment .....	2-3	2.5.7 ASI OUT 1, 2 and 3 Outputs .....	2-13
	Lightning Protection.....	2-3	2.5.8 Control Interfaces.....	2-13
2.1.4	EMC Compliance Statements .....	2-3	Connection .....	2-13
	EN 55022 / AS/NZS 3548.....	2-3	Ethernet #1 and #2.....	2-14
	FCC .....	2-4	Alarm .....	2-14
			Remote Control.....	2-15
2.2	Preliminary Checks .....	2-4	2.5.9 Data.....	2-15
2.2.1	Mechanical Inspection .....	2-4	RS-232 Connector .....	2-15
2.2.2	Moving the Equipment Safely.....	2-4	RS-422 Connector .....	2-16
2.3	Installing the Equipment.....	2-4	2.5.10 Satellite Modulator IF Output .....	2-17
2.3.1	Fixing Method.....	2-4	IF Out (Main).....	2-17
2.3.2	Cable Routing.....	2-5	IF Out (Monitor).....	2-17
2.3.3	Equipment Access.....	2-5	2.5.11 Satellite Modulator L-Band Output .....	2-17
2.3.4	Ventilation.....	2-5	L-Band In.....	2-17
			L-Band Out (Main).....	2-18
			L-Band Out (Monitor) .....	2-18
			Up-Converter Power .....	2-18
2.4	AC Mains Operating Voltage and Earthing .....	2-7	2.6 Powering Up/Down.....	2-18
2.4.1	AC Power Supply .....	2-7	2.6.1 Before Powering Up .....	2-18
2.4.2	Power Cable and Earthing.....	2-7	2.6.2 Powering Up.....	2-19
	General.....	2-7	2.6.3 Powering Down.....	2-19
	Protective Earth/Technical Earth .....	2-8	2.7 Setting the Encoder IP Address .....	2-19
	Connecting the Encoder to the AC Power		2.7.1 Methods of Changing the Encoder IP	
	Supply.....	2-8	Address.....	2-19
			2.7.2 From the Front Panel Menus .....	2-19
2.5	Signal Connections For the Basic Unit.....	2-9	<b>List of Figures</b>	
2.5.1	Introduction.....	2-9	Figure 2.1: Fitting the Encoder into a Rack .....	2-5
2.5.2	Connecting Up the Basic Encoder.....	2-10		
2.5.3	Power Supply .....	2-11		
2.5.4	Technical Earth.....	2-11		
2.5.5	Video Inputs.....	2-11		

Figure 2.2: Air Path Through the Enclosure ..... 2-6  
Figure 2.3: IF Rear Panel Component Parts and Connectors..... 2-9  
Figure 2.4: L-Band Rear Panel Component Parts and  
Connectors..... 2-9  
Figure 2.5: Equipment Connections for the Basic Unit..... 2-10  
Figure 2.6: Changing the Encoder IP Address ..... 2-19

**List of Tables**

Table 2.1: Supply Cable Wiring Colours..... 2-7  
Table 2.2: Non Standard Supply Cord Wire Colours..... 2-8  
Table 2.3: SDI Connector ..... 2-11  
Table 2.4: HD SDI In Connector..... 2-11  
Table 2.5: H SYNC Connector ..... 2-12  
Table 2.6: COMP VIDEO Connector ..... 2-12  
Table 2.7: Audio In Connector..... 2-13  
Table 2.8: ASI OUT 1, 2 and 3 Connectors..... 2-13  
Table 2.9: Ethernet Connector ..... 2-14  
Table 2.10: Alarm Connector..... 2-14  
Table 2.11: Remote Control Connector (RS-232/ RS-485)..... 2-15  
Table 2.12: RS-232 Data Connector (Base Board) -  
Asynchronous ..... 2-15  
Table 2.13: RS-422 Data Connector (Base Board) -  
Synchronous ..... 2-16  
Table 2.14: IF Out Connector (Main)..... 2-17  
Table 2.15: IF Output Connector (Monitor)..... 2-17  
Table 2.16: L-Band In Connector ..... 2-17  
Table 2.17: L-Band Out (Main) Connector ..... 2-18  
Table 2.18: L-Band Out (Monitor) Connector ..... 2-18



## 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 General

Installation of the Encoder is normally performed by TANDBERG Television personnel. This chapter provides configuration and connection information for planning installations, checking the final set-up in the event of a fault, modifying the requirements or moving the equipment to another location. In the event of problems, contact Customer Services.

### 2.1.3 Site Requirements

#### Power Supplies

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.

### 2.1.4 EMC Compliance Statements<sup>1</sup>

#### 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.

<sup>1</sup> The EMC information was correct at the time of manufacture. The EMC tests were performed with the Technical earth attached.

## 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.

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

## 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*).

Do not use this product as a support for any other equipment.

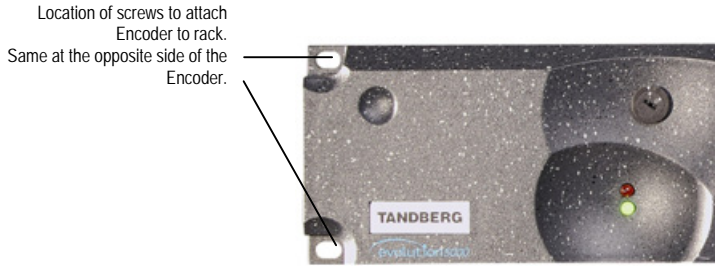


Figure 2.1: Fitting the Encoder into a Rack

### 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...**

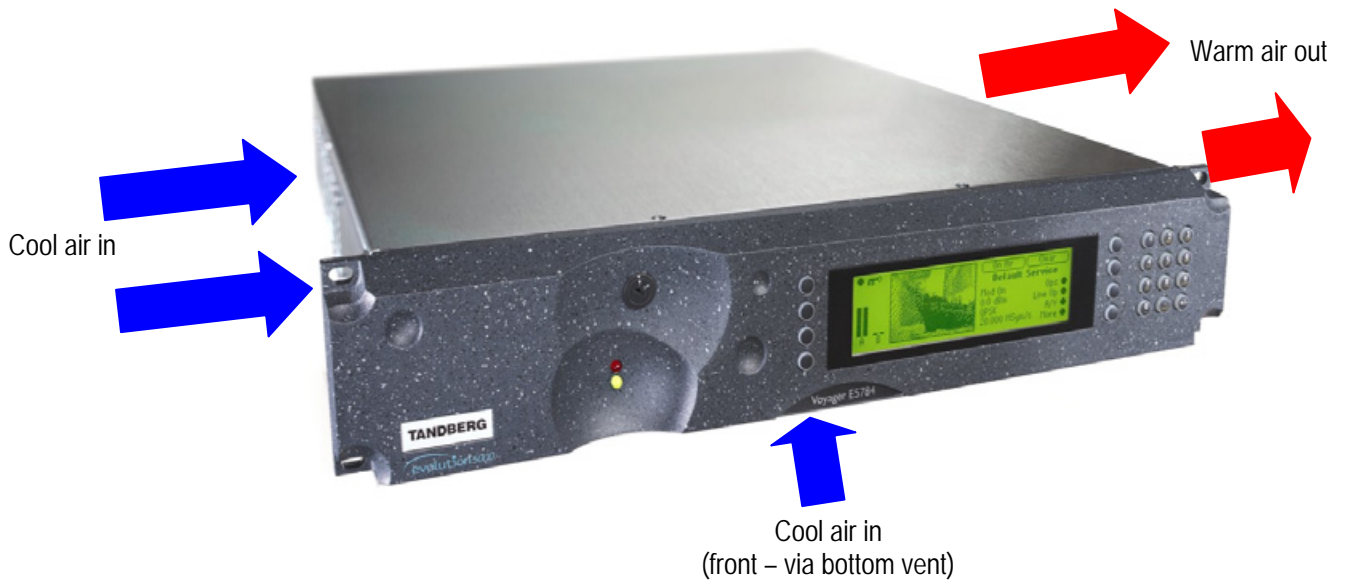
NEVER PUSH OBJECTS OF ANY KIND INTO THIS EQUIPMENT THROUGH OPENINGS AS THEY MAY TOUCH DANGEROUS VOLTAGE POINTS OR SHORT-OUT PARTS THAT COULD RESULT IN A FIRE OR ELECTRIC SHOCK. NEVER SPILL LIQUID OF ANY KIND ON THE PRODUCT.

**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 at 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.

It is important not to block the front air intake on the bottom-left corner of the front panel (see *Figure 2.2*).



*Figure 2.2: Air Path Through the Enclosure*

**NOTE...**

Cooling arrangements in current models may differ to those shown.

## 2.4 AC Mains Operating Voltage and Earthing

### 2.4.1 AC 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 a.c. 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 moulded plugs suitable for the USA, UK or Europe.

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

*Table 2.1: Supply Cable Wiring Colours*

	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

If the colours do not correspond with the coloured markings identifying the terminals in a locally supplied plug, proceed as in *Table 2.2* (included for reference).

Table 2.2: Non Standard Supply Cord Wire Colours

Wire Colour (UK)	Action
green-and-yellow	...must be connected to the terminal in the plug which is marked with the letter E or the safety earth symbol $\perp$ or coloured green or green-and-yellow.
blue	...must be connected to the terminal in the plug which is marked with the letter N or coloured black.
brown	...must be connected to the terminal in the plug which is marked with the letter L or coloured red.

## 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  $\perp$ ) 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 A M5 X 12mm LONG POZIDRIV PANHEAD. USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

## Connecting the Encoder to the AC 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 Signal Connections For the Basic Unit

### 2.5.1 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*).

Only those connectors used are labelled in *Figure 2.3* and *Figure 2.4*.

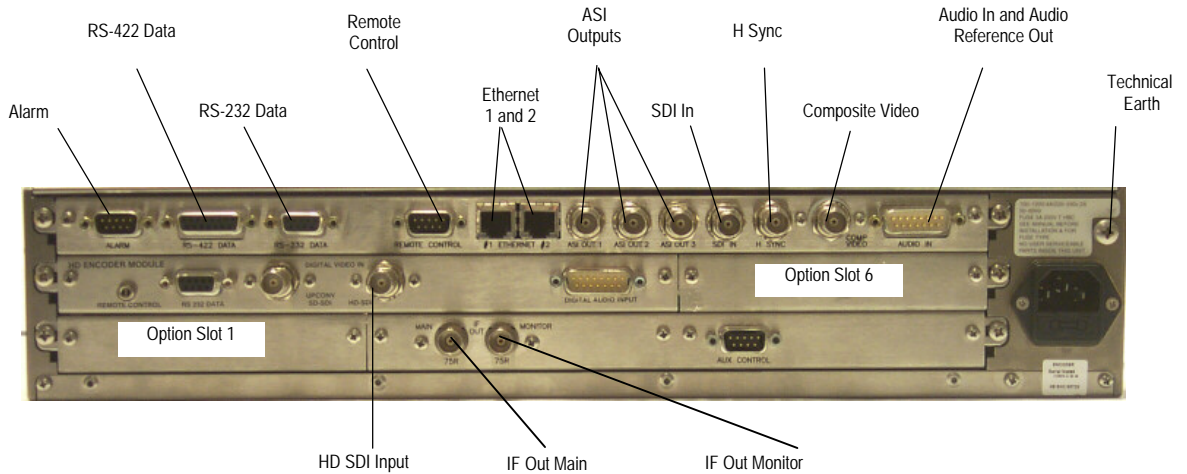


Figure 2.3: IF Rear Panel Component Parts and Connectors

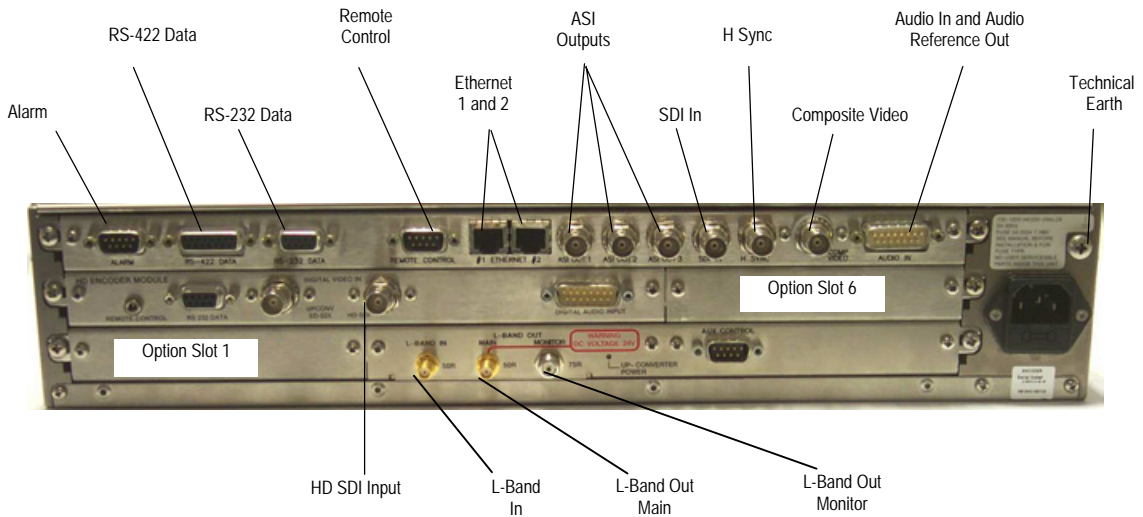


Figure 2.4: L-Band Rear Panel Component Parts and Connectors

## 2.5.2 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 *Section 2.5*, *Figure 2.5* for pin-out details of the connectors).

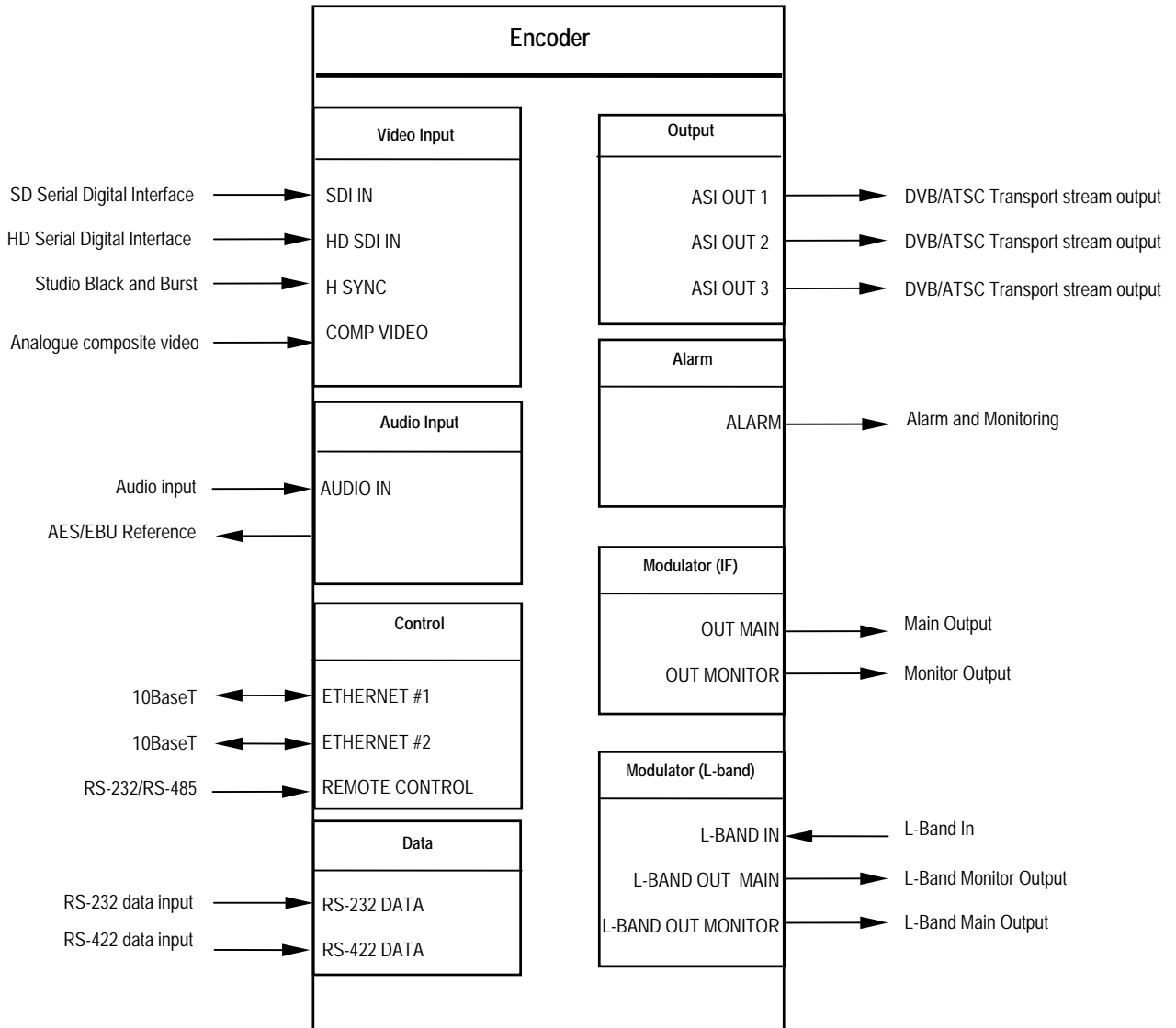


Figure 2.5: Equipment Connections for the Basic Unit

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.



## 2.5.3 Power Supply

Section 2.4, *AC Mains Operating Voltage and Earthing* provides details of power supply connection, Protective earthing and safety. Read all the instructions carefully and take note of all warnings and cautions.

## 2.5.4 Technical Earth

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

## 2.5.5 Video Inputs

### SDI IN (Standard Definition)

A 75  $\Omega$  BNC connector provides a serial digital video input to the unit. See *Chapter 4, Operating the Equipment Locally, Video Input Option* for the types of video and selection method. This input is terminated in 75  $\Omega$ .

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'.

For more information about EDH refer to *Annex 1, EDH Capability for E57xx Encoders*.

Table 2.3: SDI Connector

Pin	Signal
Centre	Video Input
Screen	Ground
Impedance	75 $\Omega$



### HD SDI INPUT (High Definition)

A 75  $\Omega$  BNC connector provides a high definition serial digital video input to the unit.

Table 2.4: HD SDI In Connector

Pin	Signal
Centre	Video Input
Screen	Ground



#### NOTE...

Up to four channels of **embedded audio** can be carried in the serial video stream. These are chosen using the **Audio Source** and **Embedded Src 12** (audio channels 1 and 2) or **Embedded Src 34** (audio channels 3 and 4) option menus.

## 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, or for locking Encoders to an evolution 5000 Multiplexer. For details on the genlocking system see *Annex F, Audio Modes*.



Table 2.5: 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...**

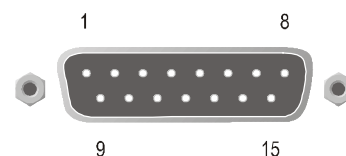
The input is differential to prevent 50 Hz/60 Hz hum.

Table 2.6: COMP VIDEO Connector

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

## 2.5.6 Audio Inputs

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 which 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) (-)
2	Not connected		10	Right Channel A (+)	
3	Right Channel A (-)		11	Not connected	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
5	Not connected		13	Right Channel B (+)	
6	Right Channel B (-)		14	Not connected	
7		AES/EBU Reference (Signal)	15		AES/EBU Reference (Ground)
8	Not connected				

**NOTES...**

1. In analogue mode termination is either 20 k $\Omega$  or 600  $\Omega$ .
2. In AES/EBU mode termination is 110  $\Omega$ .
3. When the Encoder is powered down the digital channel is selected with 110  $\Omega$  termination.
4. The digital audio input does not support SPDIF.
5. In order to comply with EMC regulations, use the audio break-out cable supplied with the unit.

## 2.5.7 ASI OUT 1, 2 and 3 Outputs

Connect the Multiplexer or Modulator ASI cable to the appropriate ASI OUT connector, using good quality 75  $\Omega$  coaxial cable (for example, BBC PSF 1/3).



A 75  $\Omega$  BNC connector provides the output from the Encoder.

Table 2.8: ASI OUT 1, 2 and 3 Connectors

Pin	Signal
Centre	Signal
Screen	Ground

## 2.5.8 Control Interfaces

### Connection

Operation of the Encoder from a TANDBERG Television control system is via the Ethernet network running the Simple Network Management Protocol (SNMP) protocol. Connect the **ETHERNET** connector to the controller (for example, MEM). 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.

## Ethernet #1 and #2

An 8-way, RJ-45 connector provides a 10BaseT Ethernet interface for communications with the MEM for control and monitoring. The Encoder has a single switched Ethernet channel. Ethernet#1 is selected as default at power-up. If a carrier is not detected on Ethernet#1 then the input switches to Ethernet#2. This gives a redundant Ethernet control via two hubs.

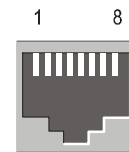


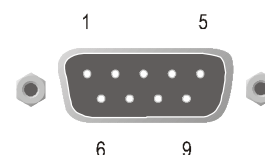
Table 2.9: Ethernet Connector

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.

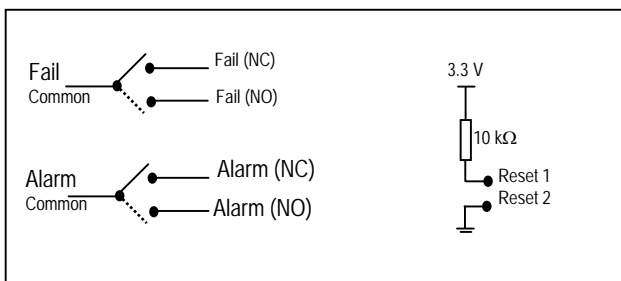
A 9-way, D-type male connector provides an alarm relay interface which can be used to send a signal to remote equipment.



When there are no active alarms or fails, the relays are energised. They are de-energised when there is an active alarm or active fail. Thus, a loss of power will be signalled as an alarm and fail.

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 k $\Omega$ )		



### NOTE...

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

## Remote Control

A 9-way, D-type male connector provides an RS-232/RS-485 port for remote control of the Encoder (see *Serial Protocol Option*). This connector is wired as a DTE.

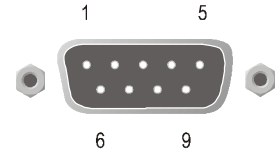


Table 2.11: Remote Control Connector (RS-232/ RS-485)

Remote (DTE)		Encoder (DTE) Remote Control	
Signal Name	Signal Direction	Pin	Signal Name
		1	Not connected
Transmit Data	→	2	Received Data (RS-232)
Received Data	←	3	Transmit Data (RS-232)
		4	Not connected
Signal Ground	—	5	Signal Ground
Transmit Data B	→	6	Received Data B (RS-485)
Received Data A	←	7	Transmit Data A (RS-485)
Received Data B	←	8	Transmit Data B (RS-485)
Transmit Data A	→	9	Received Data A (RS-485)

**NOTES...**

- Signal names are with respect to a DTE in accordance with the RS-232 and RS-485 specification. A is positive and B is negative.
- A null modem connection must be used when connecting DTE together.

## 2.5.9 Data

### RS-232 Connector

RS-232 data is available on the Base Board.

Table 2.12: RS-232 Data Connector (Base Board) - Asynchronous

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

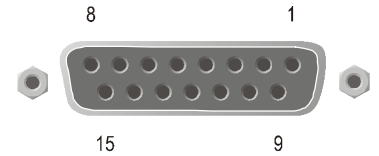


Table 2.13: RS-422 Data Connector (Base Board) - Synchronous

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

## 2.5.10 Satellite Modulator IF Output

### IF Out (Main)

75  $\Omega$  BNC socket provides an IF output.

Table 2.14: IF Out Connector (Main)

Item	Specification	
Connector type	BNC 75 $\Omega$ Female	
Type	Analogue	
Connector designation	IF OUT MAIN	
Pin-outs	Centre	IF Output
	Screen	Ground



### IF Out (Monitor)

75  $\Omega$  BNC socket provides an IF output used for monitoring.

Table 2.15: IF Output Connector (Monitor)

Item	Specification	
Connector type	BNC 75 $\Omega$ Female	
Type	Analogue	
Connector designations	IF OUT MONITOR	
Pin-outs	Centre	IF Output
	Screen	Ground



## 2.5.11 Satellite Modulator L-Band Output

### L-Band In

50  $\Omega$  SMA female connector provides an L-band input to allow another L-band signal to be summed with the modulator output.

Table 2.16: L-Band In Connector

Item	Specification	
Connector Type	50 $\Omega$ SMA Female	
Type	Analogue	
Connector designation	L-Band In	
Pin-outs	Centre	Signal
	Screen	Ground



## L-Band Out (Main)

50  $\Omega$  SMA female connector provides the main L-band output. This can also provide +24 Vdc at up to 500 mA to power an up-converter.



Table 2.17: L-Band Out (Main) Connector

Item	Specification
Connector Type	50 $\Omega$ SMA Female
Type	Analogue
Connector designation	L-Band Out Main
Pin-outs	Centre
	Signal
	Screen
	Ground

### CAUTION...

The modulator provides d.c. power to drive an up-converter. Do not connect equipment to the main output which might be damaged by d.c. power without protecting with a suitable d.c. block.

## L-Band Out (Monitor)

75  $\Omega$  F-type female provides an L-band monitoring output which is –30 dB relative to the main output.



Table 2.18: L-Band Out (Monitor) Connector

Item	Specification
Connector Type	75 $\Omega$ F-type Female
Type	Analogue
Connector designation	L-Band Out Monitor
Pin-outs	Centre
	Signal
	Screen
	Ground

## Up-Converter Power

An LED is illuminated when the +24 Vdc up-converter power on the main output is switched on.

## 2.6 Powering Up/Down

### 2.6.1 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.



## 2.6.2 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.
3. Ensure that the Stand-by switch is set to On (see *Chapter 1, Introduction, Figure 1.8*).

After the boot period the Encoder Input Monitor 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.

## 2.6.3 Powering Down

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

## 2.7 Setting the Encoder IP Address

### 2.7.1 Methods of Changing the Encoder IP Address

If, for any reason, the IP address has to be changed, this can be achieved via the front panel menus (see *Section 4.7.4 Remote Control Menu*). The user may also set the network mask.

### NOTE...

The new IP address is only accepted after the Encoder is repowered.

### 2.7.2 From the Front Panel Menus

To access the IP Address option from the front panel menus, press the **IP Address** softkey in the Remote Control Menu. Edit the IP address via the keypad and then press the **Enter** softkey.

IP Address		
← Left	Encoder IP Address :	+
→ Right	`172.16.248.91`	-
0		Enter ●
0	Update using softkeys	Quit ●

Figure 2.6: Changing the Encoder IP Address

BLANK

# Chapter 3

## Options and Upgrades

### Contents

3.1	What's Available.....	3-3	3.5.6	ATSC Remultiplexing.....	3-14
3.1.1	Option Functions .....	3-3	3.5.7	Setting Bit-rates and Avoiding Overflow.....	3-14
3.1.2	Limitations on Number of Option Modules ...	3-4	3.5.8	What to do if Overflow Occurs .....	3-15
	Overview.....	3-4	3.6	SMPTE 310 (SSI) and ASI Optical Outputs	
3.1.3	Limitations on Use of Option Modules .....	3-4		Option Modules (M2/EOM2/ASI-OPT) and	
3.1.4	How to See Which Options are			(M2/EOM2/SSI-US) .....	3-16
	Fitted/Enabled .....	3-4	3.6.1	Overview .....	3-16
3.2	Basic Interoperable Scrambling System - BISS		3.6.2	Assembly.....	3-16
	(M2/EDCOM2/BISS) .....	3-5		Rear Panel .....	3-16
3.3	Additional Audio and Linear PCM Option			SMPTE 310 1, 2 and 3 Connectors .....	3-17
	(M2/EOM2/AUDLIN2) .....	3-6		ASI OUT 1, 2 Connectors .....	3-17
3.3.1	Overview.....	3-6	3.7	ATM Network Interface Option Module	
3.3.2	Assembly .....	3-6		(M2/EOM2/ATMS155_...) .....	3-18
	Rear Panel.....	3-6	3.7.1	Overview .....	3-18
	Audio In Connector.....	3-7	3.7.2	Assembly.....	3-18
3.4	Advanced Audio Coding Option		3.7.3	Common Connectors .....	3-18
	(M2/EOM2/ADVAUD).....	3-8		DVB-ASI Copper Input.....	3-18
3.4.1	Overview.....	3-8		DVB-ASI Copper Output .....	3-18
3.4.2	Assembly .....	3-8		10BaseT Ethernet Connector .....	3-19
	Rear Panel.....	3-8	3.8	STM-1 OC3 Multimode Physical Interface Module	
	AES x Connector .....	3-9		(M2/EOM2/ATMS155MM) .....	3-19
	AES REF Connector.....	3-9	3.8.1	Assembly.....	3-19
3.5	Remux Option (M2/EOM2/REMUX).....	3-10	3.8.2	Multimode Fibre Optic Connector .....	3-20
3.5.1	Overview.....	3-10	3.9	STM-1 OC3 Monomode Physical Interface	
3.5.2	Assembly .....	3-10		Module (M2/EOM2/ATMS155SM).....	3-21
	Rear Panel.....	3-10	3.9.1	Assembly.....	3-21
	DVB ASI IN 1, 2 and 3 Connectors .....	3-11	3.9.2	Monomode Fibre Optic Connector .....	3-21
	DVB ASI OUT 1 Connector .....	3-11	3.10	M2/EOM2/ATMS34 PDH/E3 Module.....	3-22
3.5.3	Stages of Remultiplexing .....	3-11	3.10.1	Assembly.....	3-22
3.5.4	Function of Remultiplexer .....	3-13	3.10.2	Connectors.....	3-23
3.5.5	Using the Remultiplexer .....	3-14	3.11	M2/EOM2/ATMS45 PDH/DS3 Module .....	3-23

3.11.1	Assembly.....	3-23
3.11.2	Connectors.....	3-24
3.12	M2/EOM2/ATMS155E STM-1 Electrical Module.....	3-24
3.12.1	Assembly.....	3-24
3.12.2	Connectors.....	3-25
3.13	IP Output Card (M2/EOM2/IP) IP Card Pro-MPEG FEC (M2/EOM2/IP/PROFEC).....	3-26
3.13.1	Overview.....	3-26
3.13.2	Support for Pro MPEG FEC.....	3-26
3.13.3	Smallcasting Mode.....	3-26
3.13.4	Assembly.....	3-27
	Rear Panel.....	3-27
	ASI In.....	3-27
	RS-232 Control.....	3-27
	ASI Out.....	3-27
	Ethernet Output.....	3-28
3.14	G.703 Interface Card Option (M2/EOM2/G703).....	3-29
3.14.1	Overview.....	3-29
3.14.2	Assembly.....	3-29
	Rear Panel.....	3-29
	OUT Connector.....	3-29
	IN Connector.....	3-30
	RS-232 Connector.....	3-30
3.15	GPI Card (M2/EOM2/GPI).....	3-30
3.15.1	Overview.....	3-30
3.15.2	Assembly.....	3-31
3.15.3	Connector.....	3-31
3.16	Software Options.....	3-32
3.16.1	Standard Definition.....	3-32
	M2/ESO2/NR.....	3-32
	M2/ESO2/VBR.....	3-32
	M2/ESO2/422.....	3-32
	M2/ESO2/RAS.....	3-32
	M2/ESO2/ACON.....	3-32
	M2/ESO2/AC3.....	3-32
	M2/ESO2/SM38PSK.....	3-32
	M2/ESO2/SM316QAM.....	3-32
	M2/ESO2/LSYM.....	3-32
	M2/ESO2/MHP.....	3-32
	M2/ESO2/DTS.....	3-32
	M2/ESO2/525VBIDATA.....	3-33
	M2/ESO2/DPI.....	3-33
	M2/ESO2/EthernetData.....	3-33
3.16.2	High Definition.....	3-33
	M2/ESO2/HDNR.....	3-33
	M2/ESO2/HDVBR.....	3-33
	M2/ESO2/HD422.....	3-33
	M2/ESO2/HD-MPASS.....	3-33

## List of Figures

Figure 3.1: Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2).....	3-6
Figure 3.2: Advanced Audio Coding Option (M2/EOM2/ADVAUD).....	3-8
Figure 3.3: Remux Option (M2/EOM2/REMUX).....	3-10
Figure 3.4: Block Diagram – One Stage of Remultiplexing.....	3-12
Figure 3.5: Block Diagram – Two Stages of Remultiplexing.....	3-12
Figure 3.6: Remultiplexer Block Diagram.....	3-13
Figure 3.7: SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US).....	3-16
Figure 3.8: ATM Network Interface Module, Multimode Optical (M2/EOM2/ATMS155MM).....	3-20
Figure 3.9: ATM Network Interface Module, Monomode Optical (M2/EOM2/ATMS155SM).....	3-21
Figure 3.10: Rear Panel Connectors (M2/EOM2/ATMS34 ATM PDH/E3 Module).....	3-22
Figure 3.11: Rear Panel Connectors (M2/EOM2/ATMS45 ATM PDH/DS3 Module).....	3-24
Figure 3.12: Rear Panel Connectors (M2/EOM2/ATMS155E ATM STM-1 Electrical Module).....	3-25
Figure 3.13: IP Output Protocol Stack.....	3-26
Figure 3.14: G.703 Interface Card Option M2/EOM2/G703.....	3-29
Figure 3.15: General Purpose Interface M2/EOM2/GPI.....	3-31

## List of Tables

Table 3.1: Hardware Option Module Positions.....	3-3
Table 3.2: Software Options.....	3-4
Table 3.3: Audio In Connector.....	3-7
Table 3.4: Audio In Connector.....	3-9
Table 3.5: DVB ASI In Connector.....	3-11
Table 3.6: DVB ASI Out Connector.....	3-11
Table 3.7: SMPTE 310 Connector.....	3-17
Table 3.8: ASI Out Connector.....	3-17
Table 3.9: DVB-ASI Copper Input Connector.....	3-18
Table 3.10: DVB-ASI Copper Output Connector.....	3-19
Table 3.11: Ethernet Connector.....	3-19
Table 3.12: Multimode Fibre Optic Connector.....	3-20
Table 3.13: Monomode Fibre Optic Connector.....	3-22
Table 3.14: PDH/E3 Connector.....	3-23
Table 3.15: PDH/DS3 Connector.....	3-24
Table 3.16: SDH STM-1/SONET STS-3c Electrical Connector.....	3-25
Table 3.17: ASI In Connector.....	3-27
Table 3.18: ASI Out Connector.....	3-28
Table 3.19: RJ-45 Connector.....	3-28
Table 3.20: Out Connector.....	3-29
Table 3.21: In Connector.....	3-30
Table 3.22: GPI Connector.....	3-31

## 3.1 What's Available

### 3.1.1 Option Functions

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

Each hardware option module consists of a horizontally mounted PCB with rear panel connector space (except the M2/EDCOM2/BISS which has no external connectors and does not occupy an option slot). At reset, the software of the Encoder detects which modules are fitted and configures them as necessary. The modules can be fitted into the positions indicated in *Table 3.1*.

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 3.1: Hardware Option Module Positions*

Marketing Code	Name	Slot No.	Max No. of Cards
<b>Daughter Card Options</b>			
M2/EDCOM2/BISS	BISS <sup>1</sup> scrambling option - Mode 0, 1 and BISS-E only - with secure key entry	—	
<b>Hardware Options</b>			
M2/EOM2/AUDLIN2	Additional Audio + Linear PCM	1	1
M2/EOM2/ADVAUD	Advanced Audio Coding Card	1	1
M2/EOM2/REMUX	Remux Option Module	1	1
M2/EOM2/ASI-OPT	SMPTE 310 (SSI) and ASI Optical Outputs	6	1
M2/EOM2/SSI-US	SMPTE 310 (SSI) Output	6	1
M2/EOM2/ATMS155MM	STM-1 OC3 Multimode Physical Interface Module (SDH STM-1/SONET STS-3c Multimode Optical)	6	1
M2/EOM2/ATMS155SM	STM-1 OC3 Monomode Physical Interface Module (SDH STM-1/SONET STS-3c Monomode Optical)	6	1
M2/EOM2/ATMS34	PDH/E3 Module	6	1
M2/EOM2/ATMS45	PDH/DS3 Module	6	1
M2/EOM2/ATMS155E	STM-1 Electrical Module	6	1
M2/EOM2/IP	IP Output Card	6	1
M2/EOM2/IP/PROFEC	IP Card Pro-MPEG FEC	3, 5 or 6	1
M2/EOM2/G703	G.703 Interface Card	6	1
M2/EOM2/GPI	GPI Card	1, 2, 3, 4, 5, 6	1

**NOTE...**

Empty option slots must be fitted with a blanking plate.

<sup>1</sup> BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Table 3.2: Software Options

Marketing Code	Name
<b>SD Options</b>	
M2/ESO2/NR	Noise Reduction - three levels of professional-grade adaptive noise reduction.
M2/ESO2/VBR	Reflex and VBR - automatic variable bit-rate at a fixed quality setting for optimum bandwidth usage in stand-alone or Reflex statistical multiplexing modes.
M2/ESO2/422	MPEG-2 422P@ML - for professional editing quality pictures, 1.5 Mbit/s to 50 Mbit/s.
M2/ESO2/RAS	RAS (Remote Authorisation System) - allows material to be protected from illegal viewing using TANDBERG Television's proprietary scrambling system.
M2/ESO2/ACON	Auto Concatenation - aligns the Encoder to the previous Encoder's GOP structure to significantly reduce coding artefacts caused by successive coding and decoding.
M2/ESO2/AC3	Dolby Digital (AC-3) - enables Dolby AC-3 stereo encoding.
M2/ESO2/SM38PSK	8PSK Modulation (applicable to E5784 or E5788-LBAND).
M2/ESO2/SM316QAM	16QAM Modulation (applicable to E5784 or E5788-LBAND).
M2/ESO2/LSYM	Low symbol Rate Capability.
M2/ESO2/MHP	MHP Timing Events
M2/ESO2/DTS	DTS Audio
M2/ESO2/525VBIDATA	NABTS and GEMSTAR 2.0 VBI extraction
M2/ESO2/DPI	SCTE35 DPI
M2/ESO2/EthernetData	Enables the Data C – Ethernet data option
<b>HD Options</b>	
M2/ESO2/HDNR	HD Noise Reduction
M2/ESO2/HDVBR	Reflex and VBR - automatic variable bit-rate at a fixed quality setting for optimum bandwidth usage in stand-alone or Reflex statistical multiplexing modes.
M2/ESO2/HD422	MPEG-2 422P@ML - for professional editing quality pictures.
M2/ESO2/HD-MPASS	Upgrades the Encoder to operate in multipass mode in a reflex group.

### 3.1.2 Limitations on Number of Option Modules

#### Overview

If the Remux option is not fitted then there can be a maximum of two option modules.

If the Remux option module is fitted there can be a maximum of one other option module.

Base Board	
HD Encoder Module	Option Slot 6
Option Slot 1	IF or L-Band Modulator

### 3.1.3 Limitations on Use of Option Modules

Although both BISS (M2/EDCOM2/BISS) and RAS (M2/ESO2/RAS) may be present in the Encoder, only one may be used at a time.

### 3.1.4 How to See Which Options are Fitted/Enabled

The Encoder has a number of hardware and software options (see *Table 3.1* and *Table 3.2*). To see which are fitted/enabled refer to the Build Menu (see *Chapter 4, Operating the Equipment Locally, Figure 4.9*).

## 3.2 Basic Interoperable Scrambling System - BISS (M2/EDCOM2/BISS)

With the appropriate configuration, the Encoder can use the Basic Interoperable Scrambling System (BISS<sup>2</sup>) to scramble the outgoing transport stream. This system has been developed by the European Broadcasting Union (EBU) as an open scrambling system.

BISS has these main levels of operation: Mode 1, Mode 2 and Mode 3. Mode 0 corresponds to no scrambling. BISS-E is also available.

BISS Mode 1 operation uses a fixed value for the control word to scramble the services in the transport stream from the Encoder. To descramble the transmission, the Decoder needs to have the matching control word value.

### NOTES...

1. This option module is installed as a daughter card to the Base Board, with no external connectors and does not use an option slot.
2. The BISS software must also be enabled in the Encoder (see Customer Services).

BISS scrambling (when fitted) is enabled and controlled via the Setup/Mux Menu (see *Chapter 4, Operating the Equipment Locally, Section 4.10.14*).

---

<sup>2</sup> BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

## 3.3 Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2)

### 3.3.1 Overview

The Additional Audio option module supplements the audio encoding functionality of the Encoder. This module supports audio standards MPEG-1 (layer 2), Dolby Digital (AC-3), Linear PCM, Dolby Digital (AC-3) Pass-through, Dolby E Pass-through and DTS Pass-through. The module can take in audio as either stereo analogue or digital AES/EBU (on left channel only) via a 15-way D-type connector provided on its rear panel.

Alternatively, any two of the four pairs of embedded AES/EBU channels extracted from the video can be routed to the module for encoding. This option supports all the standard bit-rates and encoding modes associated with each compression standard.

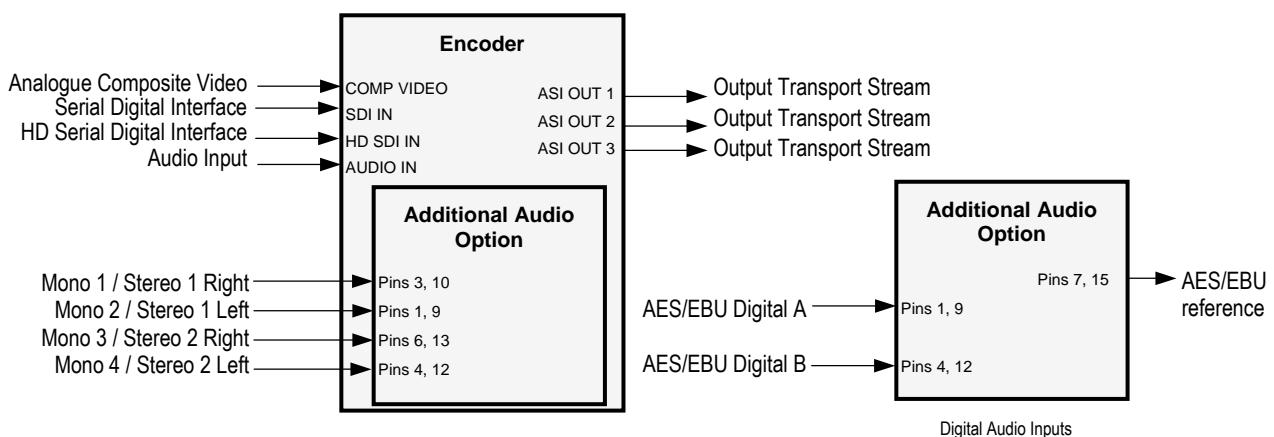
M2/EOM2/AUDLIN2 supports 12 dB, 15 dB, 18 dB and 24 dB audio clip level.

The Audio Menu associated with this option is described in *Chapter 4, Operating the Equipment Locally, Section 4.9*. In the Audio Setup Menu additional options are displayed for Audio XA and Audio XB, where X is the option slot number where the module is fitted.

Refer to *Annex F, Audio Modes* for details of Encoder locking to ensure correct performance.

### 3.3.2 Assembly

#### Rear Panel



#### NOTE...

The AES/EBU reference signal is provided for backwards compatibility only. When using E57xx Encoders use the reference signal provided by the Base Board.

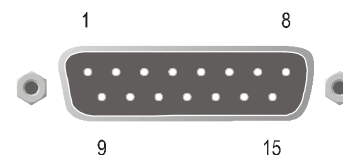
Figure 3.1: Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2)



See *Table 3.1* for the slots that it can be installed in.

## Audio In Connector

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.

*Table 3.3: 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) (-)
2	Not connected		10	Right Channel A (+)	
3	Right Channel A (-)		11	Not connected	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
5	Not connected		13	Right Channel B (+)	
6	Right Channel B (-)		14	Not connected	
7		AES/EBU Reference (Output Signal)	15		AES/EBU Reference (Ground)
8	Not connected				

### NOTES...

1. In analogue mode termination is either 20 k $\Omega$  or 600  $\Omega$ .
2. In AES/EBU mode termination is 110  $\Omega$  (default).
3. When the Encoder is powered down the digital channel is selected with 110  $\Omega$  termination.
4. The digital audio input does not support SPDIF.

### CAUTION...

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

## 3.4 Advanced Audio Coding Option (M2/EOM2/ADVAUD)

### 3.4.1 Overview

The Advanced Audio Coding option module supplements the audio encoding functionality of the Encoder to enable it to be used as a drop-in replacement for other Encoders. It can encode four stereo audio pairs (two-channels) or one multi-channel (six-channels - multichannel MPEG-2 AAC (ISO/IEC 13818-7) (LC)) and one stereo pair (two-channels). No other combination of channel inputs is permitted.

The module can receive up to four simultaneous, independent AES3-2003 inputs on four 75  $\Omega$  BNC co-axial AES3 inputs (compliant to AES-3id-2001) located at the Encoder's rear panel. It can also accept four AES3 inputs from the Encoder's backplane to permit the use of embedded audio. Each input supports 16, 20 and 24-bit resolutions and 48 kHz sampling and is capable of passing 16, 20 and 24 bit samples to the audio encoders. 24 or 20 bit input samples can be rounded to 16 bits.

The module accepts a PCR clock of 27 MHz in the form of a 3 wire serial interface. The inputs are synchronised to the system reference clock through the use of phase locked sample-rate converters prior to encoding.

### 3.4.2 Assembly

#### Rear Panel

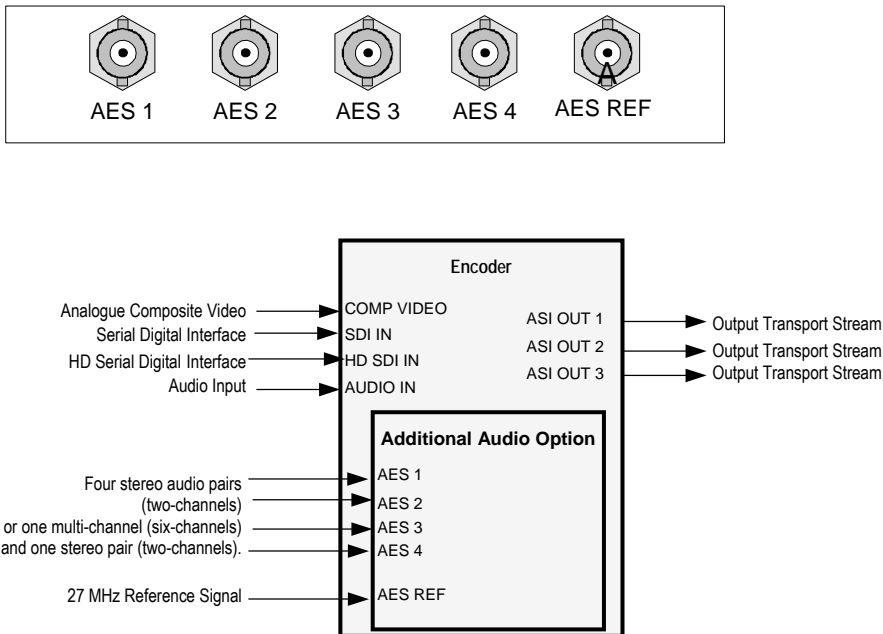


Figure 3.2: Advanced Audio Coding Option (M2/EOM2/ADVAUD)

The Additional Audio Coding option module comprises Assembly S14048 and Card S13600. See *Table 3.1* for the slots that it can be installed in.

## AES x Connector

Connect the audio input cables to the appropriate AES input connectors.



Each connector accepts a single stereo pair. They may be independently configured or form part of an multi-channel input.

## AES REF Connector

This connector allows the connection of a 27 MHz studio timing reference.



Table 3.4: 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) (-)
2	Not connected		10	Right Channel A (+)	
3	Right Channel A (-)		11	Not connected	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
5	Not connected		13	Right Channel B (+)	
6	Right Channel B (-)		14	Not connected	
7		AES/EBU Reference (Output Signal)	15		AES/EBU Reference (Ground)
8	Not connected				

### NOTES...

1. In analogue mode termination is either 20 k $\Omega$  or 600  $\Omega$ .
2. In AES/EBU mode termination is 110  $\Omega$  (default).
3. When the Encoder is powered down the digital channel is selected with 110  $\Omega$  termination.
4. The digital audio input does not support SPDIF.

### CAUTION...

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

## 3.5 Remux Option (M2/EOM2/REMUX)

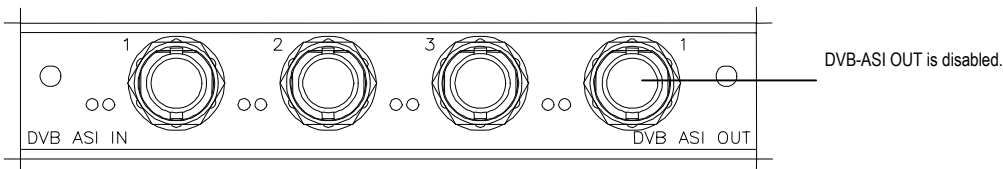
### 3.5.1 Overview

The Remux option module is capable of accepting up to three separate transport streams via ASI connectors, and one transport stream from the host Encoder. The maximum permissible data rate of each input transport stream is 50 Mbit/s. Some or all of the services in the input transport streams are then multiplexed together to produce a Multiple Channels Per Carrier (MCPC) output at up to 65 Mbit/s. For a specification of this interface see *Annex B, Technical Specification*

### 3.5.2 Assembly

#### Rear Panel

See *Table 3.1* for the slots that it can be installed in.



**CAUTION...**

When remultiplexing, be aware that both PIDs will be remapped according to the Host Encoder input used.

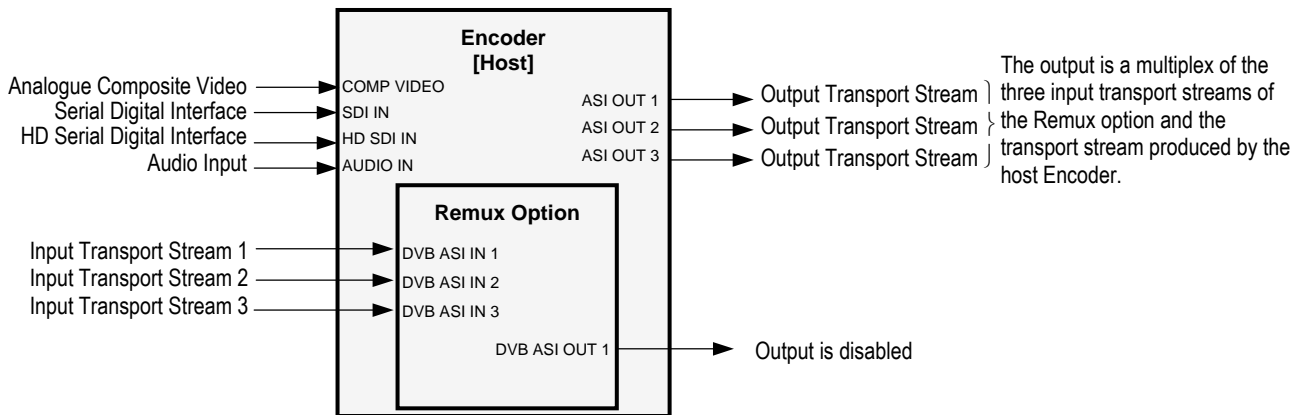


Figure 3.3: Remux Option (M2/EOM2/REMUX)

### DVB ASI IN 1, 2 and 3 Connectors

A 75  $\Omega$  BNC connector provides an input to the unit.



Table 3.5: DVB ASI In Connector

Pin	Signal
Centre	Signal
Screen	Ground

#### NOTE...

When connecting the inputs, always start from DVB ASI IN 1 and work upwards.

### DVB ASI OUT 1 Connector

A 75  $\Omega$  BNC connector provides an output from the unit.



Table 3.6: DVB ASI Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

#### NOTE...

This output is disabled.

## 3.5.3 Stages of Remultiplexing

The Remultiplexer is capable of combining four inputs. Three inputs are in the form of ASI feeds to the rear panel, the fourth input is fed from the host Encoder (or primary Encoder). This basic configuration, using a single stage of remultiplexing, means that four Encoder services (or streams) can be combined together in the output. *Figure 3.4* shows a typical satellite system using one stage of remultiplexing.

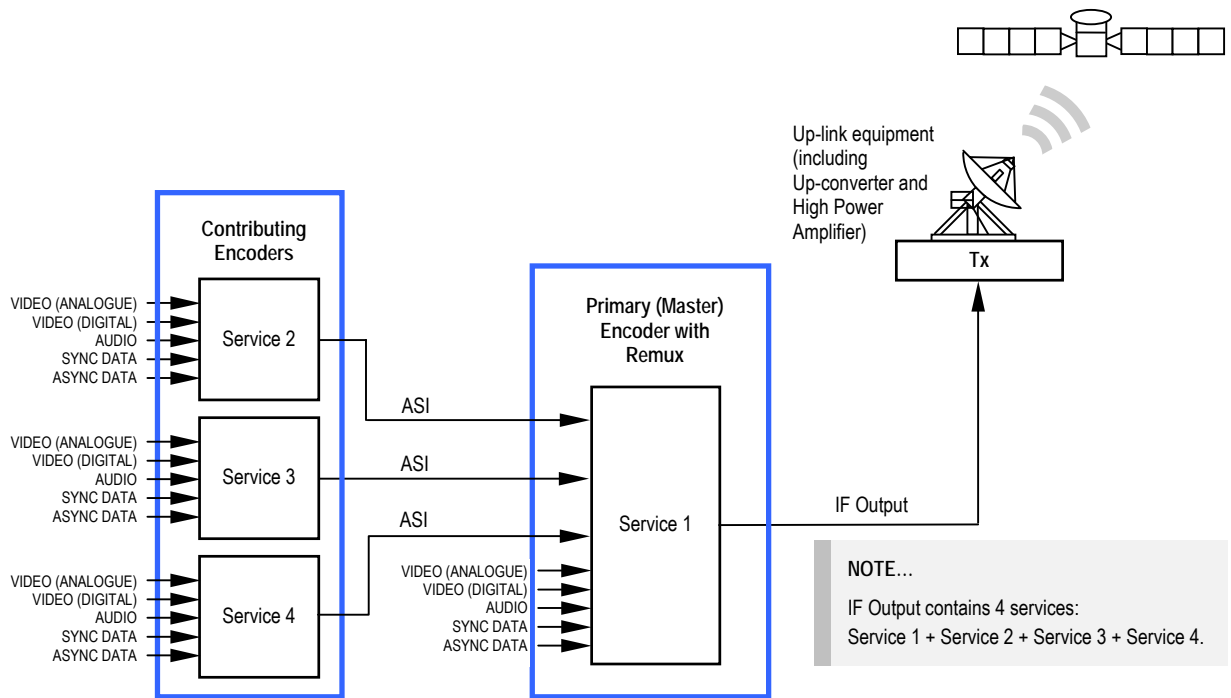


Figure 3.4: Block Diagram – One Stage of Remultiplexing

Similarly, if two stages of remultiplexing are introduced, thirteen Encoders can be combined, providing up to thirteen services in the remultiplexed output. This is the maximum number of services that can be provided using this system, see Figure 3.5.

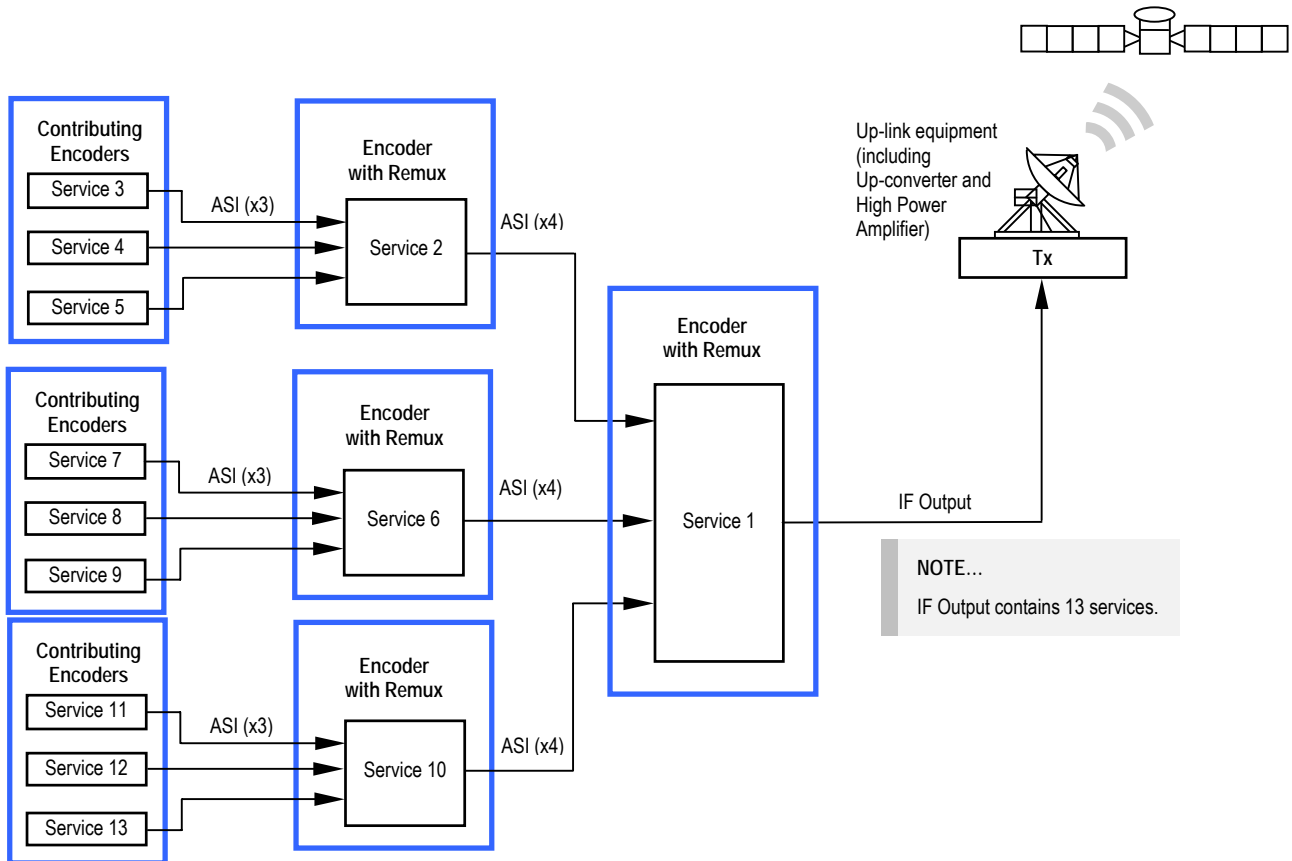


Figure 3.5: Block Diagram – Two Stages of Remultiplexing

### 3.5.4 Function of Remultiplexer

It is the function of the Remultiplexer to combine the locally generated host services with the externally supplied input services, connected via ASI inputs to the rear of the unit. If the Service ID (DVB) or Program Number (ATSC), PIDs or service names, of two or more of the services clash, the Remultiplexer can remap the Service ID or program number, remap PIDs, and alter the service names to resolve the clash.

If a new service is detected on any input, and it clashes with an existing service, it is the new service's Service ID or Program Number, PIDs, or Service Name that are remapped to resolve the conflict. Service names are made unique by the addition of a number, for example 'Default Service' may be renamed 'Default Service [2]'.

The way the Remultiplexer deals with user requests to remap PIDs depends on its mode of operation.

If the user attempts to move/remap a PID to a PID already being used, the Remultiplexer allows this to happen, and automatically remaps the element that was on that PID.

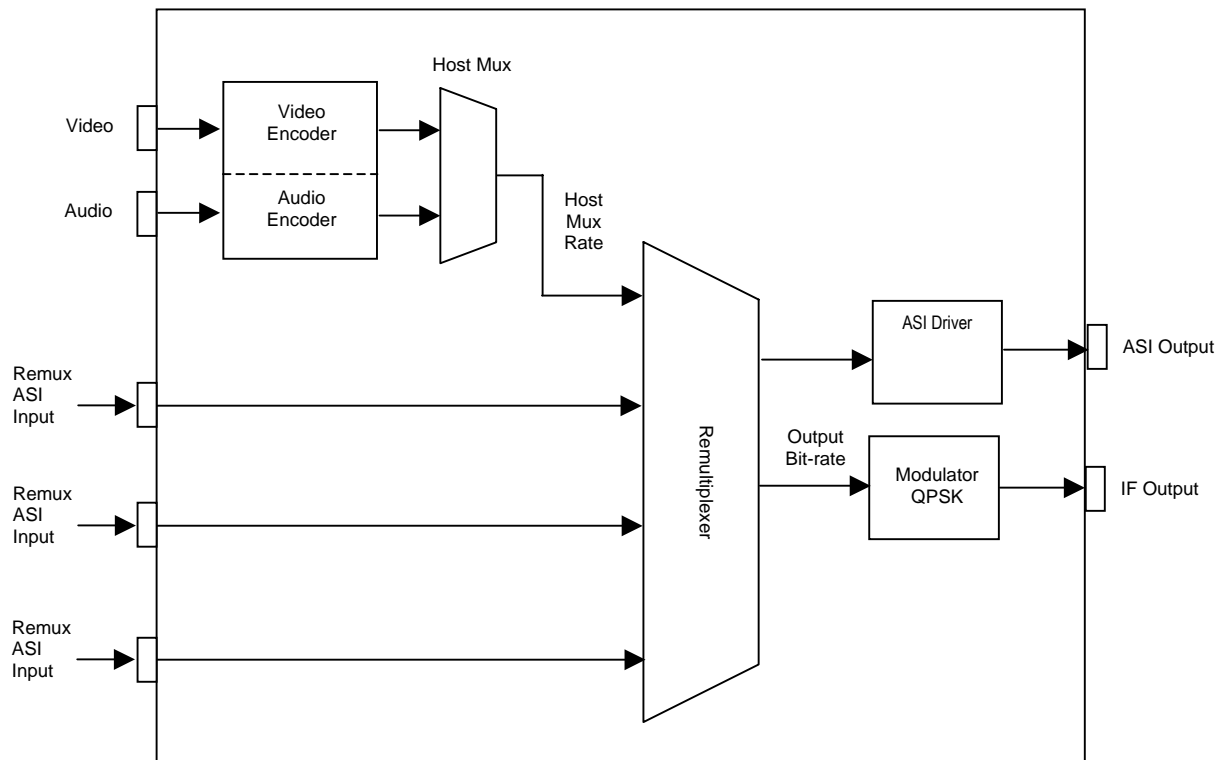


Figure 3.6: Remultiplexer Block Diagram

### 3.5.5 Using the Remultiplexer

Set the output bit-rate to the required value in the *Setup/Mux* Menu.

Connect transport streams that are to be combined (remultiplexed) with the host Encoder's services to the ASI inputs on the rear of the unit.

**NOTE...**

It is possible to remultiplex any DVB or ATSC compliant transport stream but at the time of publication, only transport streams generated by TANDBERG Television equipment are guaranteed to work when fed to the Remultiplexing module.

The equipment will automatically detect the services on these inputs. The list of detected services is displayed in the *Setup/Mux* Menu.

Each service can be individually switched 'Off', 'On', or 'On with scrambling'. If the service is set to 'Off', then there is no trace of the service in the output transport stream. New services can be set to default to either Off or On. If it was connected to the Remultiplexer the last time the Encoder was powered, then it assumes its previous state.

It is possible to remultiplex transport streams that have already been scrambled by BISS encryption, but it is not possible to remultiplex transport streams that have already been scrambled using RAS encryption. Also it is not possible to scramble a service that has already been scrambled.

### 3.5.6 ATSC Remultiplexing

The Remultiplexer can work with ATSC compliant transport streams. It remaps the services following the ATSC program paradigm.

The Encoder can be configured to generate the PSIP for the output transport stream. It generates the minimum number of tables to give an ATSC compliant output transport stream, i.e. Event Information Tables (EIT) 0, 1, 2 and 3, the System Time Table (STT), the Rating Region Table (RRT), the Master Guide Table (MGT), and either the Cable Virtual Channel Table (CVCT) or the Terrestrial Virtual Channel Table (TVCT), depending on the delivery descriptor set. It will not pass through any tables that are present on the ASI input transport streams.

Alternatively, an external PSIP generator can be connected to one of the Remultiplexer inputs and the remultiplexer programmed to pass through a range of PIDs, thus inserting the PSIP into the output transport stream.

For more information about using the Remux card in ATSC with internal and external PSIP see *Annex H, Use of Remux Card in ATSC*.

### 3.5.7 Setting Bit-rates and Avoiding Overflow

Overflow is the condition in which the total of the contributing service bit-rates, (including the host mux), exceeds the output bit-rate of the primary remultiplexing unit.

**NOTE...**

Only useful packets (e.g. video, audio and data, etc) count towards the bit-rate of the contributing service bit-rates, not null packets.



---

The easiest way to configure the bit-rates to avoid overflow, is as follows:

1. Divide the 188 byte output bit-rate of the primary (master) remultiplexing unit, (this can be found in the Setup/Mux/Remux Module/Output Bit-rate), by the number of contributing services (including the primary service). Such that:

$$\text{O/P Rate (188)} / N = \text{Host Rate (188)}$$

[Where N = number of services to be combined including primary]

2. Then set the Host Rates (188) of each contributing unit and the master unit to equal the calculated Host Rate.

If the above procedure is followed, an equal bit-rate is allocated to each contributing unit. By setting the host rates, the video and audio bit-rates will be automatically adjusted to suit.

The amount of spare bit-rate and input bit-rate that has been used in the Remultiplexer can be monitored using the bar graph indicators in the Setup/Mux/Remux Module Menu.

### 3.5.8 What to do if Overflow Occurs

If an 'Overflow Error' is indicated on the equipment, then the incoming contributing bit-rate exceeds the outgoing bit-rate. To avoid corruption reduce the incoming bit-rate by either removing services, (turn the service Off or remove the ASI input), or reduce the bit-rate of the incoming service.

### 3.6 SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US)

#### 3.6.1 Overview

The modules allow the Encoder to output MPEG-2 transport streams in the following formats: ASI (optical) and SMPTE 310M - 1998 (electrical).

There are two ASI multimode optical outputs which conform to the DVB document A010 (*Section 4.4 and Annex B*) and three copper SI Outputs which conform to the SMPTE Standard 310M Level 2.

**NOTE...**  
Level 2 performance is exceeded but not as far as that of level 3.

M2/EOM2/ASI-OPT has both ASI/SSI capability whilst the M2/EOM2/SSI-US has only SSI.

#### 3.6.2 Assembly

##### Rear Panel

These option modules can only be installed in slot 3 or 6.

**CAUTION...**  
The SMPTE 310 output cannot be used with the M2/ESO2/RAS RAS Scrambling mode.

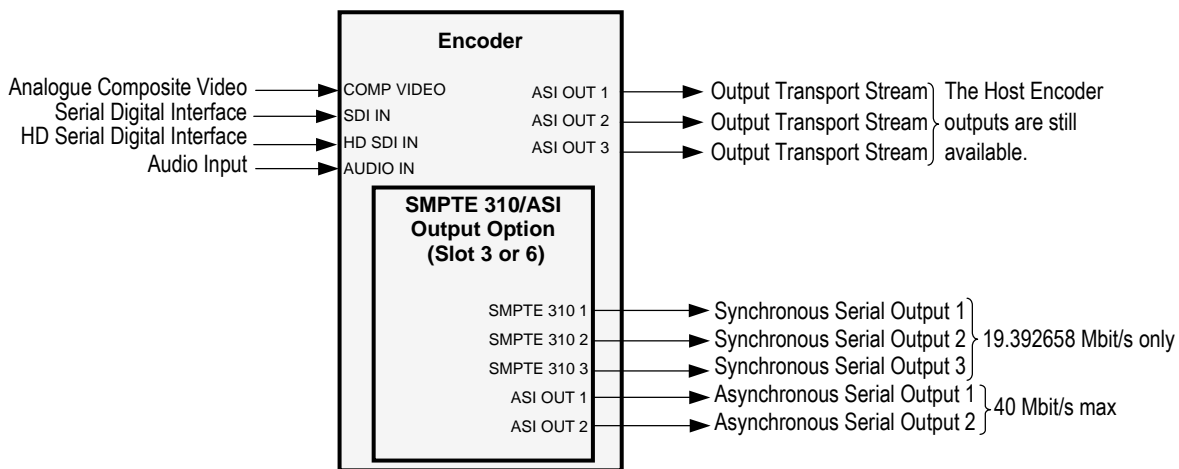
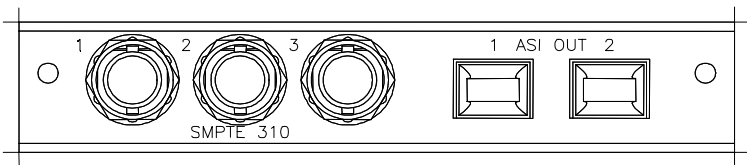


Figure 3.7: SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US)

## SMPTE 310 1, 2 and 3 Connectors

A 75  $\Omega$  female BNC connector provides an SMPTE 310 compliant synchronous serial (SSI) output for the unit.

Table 3.7: SMPTE 310 Connector

Pin	Signal
Centre	Signal
Screen	Ground

## ASI OUT 1, 2 Connectors

Provides a DVB compliant ASI optical output at 270 Mbit/s.



Table 3.8: ASI Out Connector

Item	Specification
Connector type	SC type
Connector designation	ASI OUT 1, 2
Wavelength	1300 nm Multimode (MMF)

### NOTE...

The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

### WARNING...

LED: CLASS I LASER PRODUCT  
DO NOT LOOK INTO THE APERTURE.  
LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

### NOTE...

The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

## 3.7 ATM Network Interface Option Module (M2/EOM2/ATMS155\_...)

### 3.7.1 Overview

The ATM<sup>3</sup> Network Interface Module allows the Encoder to transmit and receive MPEG-2 transport streams over broadband telecommunications networks (B-ISDN) using ATM.

There are different variants of the ATM Network Interface Module. The module comprises an ATM Network Interface (common to all models) and a Physical Layer Module suitable for the application required. Refer to *Table 3.1* for details of the variants.

Menus associated with the ATM Modules are described in *Chapter 4, Operating the Equipment Locally*.

### 3.7.2 Assembly

To provide the interface to the B-ISDN Telecommunications network, the Physical Layer Module must be installed according to the type of network required. These are described in *Section 3.8, STM-1 OC3 Multimode Physical Interface Module (M2/EOM2/ATMS155MM)* on page 3-19 and *Section 3.9, STM-1 OC3 Monomode Physical Interface Module (M2/EOM2/ATMS155SM)* on page 3-21.

The S11906 has the following connectors: DVB-ASI Copper Input, DVB-ASI Copper Output and the Ethernet Connector. They are present on all variants of the ATM Module.

### 3.7.3 Common Connectors

#### DVB-ASI Copper Input

A BNC, female 75  $\Omega$  connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.



*Table 3.9: DVB-ASI Copper Input Connector*

Item	Specification	
Safety status	SELV	
Type	Analogue	
Connector designation	DVB ASI-C IN	
Connector type	BNC 75 $\Omega$ socket	
Pin-outs:	Centre	Signal
	Shield	Ground/Chassis

#### DVB-ASI Copper Output

A BNC, female 75  $\Omega$  connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.



<sup>3</sup> ATM is the abbreviation for Asynchronous Transfer Mode.

Table 3.10: DVB-ASI Copper Output Connector

Item	Specification	
Safety status	SELV	
Type	Analogue	
Connector designation	DVB ASI-C OUT	
Connector type	BNC 75 $\Omega$ socket	
Pin-outs:	Centre	Signal
	Shield	Ground/Chassis

## 10BaseT Ethernet Connector

The Ethernet is used to connect the ATM card to a local control LAN and for engineering access. Connect the Ethernet cable to the RJ-45 (10BaseT) connectors on the equipment.

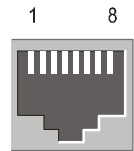


Table 3.11: Ethernet Connector

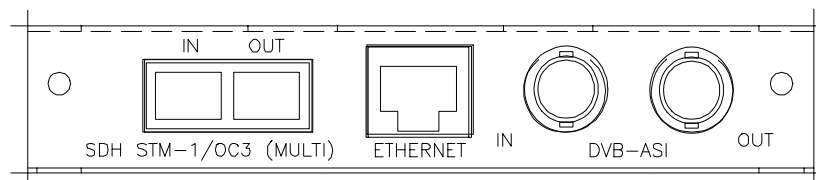
Item	Specification	
Type	RJ-45	
Connector designation	Ethernet	
Location	At rear panel	
Pin:	Pin 1 — Tx Out (+)	Pin 3 — Rx In (+)
(Unused pins not connected)	Pin 2 — Tx Out (-)	Pin 6 — Rx In (-)

## 3.8 STM-1 OC3 Multimode Physical Interface Module (M2/EOM2/ATMS155MM)

### 3.8.1 Assembly

See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.



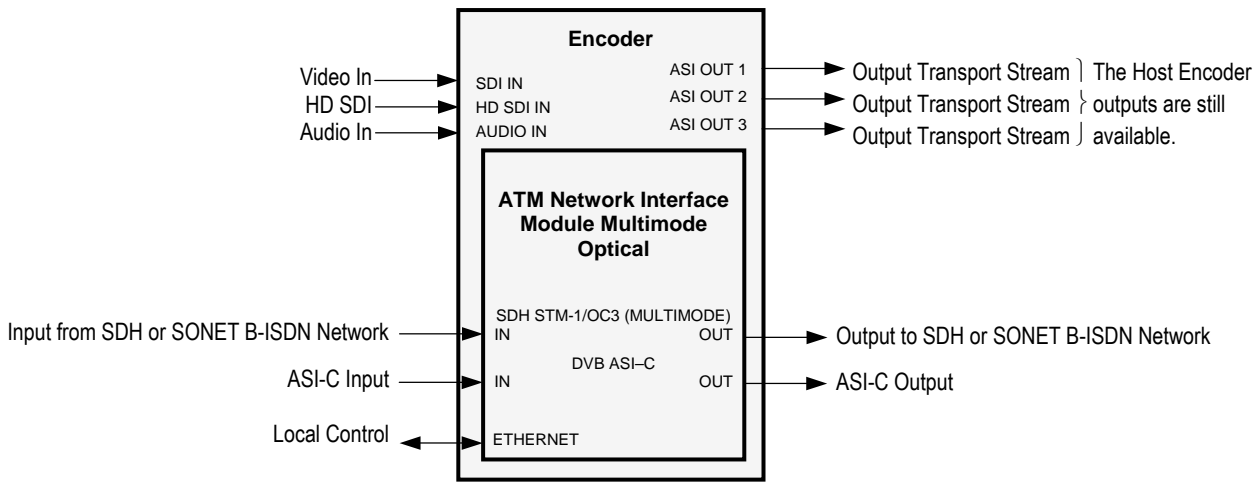


Figure 3.8: ATM Network Interface Module, Multimode Optical (M2/EOM2/ATMS155MM)

### 3.8.2 Multimode Fibre Optic Connector

**WARNING...**  
**LED: CLASS I LASER PRODUCT**  
**DO NOT LOOK INTO THE APERTURE.**  
**LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.**

- NOTES...**
1. The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.
  2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Multimode Optical.

This port is available on the S8063 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.



Table 3.12: Multimode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MULTIMODE)
Wavelength	1300 nm Multimode (MMF)

**NOTE...**  
 The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

## 3.9 STM-1 OC3 Monomode Physical Interface Module (M2/EOM2/ATMS155SM)

### 3.9.1 Assembly

See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.

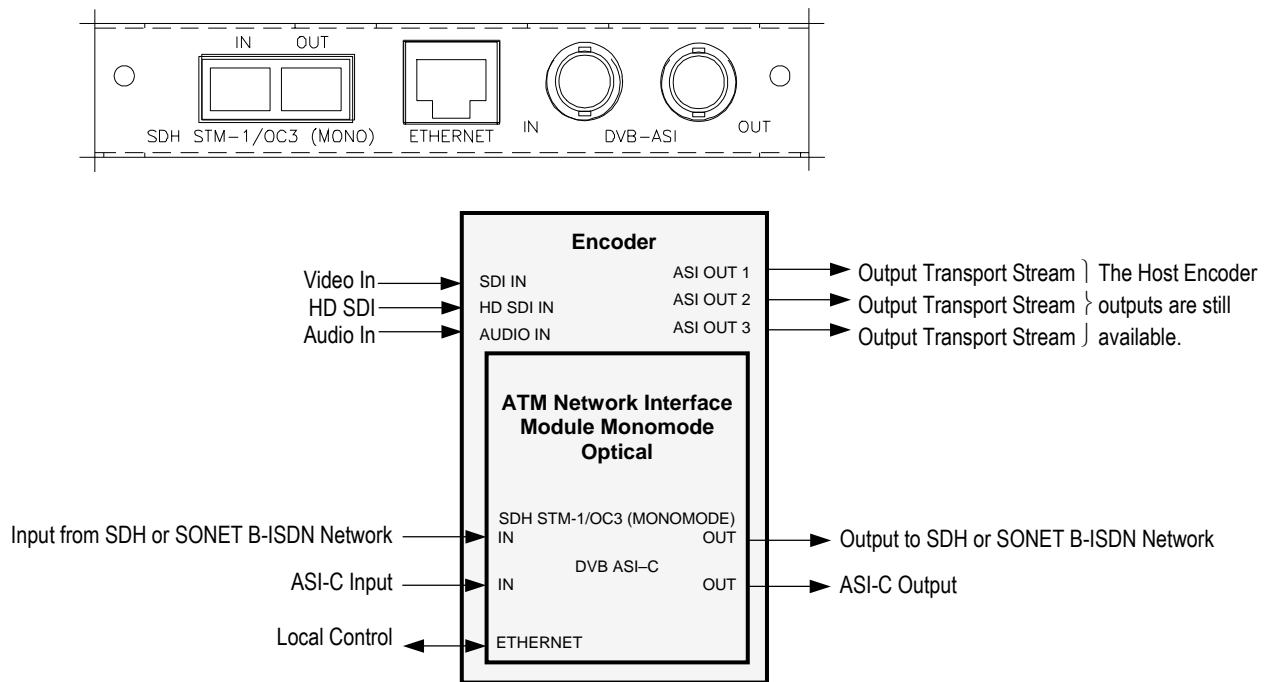


Figure 3.9: ATM Network Interface Module, Monomode Optical (M2/EOM2/ATMS155SM)

### 3.9.2 Monomode Fibre Optic Connector

**WARNING...**

**LASER: CLASS I LASER PRODUCT**

**DO NOT LOOK INTO THE APERTURE.**

**LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.**

#### NOTES...

1. The Class 1 LASER warning is as defined in paragraph 5.2 of EN 60825-1 1994.
2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Monomode Optical.
3. The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

This port is available on the S8067 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.



Table 3.13: Monomode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MONOMODE)
Wavelength	1300 nm Monomode / Singlemode (SMF)

### 3.10 M2/EOM2/ATMS34 PDH/E3 Module

#### 3.10.1 Assembly

See Table 3.1 for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to Section 3.7.3, Common Connectors on page 3-18.

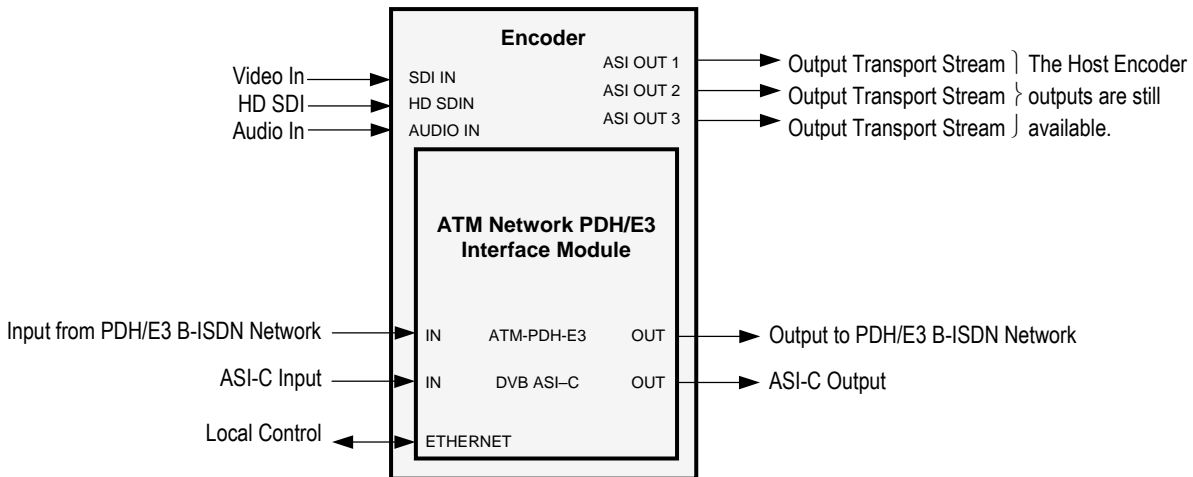
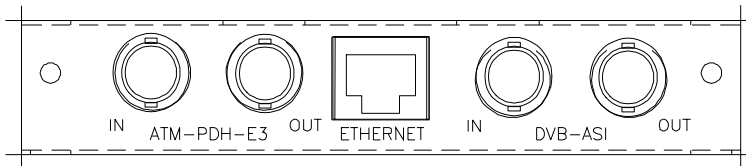


Figure 3.10: Rear Panel Connectors (M2/EOM2/ATMS34 ATM PDH/E3 Module)



### 3.10.2 Connectors

This port is available on the S11366 physical layer option module. It provides a bi-directional interface to a PDH/E3 network at a transmission rate of 34.368 Mbit/s. This is a full duplex service.



Table 3.14: PDH/E3 Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-E3

## 3.11 M2/EOM2/ATMS45 PDH/DS3 Module

### 3.11.1 Assembly

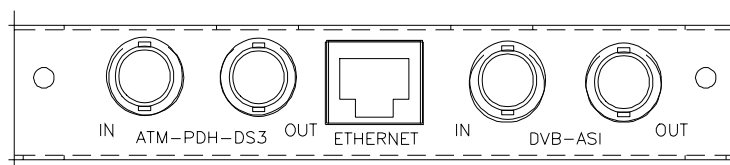
See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.

DS-3 is the third level in the PDH multiplex hierarchy found in North America. DS-3 has a bandwidth of 44.736 Mbit/s and carries seven DS-2 channels of 6.312 Mbit/s, these in turn carry four DS-1 signals of 1.544 Mbit/s.

There are currently four different ways to transmit ATM cells over DS-3. They are:

- C-bit parity ADM
- C-bit parity PLCP
- M23 ADM
- M23 PLCP



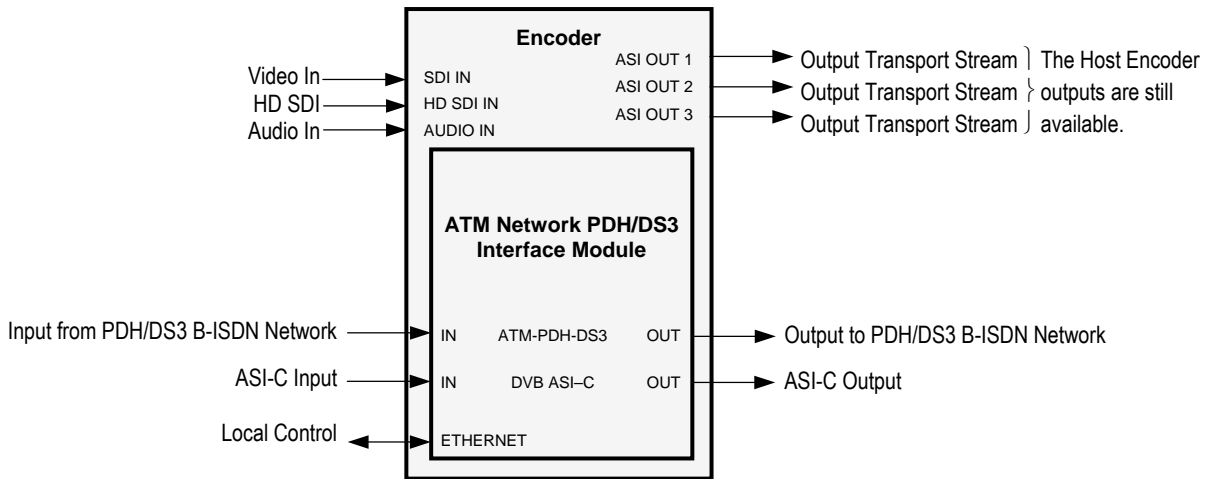


Figure 3.11: Rear Panel Connectors (M2/EOM2/ATMS45 ATM PDH/DS3 Module)

### 3.11.2 Connectors

This port is available on the S11365 physical layer option module. It provides a bi-directional interface to a PDH/DS3 network at a transmission rate of 45 Mbit/s. This is a full duplex service.



Table 3.15: PDH/DS3 Connector

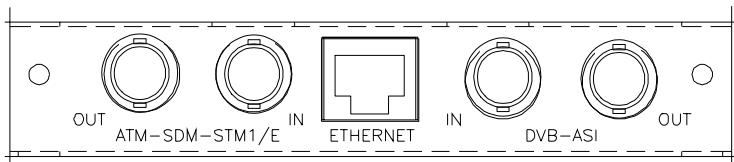
Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-DS3

## 3.12 M2/EOM2/ATMS155E STM-1 Electrical Module

### 3.12.1 Assembly

See Table 3.1 for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to Section 3.7.3, Common Connectors on page 3-18.



**NOTE...**  
Be aware that the BNC connector positions on this module are reversed when compared to the same connectors on the E3 and DS3 modules.

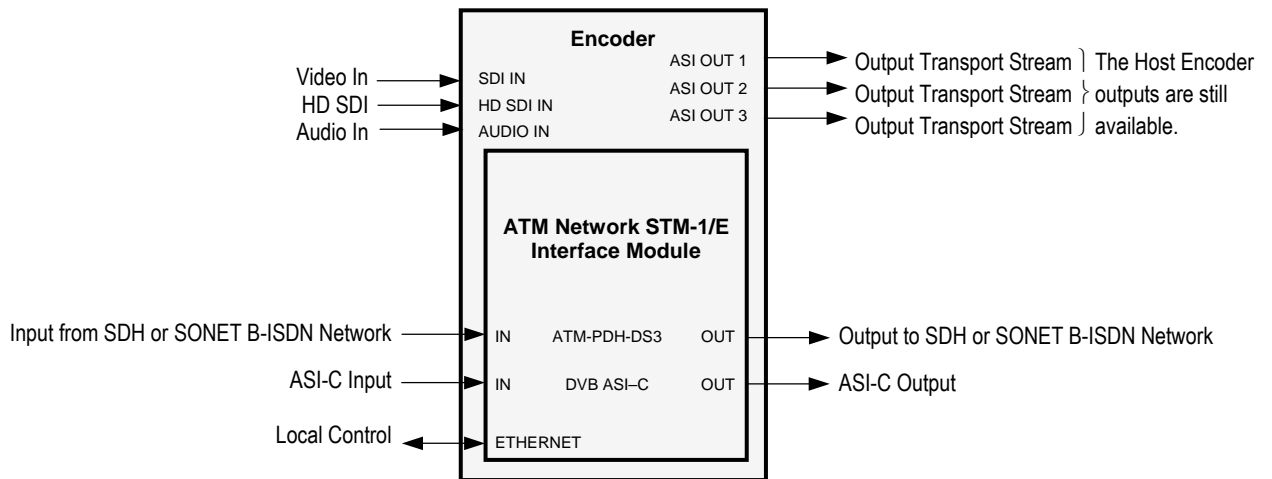


Figure 3.12: Rear Panel Connectors (M2/EOM2/ATMS155E ATM STM-1 Electrical Module)

### 3.12.2 Connectors

This port is available on the S11367 physical layer option module. It provides a bi-directional interface to a SDH STM-1/SONET STS-3c network at a transmission rate of 155.520 Mbit/s. This is a full duplex service.

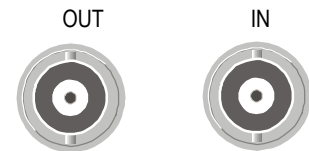


Table 3.16: SDH STM-1/SONET STS-3c Electrical Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-SDM-STM1/E

## 3.13 IP Output Card (M2/EOM2/IP)

### IP Card Pro-MPEG FEC (M2/EOM2/IP/PROFEC)

#### 3.13.1 Overview

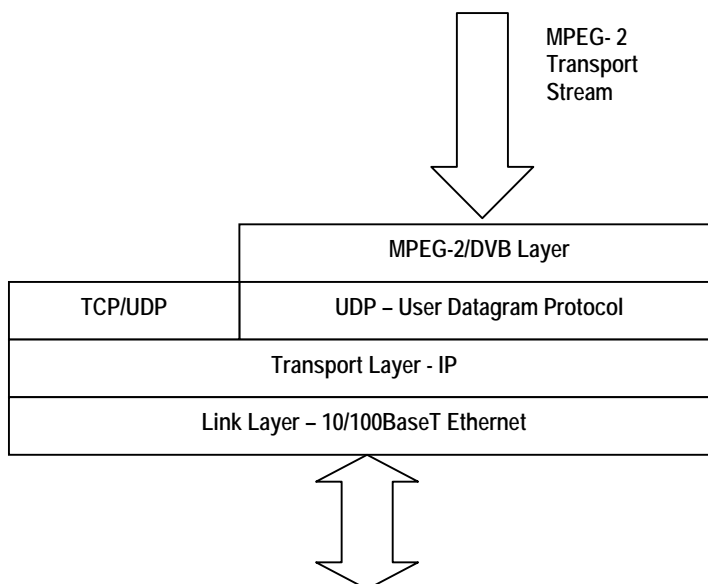
The IP Output card provides a 10/100BaseT Ethernet port, out of which the transport stream generated by the Encoder can be output in UDP packets at up to 50 Mbit/s.

The mapping of MPEG-2 transport stream packets into IP data frames is done according to the protocol stack shown in *Figure 3.13*.

##### NOTE...

More support has been given in V2.8.x of the IP Output Card in V3.6.x of the Encoder. This is accessed using menu items on the IP menu tree from the front panel, telnet and web interfaces.

- The IP output can be turned off using the IP Output menu item.
- A Line Mode menu item allows the setting to be either 'Fixed' or 'Auto'.



*Figure 3.13: IP Output Protocol Stack*

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 10/100 Mbit/s, twisted pair, via RJ-45 connector).

#### 3.13.2 Support for Pro MPEG FEC

This option sets the parameters and protocol required to send video over IP.

#### 3.13.3 Smallcasting Mode

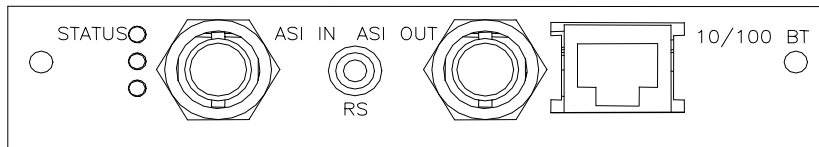
In this mode, the transport stream can be transmitted to four specified IP addresses.

**NOTE...**

The maximum multiplexer output rate, which can be reliably streamed to each IP address, is reduced for each extra destination address that is added. i.e. if two destinations are specified, the maximum rate for each address is half of that for one address, and so on.

### 3.13.4 Assembly

#### Rear Panel



#### ASI In

A 75 Ω female BNC connector provides an ASI input.

**NOTE...**

This connector is not used.

Table 3.17: ASI In Connector

Item	Specification	
Connector Type	75 Ω BNC Female	
Connector designation	ASI IN	
Pin-outs	Centre	Signal
	Screen	Ground

#### RS-232 Control

A 3.5mm socket provides a debug interface.

**NOTE...**

This connector is for TANDBERG Television use only.

#### ASI Out

A 75 Ω female BNC connector provides an ASI output.

**NOTE...**

This connector is not used.

Table 3.18: ASI Out Connector

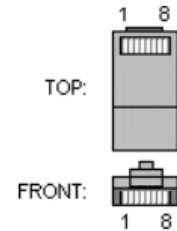
Item	Specification	
Connector Type	75 $\Omega$ BNC Female	
Connector designation	ASI OUT	
Pin-outs	Centre	Signal
	Screen	Ground

## Ethernet Output

An RJ-45 connector provides a 10/100BaseT Ethernet port.

Table 3.19: 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 (+)
	4	Not Connected
	5	Not Connected
	6	Rx In (-)
	7	Not Connected
	8	Not Connected



## 3.14 G.703 Interface Card Option (M2/EOM2/G703)

### 3.14.1 Overview

See *Table 3.1* for the slots that it can be installed in.

The G.703 Interface Card provides a G.703 adapted Encoder Transport Stream Output at a maximum rate of either:

- DS-3 at 44.736 Mbit/s
- E3 at 34.368 Mbit/s

See *Table 3.1* for the slots that it can be installed in.

### 3.14.2 Assembly

#### Rear Panel

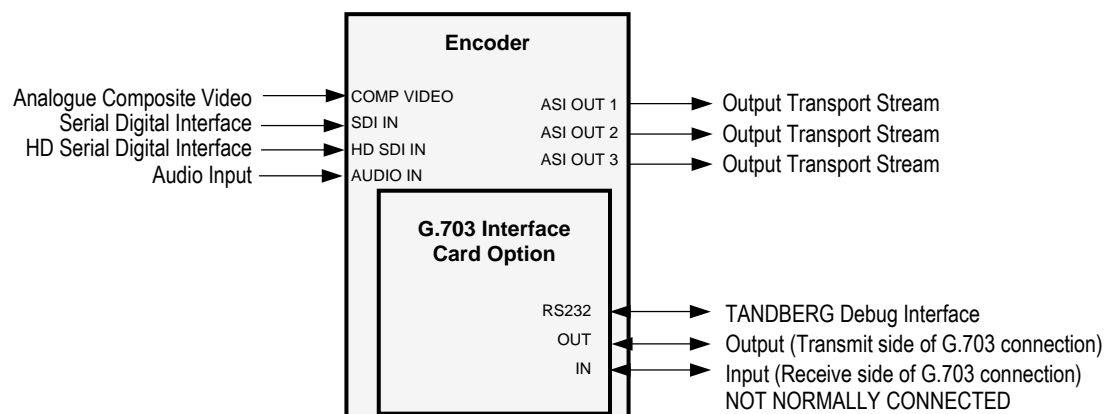
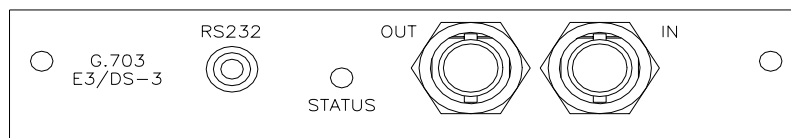


Figure 3.14: G.703 Interface Card Option M2/EOM2/G703

#### OUT Connector

A 75  $\Omega$  female BNC connector provides a G.703 transport stream output.

Table 3.20: Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

## IN Connector

**NOTE...**

This is not normally connected.

A 75  $\Omega$  female BNC connector provides a G.703 transport stream input.

*Table 3.21: In Connector*

Pin	Signal
Centre	Signal
Screen	Ground

## RS-232 Connector

A 3.5 mm socket provides a TANDBERG debug interface.

## 3.15 GPI Card (M2/EOM2/GPI)

### 3.15.1 Overview

The GPI Card connector allows various specific Encoder functions to be controlled using contact closure inputs. In addition, contact closure outputs are available for future use.

- 8 Contact Closure Inputs (intended to operate at TTL level signals) with input protection. The controlled functions are software assigned.
- 2 Contact Closure Outputs which can be either open circuit or connected to the common output. Each output has inverted or non-inverted contacts



### 3.15.2 Assembly

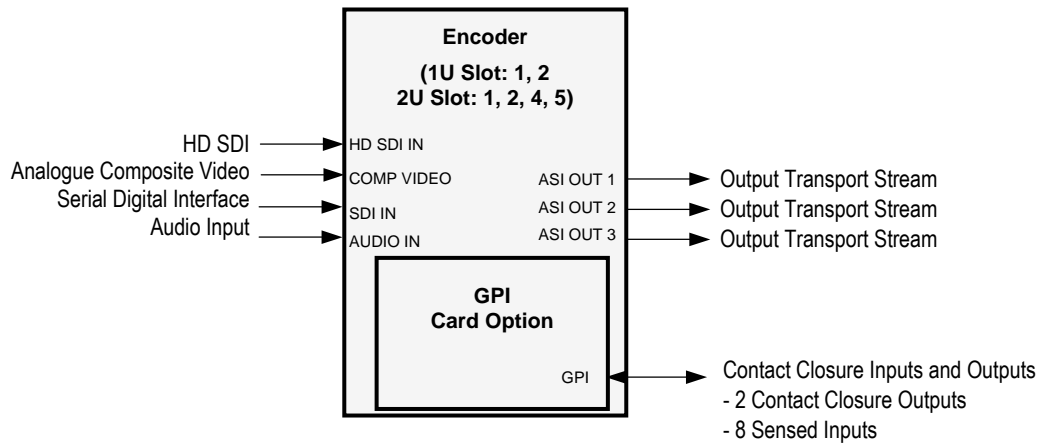


Figure 3.15: General Purpose Interface M2/EOM2/GPI

### 3.15.3 Connector

Table 3.22: GPI Connector

Item	Specification	Item	Specification
Connector Type	15-way D-type Male	Connector designation	GPI
Pin-out	1 Input 0	Pin-out	9 GND
	2 Input 1		10 Output 1 NI
	3 Input 2		11 Output 1 Common
	4 Input 3		12 Output 1 I
	5 Input 4		13 Output 2 NI
	6 Input 5		14 Output 2 Common
	7 Input 6		15 Output 2 I
	8 Input 7		

## **3.16 Software Options**

### **3.16.1 Standard Definition**

#### **M2/ESO2/NR**

This purchasable option upgrades the Encoder to include noise reduction mode. Contact Customer Services for details.

#### **M2/ESO2/VBR**

This purchasable option upgrades the Encoder to include variable bit-rate. Contact Customer Services for details.

#### **M2/ESO2/422**

This purchasable option upgrades the Encoder to include 4:2:2 video encoding mode. Contact Customer Services for details.

#### **M2/ESO2/RAS**

This purchasable option upgrades the Encoder to include RAS mode. Contact Customer Services for details.

#### **M2/ESO2/ACON**

This purchasable option upgrades the Encoder to include auto concatenation. Contact Customer Services for details.

#### **M2/ESO2/AC3**

This purchasable option allows the Encoder to provide Dolby Digital (AC-3) audio. Contact Customer Services for details.

#### **M2/ESO2/SM38PSK**

This purchasable option allows the Encoder to provide 8PSK modulation. Contact Customer Services for details.

#### **M2/ESO2/SM316QAM**

This purchasable option allows the Encoder to provide 16QAM modulation. Contact Customer Services for details.

#### **M2/ESO2/LSYM**

This purchasable option allows the Encoder to work at low symbol rates (300 ksym/s minimum). Contact Customer Services for details.

#### **M2/ESO2/MHP**

This purchasable option allows the Encoder to provide MHP timing Events. Contact Customer Services for details.

#### **M2/ESO2/DTS**

This purchasable option allows the Encoder to provide DTS Audio. Contact Customer Services for details.

**M2/ESO2/525VBIDATA**

This purchasable option allows the Encoder to provide NABTS and GEMSTAR 2.0 VBI extraction. Contact Customer Services for details

**M2/ESO2/DPI**

This purchasable licence key allows the GPI purchasable option module to provide an SCTE35 splicing. Contact Customer Services for details.

**M2/ESO2/EthernetData**

This purchasable licence key enables the reception of fully formed 188-byte transport packets coming in as UDP datagrams on the Encoder's Ethernet port.

**3.16.2 High Definition****M2/ESO2/HDNR**

This purchasable option upgrades the Encoder to include noise reduction mode for HD. Contact Customer Services for details.

**M2/ESO2/HDVBR**

This purchasable option upgrades the Encoder to include variable bit-rate for HD. Contact Customer Services for details.

**M2/ESO2/HD422**

This purchasable option upgrades the Encoder to include 4:2:2 video encoding mode for HD. Contact Customer Services for details and to check that you have the relevant hardware required.

**M2/ESO2/HD-MPASS**

This purchasable option upgrades the Encoder to operate in multipass mode in a reflex group. Contact Customer Services for details.

BLANK

# Chapter 3

## Options and Upgrades

### Contents

3.1	What's Available.....	3-3	3.5.6	ATSC Remultiplexing.....	3-14
3.1.1	Option Functions .....	3-3	3.5.7	Setting Bit-rates and Avoiding Overflow.....	3-14
3.1.2	Limitations on Number of Option Modules ...	3-4	3.5.8	What to do if Overflow Occurs .....	3-15
	Overview.....	3-4	3.6	SMPTE 310 (SSI) and ASI Optical Outputs	
3.1.3	Limitations on Use of Option Modules .....	3-4		Option Modules (M2/EOM2/ASI-OPT) and	
3.1.4	How to See Which Options are			(M2/EOM2/SSI-US) .....	3-16
	Fitted/Enabled .....	3-4	3.6.1	Overview .....	3-16
3.2	Basic Interoperable Scrambling System - BISS		3.6.2	Assembly.....	3-16
	(M2/EDCOM2/BISS) .....	3-5		Rear Panel .....	3-16
3.3	Additional Audio and Linear PCM Option			SMPTE 310 1, 2 and 3 Connectors .....	3-17
	(M2/EOM2/AUDLIN2) .....	3-6		ASI OUT 1, 2 Connectors .....	3-17
3.3.1	Overview.....	3-6	3.7	ATM Network Interface Option Module	
3.3.2	Assembly .....	3-6		(M2/EOM2/ATMS155_...) .....	3-18
	Rear Panel.....	3-6	3.7.1	Overview .....	3-18
	Audio In Connector.....	3-7	3.7.2	Assembly.....	3-18
3.4	Advanced Audio Coding Option		3.7.3	Common Connectors .....	3-18
	(M2/EOM2/ADVAUD).....	3-8		DVB-ASI Copper Input.....	3-18
3.4.1	Overview.....	3-8		DVB-ASI Copper Output .....	3-18
3.4.2	Assembly .....	3-8		10BaseT Ethernet Connector .....	3-19
	Rear Panel.....	3-8	3.8	STM-1 OC3 Multimode Physical Interface Module	
	AES x Connector .....	3-9		(M2/EOM2/ATMS155MM) .....	3-19
	AES REF Connector.....	3-9	3.8.1	Assembly.....	3-19
3.5	Remux Option (M2/EOM2/REMUX).....	3-10	3.8.2	Multimode Fibre Optic Connector .....	3-20
3.5.1	Overview.....	3-10	3.9	STM-1 OC3 Monomode Physical Interface	
3.5.2	Assembly .....	3-10		Module (M2/EOM2/ATMS155SM).....	3-21
	Rear Panel.....	3-10	3.9.1	Assembly.....	3-21
	DVB ASI IN 1, 2 and 3 Connectors .....	3-11	3.9.2	Monomode Fibre Optic Connector .....	3-21
	DVB ASI OUT 1 Connector .....	3-11	3.10	M2/EOM2/ATMS34 PDH/E3 Module.....	3-22
3.5.3	Stages of Remultiplexing .....	3-11	3.10.1	Assembly.....	3-22
3.5.4	Function of Remultiplexer .....	3-13	3.10.2	Connectors.....	3-23
3.5.5	Using the Remultiplexer .....	3-14	3.11	M2/EOM2/ATMS45 PDH/DS3 Module .....	3-23

3.11.1	Assembly.....	3-23
3.11.2	Connectors.....	3-24
3.12	M2/EOM2/ATMS155E STM-1 Electrical Module.....	3-24
3.12.1	Assembly.....	3-24
3.12.2	Connectors.....	3-25
3.13	IP Output Card (M2/EOM2/IP) IP Card Pro-MPEG FEC (M2/EOM2/IP/PROFEC).....	3-26
3.13.1	Overview.....	3-26
3.13.2	Support for Pro MPEG FEC.....	3-26
3.13.3	Smallcasting Mode.....	3-26
3.13.4	Assembly.....	3-27
	Rear Panel.....	3-27
	ASI In.....	3-27
	RS-232 Control.....	3-27
	ASI Out.....	3-27
	Ethernet Output.....	3-28
3.14	G.703 Interface Card Option (M2/EOM2/G703).....	3-29
3.14.1	Overview.....	3-29
3.14.2	Assembly.....	3-29
	Rear Panel.....	3-29
	OUT Connector.....	3-29
	IN Connector.....	3-30
	RS-232 Connector.....	3-30
3.15	GPI Card (M2/EOM2/GPI).....	3-30
3.15.1	Overview.....	3-30
3.15.2	Assembly.....	3-31
3.15.3	Connector.....	3-31
3.16	Software Options.....	3-32
3.16.1	Standard Definition.....	3-32
	M2/ESO2/NR.....	3-32
	M2/ESO2/VBR.....	3-32
	M2/ESO2/422.....	3-32
	M2/ESO2/RAS.....	3-32
	M2/ESO2/ACON.....	3-32
	M2/ESO2/AC3.....	3-32
	M2/ESO2/SM38PSK.....	3-32
	M2/ESO2/SM316QAM.....	3-32
	M2/ESO2/LSYM.....	3-32
	M2/ESO2/MHP.....	3-32
	M2/ESO2/DTS.....	3-32
	M2/ESO2/525VBIDATA.....	3-33
	M2/ESO2/DPI.....	3-33
	M2/ESO2/EthernetData.....	3-33
3.16.2	High Definition.....	3-33
	M2/ESO2/HDNR.....	3-33
	M2/ESO2/HDVBR.....	3-33
	M2/ESO2/HD422.....	3-33
	M2/ESO2/HD-MPASS.....	3-33

## List of Figures

Figure 3.1:	Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2).....	3-6
Figure 3.2:	Advanced Audio Coding Option (M2/EOM2/ADVAUD).....	3-8
Figure 3.3:	Remux Option (M2/EOM2/REMUX).....	3-10
Figure 3.4:	Block Diagram – One Stage of Remultiplexing.....	3-12
Figure 3.5:	Block Diagram – Two Stages of Remultiplexing.....	3-12
Figure 3.6:	Remultiplexer Block Diagram.....	3-13
Figure 3.7:	SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US).....	3-16
Figure 3.8:	ATM Network Interface Module, Multimode Optical (M2/EOM2/ATMS155MM).....	3-20
Figure 3.9:	ATM Network Interface Module, Monomode Optical (M2/EOM2/ATMS155SM).....	3-21
Figure 3.10:	Rear Panel Connectors (M2/EOM2/ATMS34 ATM PDH/E3 Module).....	3-22
Figure 3.11:	Rear Panel Connectors (M2/EOM2/ATMS45 ATM PDH/DS3 Module).....	3-24
Figure 3.12:	Rear Panel Connectors (M2/EOM2/ATMS155E ATM STM-1 Electrical Module).....	3-25
Figure 3.13:	IP Output Protocol Stack.....	3-26
Figure 3.14:	G.703 Interface Card Option M2/EOM2/G703.....	3-29
Figure 3.15:	General Purpose Interface M2/EOM2/GPI.....	3-31

## List of Tables

Table 3.1:	Hardware Option Module Positions.....	3-3
Table 3.2:	Software Options.....	3-4
Table 3.3:	Audio In Connector.....	3-7
Table 3.4:	Audio In Connector.....	3-9
Table 3.5:	DVB ASI In Connector.....	3-11
Table 3.6:	DVB ASI Out Connector.....	3-11
Table 3.7:	SMPTE 310 Connector.....	3-17
Table 3.8:	ASI Out Connector.....	3-17
Table 3.9:	DVB-ASI Copper Input Connector.....	3-18
Table 3.10:	DVB-ASI Copper Output Connector.....	3-19
Table 3.11:	Ethernet Connector.....	3-19
Table 3.12:	Multimode Fibre Optic Connector.....	3-20
Table 3.13:	Monomode Fibre Optic Connector.....	3-22
Table 3.14:	PDH/E3 Connector.....	3-23
Table 3.15:	PDH/DS3 Connector.....	3-24
Table 3.16:	SDH STM-1/SONET STS-3c Electrical Connector.....	3-25
Table 3.17:	ASI In Connector.....	3-27
Table 3.18:	ASI Out Connector.....	3-28
Table 3.19:	RJ-45 Connector.....	3-28
Table 3.20:	Out Connector.....	3-29
Table 3.21:	In Connector.....	3-30
Table 3.22:	GPI Connector.....	3-31

## 3.1 What's Available

### 3.1.1 Option Functions

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

Each hardware option module consists of a horizontally mounted PCB with rear panel connector space (except the M2/EDCOM2/BISS which has no external connectors and does not occupy an option slot). At reset, the software of the Encoder detects which modules are fitted and configures them as necessary. The modules can be fitted into the positions indicated in *Table 3.1*.

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 3.1: Hardware Option Module Positions*

Marketing Code	Name	Slot No.	Max No. of Cards
<b>Daughter Card Options</b>			
M2/EDCOM2/BISS	BISS <sup>1</sup> scrambling option - Mode 0, 1 and BISS-E only - with secure key entry	—	
<b>Hardware Options</b>			
M2/EOM2/AUDLIN2	Additional Audio + Linear PCM	1	1
M2/EOM2/ADVAUD	Advanced Audio Coding Card	1	1
M2/EOM2/REMUX	Remux Option Module	1	1
M2/EOM2/ASI-OPT	SMPTE 310 (SSI) and ASI Optical Outputs	6	1
M2/EOM2/SSI-US	SMPTE 310 (SSI) Output	6	1
M2/EOM2/ATMS155MM	STM-1 OC3 Multimode Physical Interface Module (SDH STM-1/SONET STS-3c Multimode Optical)	6	1
M2/EOM2/ATMS155SM	STM-1 OC3 Monomode Physical Interface Module (SDH STM-1/SONET STS-3c Monomode Optical)	6	1
M2/EOM2/ATMS34	PDH/E3 Module	6	1
M2/EOM2/ATMS45	PDH/DS3 Module	6	1
M2/EOM2/ATMS155E	STM-1 Electrical Module	6	1
M2/EOM2/IP	IP Output Card	6	1
M2/EOM2/IP/PROFEC	IP Card Pro-MPEG FEC	3, 5 or 6	1
M2/EOM2/G703	G.703 Interface Card	6	1
M2/EOM2/GPI	GPI Card	1, 2, 3, 4, 5, 6	1

**NOTE...**

Empty option slots must be fitted with a blanking plate.

<sup>1</sup> BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Table 3.2: Software Options

Marketing Code	Name
<b>SD Options</b>	
M2/ESO2/NR	Noise Reduction - three levels of professional-grade adaptive noise reduction.
M2/ESO2/VBR	Reflex and VBR - automatic variable bit-rate at a fixed quality setting for optimum bandwidth usage in stand-alone or Reflex statistical multiplexing modes.
M2/ESO2/422	MPEG-2 422P@ML - for professional editing quality pictures, 1.5 Mbit/s to 50 Mbit/s.
M2/ESO2/RAS	RAS (Remote Authorisation System) - allows material to be protected from illegal viewing using TANDBERG Television's proprietary scrambling system.
M2/ESO2/ACON	Auto Concatenation - aligns the Encoder to the previous Encoder's GOP structure to significantly reduce coding artefacts caused by successive coding and decoding.
M2/ESO2/AC3	Dolby Digital (AC-3) - enables Dolby AC-3 stereo encoding.
M2/ESO2/SM38PSK	8PSK Modulation (applicable to E5784 or E5788-LBAND).
M2/ESO2/SM316QAM	16QAM Modulation (applicable to E5784 or E5788-LBAND).
M2/ESO2/LSYM	Low symbol Rate Capability.
M2/ESO2/MHP	MHP Timing Events
M2/ESO2/DTS	DTS Audio
M2/ESO2/525VBIDATA	NABTS and GEMSTAR 2.0 VBI extraction
M2/ESO2/DPI	SCTE35 DPI
M2/ESO2/EthernetData	Enables the Data C – Ethernet data option
<b>HD Options</b>	
M2/ESO2/HDNR	HD Noise Reduction
M2/ESO2/HDVBR	Reflex and VBR - automatic variable bit-rate at a fixed quality setting for optimum bandwidth usage in stand-alone or Reflex statistical multiplexing modes.
M2/ESO2/HD422	MPEG-2 422P@ML - for professional editing quality pictures.
M2/ESO2/HD-MPASS	Upgrades the Encoder to operate in multipass mode in a reflex group.

### 3.1.2 Limitations on Number of Option Modules

#### Overview

If the Remux option is not fitted then there can be a maximum of two option modules.

If the Remux option module is fitted there can be a maximum of one other option module.

Base Board	
HD Encoder Module	Option Slot 6
Option Slot 1	IF or L-Band Modulator

### 3.1.3 Limitations on Use of Option Modules

Although both BISS (M2/EDCOM2/BISS) and RAS (M2/ESO2/RAS) may be present in the Encoder, only one may be used at a time.

### 3.1.4 How to See Which Options are Fitted/Enabled

The Encoder has a number of hardware and software options (see *Table 3.1* and *Table 3.2*). To see which are fitted/enabled refer to the Build Menu (see *Chapter 4, Operating the Equipment Locally, Figure 4.9*).



## 3.2 Basic Interoperable Scrambling System - BISS (M2/EDCOM2/BISS)

With the appropriate configuration, the Encoder can use the Basic Interoperable Scrambling System (BISS<sup>2</sup>) to scramble the outgoing transport stream. This system has been developed by the European Broadcasting Union (EBU) as an open scrambling system.

BISS has these main levels of operation: Mode 1, Mode 2 and Mode 3. Mode 0 corresponds to no scrambling. BISS-E is also available.

BISS Mode 1 operation uses a fixed value for the control word to scramble the services in the transport stream from the Encoder. To descramble the transmission, the Decoder needs to have the matching control word value.

### NOTES...

1. This option module is installed as a daughter card to the Base Board, with no external connectors and does not use an option slot.
2. The BISS software must also be enabled in the Encoder (see Customer Services).

BISS scrambling (when fitted) is enabled and controlled via the Setup/Mux Menu (see *Chapter 4, Operating the Equipment Locally, Section 4.10.14*).

---

<sup>2</sup> BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

### 3.3 Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2)

#### 3.3.1 Overview

The Additional Audio option module supplements the audio encoding functionality of the Encoder. This module supports audio standards MPEG-1 (layer 2), Dolby Digital (AC-3), Linear PCM, Dolby Digital (AC-3) Pass-through, Dolby E Pass-through and DTS Pass-through. The module can take in audio as either stereo analogue or digital AES/EBU (on left channel only) via a 15-way D-type connector provided on its rear panel.

Alternatively, any two of the four pairs of embedded AES/EBU channels extracted from the video can be routed to the module for encoding. This option supports all the standard bit-rates and encoding modes associated with each compression standard.

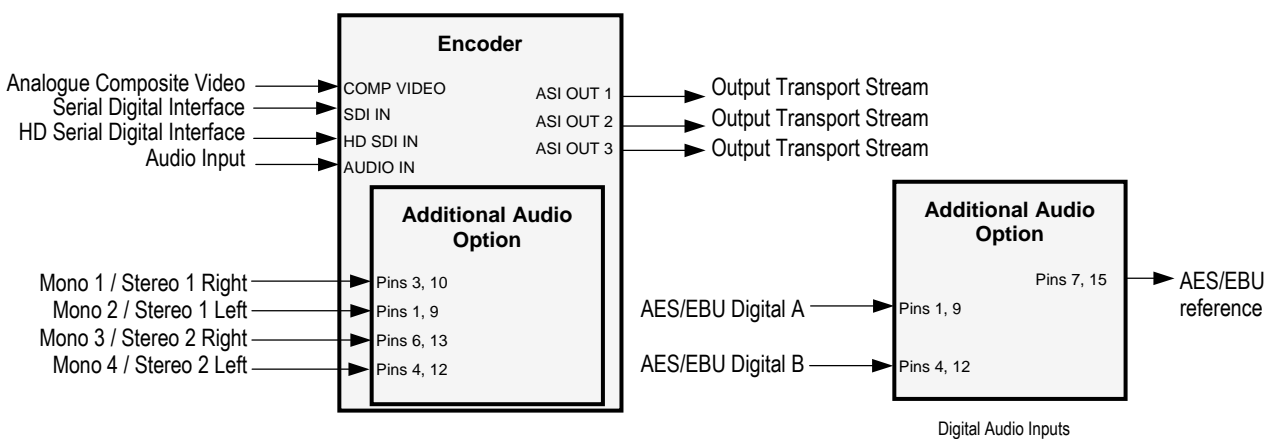
M2/EOM2/AUDLIN2 supports 12 dB, 15 dB, 18 dB and 24 dB audio clip level.

The Audio Menu associated with this option is described in *Chapter 4, Operating the Equipment Locally, Section 4.9*. In the Audio Setup Menu additional options are displayed for Audio XA and Audio XB, where X is the option slot number where the module is fitted.

Refer to *Annex F, Audio Modes* for details of Encoder locking to ensure correct performance.

#### 3.3.2 Assembly

##### Rear Panel



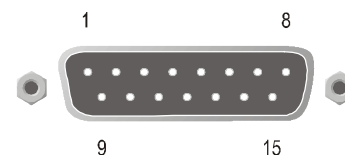
**NOTE...**  
The AES/EBU reference signal is provided for backwards compatibility only. When using E57xx Encoders use the reference signal provided by the Base Board.

Figure 3.1: Additional Audio and Linear PCM Option (M2/EOM2/AUDLIN2)

See *Table 3.1* for the slots that it can be installed in.

## Audio In Connector

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.

*Table 3.3: 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) (-)
2	Not connected		10	Right Channel A (+)	
3	Right Channel A (-)		11	Not connected	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
5	Not connected		13	Right Channel B (+)	
6	Right Channel B (-)		14	Not connected	
7		AES/EBU Reference (Output Signal)	15		AES/EBU Reference (Ground)
8	Not connected				

### NOTES...

1. In analogue mode termination is either 20 k $\Omega$  or 600  $\Omega$ .
2. In AES/EBU mode termination is 110  $\Omega$  (default).
3. When the Encoder is powered down the digital channel is selected with 110  $\Omega$  termination.
4. The digital audio input does not support SPDIF.

### CAUTION...

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

## 3.4 Advanced Audio Coding Option (M2/EOM2/ADVAUD)

### 3.4.1 Overview

The Advanced Audio Coding option module supplements the audio encoding functionality of the Encoder to enable it to be used as a drop-in replacement for other Encoders. It can encode four stereo audio pairs (two-channels) or one multi-channel (six-channels - multichannel MPEG-2 AAC (ISO/IEC 13818-7) (LC)) and one stereo pair (two-channels). No other combination of channel inputs is permitted.

The module can receive up to four simultaneous, independent AES3-2003 inputs on four 75  $\Omega$  BNC co-axial AES3 inputs (compliant to AES-3id-2001) located at the Encoder's rear panel. It can also accept four AES3 inputs from the Encoder's backplane to permit the use of embedded audio. Each input supports 16, 20 and 24-bit resolutions and 48 kHz sampling and is capable of passing 16, 20 and 24 bit samples to the audio encoders. 24 or 20 bit input samples can be rounded to 16 bits.

The module accepts a PCR clock of 27 MHz in the form of a 3 wire serial interface. The inputs are synchronised to the system reference clock through the use of phase locked sample-rate converters prior to encoding.

### 3.4.2 Assembly

#### Rear Panel

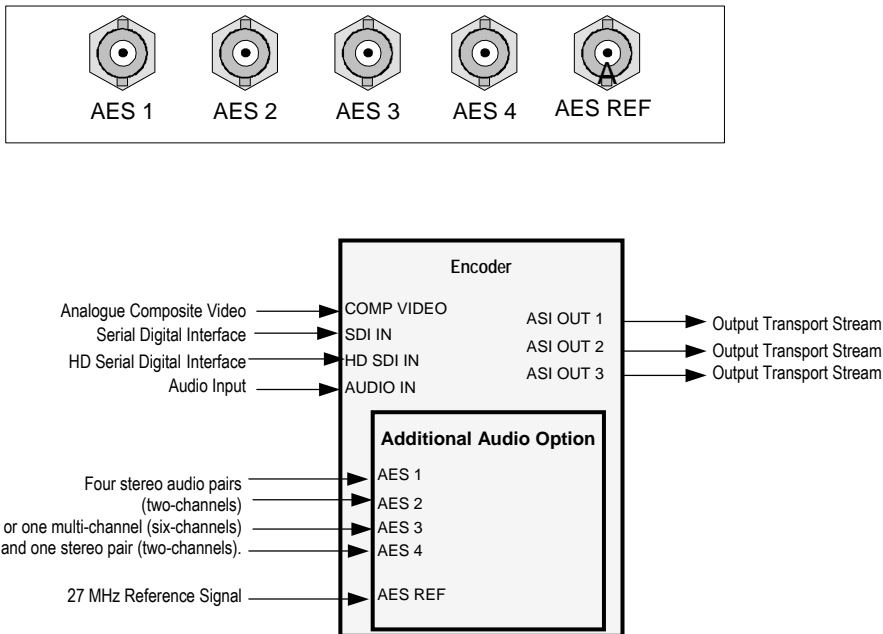


Figure 3.2: Advanced Audio Coding Option (M2/EOM2/ADVAUD)

The Additional Audio Coding option module comprises Assembly S14048 and Card S13600. See *Table 3.1* for the slots that it can be installed in.

## AES x Connector

Connect the audio input cables to the appropriate AES input connectors.



Each connector accepts a single stereo pair. They may be independently configured or form part of an multi-channel input.

## AES REF Connector

This connector allows the connection of a 27 MHz studio timing reference.



Table 3.4: 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) (-)
2	Not connected		10	Right Channel A (+)	
3	Right Channel A (-)		11	Not connected	
4	Left Channel B (+)	AES/EBU (B) (+)	12	Left Channel B (-)	AES/EBU (B) (-)
5	Not connected		13	Right Channel B (+)	
6	Right Channel B (-)		14	Not connected	
7		AES/EBU Reference (Output Signal)	15		AES/EBU Reference (Ground)
8	Not connected				

### NOTES...

1. In analogue mode termination is either 20 k $\Omega$  or 600  $\Omega$ .
2. In AES/EBU mode termination is 110  $\Omega$  (default).
3. When the Encoder is powered down the digital channel is selected with 110  $\Omega$  termination.
4. The digital audio input does not support SPDIF.

### CAUTION...

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

## 3.5 Remux Option (M2/EOM2/REMUX)

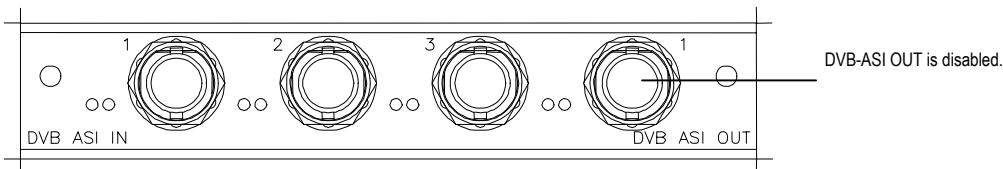
### 3.5.1 Overview

The Remux option module is capable of accepting up to three separate transport streams via ASI connectors, and one transport stream from the host Encoder. The maximum permissible data rate of each input transport stream is 50 Mbit/s. Some or all of the services in the input transport streams are then multiplexed together to produce a Multiple Channels Per Carrier (MCPC) output at up to 65 Mbit/s. For a specification of this interface see *Annex B, Technical Specification*

### 3.5.2 Assembly

#### Rear Panel

See *Table 3.1* for the slots that it can be installed in.



**CAUTION...**

When remultiplexing, be aware that both PIDs will be remapped according to the Host Encoder input used.

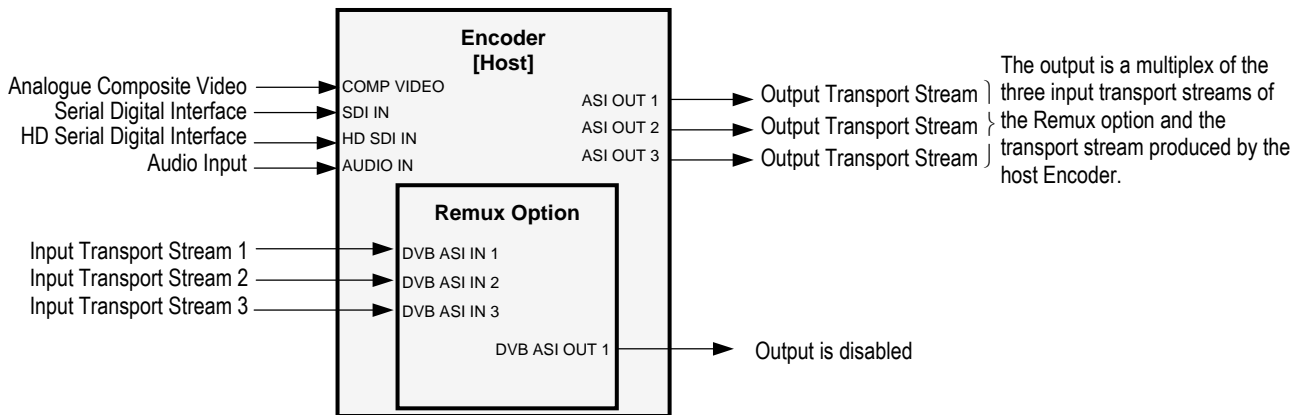


Figure 3.3: Remux Option (M2/EOM2/REMUX)

### DVB ASI IN 1, 2 and 3 Connectors

A 75  $\Omega$  BNC connector provides an input to the unit.



Table 3.5: DVB ASI In Connector

Pin	Signal
Centre	Signal
Screen	Ground

#### NOTE...

When connecting the inputs, always start from DVB ASI IN 1 and work upwards.

### DVB ASI OUT 1 Connector

A 75  $\Omega$  BNC connector provides an output from the unit.



Table 3.6: DVB ASI Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

#### NOTE...

This output is disabled.

### 3.5.3 Stages of Remultiplexing

The Remultiplexer is capable of combining four inputs. Three inputs are in the form of ASI feeds to the rear panel, the fourth input is fed from the host Encoder (or primary Encoder). This basic configuration, using a single stage of remultiplexing, means that four Encoder services (or streams) can be combined together in the output. *Figure 3.4* shows a typical satellite system using one stage of remultiplexing.

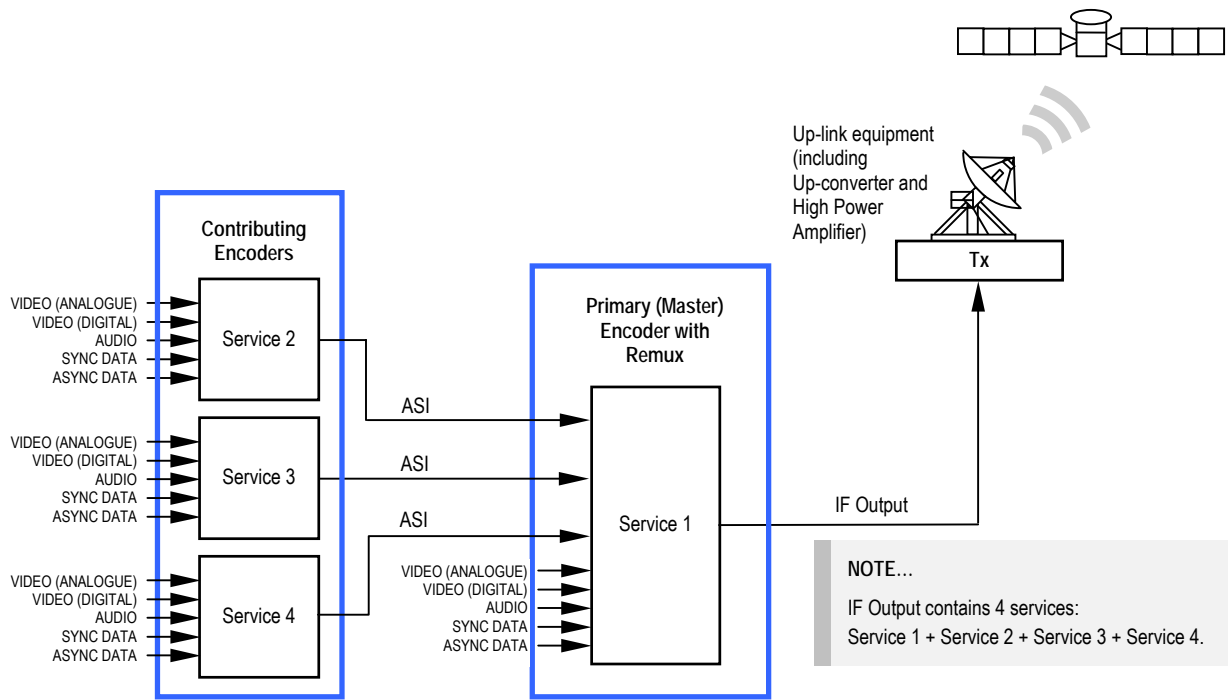


Figure 3.4: Block Diagram – One Stage of Remultiplexing

Similarly, if two stages of remultiplexing are introduced, thirteen Encoders can be combined, providing up to thirteen services in the remultiplexed output. This is the maximum number of services that can be provided using this system, see Figure 3.5.

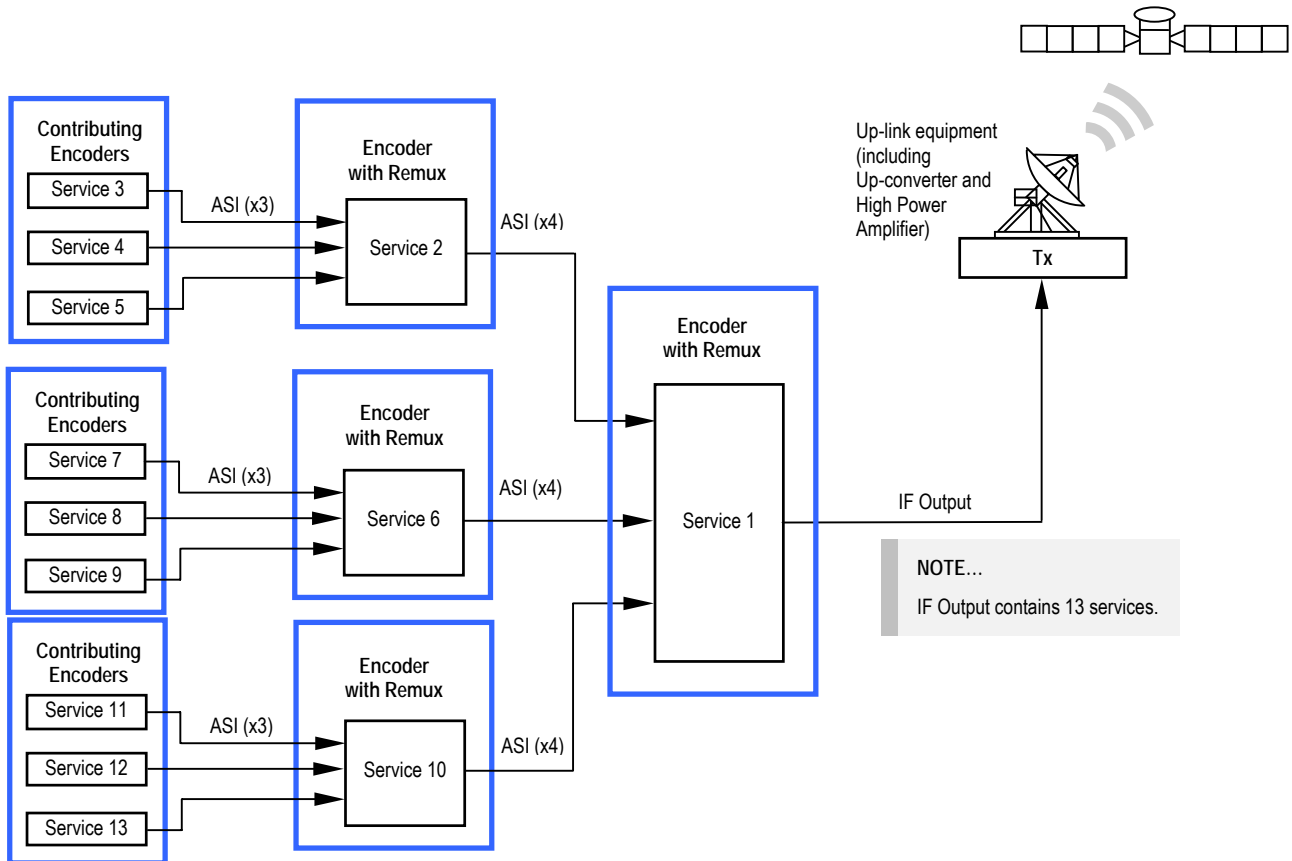


Figure 3.5: Block Diagram – Two Stages of Remultiplexing



### 3.5.4 Function of Remultiplexer

It is the function of the Remultiplexer to combine the locally generated host services with the externally supplied input services, connected via ASI inputs to the rear of the unit. If the Service ID (DVB) or Program Number (ATSC), PIDs or service names, of two or more of the services clash, the Remultiplexer can remap the Service ID or program number, remap PIDs, and alter the service names to resolve the clash.

If a new service is detected on any input, and it clashes with an existing service, it is the new service's Service ID or Program Number, PIDs, or Service Name that are remapped to resolve the conflict. Service names are made unique by the addition of a number, for example 'Default Service' may be renamed 'Default Service [2]'.

The way the Remultiplexer deals with user requests to remap PIDs depends on its mode of operation.

If the user attempts to move/remap a PID to a PID already being used, the Remultiplexer allows this to happen, and automatically remaps the element that was on that PID.

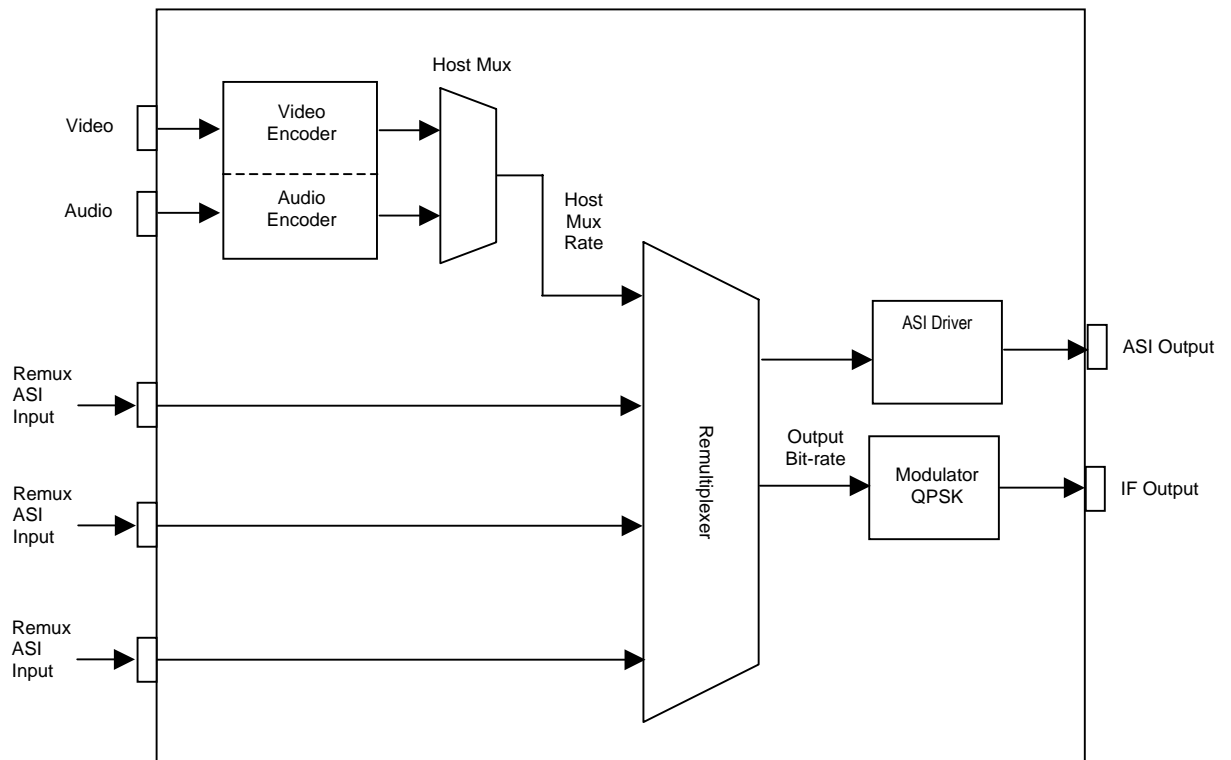


Figure 3.6: Remultiplexer Block Diagram

### 3.5.5 Using the Remultiplexer

Set the output bit-rate to the required value in the Setup/Mux Menu.

Connect transport streams that are to be combined (remultiplexed) with the host Encoder's services to the ASI inputs on the rear of the unit.

**NOTE...**

It is possible to remultiplex any DVB or ATSC compliant transport stream but at the time of publication, only transport streams generated by TANDBERG Television equipment are guaranteed to work when fed to the Remultiplexing module.

The equipment will automatically detect the services on these inputs. The list of detected services is displayed in the Setup/Mux Menu.

Each service can be individually switched 'Off', 'On', or 'On with scrambling'. If the service is set to 'Off', then there is no trace of the service in the output transport stream. New services can be set to default to either Off or On. If it was connected to the Remultiplexer the last time the Encoder was powered, then it assumes its previous state.

It is possible to remultiplex transport streams that have already been scrambled by BISS encryption, but it is not possible to remultiplex transport streams that have already been scrambled using RAS encryption. Also it is not possible to scramble a service that has already been scrambled.

### 3.5.6 ATSC Remultiplexing

The Remultiplexer can work with ATSC compliant transport streams. It remaps the services following the ATSC program paradigm.

The Encoder can be configured to generate the PSIP for the output transport stream. It generates the minimum number of tables to give an ATSC compliant output transport stream, i.e. Event Information Tables (EIT) 0, 1, 2 and 3, the System Time Table (STT), the Rating Region Table (RRT), the Master Guide Table (MGT), and either the Cable Virtual Channel Table (CVCT) or the Terrestrial Virtual Channel Table (TVCT), depending on the delivery descriptor set. It will not pass through any tables that are present on the ASI input transport streams.

Alternatively, an external PSIP generator can be connected to one of the Remultiplexer inputs and the remultiplexer programmed to pass through a range of PIDs, thus inserting the PSIP into the output transport stream.

For more information about using the Remux card in ATSC with internal and external PSIP see *Annex H, Use of Remux Card in ATSC*.

### 3.5.7 Setting Bit-rates and Avoiding Overflow

Overflow is the condition in which the total of the contributing service bit-rates, (including the host mux), exceeds the output bit-rate of the primary remultiplexing unit.

**NOTE...**

Only useful packets (e.g. video, audio and data, etc) count towards the bit-rate of the contributing service bit-rates, not null packets.

---

The easiest way to configure the bit-rates to avoid overflow, is as follows:

1. Divide the 188 byte output bit-rate of the primary (master) remultiplexing unit, (this can be found in the Setup/Mux/Remux Module/Output Bit-rate), by the number of contributing services (including the primary service). Such that:

$$\text{O/P Rate (188)} / N = \text{Host Rate (188)}$$

[Where N = number of services to be combined including primary]

2. Then set the Host Rates (188) of each contributing unit and the master unit to equal the calculated Host Rate.

If the above procedure is followed, an equal bit-rate is allocated to each contributing unit. By setting the host rates, the video and audio bit-rates will be automatically adjusted to suit.

The amount of spare bit-rate and input bit-rate that has been used in the Remultiplexer can be monitored using the bar graph indicators in the Setup/Mux/Remux Module Menu.

### 3.5.8 What to do if Overflow Occurs

If an 'Overflow Error' is indicated on the equipment, then the incoming contributing bit-rate exceeds the outgoing bit-rate. To avoid corruption reduce the incoming bit-rate by either removing services, (turn the service Off or remove the ASI input), or reduce the bit-rate of the incoming service.

### 3.6 SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US)

#### 3.6.1 Overview

The modules allow the Encoder to output MPEG-2 transport streams in the following formats: ASI (optical) and SMPTE 310M - 1998 (electrical).

There are two ASI multimode optical outputs which conform to the DVB document A010 (*Section 4.4 and Annex B*) and three copper SI Outputs which conform to the SMPTE Standard 310M Level 2.

**NOTE...**  
Level 2 performance is exceeded but not as far as that of level 3.

M2/EOM2/ASI-OPT has both ASI/SSI capability whilst the M2/EOM2/SSI-US has only SSI.

#### 3.6.2 Assembly

##### Rear Panel

These option modules can only be installed in slot 3 or 6.

**CAUTION...**  
The SMPTE 310 output cannot be used with the M2/ESO2/RAS RAS Scrambling mode.

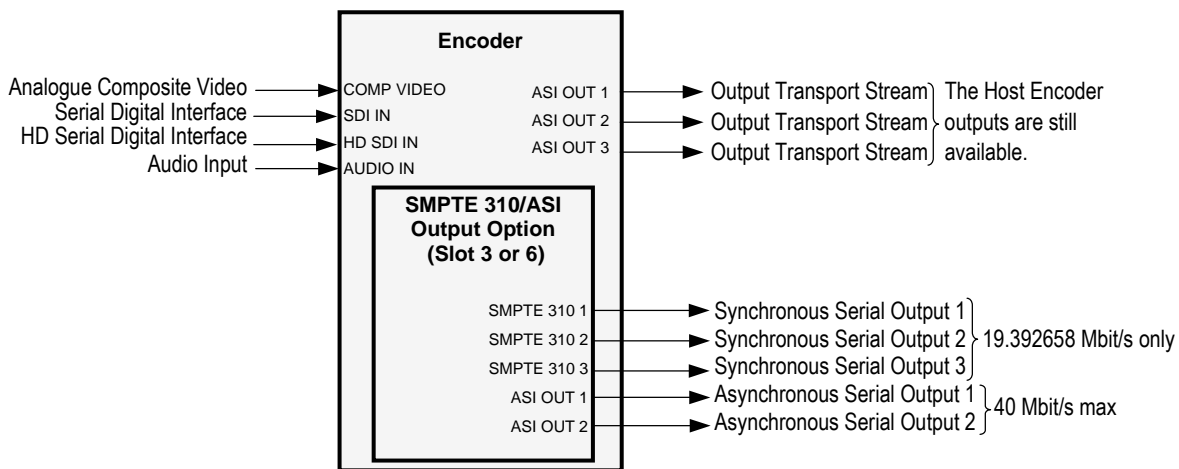
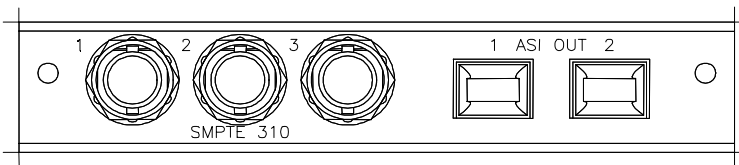


Figure 3.7: SMPTE 310 (SSI) and ASI Optical Outputs Option Modules (M2/EOM2/ASI-OPT) and (M2/EOM2/SSI-US)

## SMPTE 310 1, 2 and 3 Connectors

A 75  $\Omega$  female BNC connector provides an SMPTE 310 compliant synchronous serial (SSI) output for the unit.

Table 3.7: SMPTE 310 Connector

Pin	Signal
Centre	Signal
Screen	Ground

## ASI OUT 1, 2 Connectors

Provides a DVB compliant ASI optical output at 270 Mbit/s.



Table 3.8: ASI Out Connector

Item	Specification
Connector type	SC type
Connector designation	ASI OUT 1, 2
Wavelength	1300 nm Multimode (MMF)

### NOTE...

The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

### WARNING...

LED: CLASS I LASER PRODUCT  
DO NOT LOOK INTO THE APERTURE.  
LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

### NOTE...

The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

## 3.7 ATM Network Interface Option Module (M2/EOM2/ATMS155\_...)

### 3.7.1 Overview

The ATM<sup>3</sup> Network Interface Module allows the Encoder to transmit and receive MPEG-2 transport streams over broadband telecommunications networks (B-ISDN) using ATM.

There are different variants of the ATM Network Interface Module. The module comprises an ATM Network Interface (common to all models) and a Physical Layer Module suitable for the application required. Refer to *Table 3.1* for details of the variants.

Menus associated with the ATM Modules are described in *Chapter 4, Operating the Equipment Locally*.

### 3.7.2 Assembly

To provide the interface to the B-ISDN Telecommunications network, the Physical Layer Module must be installed according to the type of network required. These are described in *Section 3.8, STM-1 OC3 Multimode Physical Interface Module (M2/EOM2/ATMS155MM)* on page 3-19 and *Section 3.9, STM-1 OC3 Monomode Physical Interface Module (M2/EOM2/ATMS155SM)* on page 3-21.

The S11906 has the following connectors: DVB-ASI Copper Input, DVB-ASI Copper Output and the Ethernet Connector. They are present on all variants of the ATM Module.

### 3.7.3 Common Connectors

#### DVB-ASI Copper Input

A BNC, female 75  $\Omega$  connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.



*Table 3.9: DVB-ASI Copper Input Connector*

Item	Specification	
Safety status	SELV	
Type	Analogue	
Connector designation	DVB ASI-C IN	
Connector type	BNC 75 $\Omega$ socket	
Pin-outs:	Centre	Signal
	Shield	Ground/Chassis

#### DVB-ASI Copper Output

A BNC, female 75  $\Omega$  connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.



<sup>3</sup> ATM is the abbreviation for Asynchronous Transfer Mode.

Table 3.10: DVB-ASI Copper Output Connector

Item	Specification	
Safety status	SELV	
Type	Analogue	
Connector designation	DVB ASI-C OUT	
Connector type	BNC 75 $\Omega$ socket	
Pin-outs:	Centre	Signal
	Shield	Ground/Chassis

## 10BaseT Ethernet Connector

The Ethernet is used to connect the ATM card to a local control LAN and for engineering access. Connect the Ethernet cable to the RJ-45 (10BaseT) connectors on the equipment.

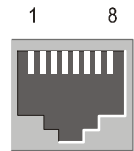


Table 3.11: Ethernet Connector

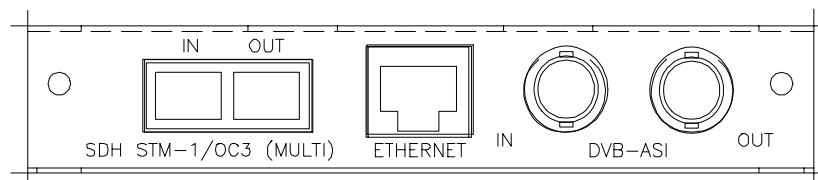
Item	Specification	
Type	RJ-45	
Connector designation	Ethernet	
Location	At rear panel	
Pin:	Pin 1 — Tx Out (+)	Pin 3 — Rx In (+)
(Unused pins not connected)	Pin 2 — Tx Out (-)	Pin 6 — Rx In (-)

## 3.8 STM-1 OC3 Multimode Physical Interface Module (M2/EOM2/ATMS155MM)

### 3.8.1 Assembly

See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.



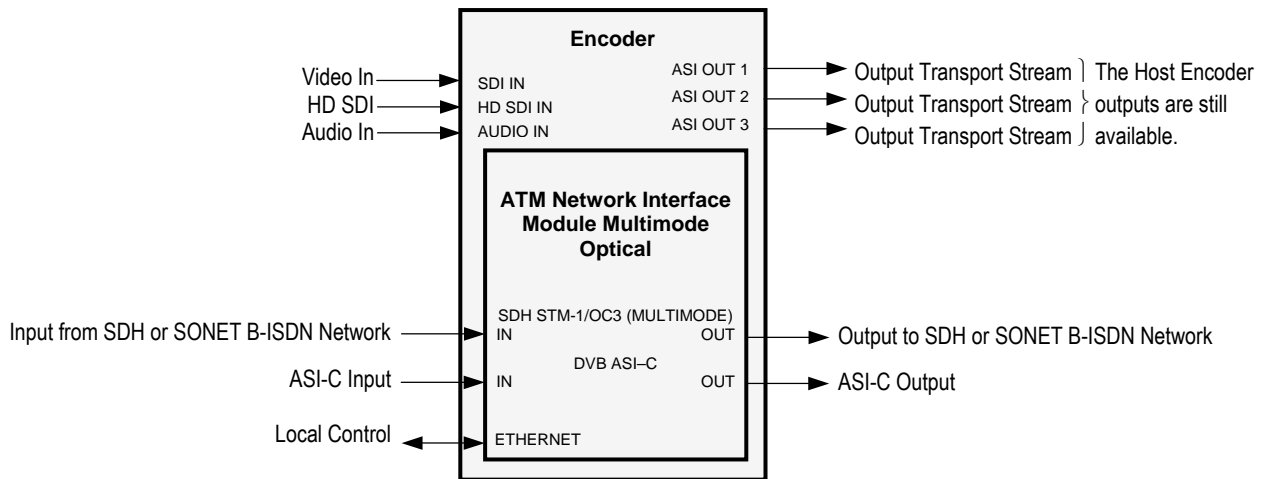


Figure 3.8: ATM Network Interface Module, Multimode Optical (M2/EOM2/ATMS155MM)

### 3.8.2 Multimode Fibre Optic Connector

**WARNING...**  
**LED: CLASS I LASER PRODUCT**  
**DO NOT LOOK INTO THE APERTURE.**  
**LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.**

- NOTES...**
1. The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.
  2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Multimode Optical.

This port is available on the S8063 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.



Table 3.12: Multimode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MULTIMODE)
Wavelength	1300 nm Multimode (MMF)

**NOTE...**  
 The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.



## 3.9 STM-1 OC3 Monomode Physical Interface Module (M2/EOM2/ATMS155SM)

### 3.9.1 Assembly

See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.

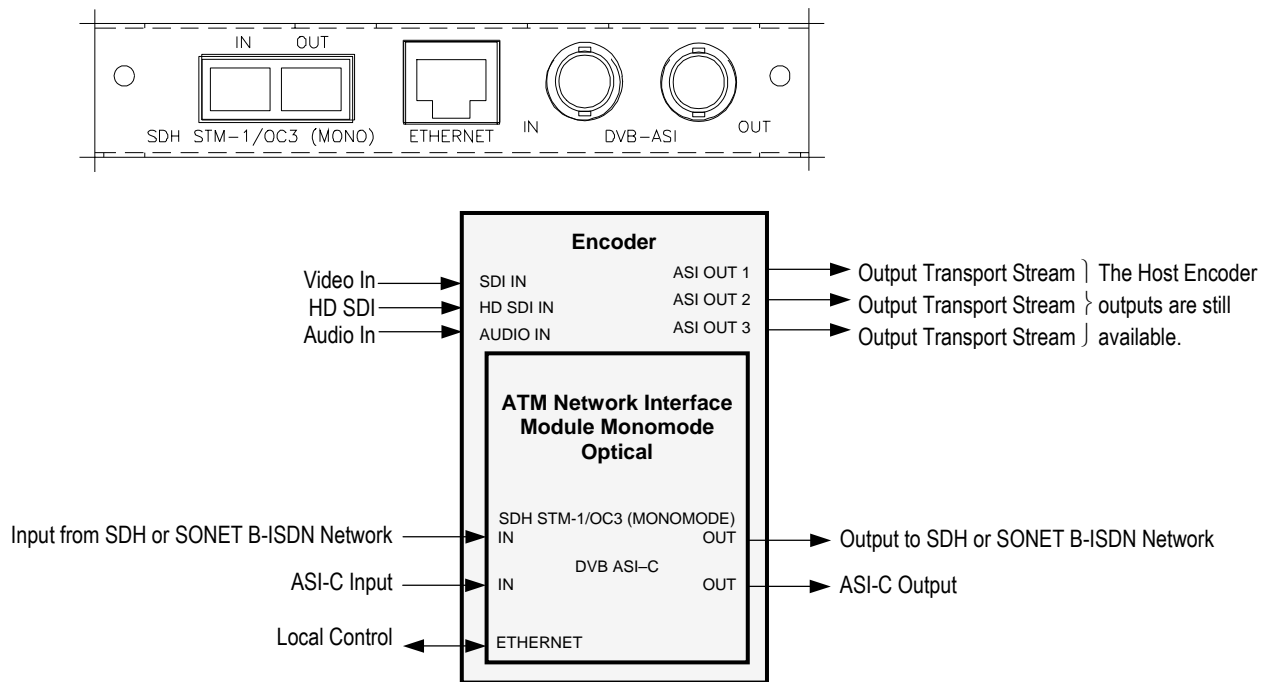


Figure 3.9: ATM Network Interface Module, Monomode Optical (M2/EOM2/ATMS155SM)

### 3.9.2 Monomode Fibre Optic Connector

**WARNING...**

**LASER: CLASS I LASER PRODUCT**

**DO NOT LOOK INTO THE APERTURE.**

**LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.**

#### NOTES...

1. The Class 1 LASER warning is as defined in paragraph 5.2 of EN 60825-1 1994.
2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Monomode Optical.
3. The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

This port is available on the S8067 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.



Table 3.13: Monomode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MONOMODE)
Wavelength	1300 nm Monomode / Singlemode (SMF)

### 3.10 M2/EOM2/ATMS34 PDH/E3 Module

#### 3.10.1 Assembly

See Table 3.1 for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to Section 3.7.3, Common Connectors on page 3-18.

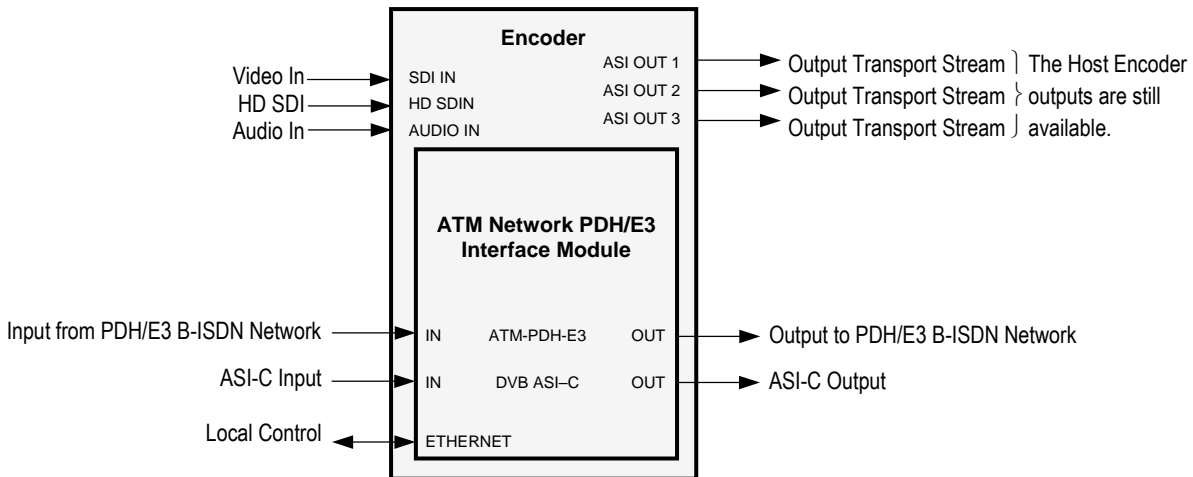
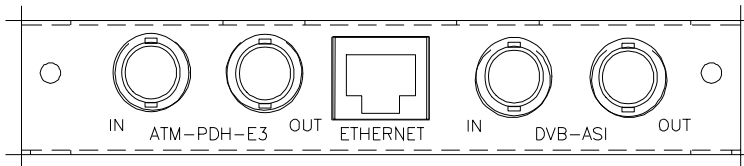


Figure 3.10: Rear Panel Connectors (M2/EOM2/ATMS34 ATM PDH/E3 Module)

### 3.10.2 Connectors

This port is available on the S11366 physical layer option module. It provides a bi-directional interface to a PDH/E3 network at a transmission rate of 34.368 Mbit/s. This is a full duplex service.



Table 3.14: PDH/E3 Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-E3

## 3.11 M2/EOM2/ATMS45 PDH/DS3 Module

### 3.11.1 Assembly

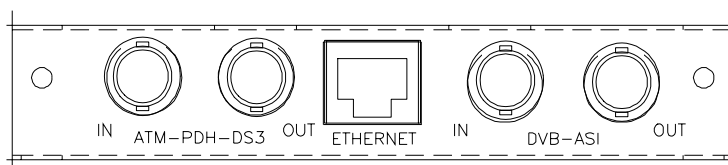
See *Table 3.1* for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.7.3, Common Connectors* on page 3-18.

DS-3 is the third level in the PDH multiplex hierarchy found in North America. DS-3 has a bandwidth of 44.736 Mbit/s and carries seven DS-2 channels of 6.312 Mbit/s, these in turn carry four DS-1 signals of 1.544 Mbit/s.

There are currently four different ways to transmit ATM cells over DS-3. They are:

- C-bit parity ADM
- C-bit parity PLCP
- M23 ADM
- M23 PLCP



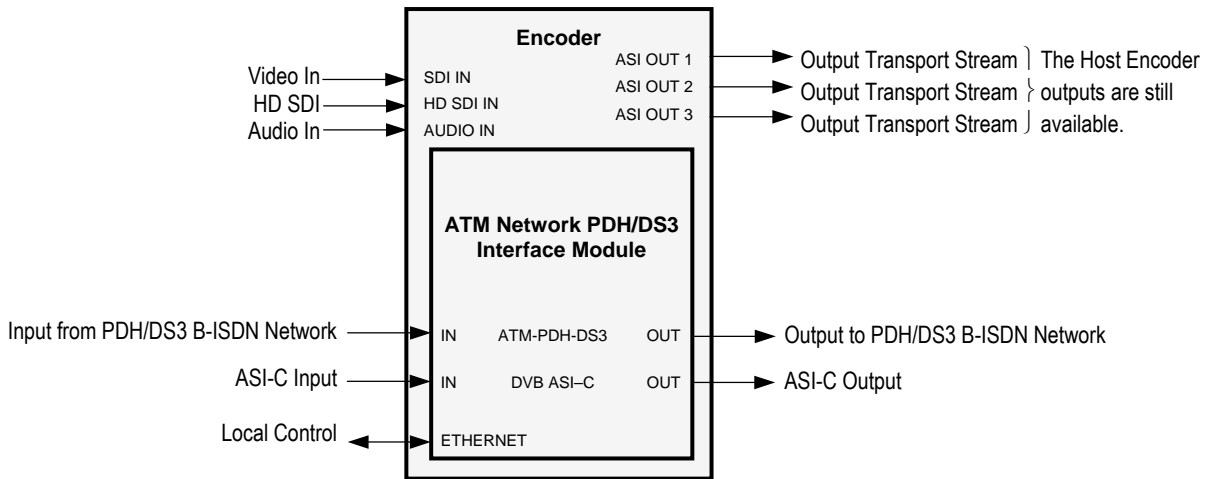


Figure 3.11: Rear Panel Connectors (M2/EOM2/ATMS45 ATM PDH/DS3 Module)

### 3.11.2 Connectors

This port is available on the S11365 physical layer option module. It provides a bi-directional interface to a PDH/DS3 network at a transmission rate of 45 Mbit/s. This is a full duplex service.



Table 3.15: PDH/DS3 Connector

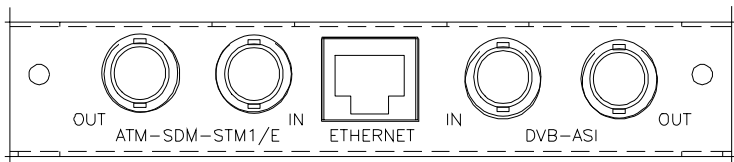
Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-DS3

## 3.12 M2/EOM2/ATMS155E STM-1 Electrical Module

### 3.12.1 Assembly

See Table 3.1 for the slots that it can be installed in.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to Section 3.7.3, Common Connectors on page 3-18.



**NOTE...**  
Be aware that the BNC connector positions on this module are reversed when compared to the same connectors on the E3 and DS3 modules.

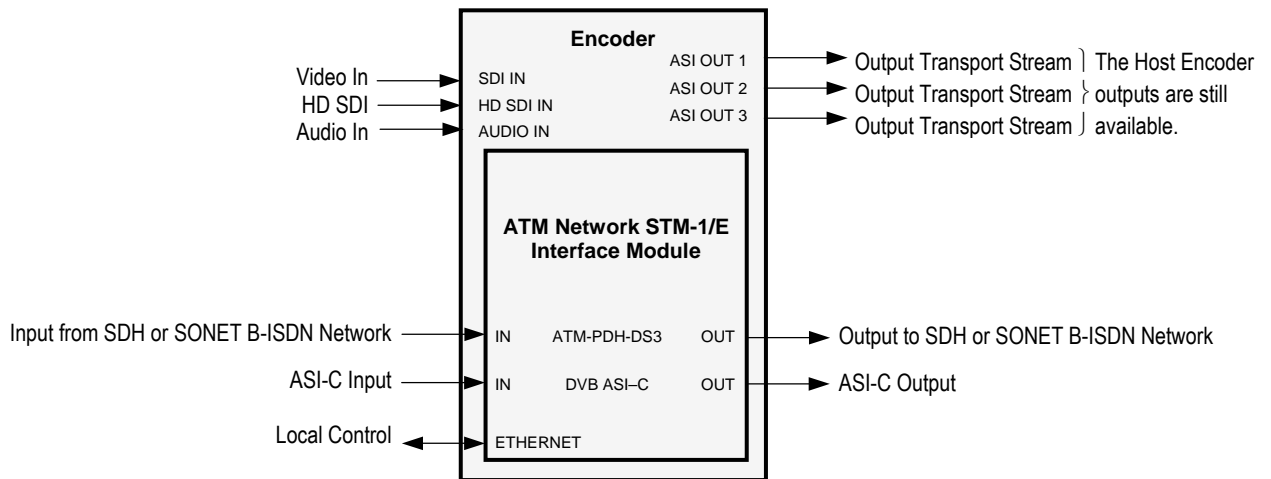


Figure 3.12: Rear Panel Connectors (M2/EOM2/ATMS155E ATM STM-1 Electrical Module)

### 3.12.2 Connectors

This port is available on the S11367 physical layer option module. It provides a bi-directional interface to a SDH STM-1/SONET STS-3c network at a transmission rate of 155.520 Mbit/s. This is a full duplex service.

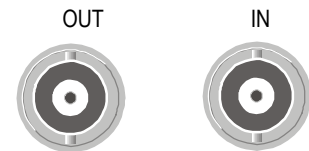


Table 3.16: SDH STM-1/SONET STS-3c Electrical Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-SDM-STM1/E

## 3.13 IP Output Card (M2/EOM2/IP)

### IP Card Pro-MPEG FEC (M2/EOM2/IP/PROFEC)

#### 3.13.1 Overview

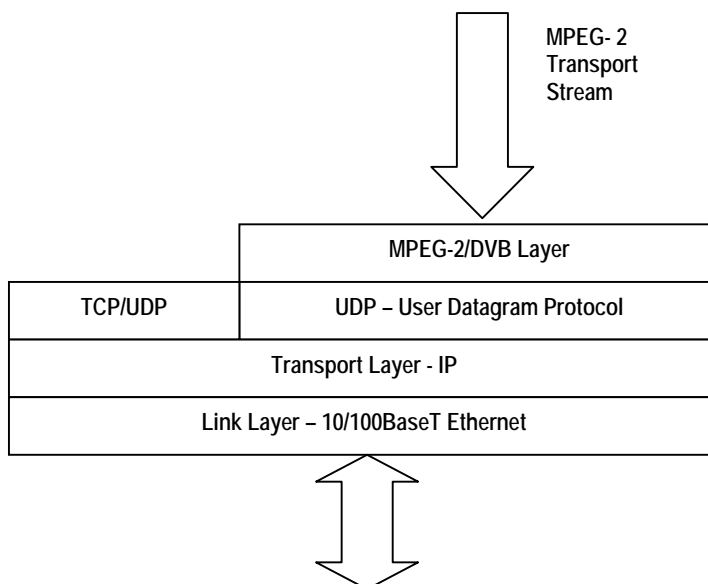
The IP Output card provides a 10/100BaseT Ethernet port, out of which the transport stream generated by the Encoder can be output in UDP packets at up to 50 Mbit/s.

The mapping of MPEG-2 transport stream packets into IP data frames is done according to the protocol stack shown in *Figure 3.13*.

##### NOTE...

More support has been given in V2.8.x of the IP Output Card in V3.6.x of the Encoder. This is accessed using menu items on the IP menu tree from the front panel, telnet and web interfaces.

- The IP output can be turned off using the IP Output menu item.
- A Line Mode menu item allows the setting to be either 'Fixed' or 'Auto'.



*Figure 3.13: IP Output Protocol Stack*

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 10/100 Mbit/s, twisted pair, via RJ-45 connector).

#### 3.13.2 Support for Pro MPEG FEC

This option sets the parameters and protocol required to send video over IP.

#### 3.13.3 Smallcasting Mode

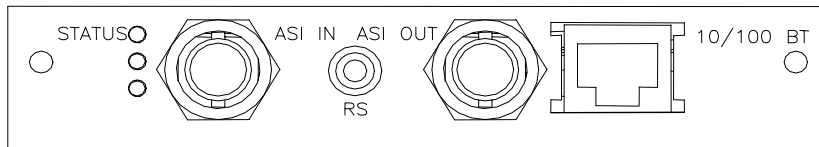
In this mode, the transport stream can be transmitted to four specified IP addresses.

**NOTE...**

The maximum multiplexer output rate, which can be reliably streamed to each IP address, is reduced for each extra destination address that is added. i.e. if two destinations are specified, the maximum rate for each address is half of that for one address, and so on.

### 3.13.4 Assembly

#### Rear Panel



#### ASI In

A 75 Ω female BNC connector provides an ASI input.

**NOTE...**

This connector is not used.

Table 3.17: ASI In Connector

Item	Specification	
Connector Type	75 Ω BNC Female	
Connector designation	ASI IN	
Pin-outs	Centre	Signal
	Screen	Ground

#### RS-232 Control

A 3.5mm socket provides a debug interface.

**NOTE...**

This connector is for TANDBERG Television use only.

#### ASI Out

A 75 Ω female BNC connector provides an ASI output.

**NOTE...**

This connector is not used.

Table 3.18: ASI Out Connector

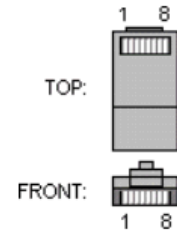
Item	Specification	
Connector Type	75 $\Omega$ BNC Female	
Connector designation	ASI OUT	
Pin-outs	Centre	Signal
	Screen	Ground

## Ethernet Output

An RJ-45 connector provides a 10/100BaseT Ethernet port.

Table 3.19: 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 (+)
	4	Not Connected
	5	Not Connected
	6	Rx In (-)
	7	Not Connected
	8	Not Connected





## 3.14 G.703 Interface Card Option (M2/EOM2/G703)

### 3.14.1 Overview

See *Table 3.1* for the slots that it can be installed in.

The G.703 Interface Card provides a G.703 adapted Encoder Transport Stream Output at a maximum rate of either:

- DS-3 at 44.736 Mbit/s
- E3 at 34.368 Mbit/s

See *Table 3.1* for the slots that it can be installed in.

### 3.14.2 Assembly

#### Rear Panel

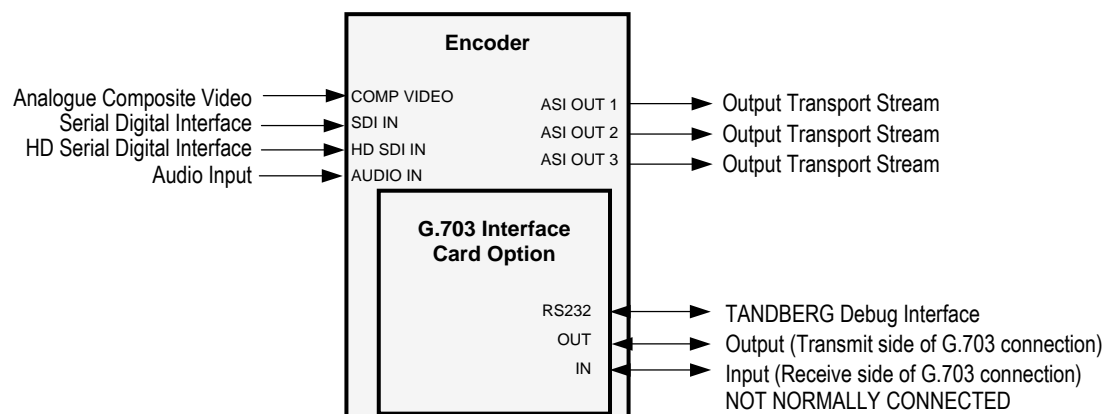
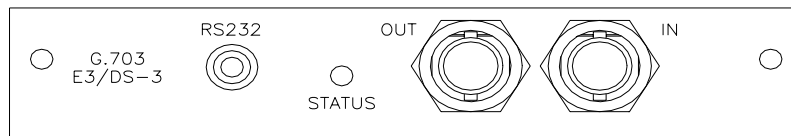


Figure 3.14: G.703 Interface Card Option M2/EOM2/G703

#### OUT Connector

A 75  $\Omega$  female BNC connector provides a G.703 transport stream output.

Table 3.20: Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

## IN Connector

**NOTE...**

This is not normally connected.

A 75  $\Omega$  female BNC connector provides a G.703 transport stream input.

*Table 3.21: In Connector*

Pin	Signal
Centre	Signal
Screen	Ground

## RS-232 Connector

A 3.5 mm socket provides a TANDBERG debug interface.

## 3.15 GPI Card (M2/EOM2/GPI)

### 3.15.1 Overview

The GPI Card connector allows various specific Encoder functions to be controlled using contact closure inputs. In addition, contact closure outputs are available for future use.

- 8 Contact Closure Inputs (intended to operate at TTL level signals) with input protection. The controlled functions are software assigned.
- 2 Contact Closure Outputs which can be either open circuit or connected to the common output. Each output has inverted or non-inverted contacts

### 3.15.2 Assembly

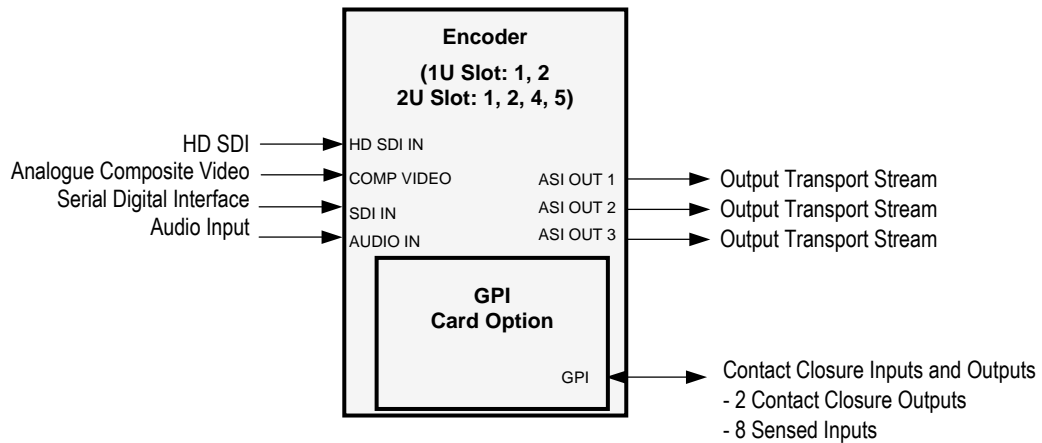


Figure 3.15: General Purpose Interface M2/EOM2/GPI

### 3.15.3 Connector

Table 3.22: GPI Connector

Item	Specification	Item	Specification
Connector Type	15-way D-type Male	Connector designation	GPI
Pin-out	1 Input 0	Pin-out	9 GND
	2 Input 1		10 Output 1 NI
	3 Input 2		11 Output 1 Common
	4 Input 3		12 Output 1 I
	5 Input 4		13 Output 2 NI
	6 Input 5		14 Output 2 Common
	7 Input 6		15 Output 2 I
	8 Input 7		

## **3.16 Software Options**

### **3.16.1 Standard Definition**

#### **M2/ESO2/NR**

This purchasable option upgrades the Encoder to include noise reduction mode. Contact Customer Services for details.

#### **M2/ESO2/VBR**

This purchasable option upgrades the Encoder to include variable bit-rate. Contact Customer Services for details.

#### **M2/ESO2/422**

This purchasable option upgrades the Encoder to include 4:2:2 video encoding mode. Contact Customer Services for details.

#### **M2/ESO2/RAS**

This purchasable option upgrades the Encoder to include RAS mode. Contact Customer Services for details.

#### **M2/ESO2/ACON**

This purchasable option upgrades the Encoder to include auto concatenation. Contact Customer Services for details.

#### **M2/ESO2/AC3**

This purchasable option allows the Encoder to provide Dolby Digital (AC-3) audio. Contact Customer Services for details.

#### **M2/ESO2/SM38PSK**

This purchasable option allows the Encoder to provide 8PSK modulation. Contact Customer Services for details.

#### **M2/ESO2/SM316QAM**

This purchasable option allows the Encoder to provide 16QAM modulation. Contact Customer Services for details.

#### **M2/ESO2/LSYM**

This purchasable option allows the Encoder to work at low symbol rates (300 ksym/s minimum). Contact Customer Services for details.

#### **M2/ESO2/MHP**

This purchasable option allows the Encoder to provide MHP timing Events. Contact Customer Services for details.

#### **M2/ESO2/DTS**

This purchasable option allows the Encoder to provide DTS Audio. Contact Customer Services for details.

**M2/ESO2/525VBIDATA**

This purchasable option allows the Encoder to provide NABTS and GEMSTAR 2.0 VBI extraction. Contact Customer Services for details

**M2/ESO2/DPI**

This purchasable licence key allows the GPI purchasable option module to provide an SCTE35 splicing. Contact Customer Services for details.

**M2/ESO2/EthernetData**

This purchasable licence key enables the reception of fully formed 188-byte transport packets coming in as UDP datagrams on the Encoder's Ethernet port.

**3.16.2 High Definition****M2/ESO2/HDNR**

This purchasable option upgrades the Encoder to include noise reduction mode for HD. Contact Customer Services for details.

**M2/ESO2/HDVBR**

This purchasable option upgrades the Encoder to include variable bit-rate for HD. Contact Customer Services for details.

**M2/ESO2/HD422**

This purchasable option upgrades the Encoder to include 4:2:2 video encoding mode for HD. Contact Customer Services for details and to check that you have the relevant hardware required.

**M2/ESO2/HD-MPASS**

This purchasable option upgrades the Encoder to operate in multipass mode in a reflex group. Contact Customer Services for details.

BLANK

# Chapter 4

## Operating the Equipment Locally

### Contents

4.1	Introduction .....	4-11	
4.2	Establishing Local Control.....	4-11	
4.2.1	Input Monitor.....	4-11	
4.2.2	Summary Screen.....	4-12	
4.2.3	Line Up Menu .....	4-12	
4.2.4	A(audio)/V(ideo) Menu .....	4-12	
4.2.5	Keyboard Lock.....	4-12	
4.3	Navigating the Display Screens .....	4-13	
4.3.1	Moving Through the Menu Screens .....	4-13	
4.3.2	How to Use the Keypad.....	4-13	
4.3.3	How to Use the Functions Associated with Softkeys .....	4-14	
4.3.4	Display Screens.....	4-15	
4.3.5	Menu Formats .....	4-15	
4.3.6	Summary Screen and Advanced Menus .....	4-17	
4.4	Setup Menu.....	4-17	
4.5	System Menu .....	4-17	
4.5.1	Introduction.....	4-17	
4.5.2	Service Info Menu (Syntax = ATSC).....	4-19	
	Overview.....	4-19	
	Short Channel Name Option .....	4-19	
	Long Channel Name Option .....	4-19	
	Syntax Option .....	4-19	
	Remux Input n Mode .....	4-19	
	SI Level Option .....	4-20	
	Ext. PSIP Source Option .....	4-20	
	PSIP Status .....	4-20	
	PSIP Min PID.....	4-20	
	PSIP Max PID.....	4-20	
	Data n min/max .....	4-20	
	Major Channel Option.....	4-20	
	Minor Channel Option .....	4-21	
	Program Number Option.....	4-21	
	Service Type Option .....	4-21	
	Transport Stream Id Option .....	4-21	
	Program Paradigm Option .....	4-21	
	PMT PID Option.....	4-21	
	Daylight Saving .....	4-21	
	DST Start Date and DST End Date Options.....	4-21	
	DVB Subtitles.....	4-21	
4.5.3	Service Info Menu (Syntax = DVB) .....	4-22	
	Overview .....	4-22	
	Network Name Option.....	4-22	
	Service Provider Option .....	4-22	
	Service Name Option.....	4-22	
	Syntax Option .....	4-22	
	Remux Input n in Mode.....	4-23	
	SI Level Option .....	4-23	
	Data n min/max.....	4-23	
	Network Id Option .....	4-24	
	Service Id Option .....	4-24	
	Transport Stream Id Option .....	4-24	
	Service Type Option .....	4-24	
	PMT PID Option.....	4-24	
	Stream ID Descriptor Option.....	4-24	
	Dolby AC-3 Descriptor Option.....	4-24	
	Logical Chan Desc Option .....	4-25	
	Logical Channel Option.....	4-25	
	DVB Subtitles.....	4-25	
4.5.4	Remote Control Menu.....	4-25	
	Overview .....	4-25	
	IP Address Option.....	4-26	
	MAC Address Option .....	4-26	

Network Mask Option.....	4-26	4.6.2	Video Source Menu.....	4-34
Gateway Address Option.....	4-26		Overview.....	4-34
Set Community Name Option.....	4-26		Video Input Option.....	4-34
SNMP Master Option.....	4-26		Input Source Select (SD Only).....	4-37
Last SNMP Master Option.....	4-26		Frame Rate Option (SD Only).....	4-37
Last SNMP Poll Option.....	4-26		HD Input Format.....	4-37
SNMP Trap IP Option.....	4-26		Input Video Sense (HD Only).....	4-37
Trap Level Report Option.....	4-26		Input Horiz Res (HD Only).....	4-38
Browser User Name Option.....	4-26		Video Locked (SD Only) and HD Video Locked Option.....	4-38
Browser Password Option.....	4-26		Ident Text Option (SD Only).....	4-38
SNTP Server Option.....	4-27		Video Bandwidth Option.....	4-38
Ethernet Bandwidth Option.....	4-27		Adaptive Pre-processing.....	4-38
SABus Address Option.....	4-27		OP Video Loss Option.....	4-38
Serial Protocol Option.....	4-27		Predictive Processing (SD Only).....	4-39
SABus Baud Rate Option.....	4-27		Input Termination Option (SD Analogue Only).....	4-39
SABus Data Bits Option.....	4-27		Noise Reduction Option.....	4-39
Serial Menu Remote Control.....	4-27		Max Still Period Option (SD Only).....	4-40
4.5.5 General Menu.....	4-28		Default 625 [Analog].....	4-40
Overview.....	4-28		Default 525 [Analog].....	4-40
Model Number Option.....	4-28		I/P Monitor Refresh Option.....	4-41
Config Name Option.....	4-28		Text Colour Option (SD Only).....	4-41
Local Time Option.....	4-28		Background Colour Option (SD Only).....	4-41
Local Date Option.....	4-28		Logo Option (When Logo Downloaded into Unit).....	4-41
UTC Offset Option.....	4-28		Time Code Option.....	4-41
GPS UTC Offset.....	4-28	4.6.3	Video Filter/Process (SD only).....	4-42
Temperature Option.....	4-28	4.6.4	Video Encoder Menu.....	4-42
Screen Saver Option.....	4-29		Overview.....	4-42
Keypress Beep Option.....	4-29		Profile/Level Option.....	4-42
Power Dip Recovery Option.....	4-29		Compression Mode Option.....	4-42
Upgrade Encoder Option.....	4-29		Bit-rate Option.....	4-44
Software Release Option.....	4-29		Bit-rate Tracking.....	4-44
Fan Control Option.....	4-29		VBR Mode (HD).....	4-44
4.5.6 Time and Date.....	4-30		VBR Mode (SD Only) Option.....	4-45
4.5.7 Advanced Menu.....	4-30		Delay Option.....	4-46
Overview.....	4-30		Resolution Option.....	4-46
Setup Password Option.....	4-30		Aspect Ratio Option.....	4-47
Current Password Option.....	4-30		AFD Option (SD Only).....	4-47
Display Errors Option.....	4-30		GOP Structure Option.....	4-48
System Control Option.....	4-30		GOP Length Option.....	4-49
Action On PID Error Option.....	4-31		Long GOPs Option.....	4-49
SNMP Control Option.....	4-31		Adaptive GOP.....	4-50
Display Contrast Option.....	4-31		Field/Frame Option (SD Only).....	4-50
No. Services Option.....	4-31		3:2 Pulldown Option.....	4-50
Mbd. Service PIDs Option.....	4-31		Concatenation Option (SD Only).....	4-51
Reset On Download Option (Status Only) ..	4-31		PID Option.....	4-51
Reset Encoder Option.....	4-32		Component Tag Option.....	4-51
4.5.8 Digital Programme Insertion (DPI) Menu....	4-32		Reflex Enable Option.....	4-51
4.5.9 Build Menu.....	4-32		Indicated Bit-Rate Option (SD Only).....	4-51
4.5.10 Additional Services (Mbd Services Menu) ..	4-32		Copyright Option.....	4-51
Overview.....	4-32		Original Option.....	4-51
Host Service 1.....	4-32		Scene Cut Detection.....	4-51
4.6 Video Menu.....	4-34			
4.6.1 Introduction.....	4-34			



Insert VBV Delay Option (SD Only).....	4-52	Audio Alignment.....	4-70
PES Header Option.....	4-52	Lip Sync Adjustment.....	4-71
AFD Location Option (SD Only).....	4-52	Input Level L Option.....	4-71
Intra DC Precision.....	4-52	Input Level R Option.....	4-71
Rate Buffer Mode (SD Only).....	4-52	Audio Bit-rate Option.....	4-71
Encoder Type Option.....	4-52	Coding Mode Option.....	4-72
S/W Release Option.....	4-52	Auto Lip Sync Option.....	4-72
AFD HD (HD Only).....	4-52	Lip Sync Offset Option.....	4-72
4.6.5 Vertical Blanking Interval (VBI)/Userdata		Audio Delay Option.....	4-73
Menu.....	4-53	Use Minimum Delay.....	4-73
Overview.....	4-53	Actual Audio Delay.....	4-73
VBI/Userdata Menu (25/50 Hz Frame		Sampling Rate Option.....	4-73
Rate).....	4-53	Clip Level Option.....	4-73
VBI Menu (29.97/30/59.94/60 Hz Frame		Impedance Option.....	4-73
Rate).....	4-59	Language Option.....	4-73
4.7 Audio Menu.....	4-62	Bit Stream Mode Option.....	4-74
4.7.1 Overview.....	4-62	Dialogue Level Option.....	4-74
4.7.2 Audio A / B Menus – MPEG Layer 2.....	4-62	Dolby Srnd Mode Option.....	4-74
Introduction.....	4-62	Production Info Option.....	4-74
Source Option.....	4-62	Mixing Level Option.....	4-75
Coding Standard Option.....	4-62	Room Type Option.....	4-75
Input Level L Option.....	4-64	Copyright Option.....	4-75
Input Level R Option.....	4-64	Original Option.....	4-75
Audio Bit-rate Option.....	4-64	Dynamic Range Option.....	4-75
Coding Mode Option.....	4-64	RF Protection Option.....	4-76
VPS Controls Coding Mode.....	4-65	De-emphasis Option.....	4-76
VPS Coding Mode.....	4-65	DC Filter Option.....	4-76
VPS Word 5.....	4-65	Low Pass Filter Option.....	4-76
VPS Stereo Mode.....	4-66	Embedded Source Option.....	4-76
VPS Dual Chan Mode.....	4-66	Embedded 1-2 DID Option.....	4-77
Auto Lip Sync Option.....	4-67	Embedded 3-4 DID Option.....	4-77
Use Minimum Delay.....	4-67	Audio PID Option.....	4-77
Lip Sync Offset Option.....	4-67	Component Tag Option.....	4-77
Audio Delay Option.....	4-67	PCR On Audio PID Option.....	4-77
Actual Audio Delay.....	4-67	OP Digital Loss.....	4-77
Clip Level Option.....	4-67	Hardware Release Option.....	4-78
Impedance Option.....	4-68	Software Release Option.....	4-78
Language or Language Left/Right Option ..	4-68		
De-emphasis Option.....	4-68	4.7.4 Audio (Dolby (AC-3) Pass-thru, Dolby E	
Copyright Option.....	4-68	Pass-thru and DTS Pass-thru) Menu.....	4-78
Original Option.....	4-68	Source Option.....	4-78
Embedded Source Option.....	4-68	Coding Standard Option.....	4-78
Embedded 1-2 DID Option.....	4-69	Audio Alignment (Dolby E only).....	4-78
Embedded 3-4 DID Option.....	4-69	Lip Sync Adjustment.....	4-79
Audio PID Option.....	4-69	Audio Bit-rate Option.....	4-79
Component Tag Option.....	4-69	Auto Lip Sync Option.....	4-79
PCR On Audio PID Option.....	4-69	Use Minimum Delay.....	4-79
OP Digital Loss.....	4-69	Lip Sync Offset Option.....	4-80
Hardware Release Option.....	4-69	Audio Delay Option.....	4-80
Software Release Option.....	4-70	Actual Audio Delay.....	4-80
4.7.3 Audio (Dolby Digital (AC-3) Menu).....	4-70	Language Option.....	4-80
Source Option.....	4-70	SMPTE 302M Standard Option.....	4-80
Coding Standard Option.....	4-70	Channel Option.....	4-80
		Embedded Source Option.....	4-81

Embedded 1-2 DID Option.....	4-81	Original Option.....	4-91
Embedded 3-4 DID Option.....	4-81	Embedded 1-2 DID Option .....	4-91
Audio PID Option .....	4-81	Embedded 3-4 DID Option .....	4-91
Component Tag Option.....	4-81	Level [L] Option .....	4-92
PCR On Audio PID Option.....	4-81	Level [R] Option.....	4-92
OP Digital Loss .....	4-81	Component Tag Option .....	4-92
Hardware Release Option.....	4-82	4.8 Data Menu .....	4-93
Software Release Option .....	4-82	4.8.1 Introduction.....	4-93
4.7.5 Audio (Linear PCM [Direct][Via SRC])		4.8.2 Data A - RS232 Menu .....	4-93
Menu .....	4-82	Encoding Option .....	4-93
Source Option .....	4-82	Baud Rate Option.....	4-94
Coding Standard Option .....	4-82	RS232 PID Option.....	4-94
Audio Alignment.....	4-83	Component Tag Option .....	4-94
Lip Sync Adjustment .....	4-83	Buffer Data Option.....	4-94
Input Level L Option.....	4-83	Delay Option.....	4-95
Input Level R Option .....	4-83	SNMP oid index Option .....	4-95
Coding Mode Option .....	4-84	O/P Bit-rate Option .....	4-95
Auto Lip Sync Option .....	4-84	4.8.3 Data B - RS422 Menu .....	4-95
Lip Sync Offset Option .....	4-84	Encoding Option .....	4-95
Use Minimum Delay.....	4-84	Bit-rate Option .....	4-95
Audio Delay Option .....	4-84	RS422 PID Option.....	4-96
Actual Audio Delay.....	4-84	Component Tag Option .....	4-96
Clip Level Option.....	4-85	Test Mode Option.....	4-96
Impedance Option.....	4-85	Delay Option.....	4-96
Language or Language Left/Right Option...	4-85	D Mode Option .....	4-96
SMPTE 302M Standard Option .....	4-85	SNMP oid index Option .....	4-96
Channel Option .....	4-86	Version Option.....	4-96
Embedded Source Option.....	4-86	4.8.4 Data C – Ethernet Menu.....	4-96
Embedded 1-2 DID Option.....	4-86	Licence Key.....	4-96
Embedded 3-4 DID Option.....	4-86	Encoding.....	4-96
Audio PID Option .....	4-86	Port Number .....	4-97
Component Tag Option.....	4-86	PID.....	4-97
PCR On Audio PID Option.....	4-87	Pkts Received.....	4-97
OP Digital Loss .....	4-87	Pkts Sent .....	4-97
Hardware Release Option.....	4-87	Alarm Screen.....	4-97
Software Release Option .....	4-87	4.9 Output Menu .....	4-97
4.7.6 Audio Languages Menu .....	4-87	4.9.1 Overview.....	4-97
4.7.7 Advanced Audio Coding		4.9.2 Output Format Option.....	4-97
(M2/EOM/ADVAUD) .....	4-88	4.9.3 Delivery Descriptor Menu .....	4-98
Overview .....	4-88	4.9.4 Descriptor Type Option.....	4-98
Input Source Option .....	4-88	4.9.5 Descriptor Type = Terrestrial.....	4-100
Coding Standard Option .....	4-88	Band Plan Option .....	4-100
Bit-rate Option.....	4-88	Channel Option.....	4-100
Coding Mode Option .....	4-89	Frequency Option.....	4-100
PID .....	4-90	Bandwidth Option .....	4-101
PCR On Audio PID Option.....	4-90	Modulation Type Option .....	4-101
Delay.....	4-90	Hierarchy Option.....	4-101
Auto Lip Sync Option .....	4-90	FEC (HP) and FEC (LP) Options .....	4-102
Use Minimum Delay.....	4-90	Guard Interval Option .....	4-102
Language or Language Left/Right Option...	4-91	Carriers Options .....	4-102
OP on Digital I/P Loss.....	4-91	Other Frequency Option.....	4-103
Temporal Noise Shaping.....	4-91	4.9.6 Descriptor Type = Cable.....	4-103
ADTS CRC.....	4-91		
Copyright Option .....	4-91		

Frequency Option .....	4-103	Preset Pwr Low Option .....	4-111
Modulation Type Option .....	4-103	Preset Pwr Norm Option .....	4-111
FEC (Outer) Option .....	4-103	BUC DC Power .....	4-111
FEC (Inner) Option .....	4-104	Sat Deliv Freq Option.....	4-111
Symbol Rate Option .....	4-104	Sat Orb Pos Option.....	4-112
4.9.7 Descriptor Type = Satellite .....	4-104	Sat West/East Option.....	4-112
Frequency Option .....	4-104	Polarisation Option.....	4-112
Modulation Type Option .....	4-104	Status Only Options for the Satellite	
FEC (Inner) Option .....	4-104	Modulator Menu .....	4-112
Symbol Rate .....	4-105	BUC LO Frequency.....	4-112
Orbital Position Option.....	4-105	Transmit Frequency .....	4-112
West East Option.....	4-105	BUC 10 MHz Ref O/P Option.....	4-112
Polarisation Option .....	4-105	4.9.10 Output Format = IP Streamer	
4.9.8 Output Format = Satellite Modulator (IF		(M2/EOM2/IP/PROFEC Option Module)...	4-112
Output).....	4-105	Own IP Address Option .....	4-112
TS Input Source.....	4-105	Network Mask Option.....	4-113
IF Output Option.....	4-106	Router IP Address Option .....	4-113
IF Power Option.....	4-106	IP Output.....	4-113
IF Frequency Option.....	4-106	Protocol/Pro-MPEG FEC Option.....	4-113
Modulation Option .....	4-106	TS Pkts/UDP Frm Option.....	4-113
Mod Type Option .....	4-106	Nbr of Cols Option .....	4-113
Symbol Rate Option .....	4-107	Nbr of Rows Option.....	4-113
FEC Rate Option .....	4-107	Destination x IP Address Option .....	4-113
Spectrum Sense Option .....	4-107	Destination x UDP Port Option .....	4-114
Roll Off Factor Option.....	4-107	Time To Live Option.....	4-114
Tx Bandwidth Factor Option .....	4-107	Type of Service Option .....	4-114
Tx Bandwidth Option .....	4-108	Line Mode .....	4-114
Bit-rate (188) Option .....	4-108	4.9.11 Output Format = G.703 Output .....	4-114
Bit-rate (204) Option .....	4-108	Introduction .....	4-114
Preset Pwr Low Option.....	4-108	PDH Rate Option .....	4-114
Preset Pwr Norm Option.....	4-108	Framing Option .....	4-114
Sat Deliv Freq Option .....	4-108	DS-3 Signal Level Out Option.....	4-114
Sat Orb Pos Option .....	4-109	Reed-Solomon Option .....	4-115
Sat West/East Option .....	4-109	Interleaver Option .....	4-115
Polarisation Option .....	4-109	Randomizer Option .....	4-115
Status Only Options for the Satellite		Clock Mode Option .....	4-115
Modulator Menu.....	4-109	Direction Option .....	4-115
4.9.9 Output Format = Satellite Modulator (L-		Mode Option .....	4-116
Band Output) .....	4-110	Reset Option .....	4-116
TS Input Source.....	4-110	MPEG Input Row Option.....	4-116
Rate Adaptation Option .....	4-110	Output Rate Option .....	4-116
L-Band Output Option.....	4-110	Alarm Status Option.....	4-116
L-Band Power Option .....	4-110	Show Config Status Differences Option....	4-116
Frequency Option .....	4-110	4.10 Mux Menu.....	4-116
Modulation Option .....	4-110	4.10.1 Overview .....	4-116
Mod Type Option .....	4-110	4.10.2 Mux Output, no Remux Card .....	4-116
Symbol Rate Option .....	4-111	4.10.3 Mux Output, With Remux Card .....	4-117
FEC Rate Option .....	4-111	4.10.4 Packet Length Option .....	4-120
Spectrum Invert Option.....	4-111	4.10.5 On Air Option .....	4-120
Roll Off Factor Option.....	4-111	4.10.6 Bit-rate (188) and Bit-rate (204) Option ....	4-120
Tx Bandwidth Factor Option .....	4-111	4.10.7 Clock .....	4-120
Tx Bandwidth Option .....	4-111	4.10.8 PCR PID Option.....	4-121
Bit-rate (188) Option .....	4-111	4.10.9 FPGA Firmware .....	4-121
Bit-rate (204) Option .....	4-111		

4.10.10 RAS Firmware.....	4-121	Asi Stuffing Bytes Option.....	4-133
4.10.11 BISS Hardware .....	4-121	Status-only Options .....	4-133
4.10.12 BISS Firmware.....	4-121	4.11.16 Physical Menu .....	4-134
4.10.13 RAS Options Enabled .....	4-121	Mode Option.....	4-134
Scramble Option .....	4-121	Path Label Option.....	4-134
SNG Key (RAS1) Option.....	4-122	Tx Clock Source Option.....	4-134
4.10.14 BISS Options Enabled .....	4-122	Cell Mode Option.....	4-135
Overview .....	4-122	Interface Option.....	4-135
Scramble Option .....	4-123	4.12 Remux Menu.....	4-136
Session Word Option .....	4-123	4.12.1 Introduction.....	4-136
Enc Session Word Option .....	4-123	4.12.2 Addition to Mux Menu When Remux	
BISS-E Injected Id Option .....	4-124	Fitted.....	4-136
4.11 ATM Network Interface Option Module Menu .....	4-124	Host Bit-rate Option .....	4-136
4.11.1 Overview .....	4-124	4.12.3 Remux Module Menu .....	4-136
4.11.2 Add Connection Option.....	4-124	PID Remap .....	4-136
4.11.3 Delete Connection Option .....	4-126	Packet Length Option .....	4-137
4.11.4 View Connection List Menu.....	4-126	Bit-rate Option .....	4-137
4.11.5 View Connection ID Menu.....	4-126	Status Only Options for the Remux	
View Connection ID Option.....	4-126	Module Menu.....	4-137
4.11.6 Add Profile Menu.....	4-127	4.12.4 1.Service/2.Service Menu.....	4-138
Overview .....	4-127	Output Option .....	4-138
Profile Name Option.....	4-127	Source (BNC) Option .....	4-138
VC Type Option .....	4-127	Short Name In Option.....	4-138
ATM Address Option.....	4-127	Short Name Out Option.....	4-138
VPI Option.....	4-128	Name (In) Option.....	4-138
VCI Option .....	4-128	Name Out Option .....	4-139
Direction Option .....	4-128	Service Prov (In) Option .....	4-139
AAL Option.....	4-128	Service Provider Option.....	4-139
4.11.7 Delete Profile Menu.....	4-129	Service Id (Out) Option.....	4-139
4.11.8 Edit Profile Option .....	4-129	Program Number (Out) Option.....	4-139
4.11.9 Add Authorisation Menu.....	4-129	Major Channel Option.....	4-139
Overview .....	4-129	Minor Channel Option.....	4-139
Authorisation Name Option.....	4-129	Logical Channel Option .....	4-140
ATM Address Option.....	4-129	CA Input Option.....	4-140
4.11.10 Delete Authorisation Menu.....	4-129	BISS Key Code Option.....	4-140
4.11.11 Edit Authorisation Option .....	4-130	Enc Session Word Option .....	4-140
4.11.12 Incoming Calls Option .....	4-130	Session Word Option.....	4-140
4.11.13 General Menu .....	4-130	PMT PID Option .....	4-140
IP Address Option.....	4-130	PCR PID Option .....	4-140
IP NetMask Option.....	4-130	Video Option.....	4-141
IP Gateway Option .....	4-130	ECM (CA) PID Option .....	4-141
Default ATM Prefix Option .....	4-130	VBI PID Option .....	4-141
Def UNI Version Option .....	4-131	Audio (Type of Audio) Option .....	4-142
Enable SVC PMP Option .....	4-131	Data (Type of Data) Option .....	4-142
Status-only Options.....	4-131	Teletext Option .....	4-142
4.11.14 Tx Menu .....	4-131	4.13 Digital Programme Insertion (DPI) Menu .....	4-143
TS Source Option .....	4-131	4.13.1 Option Availability.....	4-143
AAL5 PCR Aware Option.....	4-132	4.13.2 Overview.....	4-143
Status-only Options.....	4-132	4.13.3 DPI Initiated by GPI.....	4-143
4.11.15 Rx Menu.....	4-132	4.13.4 DPI Initiated by DVS 525.....	4-143
Srce Clk Tolerance Option.....	4-132	4.13.5 Menu Structure.....	4-143
CDV Tolerance Option.....	4-132	4.14 Errors Menu .....	4-145
TS Asi Output Option .....	4-133		

4.14.1 Overview.....	4-145	Table 4.5: DVB Subtitle Options.....	4-22
4.14.2 Active Errors Option .....	4-145	Table 4.6: Syntax Options .....	4-23
Status of Error Masks .....	4-145	Table 4.7: Remux Input n Mode Options.....	4-23
4.14.3 Ignored Errors.....	4-145	Table 4.8: SI Level Options .....	4-23
Status of Error Masks .....	4-145	Table 4.9: Audio AC-3 Descriptor Options .....	4-25
Restore Defaults.....	4-145	Table 4.10: DVB Subtitle Options.....	4-25
4.14.4 Masked Active Errors .....	4-146	Table 4.11: UTC Offset Options .....	4-28
4.15 Diagnostics Menu.....	4-146	Table 4.12: Screen Saver Options .....	4-29
4.16 Configs Menu .....	4-147	Table 4.13: Keypress Beep Options.....	4-29
4.16.1 Accessing the Menu .....	4-147	Table 4.14: Power Dip Recovery Options .....	4-29
4.16.2 Overview.....	4-147	Table 4.15: Fan Control Options.....	4-30
Types of Configuration .....	4-147	Table 4.16: System Control Options.....	4-30
Active Configuration .....	4-147	Table 4.17: Action on PID Error Options .....	4-31
User Configurations.....	4-148	Table 4.18: SNMP Control Options .....	4-31
Backup Configurations .....	4-148	Table 4.19: Video Input Options.....	4-34
Factory HD Default Configurations.....	4-148	Table 4.20: Input Source Select Options.....	4-37
Configuration, Write-Protection .....	4-148	Table 4.21: Frame Rate Options .....	4-37
4.16.3 Quick Configuration From the Summary Screen .....	4-149	Table 4.22: HD Input Format .....	4-37
4.16.4 Load Active Config Option.....	4-149	Table 4.23: Profile/Level Options.....	4-37
4.16.5 Store Active Config Option .....	4-149	Table 4.24: Video Bandwidth Options .....	4-38
4.16.6 Load Configs From Backup Option .....	4-149	Table 4.25: OP Video Loss Options .....	4-39
4.16.7 Store Configs in Backup Option .....	4-149	Table 4.26: Predictive Processing.....	4-39
4.16.8 Factory HD Defaults Option.....	4-150	Table 4.27: Noise Reduction Options (HD Only).....	4-40
		Table 4.28: Noise Reduction Options (SD Only).....	4-40
		Table 4.29: Default 625 Options .....	4-40
		Table 4.30: Default 525 Options.....	4-41
		Table 4.31: Text Colour Options.....	4-41
		Table 4.32: Background Colour Options .....	4-41
		Table 4.33: Profile/Level Options.....	4-42
		Table 4.34: Compression Mode Options .....	4-43
		Table 4.35: Seamless Mode Bit-rate (Full Resolution Only).....	4-43
		Table 4.36: VBR Mode Options.....	4-45
		Table 4.37: Resolution Options .....	4-47
		Table 4.38: Aspect Ratio Options.....	4-47
		Table 4.39: AFD Options .....	4-48
		Table 4.40: AFD Information.....	4-48
		Table 4.41: Group of Pictures Structure Options.....	4-49
		Table 4.42: Group of Pictures Length Options (Long GOPs Disabled) .....	4-49
		Table 4.43: Field/Frame Options .....	4-50
		Table 4.44: AFD HD (HD Only) .....	4-53
		Table 4.45: VBI in Picture Options.....	4-54
		Table 4.46: VBI - Line 'n' Options.....	4-56
		Table 4.47: VBI in Picture Options.....	4-59
		Table 4.48: Source Options.....	4-62
		Table 4.49: Coding Standard Options .....	4-62
		Table 4.50: Audio Bit-rate Options.....	4-64
		Table 4.51: Coding Mode Options (MPEG-2).....	4-65
		Table 4.52: Coding Mode Options (MPEG-2).....	4-65
		Table 4.53: VPS Bits.....	4-66
		Table 4.54: VPS Stereo Mode Options.....	4-66
		Table 4.55: VPS Dual Chan Mode Options .....	4-66
		Table 4.56: Lip Sync Offset Options.....	4-67
		Table 4.57: Audio Delay Options .....	4-67
		Table 4.58: Clip Level Options.....	4-68
		Table 4.59: Embedded 1-2 DID Options.....	4-69
		Table 4.60: OP Digital Loss Options .....	4-69
		Table 4.61: Source Options.....	4-70

### List of Figures

Figure 4.1: Input Monitor.....	4-11
Figure 4.2: Summary Screen.....	4-12
Figure 4.3: Keyboard Lock .....	4-12
Figure 4.4: Keypad and Display Functions.....	4-13
Figure 4.5: Accessing Inscriptions on the Keypad.....	4-14
Figure 4.6: Menu Hierarchy – Summary Screen and Advanced Menus .....	4-16
Figure 4.7: Menu Hierarchy – Setup/System Menu.....	4-18
Figure 4.8: Menu Hierarchy – Setup/Video Menu (SD Mode).....	4-35
Figure 4.9: Menu Hierarchy – Setup/Video Menu (HD Mode).....	4-36
Figure 4.10: VBI Structure Implemented by TANDBERG for 525-line Systems (SD Only).....	4-57
Figure 4.11: VBI Structure Implemented by TANDBERG for 625-line Systems (SD Only).....	4-58
Figure 4.12: Menu Hierarchy – Setup/Audio Menu .....	4-63
Figure 4.10: Advanced Audio Coding Menu.....	4-89
Figure 4.13: Menu Hierarchy – Setup/Data Menu.....	4-93
Figure 4.14: Menu Hierarchy – Setup/Output Menu.....	4-99
Figure 4.15: Menu Hierarchy – Setup/Mux Menu (DVB).....	4-118
Figure 4.16: Menu Hierarchy – Setup/Mux Menu (ATSC).....	4-119
Figure 4.17: Menu Hierarchy – Setup/ATM Menu .....	4-125
Figure 4.18: Menu Hierarchy – Digital Programme Insertion DPI Menu (GPI Initiated) .....	4-143
Figure 4.19: Menu Hierarchy – Error Masks Menu.....	4-146
Figure 4.20: Configuration, Graphical Explanation.....	4-147

### List of Tables

Table 4.1: Keypad Key Assignments.....	4-14
Table 4.2: Syntax Options .....	4-19
Table 4.3: Remux Input n Mode Options.....	4-19
Table 4.4: SI Level Options .....	4-20

Table 4.62: Coding Standard Options .....	4-70	Table 4.119: Other Frequency Options .....	4-103
Table 4.63: Lip Sync Adjustment Options .....	4-71	Table 4.120: Modulation Type Options.....	4-103
Table 4.64: Audio Bit-rate Options (Dolby Digital (AC-3)) .....	4-71	Table 4.121: FEC (Outer) Options.....	4-103
Table 4.65: Coding Mode Options.....	4-72	Table 4.122: FEC (Inner) Options .....	4-104
Table 4.66: Lip Sync Offset Options.....	4-72	Table 4.123: Symbol Rate Options.....	4-104
Table 4.67: Audio Delay Options.....	4-73	Table 4.124: Modulation Type Options.....	4-104
Table 4.68: Clip Level Options .....	4-73	Table 4.125: Orbital Position Options.....	4-105
Table 4.69: Bit Stream Mode Options .....	4-74	Table 4.126: West East Options.....	4-105
Table 4.70: Dialogue Level Options .....	4-74	Table 4.127: Polarisation Options .....	4-105
Table 4.71: Dolby Srnd Mode Options .....	4-74	Table 4.128: TS Input Source Options .....	4-106
Table 4.72: Mixing Level Options .....	4-75	Table 4.129: IF Power Options.....	4-106
Table 4.73: Room Type Options.....	4-75	Table 4.130: IF Frequency Options.....	4-106
Table 4.74: Dynamic Range Options.....	4-76	Table 4.131: Modulation Type Options.....	4-106
Table 4.75: Embedded 1-2 DID Options .....	4-77	Table 4.132: Symbol Rate Options.....	4-107
Table 4.76: OP Digital Loss Options .....	4-77	Table 4.133: FEC Rate Options .....	4-107
Table 4.77: Source Options.....	4-78	Table 4.134: Tx Bandwidth Factor Options .....	4-108
Table 4.78: Coding Standard Options .....	4-78	Table 4.135: Preset Pwr Low Options .....	4-108
Table 4.79: Lip Sync Adjustment Options .....	4-79	Table 4.136: Preset Pwr Norm Options.....	4-108
Table 4.80: Lip Sync Offset Options.....	4-80	Table 4.137: Sat Deliv Freq Options .....	4-108
Table 4.81: Audio Delay Options.....	4-80	Table 4.138: Sat Orb Pos Options.....	4-109
Table 4.82: SMPTE 302M Standard Options .....	4-80	Table 4.139: Sat West/East Options .....	4-109
Table 4.83: Channel Options.....	4-81	Table 4.140: Polarisation Options .....	4-109
Table 4.84: Embedded 1-2 DID Options .....	4-81	Table 4.141: TS Input Source Options .....	4-110
Table 4.85: OP Digital Loss Options .....	4-82	Table 4.142: L-Band Power Options .....	4-110
Table 4.86: Source Options.....	4-82	Table 4.143: Frequency Options .....	4-110
Table 4.87: Coding Standard Options .....	4-82	Table 4.144: Packet Length Options .....	4-120
Table 4.88: Lip Sync Adjustment Options .....	4-83	Table 4.145: On Air Options .....	4-120
Table 4.89: Coding Mode Options (Linear PCM [Direct]/via SRC) .....	4-84	Table 4.146: Bit-rate (188) and Bit-rate (204) Options .....	4-120
Table 4.90: Lip Sync Offset Options.....	4-84	Table 4.147: Clock Options .....	4-121
Table 4.91: Audio Delay Options.....	4-84	Table 4.148: PCR PID Options.....	4-121
Table 4.92: Clip Level Options .....	4-85	Table 4.149: Scramble Options (RAS) .....	4-122
Table 4.93: SMPTE 302M Standard Options .....	4-86	Table 4.150: Scramble Options (BISS) .....	4-123
Table 4.94: Channel Options.....	4-86	Table 4.151: Add Connection Options.....	4-124
Table 4.95: Embedded 1-2 DID Options .....	4-86	Table 4.152: Delete Connection Options.....	4-126
Table 4.96: OP Digital Loss Options .....	4-87	Table 4.153: Add Profile Options.....	4-127
Table 4.97: Input Source Options.....	4-88	Table 4.154: VC Type Options .....	4-127
Table 4.98: Bit-rate Options.....	4-88	Table 4.155: ATM Address Options .....	4-128
Table 4.99: Coding Mode Options (AAC).....	4-89	Table 4.156: VPI Options .....	4-128
Table 4.100: Coding Mode Options (AAC).....	4-90	Table 4.157: VCI Options .....	4-128
Table 4.101: Audio Delay Options.....	4-90	Table 4.158: Direction Options .....	4-128
Table 4.102: OP on Digital I/P Loss Options.....	4-91	Table 4.159: AAL Options .....	4-129
Table 4.103: Embedded 1-2 DID Options .....	4-91	Table 4.160: Add Authorisation Options.....	4-129
Table 4.104: Data A – RS232 Encoding Option Modes .....	4-94	Table 4.161: Delete Authorisation Options.....	4-130
Table 4.105: Baud Rate Options .....	4-94	Table 4.162: Incoming Calls Options.....	4-130
Table 4.106: SNMP oid index Options .....	4-95	Table 4.163: Def UNI Options .....	4-131
Table 4.107: Bit-rate Options.....	4-95	Table 4.164: Enable SVC PMP Options.....	4-131
Table 4.108: Encoding Options .....	4-97	Table 4.165: TS Source Options .....	4-131
Table 4.109: Descriptor Type Options.....	4-98	Table 4.166: AAL5 PCR Aware Options.....	4-132
Table 4.110: Band Plan Options.....	4-100	Table 4.167: Srce Clk Tolerance Options.....	4-132
Table 4.111: Channel Options.....	4-100	Table 4.168: CDV Tolerance Options.....	4-133
Table 4.112: Frequency Options .....	4-101	Table 4.169: TS Asi Output Options.....	4-133
Table 4.113: Bandwidth Options .....	4-101	Table 4.170: Asi Stuffing Bytes Options .....	4-133
Table 4.114: Modulation Type Options.....	4-101	Table 4.171: Mode Options .....	4-134
Table 4.115: Hierarchy Options.....	4-101	Table 4.172: Path Label Options .....	4-134
Table 4.116: FEC (HP) and FEC (LP) Options .....	4-102	Table 4.173: Tx Clock Source Options.....	4-134
Table 4.117: Guard Interval Options .....	4-102	Table 4.174: Cell Mode Options .....	4-135
Table 4.118: Carriers Options .....	4-103	Table 4.175: Host Bit-rate Options .....	4-136
		Table 4.176: PID Remap Options.....	4-136

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Table 4.177: Output Options .....	4-138	Table 4.184: ECM (CA) PID Options.....	4-141
Table 4.178: Source (BNC) Options.....	4-138	Table 4.185: VBI PID Options.....	4-141
Table 4.179: Service Id (Out)Options.....	4-139	Table 4.186: Audio (Type of Audio) Options.....	4-142
Table 4.180: Program Number (Out) Options .....	4-139	Table 4.187: Data (Type of Data) Options.....	4-142
Table 4.181: PMT PID Options.....	4-140	Table 4.188: Teletext Options.....	4-142
Table 4.182: PCR PID Options.....	4-141	Table 4.189: DPI Options (DPI Mode= GPI SCTE 35).....	4-144
Table 4.183: Video Options .....	4-141		

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## 4.1 Introduction

The front panel display and keypad are used to configure, control and monitor the Encoder. The control interface is a structured menu which gives access to the various options. This chapter describes the menu hierarchy and menu items in detail.

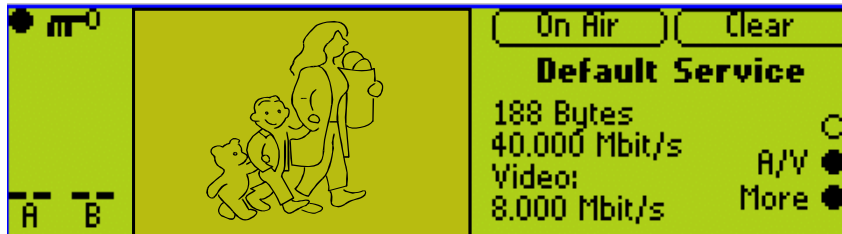
### NOTES...

1. The configuration of the Encoder after booting is the same as when power was removed, with the following exceptions:
  - The satellite modulator output is switched off.
  - The modulation of the IF carrier is switched on.
  - The output power level is set to low.
2. If the Encoder configuration after power-up, matches the required configuration, then to re-enable transmission the satellite modulator output must be switched on, and the output power level must be set to its previous setting.

## 4.2 Establishing Local Control

### 4.2.1 Input Monitor

At power-on the Encoder runs through a boot sequence (boot time with Remux option module is approximately 90 seconds). An initial Input Monitor screen is shown. This displays a picture of the currently selected video source (SD mode only), the service name of the video channel being encoded, the audio A and B channels in the form of bargraphs, and the multiplexer and video bit-rates.



### NOTE...

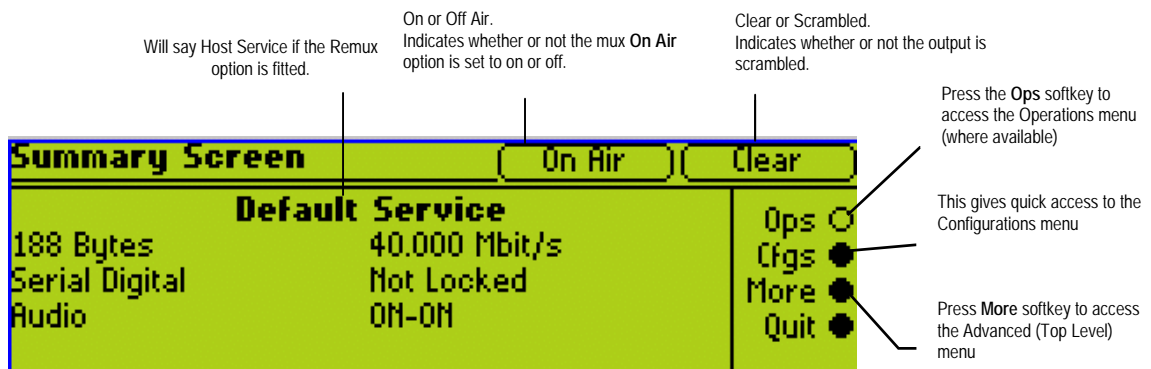
The screen may vary slightly in detail between Encoders.

Figure 4.1: Input Monitor

Pressing the **More** softkey displays the Summary Screen (see Section 4.2.2, Summary Screen).

Pressing the **A/V** softkey displays the **A**(udio)/**V**(ideo) Menu (see Section 4.2.3, Line Up Menu).

## 4.2.2 Summary Screen



**NOTE...**  
The screen may vary slightly in detail between Encoders.

Figure 4.2: Summary Screen

**NOTE...**  
The Configurations Menu can also be accessed through the Advanced Menu (see Figure 4.6).

## 4.2.3 Line Up Menu

This menu brings together various functions associated with the modulated output. There is also an approximate graphical representation of the Encoder's modulated output. At a glance, it is easy to see if the carrier is present and being modulated with a signal. It also shows the approximate RF power (which can be adjusted using this screen).

## 4.2.4 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).

## 4.2.5 Keyboard Lock

The softkeys can be locked out to prevent inadvertent operation (see the key icon in Figure 4.3).



Figure 4.3: Keyboard Lock

Press the softkey adjacent to the key icon. This shows the **Keyboard Lock** screen. Press the **Yes** softkey to disable the softkeys. They are all disabled with the exception of **Unlock**.

To enable and restore the softkey functions, press the **Unlock** softkey. This shows the **Keyboard Lock** screen. Press the **Yes** softkey.

## 4.3 Navigating the Display Screens

### 4.3.1 Moving Through the Menu Screens

Each of the menu items on the display has a connection to a softkey (see *Figure 4.4*). Press the associated softkey to select the required option. Use the + and – softkeys to scroll through the choices in the option or use the keypad on the far right of the display to change options (unless indicated otherwise in the display). The last item in the right-hand corner of each menu is `Quit`. This causes the display to revert to the previous menu in the hierarchy. The screens displayed in this manual are only representations - there might be differences between equipment, depending upon the options chosen.

#### NOTE...

In the Encoder menus when it states that you may 'update using softkeys' you can use both softkeys and keyboard keys for some options.

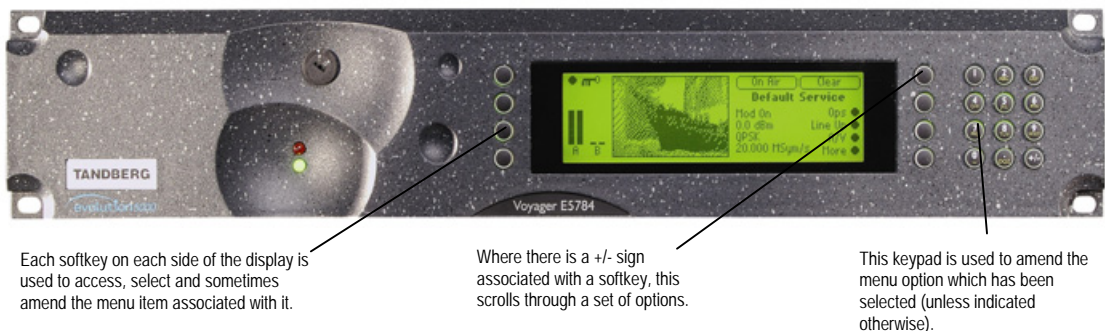


Figure 4.4: Keypad and Display Functions

### 4.3.2 How to Use the Keypad

Each key on the keypad has more than one inscription. One press of a key makes the number appear on the display screen, two quick presses makes the first letter appear etc. All keys are cyclic, displaying their assigned characters in sequence. In certain options only letters or numbers may be available.

Table 4.1: Keypad Key Assignments

Keypad	Button	1 Press	2 Presses	3 Presses	4 Presses
	1	1	(	:	)
	2	2	A	B	C
	3	3	D	E	F
	4	4	G	H	I
	5	5	J	K	L
	6	6	M	N	6
	7	7	P	R	S
	8	8	T	U	V
	9	9	W	X	Y
	0	0	Space	0	Space
	.	.	O	Q	Z
	+	+	/	-	+

Figure 4.5 gives details of how to access the inscriptions.

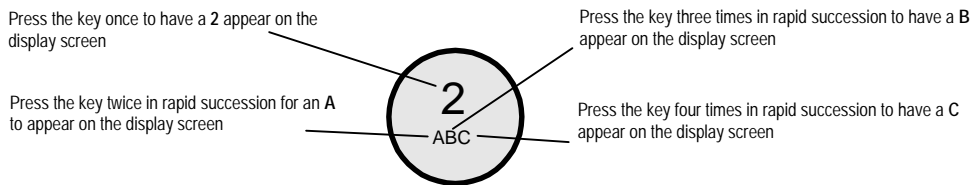
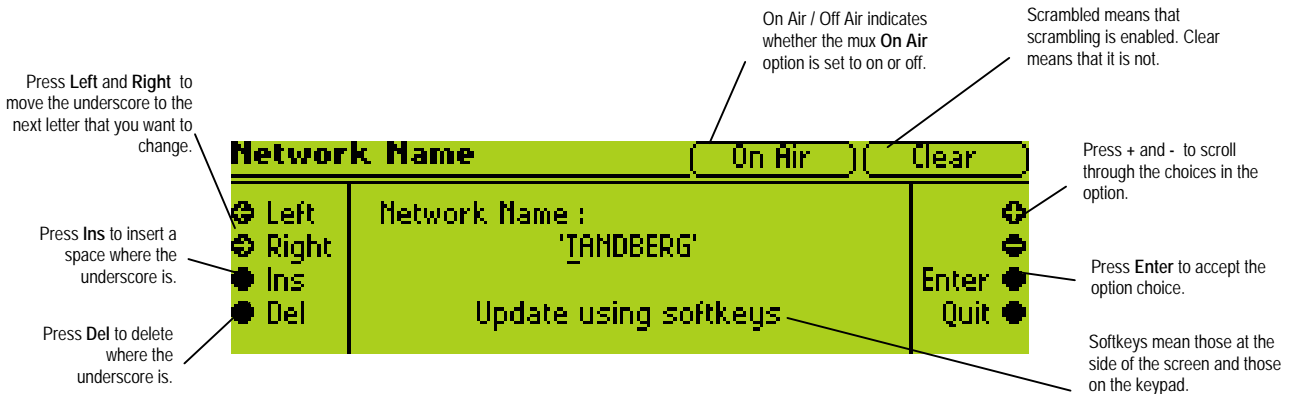


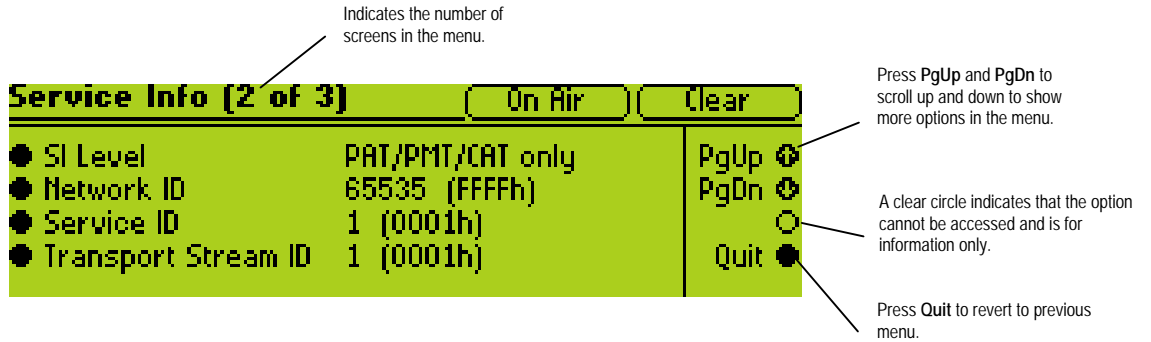
Figure 4.5: Accessing Inscriptions on the Keypad

### 4.3.3 How to Use the Functions Associated with Softkeys

The following display screens show the different functions associated with the options.



**NOTE...**  
 A black diagonal cross enclosed by a white circle (⊗) means that the Encoder is under remote control and the user does not have access to change that parameter.



### 4.3.4 Display Screens

The display screens shown in *Section 4.3.3, How to Use the Functions Associated with Softkeys* are identical to those seen on the Encoder front panel display screen. The remainder of the display screens in this chapter are representations and may differ slightly.

### 4.3.5 Menu Formats

All menus generally conform to the following format. Some of the menus provide access to sub-menus.



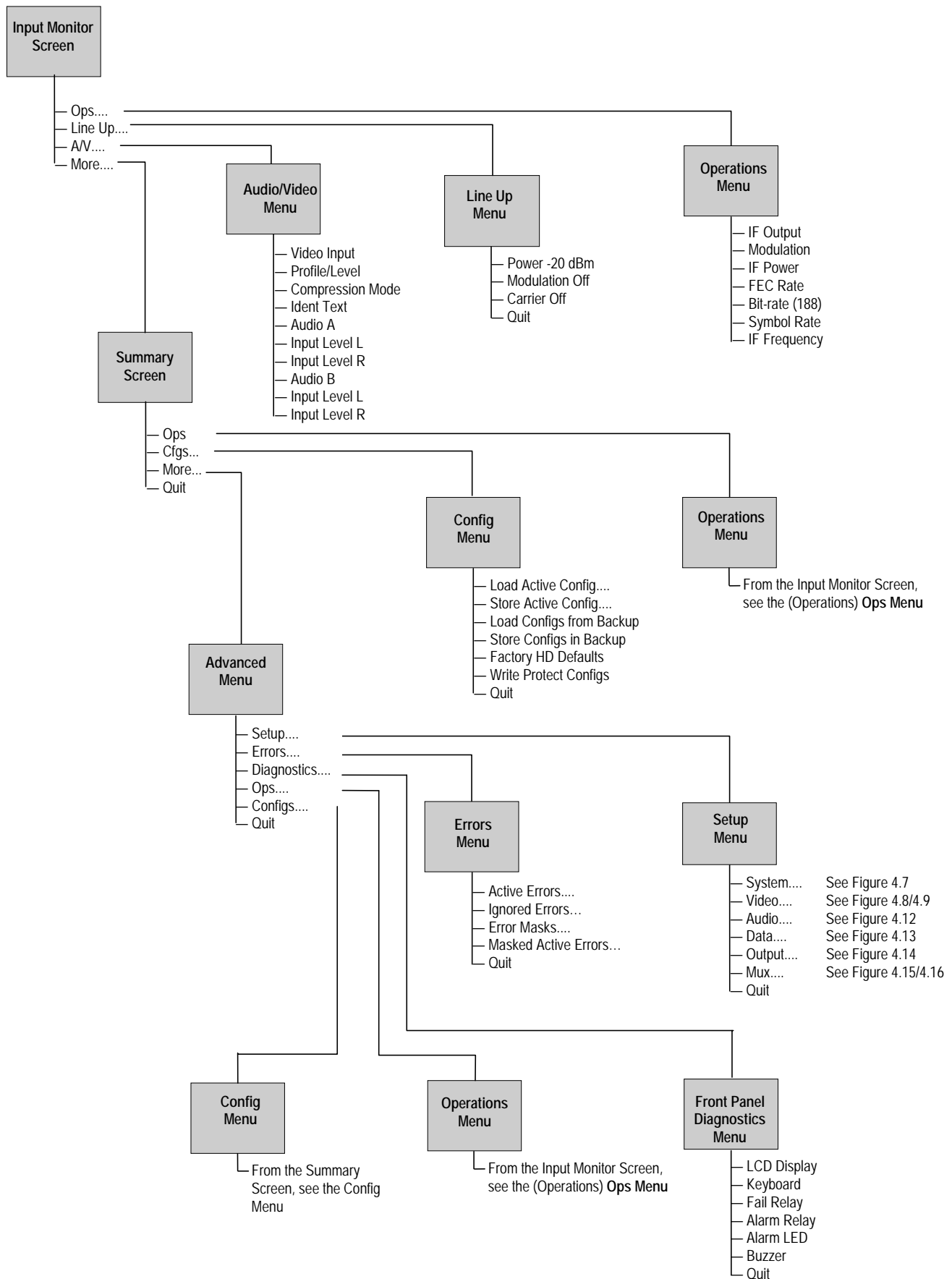


Figure 4.6: Menu Hierarchy – Summary Screen and Advanced Menus

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### 4.3.6 Summary Screen and Advanced Menu

See *Figure 4.6*, for the top-level menu hierarchy. Access the Advanced Menu from the Summary Screen. The Advanced Menu provides options for configuring and testing the Encoder.

## 4.4 Setup Menu

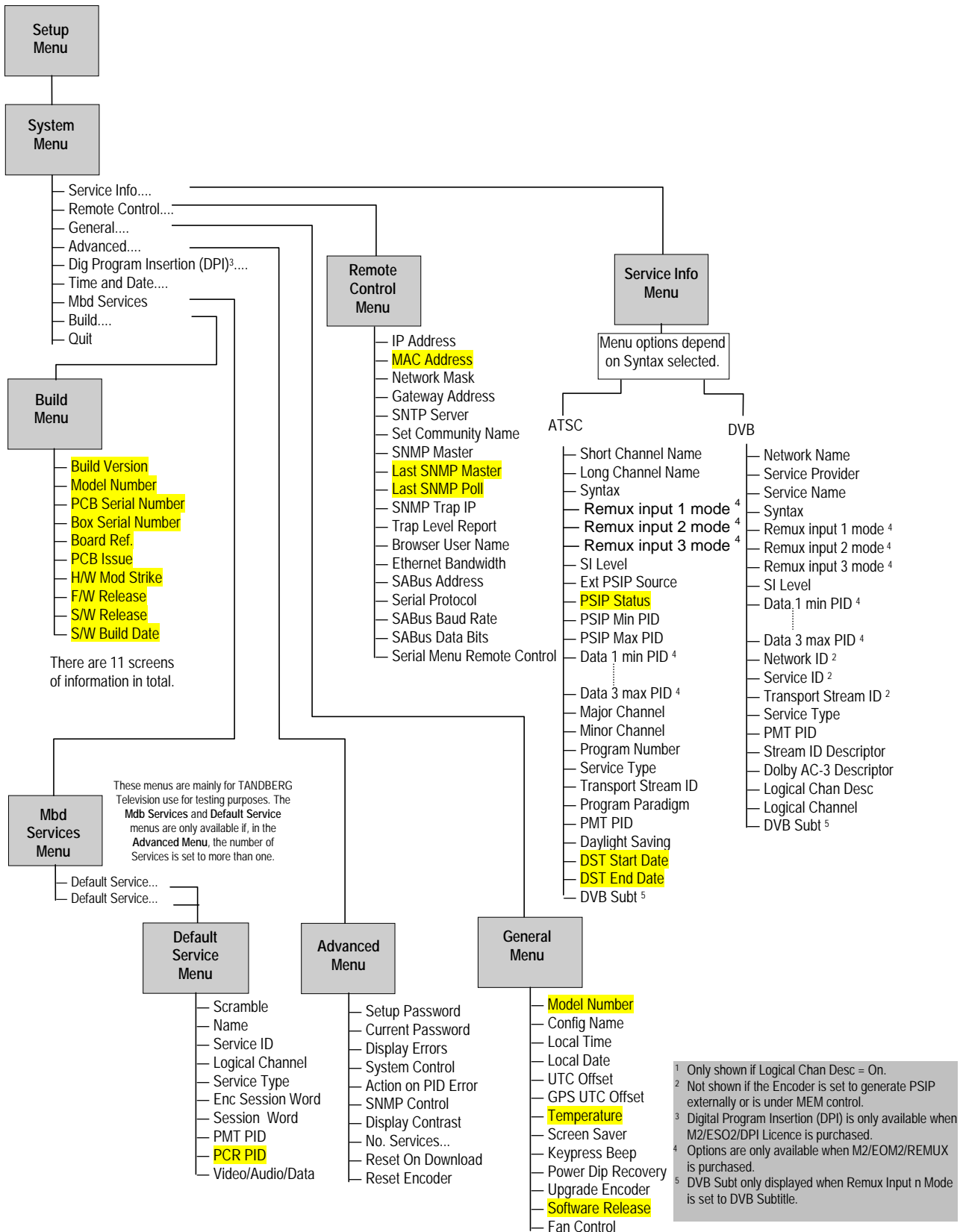
The Setup Menu can be selected from the Advanced Menu (see *Figure 4.6* for menu structure). The menu provides access to configuration and operating features and predefined configurations. If the password option has been set in the System/Advanced Menu (see *page 4-30*) then a password will be asked for to access and change a parameter.

## 4.5 System Menu

### 4.5.1 Introduction

The System Menu is selected from the Setup Menu (see *Figure 4.7* for menu structure).

This menu permits the selection of system information. Any option with a clear circle next to it cannot be accessed and changed. It is for status information only.



Shaded options are showing status and cannot be changed.

Figure 4.7: Menu Hierarchy – Setup/System Menu



## 4.5.2 Service Info Menu (Syntax = ATSC<sup>1</sup>)

### Overview

This menu provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream. The options available depend on whether the syntax is set to DVB or ATSC.

See *Figure 4.7* 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.

### Short Channel Name Option

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).

### Long Channel Name Option

This is associated with the field *extended\_channel\_name* and gives the full name of the channel.

### Syntax Option

This enables the syntax to be specified.

Table 4.2: Syntax Options

Selected Option	Description	Comments
ATSC	Advanced Television Standards Committee.	
DVB	Digital Video Broadcasting.	See page 4-21

### Remux Input n Mode

Where n=1 to 3 to designate the three inputs. See *Annex J, Setting of the Remux Card for Data/PSIP and DVB-Subtitles Input* for details on setting up these modes.

Table 4.3: Remux Input n Mode Options

Selected Option	Description
Off	Cuts the ASI input and leaves the PID mapping the same or deleting all PID mappings.
Service	Selects the current default mode where services are detected and remuxed.
DVB Subt	This mode is provided for subtitles to be added to the locally encoded service only. It is not possible to add subtitles to services arriving on a remux input in this way. Selecting this mode displays the <b>DVB Subtitle</b> option.
Data	If selected for input n, two menu entries appear <b>Input n PIDmin</b> and <b>Input n PIDmax</b> . Defaults are 0x1FD0 and 0x1FFE. This specifies the range of PIDs that is mapped through for that input. If at least one input is set for <b>Data</b> , ensure that the PSI and SI information is correct. Usually, this would mean having to turn the "SI Level" to "Off (Ext.PSIP/PSI)" and one of the remux inputs would be receiving all PSI and PSIP.

<sup>1</sup> For further information refer to ATSC Standard Doc A/65 Program and System Information Protocol for Terrestrial Broadcast and Cable - Annex D.

## SI Level Option

This enables the service information level to be specified.

Table 4.4: SI Level Options

Selected Option	Description
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/TDT/SDT/NIT/EIT – minimum DVB.
On (Ext. PSIP)	PAT/PMT/CAT/TDT/SDT/NIT.

## Ext. PSIP Source Option

This option only applies if the SI level has been set to On (Ext. PSIP). It specifies the Remux input through which the external PSIP is to be received.

## PSIP Status

This option only applies if the SI level has been set to On (Ext. PSIP). It reports the range of PIDs that will be passed through the external PSIP input.

## PSIP Min PID

This option only applies if the SI level has been set to On (Ext. PSIP). This sets the minimum PID value that will be passed through the external PSIP input.

## PSIP Max PID

This option only applies if the SI level has been set to On (Ext. PSIP). This sets the maximum PID value that will be passed through the external PSIP input.

## Data n min/max

This option enables a PIDmin and PIDmax range to be selected for a specified input [n]. All PIDs lying within this range are passed through. No attempt to extract SI information nor interpret SI/PSI information is made on this input.

The Encoder is not able to build accurate PSI tables when in data remux mode as it does not extract any info from the incoming stream. Therefore, in this case, it is necessary for PSI/PSIP to be externally generated.

There must be no PID clashes (between other inputs or the locally generated streams) as PID clashes are not resolved nor detected by the Encoder.

## Major Channel Option

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 Option

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.

### Program Number Option

This enables the Program Number to be specified. 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...**

This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.

### Service Type Option

The Service Type identifies the type of service carried in this virtual channel. The options are; Analog TV, ATSC Digital TV, ATSC Audio only, and ATSC Data Broadcast.

### Transport Stream Id Option

This sets the Transport Stream ID value for the transport stream output from the Encoder.

**NOTE...**

This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.

### Program Paradigm Option

This option determines whether PIDs are assigned in accordance with the ATSC Program Paradigm or not.

### PMT PID Option

This option shows the Program Map Table Packet Identifier.

### Daylight Saving

This option determines whether daylight saving is enabled. Select Observed to enable it and NOT Observed to disregard it.

### DST Start Date and DST End Date Options

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.

### DVB Subtitles

**NOTE...**

This option is only available when Remux Input n Mode is set to DVB Subt.

DVB Subtitle mode is provided for subtitles to be added to the locally encoded service only. It is not possible to add subtitles to services arriving on a remux input.

Table 4.5: DVB Subtitle Options

Selected Option	Description
Off	
On streams 1, 2, 3, 4	
On streams 1, 2, 3	The encoder shall include a PES Private Data component entry in the PMT and include the VBI_data_descriptor and Subtitle descriptor within this component definition in the PMT for each of the 1 to n DVB Subtitle streams.
On streams 1, 2	
On stream 1	

**NOTE...**  
 The Encoder does not check that the incoming stream actually contains DVB subtitle data nor whether the user-entered subtitle PID corresponds to the incoming stream.

### 4.5.3 Service Info Menu (Syntax = DVB)

#### Overview

The `Service Info Menu` is selected from the `System Menu` by pressing the **Service Info** softkey. This menu provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream.

The options available depend on whether the syntax is set to DVB or ATSC. See *Figure 4.7* 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.

#### Network Name Option

This option allows the network name to be changed. The information is included in the Network Information Table (NIT).

#### Service Provider Option

This option allows the service provider name to be changed. The information is included in the Service Description Table (SDT).

#### Service Name Option

This option allows the service name to be changed. The information is included in the SDT.

#### Syntax Option

This enables the syntax to be specified.

Table 4.6: Syntax Options

Selected Option	Description
ATSC	Advanced Television Standards Committee.
DVB	Digital Video Broadcasting.

### Remux Input n in Mode

Where n=1 to 3 to designate the three inputs. See *Annex J, Setting of the Remux Card for Data/PSIP and DVB-Subtitles Input* for details on setting up these modes.

Table 4.7: Remux Input n Mode Options

Selected Option	Description
Off	Cuts the ASI input and leaves the PID mapping the same or deleting all PID mappings.
Service	Selects the current default mode where services are detected and remuxed.
DVB Subt	This mode is provided for subtitles to be added to the locally encoded service only. It is not possible to add subtitles to services arriving on a remux input in this way. Selecting this mode displays the <b>DVB Subtitle</b> option.
Data	If selected for input n, two menu entries appear <b>Input n PIDmin</b> and <b>Input n PIDmax</b> . Defaults are 0x1FD0 and 0x1FFE. This specifies the range of PIDs that is mapped through for that input.  If at least one input is set for <b>Data</b> , ensure that the PSI and SI information is correct. Usually, this would mean having to turn the 'SI Level' to 'Off (Ext.PSIP/PSI)' and one of the remux inputs would be receiving all PSI and PSIP.

### SI Level Option

This enables the service information level to be specified.

Table 4.8: SI Level Options

Selected Option	Description
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)	

### Data n min/max

This option enables a PIDmin and PIDmax range to be selected for a specified input [n]. All PIDs lying within this range are passed through. No attempt to extract SI information nor interpret SI/PSI information is made on this input.

The Encoder is not able to build accurate PSI tables when in data remux mode as it does not extract any info from the incoming stream. Therefore, in this case, it is necessary for PSI/PSIP to be externally generated.

There must be no PID clashes (between other inputs or the locally generated streams) as PID clashes are not resolved nor detected by the Encoder.

## Network Id Option

This enables the Network Identity to be specified. The information is included in the NIT.

**NOTE...**

This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.

## Service Id Option

This option ties the SDT to the PMT and is the same as the Program Number in ATSC. This enables the Service Identity to be specified. The information is included in the PAT, PMT, SDT, EIT and NIT.

**NOTE...**

This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.

## Transport Stream Id Option

This sets the Transport Stream ID value for the transport stream output from the Encoder.

**NOTE...**

This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.

## Service Type Option

The service type identifies the type of service carried. The options are: Analog TV, Digital TV, Digital Radio, Teletext, and Data Broadcast. The information is included in the SDT.

## PMT PID Option

This shows the Program Map Table Packet Identifier.

## Stream ID Descriptor Option

This option turns on or off the insertion of a stream identifier descriptor within the PMT.

## Dolby AC-3 Descriptor Option

This allows a user to specify only the DVB, only the ATSC, or both the ATSC and DVB descriptors for use with audio streams.

It is necessary because the ATSC descriptor existed prior to the DVB descriptor and some Decoders (e.g. early Alteias) used the AC-3 descriptor for identifying Dolby Digital AC-3 streams.

**NOTE...**

This is only available when the syntax is set to DVB.

Table 4.9: Audio AC-3 Descriptor Options

Selected Option	Description
DVB & 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.

### Logical Chan Desc Option

This enables the Logical Channel Descriptor to be turned On or Off. The information is included in the NIT (for Australia mainly).

### Logical Channel Option

**NOTE...**

This option is only shown if the Logical Chan Desc option is set to On.

This enables a number to be given to the Logical Channel.

### DVB Subtitles

**NOTE...**

This option is only available when Remux Input n Mode is set to DVB Subt.

DVB Subtitle mode is provided for subtitles to be added to the locally encoded service only. It is not possible to add subtitles to services arriving on a remux input.

Table 4.10: DVB Subtitle Options

Selected Option	Description
Off	
On streams 1, 2, 3, 4	
On streams 1, 2, 3	The encoder shall include a PES Private Data component entry in the PMT and include the VBI_data_descriptor and Subtitle descriptor within this component definition in the PMT for each of the 1 to n DVB Subtitle streams.
On streams 1, 2	
On stream 1	

**NOTE...**

The Encoder does not check that the incoming stream actually contains DVB subtitle data nor whether the user-entered subtitle PID corresponds to the incoming stream.

## 4.5.4 Remote Control Menu

### Overview

The Encoder can be controlled remotely via either an RS-232 or a RS-485 serial link, or alternatively via Ethernet using either SNMP, or a web browser. The Remote Control Menu provides options for configuring these interfaces. See Figure 4.7 for the Remote Control Menu structure.

### **IP Address Option**

This option allows the IP Address to be changed.

### **MAC Address Option**

The MAC Address cannot be changed.

### **Network Mask Option**

This option allows the Network Mask to be changed.

### **Gateway Address Option**

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 network will be sent to this address.

### **Set Community Name Option**

This option allows the SNMP Community Name to be changed.

### **SNMP Master Option**

This gives the SNMP Master's IP address. 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.

### **Last SNMP Master Option**

This gives the last SNMP Master's IP address. It cannot be changed.

### **Last SNMP Poll Option**

The Last SNMP Poll option cannot be changed

### **SNMP Trap IP Option**

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 Option**

This enables the type of events reported via SNMP traps. The options are; Start Msgs only, Fail & Start Msgs or All Traps, which will mean all failures, warnings and start messages will be reported.

### **Browser User Name Option**

This option is only available from the front panel. The Encoder can be controlled via a web browser, but to prevent unauthorised control of the Encoder a user name and password must be supplied to 'log on' to the Encoder. This option enables the web browser user name to be set.

### **Browser Password Option**

This option is only available from the front panel. This option allows the web browser password to be set. To prevent unauthorised knowledge of the password it cannot be read back from the Encoder.



### SNTP Server Option

This option sets the IP address of a Simple Network Time Protocol (SNTP) server, which the Encoder will then synchronise it's clock to. If the SNTP Server is set to 000.000.000.000 the Encoder will not try and access an SNTP server.

### Ethernet Bandwidth Option

Problems can be experienced with Ethernet control of the Encoder if the available network bandwidth is low. This option provides a low and a high network bandwidth setting. The low bandwidth setting limits the packet size, which can prevent problems with low bandwidth networks, but at the cost of speed of communications.

### SABus Address Option

The SABus protocol is multi-drop, and has an address byte for differentiating between the devices on the SABus (the address option).

The Encoder can be controlled via an RS-232 or RS-485 serial interface using a SABus protocol (see *ST.TS.E10074* for details). The SABus protocol is multi-drop, and has an address byte for differentiating between devices. This option sets the address of the Encoder, which must be in the range 49 to 127.

### Serial Protocol Option

This option selects whether the Encoder will respond to commands via its RS-232 interface, or via its RS-485 control interface.

### SABus Baud Rate Option

This option enables the SABus Baud Rate to be set.

This option sets the Baud rate for the SABus interface. The Baud rates supported are; 1200, 2400, 4800, 9600, 19200 and 38400 Baud.

### SABus Data Bits Option

This determines whether the SABus interface is expecting 8 data bits (1 stop bit), or 7 data bits (2 stop bits).

### Serial Menu Remote Control

The Serial Menu Remote Control option can take the values: Off and RS232 Remote Control Port.

#### NOTE...

1. When selected, it is not possible to set SMPTE 333-M Port option to Remote Control. This is for serial closed captions. Thus, if using the remote control port for menu control, serial CC's must go in via the RS232 data port).
2. When set to 'RS232 Remote Control Port' the existing RS232 9-pin D-type port labelled 'Remote Control' provides a menu interface to control the encoder. When set to 'Off', this port functions as before (i.e. respond to command as described in the 'Remote Control Protocol (RCP)').

The serial menu system available via this serial port is similar to Telnet (i.e. front panel level menu available via user name 'general', 'password'.)

## 4.5.5 General Menu

### Overview

The General Menu provides options for configuring the general parameters of the Encoder such as the time and date, screen savers, and fan control. See *Figure 4.7* for the General Menu structure.

### Model Number Option

The model number of the Encoder is reported and cannot be changed. Whilst the Encoder is initialising this value may be incorrect because all the option cards may not have been identified yet.

### Config Name Option

This option allows a name to be assigned to the current Encoder configuration. It is this name that is used if the configuration is stored (see *Section 4.16, Configs Menu*).

### Local Time Option

This option is status only. It gives the local time on the Encoder.

### Local Date Option

This option is for status only. It gives the local date on the Encoder.

### UTC Offset Option

The Universal Time Co-ordinate (UTC) is effectively the same as Greenwich Mean Time (GMT). 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 on the front panel a UTC offset is needed so that the UTC time for the

*Table 4.11: UTC Offset Options*

Selected Option	Description
Min: -12 Hours	UTC offset. A positive value indicates East of Greenwich, and a negative value indicates West of Greenwich.
Max: 15 Hours	
Step Size: 1 Hour	

If the specified UTC offset is outside the valid input range, a confirmation screen is displayed which shows the minimum/maximum value allowed.

### GPS UTC Offset

This menu item has values from 0 to 60. The factory default is 13 (which is the current offset as of June 2005. The value changes at irregular times, a few times a decade). This number is used to set the GPS\_UTC\_Offset field in the ATSC STT table.

### Temperature Option

The Temperature option indicates the current internal temperature.

### Screen Saver Option

This option enables the Screen Saver to be set.

Table 4.12: Screen Saver Options

Selected Option	Description
Top Level Menu	
Van	
Service Name	If no changes have been made to the Encoder for five minutes (no softkey has been pressed) the chosen screen saver appears on the front panel display.
Off	

### Keypress Beep Option

This option enables the Keypress Beep to be set.

Table 4.13: Keypress Beep Options

Selected Option	Description
On	A beep sounds every time that a key is pressed.
Off	There is silence every time that a key is pressed.

### Power Dip Recovery Option

This option enables the Power Dip Recovery to be set. It determines the state of the satellite modulator outputs (if fitted).

Table 4.14: Power Dip Recovery Options

Selected Option	Description
On	The outputs are restored following a power dip.
Off	The outputs are not restored following a power dip.

### Upgrade Encoder Option

There are a number of features which are not enabled by default. Refer to *Chapter 3, Options and Upgrades, Table 3.1* for details.

This shows the serial number of the box, which is in the range of 0 to 65535. Send this number to TANDBERG Customer Services and they will return a software licence key to enter via the front panel to enable the features.

**NOTE...**

These software options must be purchased before the software licence key is sent.

### Software Release Option

The software release cannot be changed.

### Fan Control Option

Refer to *Annex B, Technical Specification* for more information about the temperatures at which fans activate and deactivate.

Table 4.15: Fan Control Options

Selected Option	Description
Auto (Temp. control)	The fans are activated automatically when a defined temperature is reached.
On	The fans are activated all the time.

## 4.5.6 Time and Date

This option sets the local time and date. In ATSC, daylight saving time can be set.

## 4.5.7 Advanced Menu

### Overview

The **Advanced Menu** is selected from the **System Menu** by pressing the **Advanced** softkey. This menu provides options for the advanced parameters of the Encoder. See *Figure 4.7* for the **Advanced Menu** structure.

### Setup Password Option

This option is only available from the front panel. If the Setup Password option is set to On then a password is required to change any parameters.

### Current Password Option

This option is only available from the front panel and allows the current password to be changed.

#### NOTE...

For forgotten passwords, contact Customer Services.

### Display Errors Option

This option either enables or disables the display of error or alarm messages on the front panel.

### System Control Option

This option enables the type of system control specified in the SI to be set.

Table 4.16: System Control Options

Selected Option	Description
MEM	Control of the video/audio delay (lip sync) is via the MEM.
Local	Control of the video/audio delay (lip sync) is within the Encoder <sup>2</sup> .
External (SNMP)	Control of the video/audio delay (lip sync) is via the SNMP protocol.

If the control equipment is a TT7000 System Manager, ensure that the **Auto Lip Sync** option is turned on (see on *page 4-65*). The TT7000 does not have a lip sync function therefore the Encoder has to provide this.

<sup>2</sup> To ensure correct lip sync when working with linear or pre-encoded audio, the option card M2/EOM2/AUDLIN2 should be used.

## Action On PID Error Option

This option enables the Action On PID Error to be set.

Table 4.17: Action on PID Error Options

Selected Option	Description
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.

## SNMP Control Option

This option enables the SNMP Control to be set.

Table 4.18: SNMP Control Options

Selected Option	Description
Wait for Initialisation	No SNMP reply during initialisation.
From Power On	Reply as modules start to appear.

## Display Contrast Option

### NOTE...

When this softkey is pressed, the display changes immediately.

This option allows the contrast ratio of the LCD display to be set. The contrast range is: Very Light, Light, Medium, Dark, Very Dark. As the key is pressed the display changes.

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.

## No. Services Option

This option is only available if the syntax is set to DVB. It defines how many services (up to eight) the Encoder can generate in the output transport stream. If the number of services is greater than one then there is an additional menu `Mbd Services` which allows the additional services to be defined (see *Section 4.5.10*) In ATSC only one motherboard service is possible.

## Mbd. Service PIDs Option

This option is only available if the number of services is greater than one. The motherboard service PIDs option defines whether the PIDs assigned to a service are unique, or can be duplicated between services. If the option is set to unique PIDs, then an elementary stream such as video can only be assigned to one service. Alternatively, if duplicate PIDs are allowed, then an elementary stream can be shared by services, but this does mean that both services must have the same scrambling setting.

## Reset On Download Option (Status Only)

The option is status only. The Encoder automatically reboots following a download, keeping the current configuration.

## Reset Encoder Option

A confirmation message appears 'Reset Encoder – Are you sure?'. If Yes is selected the Encoder immediately reboots, keeping the current configuration. If No, the Encoder keeps working normally.

### CAUTION...

The Reset Encoder option is not normally used. One example of its use is when code has been downloaded in background mode (such as Base Board code or Video Compression Module (VCM) code) and you want to reset the Encoder, to action the new code.

## 4.5.8 Digital Programme Insertion (DPI) Menu

The Digital Programme Insertion (DPI) Menu is only available when the M2/ESO2/DPI Licence key is purchased and is selected from the System Menu. The available options are described in *Section 4.13*.

DPI can be initiated via the M2/EOM2/GPI card or by the DVS 525 protocol.

## 4.5.9 Build Menu

The Build Menu is selected from the System Menu. The Build Menu shows the status of the options shown in *Figure 4.7*. They cannot be changed.

## 4.5.10 Additional Services (Mbd Services Menu)

### Overview

The Mbd Services Menu is only available if the number of services (defined in the Advanced Menu) has been set to greater than one. The menu has an entry for each service, to allow the service to be configured.

The number of Host Service Menus correspond to the number set in the No. Services option of the Advanced Menu. The maximum number of host services is eight.

### Host Service 1

#### Configure Menu

There will be a configure menu for each of the services.

#### Scramble Option

This option controls whether the service is in the clear (no scrambling) or the type of scrambling applied to it.

#### Name Option

This option sets the service name for the service.

#### Service ID Option

This option sets the service ID for the service, which is used to uniquely identify it in the PAT, PMT, SDT, EIT and NIT. The valid range is 0 to 65535.

### **Logical Channel Option**

This option defines the logical channel number to be given to the service. This information is included in the NIT. The valid range is 1 to 1023

### **Service Type Option**

The service type identifies the type of service carried. The options are: Analog TV, Digital TV, Digital Radio, Teletext, and Data Broadcast. The information is included in the SDT.

### **Enc Session Word Option**

This sets the encrypted session word to be used to scramble the service if the scramble option has been set to BISS-E scrambling.

### **Session Word Option**

This sets the session word to be used to scramble the service if the scramble option has been set to BISS Mode 1 scrambling.

### **PMT PID Option**

This defined the Packet Identifier (PID) to be used for the Program Map Table (PMT) associated with the service.

### **PCR PID**

This is a status display of the PCR PID, it cannot be changed.

### **Video/Audio/VBI Data Options**

There is a menu item for each elementary stream, such as video or audio, which allows the elementary stream to be defined as part of the service. The PID value of the elementary stream is shown for information.

If the Motherboard Service PIDs option in the *Advanced Menu* has been set to 'Unique PIDs', then an elementary stream can only be used in one service. If the elementary stream has already selected as part of another service, selecting it as part of this service will automatically remove it from the other service.

## 4.6 Video Menu

### 4.6.1 Introduction

The Video Menu is selected from the Setup Menu. This menu permits the selection of video parameters (see *Figure 4.8* for menu structure).

### 4.6.2 Video Source Menu

#### Overview

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

**NOTE...**

The options in the Video Source Menu depend on which Profile/Level is selected in the Video Encoder Menu (see *page 4-42*).

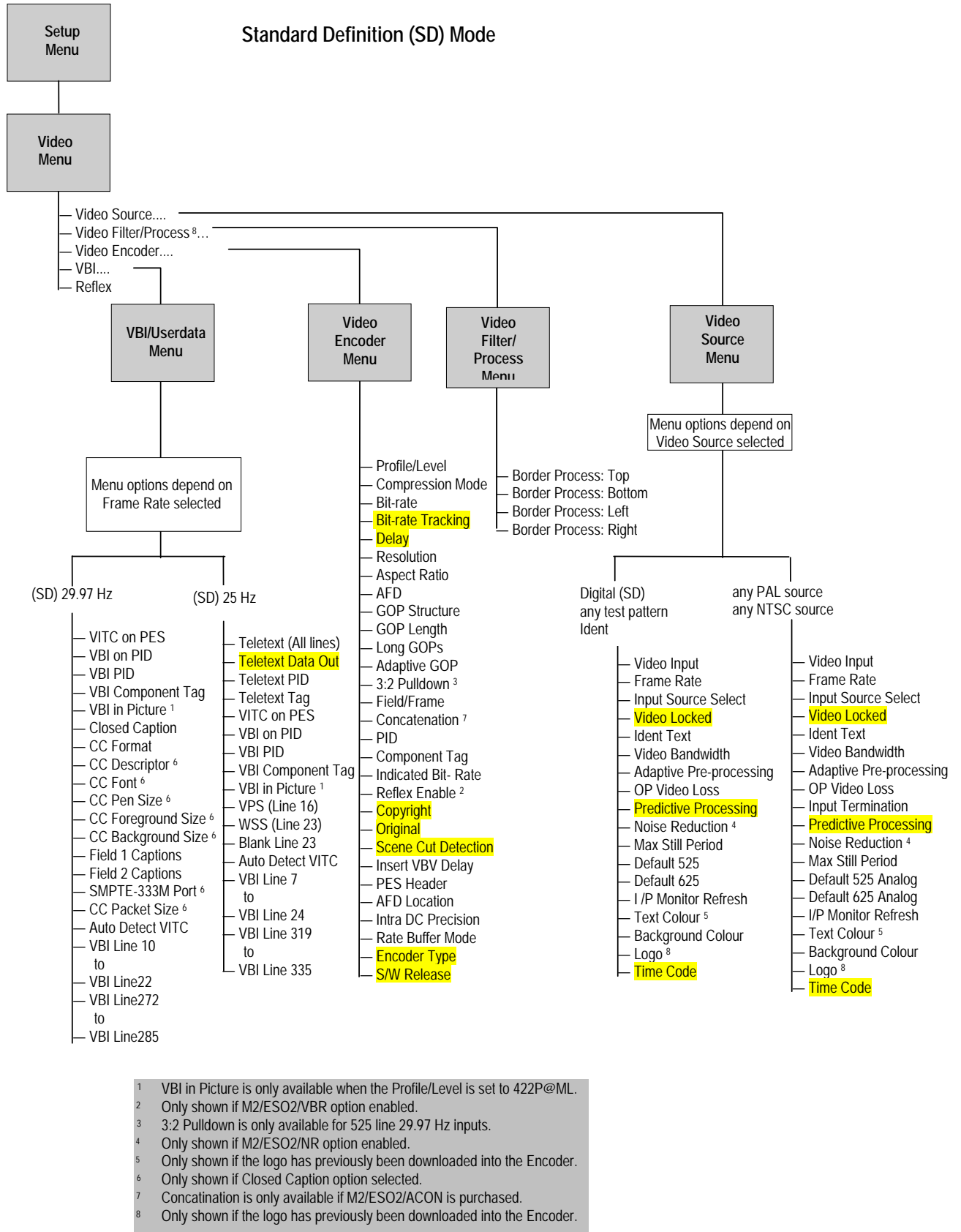
#### Video Input Option

This option enables the Video Input to be set.

*Table 4.19: Video Input Options*

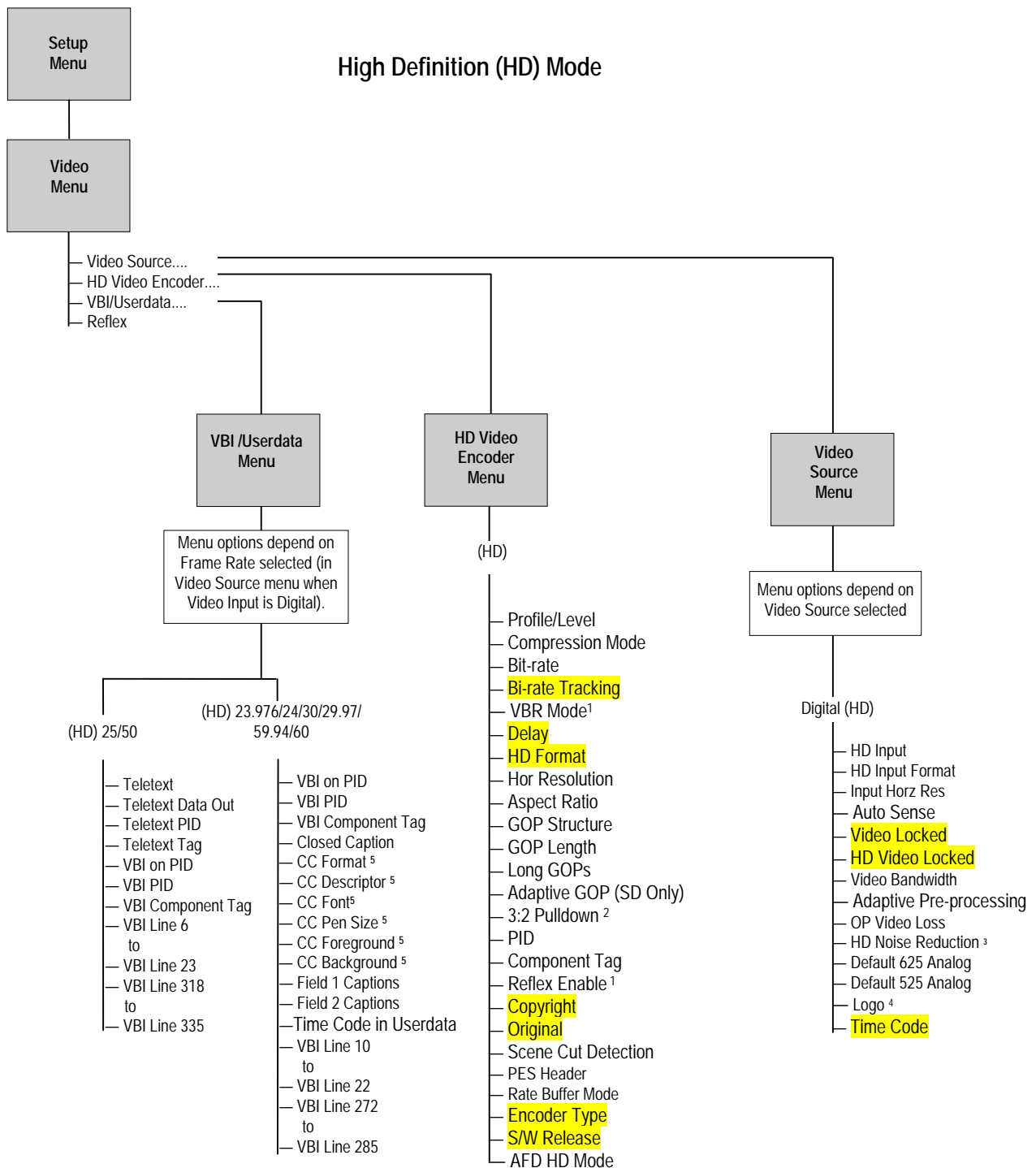
Video Type	Selected Option	Description
None	Off	Video input switched off.
Analogue Composite	NTSC No Pedestal	NTSC-M composite video input (with no Pedestal) on <b>COMP VIDEO</b> connector.
	NTSC with Pedestal	NTSC-M composite video input (with Pedestal) on <b>COMP VIDEO</b> connector.
	PAL-B/G/H/I	PAL-B/G/H/I composite video input on <b>COMP VIDEO</b> connector.
	PAL-D	PAL-D composite video input on <b>COMP VIDEO</b> connector.
	PAL-M	PAL-M composite video input on <b>COMP VIDEO</b> connector.
	PAL-N (Jamaica)	PAL- N (Jamaica) composite video input on <b>COMP VIDEO</b> connector.
	PAL-N	PAL- N composite video input on <b>COMP VIDEO</b> connector.
(SD) Ident, Digital and Internal Test Pattern Video Sources	Serial Digital	Serial digital video input on <b>SDI IN</b> connector.
	Bars & Red	Colour bars and red internal test pattern.
	Black	Black internal test pattern.
	Moving Pattern	Moving internal test pattern.
	Ident	Video Source which allows the user to superimpose identification text on the video. Mainly used for test purposes.
HD	HD-SDI	HD Serial digital video input on <b>HD SDI IN</b> connector.
	Color Bars	Colour bar test pattern.
	Black	Black internal test pattern.
	Monitor	Test Pattern





Shaded options are showing status and cannot be changed.

Figure 4.8: Menu Hierarchy – Setup/Video Menu (SD Mode)



<sup>1</sup> Only shown if M2/ESO2/HDVBR option enabled.  
<sup>2</sup> 3:2 Pulldown is only available for 525 line 29.97 Hz inputs.  
<sup>3</sup> HD Noise Reduction only shown if M2/ESO2/NR option enabled.  
<sup>4</sup> Logo only shown if the logo has previously been downloaded into the Encoder.  
<sup>5</sup> CC options only shown if Closed Captions enabled.

Shaded options are showing status and cannot be changed.

Figure 4.9: Menu Hierarchy – Setup/Video Menu (HD Mode)

## Input Source Select (SD Only)

This allows the enabling or disabling of automatic frame rate detection.

Table 4.20: Input Source Select Options

Selected Option	Description
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 config defined by Default 525 Config and Default 625 Config.

## Frame Rate Option (SD Only)

**NOTE...**

The frame rate is only shown when the video input is Serial Digital, any Test Pattern or Off.

This option enables the Frame Rate to be set.

Table 4.21: Frame Rate Options

Selected Option	Description
29.97 Hz	Used in 525 lines (NTSC-M + PAL-M).
25 Hz	Used in 625 lines (PAL).

## HD Input Format

This option sets the HD format to encode coming in on the HD SDI connector.

Table 4.22: HD Input Format

Input Format	
60 Hz	480p/59.94, 480p60, 720p59.94, 720p60, 1080pSF/23.976, 1080pSF/24, 1080i/29.97, 1080i/30
50 Hz	576p50, 720p50, 1080i/25, 1080pSF/25

## Input Video Sense (HD Only)

There are two modes of operation selectable.

Table 4.23: Profile/Level Options

Selected Option	Description
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.
On	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.

### Input Horiz Res (HD Only)

A table of live options for 1080 input only and can be 1920 or 1440. This is used to set how much picture is fed to the encoding engine. If it is 1440, the sides of the video will be lost.

### Video Locked (SD Only) and HD Video Locked Option

This option indicates whether the video is locked. It is for status only and cannot be changed.

### Ident Text Option (SD Only)

This is the text that is displayed if the video output is lost (see *page 4-38*).

### Video Bandwidth Option

The Video Bandwidth Option controls the filtering of the video before it is compressed. Reducing the bandwidth requires slightly less bits in the compressed bit-stream. Refer to *ST.AN.BW.E10074* for more information.

Table 4.24: Video Bandwidth Options

Selected Option	Description
Sharp	Filter is at the maximum bandwidth possible for the resolution selected.
Medium	Slightly reduced bandwidth.
Medium Soft (SD Only)	Reduced a little further.
Soft	Reduced a little further still.
Auto	Automatically adjusts the bandwidth depending on the video bit-rate and resolution settings.

### Adaptive Pre-processing

Changes the filtering of the input signal according to the complexity of the picture. It will be a small change from the bandwidth/noise reduction setting currently selected.

### OP Video Loss Option

This option gives the choice of what is displayed on the television screen in the event of losing video input.

**NOTE...**  
 Black and ASI off are the only options available in HD mode.

Table 4.25: OP Video Loss Options

Selected Option	Description	SD	HD
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 & Red	Bars and red test pattern is 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 & Red + Ident	Bars and red test pattern is encoded if the video input is lost. Text message is superimposed.	✓	✗
Stored OSD	Available if an OSD has been downloaded to the Encoder.	✓	✓
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	✓	✓

### Predictive Processing (SD Only)

This is a read-only indication of the current mode of a multipass-capable Encoder.

Table 4.26: Predictive Processing

Selected Option	Description
Normal	Encoder is in non-multipass mode.
Advanced	Encoder is in multipass mode.

### Input Termination Option (SD Analogue Only)

This enables the termination of the analogue video input to be switched On or Off.

### Noise Reduction Option<sup>3</sup>

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 which can reduce the encoding difficulty considerably. Refer to *Application Note ST.AN.1094, Video Noise Reduction and Compression* for more information.

<sup>3</sup> Noise reduction is only available when software option M2/ESO2/NR or M2/ESO2/HDNR is purchased.

Table 4.27: Noise Reduction Options (HD Only)

Selected Option	Description
Off	
Level 1	Use noise reduction, if necessary, but don't 'damage' the picture in any way.
Level 2	Medium setting (best compromise), quite powerful, but noise reduction might, very occasionally, introduce some artefacts.
Level 3	Powerful noise reduction that may introduce some artefacts.
Level 4	Very powerful noise reduction that can introduce some artefacts.

Table 4.28: Noise Reduction Options (SD Only)

Selected Option	Description
0	Noise reduction off
Adaptive 1	Use noise reduction if necessary but don't introduce artefacts.
Adaptive 2	Medium adaptive noise reduction, best compromise between Adaptive 1 and 3
Adaptive 3	Very powerful adaptive noise reduction, may introduce some filter artefacts but will remove as much noise as is possible.
Adaptive 4	Used for turn-around systems where the input video signal includes coding artefacts.
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.

### Max Still Period Option (SD Only)

If set to a value greater than zero it triggers a 'Freeze Frame On Video Input' alarm if it detects no movement in the source video for the defined number of seconds.

### Default 625 [Analog]

This sets the default for the 625 Line standard.

Table 4.29: Default 625 Options

Selected Option	Description
PAL-B/G/H/I	
PAL-D	
PAL-M (Jaimaca)	
PAL-M	

### Default 525 [Analog]

This sets the default for the 625 Line standard.

Table 4.30: Default 525 Options

Selected Option	Description
NTSC with pedestal	
PAL-M	
NTSC no pedestal	

### I/P Monitor Refresh Option

This sets the update rate of the input video monitor on the front panel, and the web browser monitor.

### Text Colour Option (SD Only)

This option defines the text colour for any on-screen messages generated by the Encoder (e.g. by the Ident test pattern).

Table 4.31: Text Colour Options

Available Options					
White	Blue	Magenta	Yellow	Green	Pink
Black	Red	Orange	Grey	Cyan	

### Background Colour Option (SD Only)

This option defines the background colour for any on-screen messages generated by the Encoder (e.g. by the Ident test pattern).

**CAUTION...**  
 Make the background colour a contrast to the text otherwise the text will not be seen!

Table 4.32: Background Colour Options

Available Options					
White	Blue	Magenta	Yellow	Green	Pink
Black	Red	Orange	Grey	Cyan	

### Logo Option (When Logo Downloaded into Unit)

This gives the choice of superimposing the broadcaster’s logo on the video (On) or not (Off).

**NOTE...**  
 This option only appears if the logo has previously been downloaded into the equipment (see *Annex D, Creating and Downloading a Logo*).

### Time Code Option

This option 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.

### 4.6.3 Video Filter/Process (SD only)

Each of the Border Process menu items (Top/Bottom/Left/Right) has a number of defined levels. The level indicates the percentage processing being applied (i.e 0 would be no processing; 100 full processing resulting in solid block borders). There are four allowable values: 0,25,50,75.

### 4.6.4 Video Encoder Menu

#### Overview

The Video Encoder Menu is selected from the Video Menu by pressing the **Video Encoder** softkey. This menu permits the selection of video encoding parameters.

**NOTE...**  
In SD the menu is Video Encoder, in HD mode it is called HD Video Encoder.

#### Profile/Level Option

**NOTE...**  
This option is always MP@ML or MP@HL and cannot be changed unless the M2/ESO2/422 or M2/ESO2/HD422 software option is enabled.

This option enables the Profile/Level to be set.

*Table 4.33: Profile/Level Options*

Selected Option	Description
MP@ML	Main Profile @ Main Level. Typically used in 4:2:0 direct to home.
422P@ML	4:2:2 Profile @ Main Level. Typically used in 4:2:2 contribution feed. <sup>4</sup>
MP@HL	Main Profile @ High Level. Typically used in HD 4:2:0 direct to home.
422P@HL	4:2:2 Profile @ Main Level. Typically used in HD 4:2:2 contribution feed <sup>4</sup> .

#### Compression Mode Option

This enables various compression modes to be selected in which some encoding parameters are automatically controlled depending on the selected encoding delay.

**NOTES...**

1. Changing compression causes a change to GOP structure and length.
2. Picture quality may decrease with reduced delay.

<sup>4</sup> 4:2:2 is not available unless the M2/ESO2/422 or M2/ESO2/HD422 (E5788) software option is enabled.



Table 4.34: Compression Mode Options

Selected Option	Description
Seamless 1	This gives a fixed delay which allows the bit-rate to be changed, over the permitted range, without a break in transmission.
Seamless 2	
Seamless 3	
Seamless 4	
Seamless 5	
Seamless 6	
In the following modes the delay is a function of the bit-rate selected. If the bit-rate is changed there is a break in transmission.	
Standard	The normal mode, with no special techniques or fixed settings to reduce encoding delay.
Low Delay	Delay is reduced by reducing the size of the video rate buffer. This compromises video quality in some circumstances.
Very Low Delay SD Only	Delay is reduced using the same techniques as Low Delay mode. GOP structure used is IP and field pictures are used (ie B frames are not used)..
Mega Low Delay SD Only	The generated transport stream is not fully DVB compliant and may not work with all Decoders.

Table 4.35: Seamless Mode Bit-rate (Full Resolution Only)

Profile	Seamless 1 (Mbit/s)	Seamless 2 (Mbit/s)	Seamless 3 (Mbit/s)	Seamless 4 (Mbit/s)	Seamless 5 (Mbit/s)	Seamless 6 (Mbit/s)
4:2:0 (SD)	0.8 - 10	1.5 - 10	2 - 15	0.4 - 10	1 - 12	1.3 - 10
4:2:2 (SD)	1.5 - 13	3 - 27	5 - 33	0.7 - 10	2.1 - 2.5	2.5 - 20
1080 420/422 (HD)	7 - 25	7 - 50	7 - 60	7 - 20	7 - 50	7 - 60
720 420/422 (HD)	4 - 25	5.5 - 50	6.5 - 60	4 - 20	5 - 50	6.5 - 60
Rate Buffer delay	2.5 s	1.2 s	1 s	3.3 s	1.3 s	1 s

**Seamless 1** This would be used for 4:2:0 DTH statistical multiplexing applications. The Encoder delay is approximately 2.5 seconds.

**Seamless 2** mode emulates System 3000 6U and 6U+ Encoders delay. Actual minimum and maximum rates depend on video standard and resolution.

**Seamless 3** Would usually be used in 4:2:2 statistical multiplexing applications. The Encoder delay is approximately 1.1 seconds.

**Seamless 4** mode has a very low  $B_{min}$ . Actual minimum and maximum depend on the video standard and resolution. This mode would typically be used for 4:2:0 DTH statistical multiplexing applications.

**Seamless 5** mode minimum and maximum depend on the video standard and resolution.

**Seamless 6** mode is typically used with 4:2:2 statistical multiplexing and a low  $B_{min}$ . Actual minimum and maximum depend on the video standard and resolution.

**NOTE...**

In Seamless Modes 4, 5 and 6 coding performance is compromised a little to achieve lower  $B_{minS}$ .

## Bit-rate Option

This option enables the Bit-rate to be set. An error message is shown with the correct range of bit-rates if the wrong rate is entered.

**NOTE...**

In SD mode, high bit-rates in low resolutions cannot always generate sufficient bits to match the requested bit-rate. However, a valid picture will still be produced.

**CAUTION...**

When using the Encoder with a PRO IRD M2/PSR/3/422BAS in 4:2:2 SD mode the upper video bit-rate limit of the IRD is 25 Mbit/s.

## Bit-rate Tracking

If the Bit-rate option is set to its maximum then Bit-rate Tracking is automatically switched on. In this mode, any changes which cause the mux bit-rate to increase or decrease will cause the video rate to always fill the available mux bit-rate. Changes which cause the mux rate to change include varying audio bit-rate, RS-232 data bit-rate, changing symbol-rate (on Voyager units).

**NOTE...**

On an Encoder fitted with a Remux card, only changes to the **Host Bit-rate** will cause the video rate to track. Increasing the final bit-rate (e.g. by changing the symbol-rate) will NOT cause the video-rate of the local service to increase. This is to allow the final rate to be increased to accommodate more Remux services.

Bit-rate tracking is switched off by manually setting the video bit-rate to any value lower than the maximum.

## VBR Mode (HD)

This option is only available from the *Systems* Menu when the M2/ESO2/HDVBR licence key is purchased.

The VBR Mode<sup>5</sup> option is selected from the *Menu* by pressing the **VBR Mode** softkey. The option is used to provide spare capacity in the video stream. Operating in a **stuffing off** mode or in a true **variable bit rate** mode, a decision can be made as to how much impact there will be on the broadcast service. The spare capacity these modes provide is ideal for opportunistic data insertion.

<sup>5</sup> The VBR licence M2/ESO2/HDVBR is needed with this option.

Table 4.36: VBR Mode Options

Selected Option	Description
Off <constant>	VBR mode not selected. Any unused bits are stuffed.
On <stuffing off>	This uses normal quantisation levels and any unused bits are used to carry other data. This has no impact on the quality of the encoded pictures.
On <variable>	Quantisation level is limited with pictures which are easier to encode. This is done in order to provide more unused bits to carry other data. This may have an impact on the quality of certain encoded pictures.

### VBR Mode (SD Only) Option

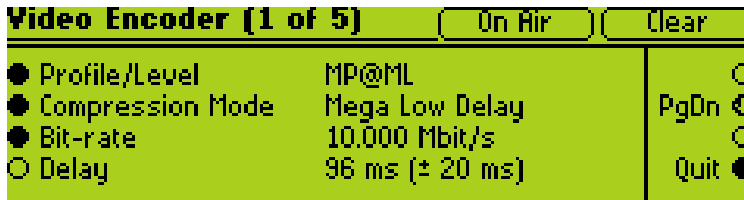
This option is only available from the *Systems* Menu when the M2/ESO2/VBR licence key is purchased.

It is possible to operate the Encoder in a stand-alone Variable Bit-rate (VBR<sup>6</sup>) mode. When in this mode the bit-rate generated by the video encoder ranges between a minimum (Bmin - dependent on Compression Mode) and a maximum (Bmax - set by user, up to a limit defined by the Compression Mode). The video encoder attempts to use a bit-rate to achieve a particular picture quality set by the user.

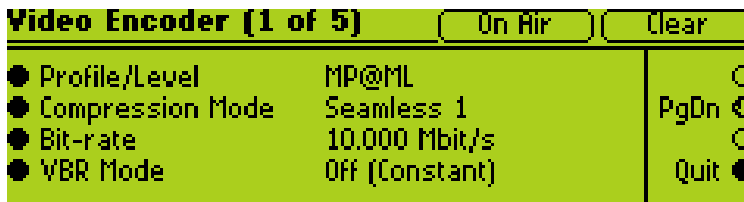
If this is set very high then the generated bit-rate clips at the Bmax value. If it is set very low then the bit-rate clips at Bmin. Somewhere in-between the bit-rate varies, depending on the picture material being encoded. Simple pictures use a lower bit-rate than complex pictures.

When in this mode the main encoder output remains at the bit-rate set within the Mux menu and any spare unused bit-rate is filled with stuffing packets. These could optionally be removed and reinserted by some equipment between the Encoder and Decoder.

A typical view of the Video Encoder menu would be:



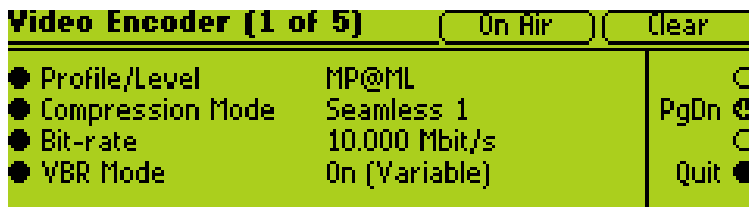
To run in VBR mode the Encoder must be placed into a Seamless Compression mode.



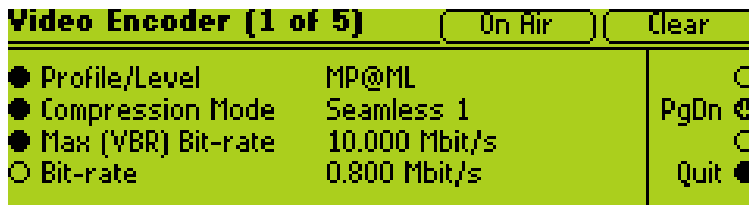
A new menu item **VBR Mode** then appears. When set to Off (Constant) the Encoder generates a fixed constant bit-rate set by the **Bit-rate** option.

When changed to On (Variable) the Encoder enters its stand-alone **VBR Mode**.

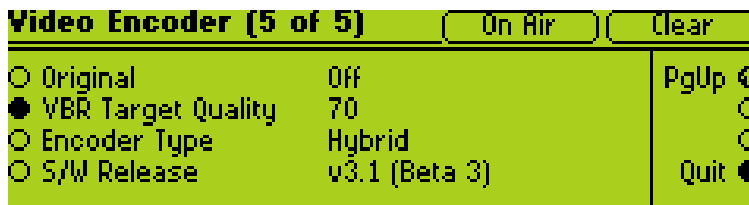
<sup>6</sup> The VBR licence M2/ESO2/VBR is needed with this option.



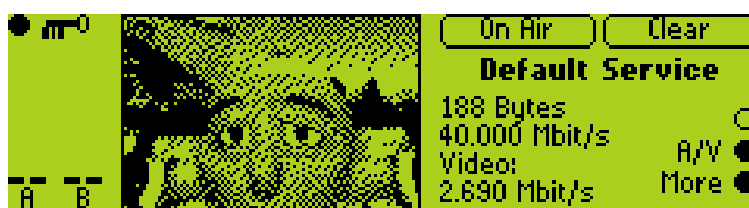
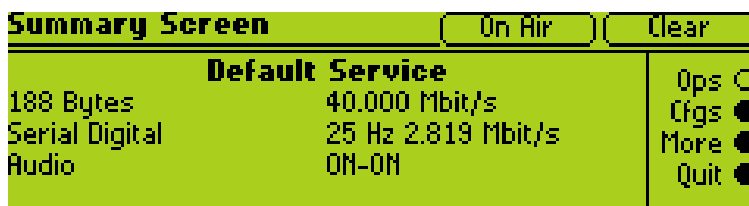
A new menu item appears **Max (VBR) Bit-rate**. This is the maximum bit-rate the Encoder will generate. The read-only menu item **Bit-rate** remains, but now indicates the bit-rate being generated by the Encoder.



The required picture quality is set in the same menu by the **VBR Target Quality** item.



When running in VBR Mode the two top-level status screens show the current bit-rate being used. This will typically vary.



### Delay Option

This option indicates the current video delay. It is for status only and cannot be changed.

### Resolution Option

This option gives both horizontal and vertical resolution. The first number indicates the horizontal resolution and the second the vertical resolution. For example, 720x576 gives a horizontal resolution of 720 and a vertical resolution 576.

Table 4.37: Resolution Options

In Auto, pixel value in brackets varies with bit-rate that is set.

Selected Option	SD Mode	Description
<b>625 Line Modes</b>		
Auto (720x576)	Auto (720x480)	Relates to the number of pixels across the screen and the number of lines down the screen (pixels x lines).
720 x576	720 x480	
704 x576	704x480	
640 x576	640x480	
544 x576	544x480	
528 x576	528x480	
480 x576	480x480	
352x576	352x480	
352x288 (SIF)	352x240 (SIF)	
<b>HD</b>		
1080 x 1920/1440/1280/960pSF 23.976		Relates to the number of lines down the screen and number of pixels across the screen (lines x pixels).
1080 x 1920/1440/1280/960pSF 24		
1080 x 1920/1440/1280/960i 25		
1080 x 1920/1440/1280/960pSF 25		
1080 x 1920/1440/1280/960i 29.97		
1080 x 1920/1440/1280/960i 30		
720 x 1280/960p 50		
720 x 1280/960p 59.94		
720 x 1280/960p 60		
576 x 720/704p 50		
480 x 720/704p 59.94		
480 x 720/704p 60		

### Aspect Ratio Option

This option does not affect the image processing.

Table 4.38: Aspect Ratio Options

Selected Option	Description
1, 0	Video image is encoded at 1:1 aspect ratio. Not currently used.
4:3	Video image is encoded at 4:3 aspect ratio. Default SD.
16:9	Video image is encoded at 16:9 aspect ratio. Default HD.
2.21:1	Video image is encoded at 2.21:1 aspect ratio. Not currently used.

### AFD Option (SD Only)

Active Format Descriptor (AFD) uses three bits of video index to define the video format. This information is encoded into user data and can then be used by a Decoder for wide-screen switching.

Table 4.39: AFD Options

Selected Option	Description
Off	No AFD data output.
On	Output AFD value zero if input is lost.
On (No Action on Error)	If the input is lost, carry on outputting last valid data.

**NOTE...**  
 625 line – with AFD set to On, lines 11 and 324 will be set to Video Index.  
 525 line – with AFD set to On, lines 14 and 277 will be set to Video Index.

Table 4.40: AFD Information

Video Input	Encoder Video Index Extraction	Encoder AFD off		Encoder AFD on		Encoder AFD on (No action on Error)	
		Sequence_header aspect_ratio_information	AFD user_data() active_format	sequence_header aspect_ratio_information	AFD user_data() active_format	sequence_header aspect_ratio_information	AFD user_data() active_format
Present	ON	Aspect ratio from Video Index	Not present	Aspect ratio from Video Index	AFD value from Video Index	Aspect ratio from Video Index	AFD value from Video Index
Present	OFF	Encoder setting	Not present	Encoder setting	0 (Active region is the same as encoded frame)	Stays at last aspect ratio extracted from Video Index	Stays at last value extracted from Video Index (This could be 0)
No input or Present but no Video Index data	ON	Encoder setting	Not present	Encoder setting	0 (Active region is the same as encoded frame)	Stays at last aspect ratio extracted from Video Index	Stays at last value extracted from Video Index (This could be 0)
No input or Present but no Video Index data	OFF	Encoder setting	Not present	Encoder setting	0 (Active region is the same as encoded frame)	Stays at last aspect ratio extracted from Video Index	Stays at last value extracted from Video Index (This could be 0)

### GOP Structure Option

This option enables the GOP Structure to be set.

Table 4.41: Group of Pictures Structure Options

Selected Option	Description
IBBBP	(IBBBPBBBPBBBI) (SD only).
IBBP	for successive B frames (IBBPBBBPBBPI) – default.
IBP	for operation with B frames (IBPBPBBBPBI).
IP	for non-B frame operation (IPPPPPPPPI) - default for very low delay modes.
IBBB	(IBBBIBBBIBBBIBBB) - professional editing standard (SD only).
IBB	IBBIBBIBBIBBIBBI) - professional editing standard.
IB	(IBIBIBIBIBIBIB) - a professional editing standard.
I-Frame	(IIIIIIIIII) - for precise editing and compression.

**NOTE...**

For some GOP changes operation can be seamless but this is not guaranteed.

### GOP Length Option

This enables the video GOP structure length to be set. The structure length determines how regularly an I frame is transmitted. The I frame provides a regular reference from which predicted frames can be generated, thereby ensuring that predictions do not become wildly inaccurate.

**NOTE...**

Some of the settings may not be available if they are not valid for use with other current encoding parameters. Also, changing the GOP structure automatically changes the GOP length if the current GOP length is not compatible with the selected structure.

Table 4.42: Group of Pictures Length Options (Long GOPs Disabled)

Valid Input Range	Description
Min: 1	GOP lengths available depend on GOP structure selected and the frame rate. Maximum GOP lengths are 12 for 25 Hz, 15 for 29.97/30 Hz, 24 for 50 Hz and 30 for 59.94/60 Hz.  I-Frame and IP encoding have 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. IBP and IB have 2, 4, 6, 8, 10, 12, 14. IBBP and IBB have 3, 6, 9, 12, 15. IBBBP and IBBB have 4, 8, 12 (SD only).
Max: 15	

### Long GOPs Option

This is used to enable or disable the use of GOP structures that are longer than 500 ms in duration. To set longer GOP values, use GOP length option with this option set to On.

Long GOP structures can improve video encoding performance, particularly at low bit-rates. However, it can lead to compression artefacts being visible on scene cuts, and a periodic build-up and removal of noise at the I-frame rate.

**NOTE...**  
 Long GOPs are not DVB compliant, and should be used with caution.

**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.

**Field/Frame Option (SD Only)**

This enables the choice of field or frame based pictures.  
 MPEG-2 encodes video at the field/frame level in what are known as pictures. These are coding units within the hierarchy of the spec. **Pictures** can be used in two ways, frame pictures and field pictures. With frame pictures a **frame** of a field 1 and field 2 is encoded as a single unit. With field pictures each individual **field** of video is encoded as a single unit, but must be followed or preceded by another **field picture** relating to its matching field.

*Table 4.43: Field/Frame Options*

Selected Option	Description
Fields	Field based pictures.
Frames	Frame based pictures.
Auto	Automatically chooses the correct option on a frame by frame basis.

**3:2 Pulldown Option**

This enables 3:2 pulldown (film) mode to be switched On and Off.

**NOTES...**

1. This option is only available for 29.97 Hz, 30 Hz, 59.97 Hz and 60 Hz modes.
2. In SD, VBI in Picture is not supported when 3:2 Pulldown is active.
3. 3:2 Pulldown is not valid for Very Low Delay and Mega Low Delay coding modes.
4. It is recommended to set this option to On.

The option should be switched on if the video material originated on film and has been converted from the 24 frames per second film rate to the 29.97 frames per second NTSC rate. This enables the Encoder to increase the video compression by only including a flag in the transport stream to represent a repeated field (when detected), rather than compressing the repeated fields.



## Concatenation Option<sup>7</sup> (SD Only)

Use this option if the signal has been coded, then decoded and is about to be coded again. It reduces picture degradation associated with multiple generation compression encoding. Setting this option may give better results as it tries to line up the I-frames. Only available to video via the SDI input. See *Application Note, ST.AN.1110, Near Loss-less MPEG Concatenation Without Helper Signals*.

## PID Option

The option is used for entering or updating video PIDs, as required. Enter a PID then press the **Enter** softkey to accept it.

To be DVB compliant, PIDs below 32 are reserved. Therefore PIDs 32 to 8191 are available for use. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.

## Component Tag Option

This item defines the optional component tag to be assigned to this video stream.

## Reflex Enable Option

The option is used to enable (On) or disable (Off) Reflex. It is only available with VBR licence keys M2/ESO2/VBR and M2/ESO2/HDVBR.

## Indicated Bit-Rate Option (SD Only)

This option controls the video bit-rate that is signalled in the transport stream. If set to 'Max Value' the maximum possible bit-rate for the profile and encoding mode is signalled. This is the way all previous generations of TANDBERG Encoders have operated. If set to 'Actual Value', and the encoding mode is not a seamless mode, then the bit-rate signalled is the actual video bit-rate set on the Encoder.

There is also a 2 Mbit/s option which signals 2 Mbit/s for use with a particular decoder range which requires this value.

## Copyright Option

This option indicates whether the information in the bit-stream is shown to be protected by copyright. It is for status only and cannot be changed.

## Original Option

This option indicates whether the bit-stream is an original or a copy of an original bit-stream. It is for status only and cannot be changed.

## Scene Cut Detection

**In SD mode**, this is a status only option. The Encoder detects that a scene change has happened and so intra-codes some or all of the blocks. That is, the picture is coded without any reference to previous frames.

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<sup>7</sup> Auto Concatenation is only available when software option M2/ESO2/ACON is purchased.

**In HD mode**, the Encoder also detects that a scene cut has occurred but, in this mode, inserts a complete new I frame to change the GOP structure to start on the new scene. This, again, stops any references to previous frames. However, changing the GOP structure may cause problems with older generation receiving equipment. Hence, Scene Cut Detection can be turned off in HD Encoder mode.

### **Insert VBV Delay Option (SD Only)**

If this option is turned on the Encoder will insert `vbv_delay` values into the picture header. This is required by some older set-top boxes. The default value is off.

### **PES Header Option**

This option controls how often the Encoder inserts a PES header into the transport stream.

The default option is 'per GOP', when the Encoder will insert a PES header at the start of every GOP. The alternative is 'per Picture', when the Encoder will insert a PES header at the start of every picture. The PES header contains the PTS (Presentation Time Stamp), and some set-top boxes require this to be sent more frequently than once every GOP, hence the PES per Picture option.

### **AFD Location Option (SD Only)**

This option indicates where the AFD information is transmitted. The options are: Sequence Header; Picture Header.

### **Intra DC Precision**

Intra DC Prec has possible values: Auto, 8 bits, 9 bits, 10 bits. 11 bits is also available in 422P@ML. **Auto** selects the optimum number of bits depending on the profile, coding mode and video bit-rate.

### **Rate Buffer Mode (SD Only)**

This has the values: Small, Medium. Refer to *Chapter 6* for information about using this option.

### **Encoder Type Option**

This option indicates the type of Encoder. It is for status only and cannot be changed.

### **S/W Release Option**

This option indicates the software release of the Video Compression Module. It is for status only and cannot be changed.

### **AFD HD (HD Only)**

The Encoder responds to a contact closure on the General Purpose Interface (GPI) to signal a change in aspect ratio.

When enabled, AFD is inserted into the picture `user_data` in accordance with the Digital TV Group (DTG) format. It is now also registered as a DVB standard (ETSI TR 101 154). When switched off, no AFD is present. The

menu items shown in *Table 4.44* are only available if the M2/EOM2/GPI GPI option card is purchased.

*Table 4.44: AFD HD (HD Only)*

Selected Option	Item	Description	Comments
AFD HD Mode	Off	No AFD data is put into user data.	
	On GPI	Signalling comes from GPI pin.	
	On user	Signalling is controlled via an SNMP OID, front panel or web page.	
AFD HD GPI Pin	Pin0, Pin 1,...Pin 7	Selects the pin to trigger the change of AFD state.	Only available if AFD mode is set to On GPI)
AFD HD 4/3 Pin Polarity	Open or Close	Selects the state, which is used to signal 4/3.	
AFD HD current state	4/3 or 16/9	Shows the current state.	Only available if AFD mode is set to On user)

## 4.6.5 Vertical Blanking Interval (VBI)/Userdata Menu

### Overview

The VBI Menu permits the selection of Vertical Blanking Interval (VBI) parameters. The Encoder can extract a maximum of eight VBI lines per field. However, this limit does not apply to Teletext. The VBI options that are available are dependent on the frame rate of the video.

### VBI/Userdata Menu (25/50 Hz Frame Rate)

#### Teletext (All lines) Option

This option provides a quick way of configuring the Encoder to the most common Teletext configuration. When turned On, it enables extraction of Teletext System B (WST) data from lines 7 to 22 and 320 to 335. It is possible to extract Teletext from lines 6, 318 and 319 as well, but these lines must be individually configured.

#### Teletext Data Out Option

This option indicates whether the Encoder is currently outputting Teletext data. It is for status only and cannot be changed.

#### Teletext PID Option

This option defines the PID to be used for Teletext data.

#### Teletext Tag Option

This option sets the component tag for the Teletext stream. The valid range is 0 to 255.

#### VITC on PES Option (SD only)

Extraction of VITC data from VBI lines as shown in VBI - Line 'n' Options on *Page 4-56*. Enabling this option will disable VBI on PID.

### VBI on PID Option

This option allows the transmission of VBI data on its own PID to be turned On or Off.

### VBI PID Option

This option defines the PID to be used for VBI data.

### VBI Component Tag Option

This option sets the component tag for the VBI stream. The valid range is 0 to 255.

### VBI In Picture Option (SD Only)

#### NOTES...

1. The **VBI in Picture** option is only accessible if the selected video profile/level is **422P@ML**<sup>8</sup>.
2. **VBI in Picture** transmits the VBI waveform as part of the picture and as such will be subject to some distortion. Most analogue VBI types are robust against this type of distortion but others, e.g. video index and ITS, are intended for SDI transmission and will not survive MPEG coding/decoding in VBI in Picture mode.

This enables the extended picture format available in the MPEG 4:2:2 specification to be selected. When selected, the Encoder compresses and transmits the VBI data as part of the active picture. This mode requires up to 3 Mbit/s of bit-rate, depending on the amount and complexity of the VBI present. It may be necessary to increase the video bit-rate accordingly to maintain picture quality.

#### NOTE...

When encoding VBI in this way **3:2 Pulldown** should be switched off. If it is not, then occasionally fields may not be encoded because of the inverse pulldown process. This results in some VBI lines not being transmitted.

When this option is not selected (or when 4:2:0 format video is used), VBI data must be transmitted in its original digital form either in an independent data stream (in the case of Teletext) or in user data fields within the MPEG video transport stream.

Table 4.45: VBI in Picture Options

Selected Option	Description
On	VBI is coded as active video.
Off	
Off (Bit-rate too low)	Insufficient bit-rate.

### VPS (Line 16) Option (SD Only)

This enables or disables the extraction of VPS (Video Programming System) data from line 16 of the video input.

<sup>8</sup> 4:2:2 is only available when software option M2/ESO2/422 is purchased.

## WSS (Line 23) Option (SD Only)

### NOTES...

1. Aspect ratio changes when WSS is enabled.
2. If the PES Header option in the **Video Encoder** menu is set to PES per picture, any aspect ratio changes will be signalled frame accurately if WSS-AFD is selected.

This enables or disables the extraction of WSS (Wide Screen Signalling) data from line 23 of the video input. The WSS format can either be in accordance with ETSI 300 294, or can be in the proprietary WSS-AFD format.

## Blank Line 23 Option (SD Only)

This option controls the blanking of line 23. The options are off or whole line blanked. The option is provided to enable line 23 VBI signals to be removed if it is found that set-top boxes are not correctly removing it when displaying in 'letter box' format. In most situations line 23 blanking should be disabled.

## Auto Detect VITC Option

If this option is enabled the Encoder automatically detects the presence of Vertical Interval Time Code (VITC) data.

**In SD mode**, the Encoder examines each VBI line, and its equivalent in the other field, for VITC signals. If it finds a VITC signal it stops searching and decodes VITC from that pair of lines. It does not look for VITC on VBI lines that are not configured to Off.

**In HD mode**, the timecode is extracted according to SMPTE RP188 from the HD SDI. It is always in Auto mode and, therefore, not shown in the menu structure. In this mode, if timecode data is found it is extracted and then put back into the video stream. If no timecode is found, a locally generated timecode is generated and inserted into the stream.

## VBI Line 'n' Option (SD Only)

### NOTE...

To autodetect VITC the lines within the VBI line option must be set to VITC (SD only).

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). Refer to *Table 4.46* for the options available for a frame rate of 25 Hz.

Table 4.46: VBI - Line 'n' Options

Option	Description
<b>Frame Rate = 29.97 Hz</b>	
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 <b>Closed Caption</b> option to <b>On [SMPTE 333M]</b> , <b>On [video 21 &amp; 284]</b> or <b>On [video line 21]</b> . It indicates that closed captioning data is extracted from the line. Setting Line 21 back to <b>Off</b> or <b>VITC</b> resets the <b>Closed Caption</b> option back to <b>Off</b> (see also <i>page 4-60</i> ).
Neilsen AMOL 1	Neilsen AMOL 1 data is extracted from the line.
Neilsen AMOL 1.1	Neilsen AMOL 1.1 data is extracted from the line.
<b>Frame Rate = 25 Hz</b>	
Off	VBI data is not extracted from the line.
Vertical Interval Time Code	VITC data extracted from the line.
Video Index	Aspect ratio will be affected (see <i>Table 4.40</i> ).
Teletext System B (World System Teletext)	Teletext System B data extracted from the line.
Inverted Teletext	Inverted Teletext is extracted from the line.
Wide Screen Signalling	The setting cannot be selected on this screen, but is set by setting the <b>WSS (Line 23)</b> option to <b>On</b> . It indicates that WSS data is extracted from the line. Setting Line 23 back to <b>Off</b> , <b>VITC</b> or <b>Teletext System B</b> resets the <b>WSS (Line 23)</b> option back to <b>Off</b> .
Closed Caption	Closed Caption data is extracted from the line.
Video Programming System	The setting cannot be selected on this screen, but is set by setting the <b>VPS (Line 16)</b> option to <b>On</b> . It indicates that VPS data is extracted from the line. Setting Line 16 back to <b>Off</b> , <b>VITC</b> or <b>Teletext System B</b> resets the <b>VPS (Line 16)</b> option back to <b>Off</b> .

When operating in ATSC mode and Closed Captions, the language of the descriptors is set by the Encoder.

When switching the Encoder from DVB to ATSC mode the PIDs are remapped. The remapping would be specified by the program paradigm. Switching back to DVB would invoke the original PIDs.

**NOTES...**

1. In HD only Teletext and Vertical Timecode options are available
2. VITC is carried as timecode in the video stream rather than as a separate PES stream. If VITC is not present, a locally generated timecode is sent instead.
3. From SV 3.6.0, VITC data can be carried in PES.

**Time Code in Userdata Option (HD Only)**

This option is used to insert a time code into userdata as defined by SMPTE 328. Only the time code section of SMPTE 328 is implemented, along with appropriate headers.

This option has the following selections: On/Off.

FIELD 1			FIELD 2		
			272	9	Same options as line 10
10		VITC (SMPTE), Video Index, Off, Closed Caption, Nielsen/AMOL 1, Nielsen/AMOL 11	273	10	Same options as line 10
11	11	Same options as line 10	274	11	Same options as line 10
12	12	Same options as line 10	275	12	Same options as line 10
13	13	Same options as line 10	276	13	Same options as line 10
14	14	Same options as line 10	277	14	Same options as line 10
15	15	Same options as line 10	278	15	Same options as line 10
16	16	Same options as line 10	279	16	Same options as line 10
17	17	Same options as line 10	280	17	Same options as line 10
18	18	Same options as line 10	281	18	Same options as line 10
19	19	Same options as line 10	282	19	Same options as line 10
20	20	Same options as line 10	283	20	Same options as line 10
21	21	Same options as line 10	284	21	Same options as line 10
22	22	Same options as line 10	285	22	Same options as line 10
23 - 262	23 - 262	ACTIVE VIDEO Start of coded video.	286 - 525	23 - 262	ACTIVE VIDEO Start of coded video.
263	263	ACTIVE VIDEO / Equalising pulses			
Line Number (whole frame)	Line Number (field by field)		Line Number (whole frame)	Line Number (field by field)	

- NOTES...**
1. In 525-line systems, fields start on the first full line after the end of the picture period. Therefore, field 1 is 262 lines long and field 2 is 263 lines long.
  2. An MPEG frame is 480 lines when formatting 525-line format pictures.
  3. For compatibility with some older Receivers the start of coded video may need to begin at line 22. Contact Customer Services for details.

Figure 4.10: VBI Structure Implemented by TANDBERG for 525-line Systems (SD Only)

FIELD 1		FIELD 2	
6	Teletext System B or Inverted Teletext, VITC, Video Index, Closed Caption, Wide Screen Signalling (WSS), Off, Video Programming System (VPS)	318	Same options as line 6
7	Same options as line 6	319	Same options as line 6
8	Same options as line 6	320	Same options as line 6
9	Same options as line 6	321	Same options as line 6
10	Same options as line 6	322	Same options as line 6
11	Same options as line 6	323	Same options as line 6
12	Same options as line 6	324	Same options as line 6
13	Same options as line 6	325	Same options as line 6
14	Same options as line 6	326	Same options as line 6
15	Same options as line 6	327	Same options as line 6
16	Same options as line 6	328	Same options as line 6
17	Same options as line 6	329	Same options as line 6
18	Same options as line 6	330	Same options as line 6
19	Same options as line 6	331	Same options as line 6
20	Same options as line 6	332	Same options as line 6
21	Same options as line 6	333	Same options as line 6
22	Same options as line 6	334	Same options as line 6
23	Same options as line 6      Start of coded video.	335	Same options as line 6
24	ACTIVE VIDEO	336	Same options as line 6      Start of coded video.
25 - 310	ACTIVE VIDEO	337 - 622	ACTIVE VIDEO
311 - 312	Equalising Pulses	623	ACTIVE VIDEO / Equalising Pulses
313	Equalising Pulses (part)	624 - 625	Equalising Pulses

- NOTES...**
- Any type of valid VBI can be on any line, even if it is not usually associated with that line.
  - 625-line fields start on the leading edge of the first vertical sync (broad) pulse. Therefore, the first half of line 313 is in field 1 and the second half is in field 2.
  - An MPEG frame is 576 lines when formatting 625-line format pictures.
  - Line 23 is the Wide Screen Signalling line. It carries information which defines the picture Aspect Ratio.
  - ETS 300 294 is the specification which describes WSS.
  - EN 300 472 is the specification associated with System B Teletext (World System Teletext).

Figure 4.11: VBI Structure Implemented by TANDBERG for 625-line Systems (SD Only)



## VBI Menu (29.97/30/59.94/60 Hz Frame Rate)

### VITC on PES Option (SD only)

Extraction of VITC data from VBI lines as shown in *Table 4.46: VBI - Line 'n' Options on Page 4-56*. Enabling this option will disable VBI on PID.

### VBI on PID Option

This option allows the transmission of VBI data on its own PID to be turned On or Off.

### VBI PID Option

This option defines the PID to be used for VBI data.

### VBI Component Tag Option

This option sets the component tag for the VBI stream. The valid range is 0 to 255.

### VBI In Picture Option (SD Only)

#### NOTES...

1. The **VBI in Picture** option is only accessible if the selected video profile/level is **422P@ML<sup>9</sup>**.
2. **VBI in Picture** transmits the VBI waveform as part of the picture and as such will be subject to some distortion. Most analogue VBI types are robust against this type of distortion but others, e.g. video index and ITS, are intended for SDI transmission and will not survive MPEG coding/decoding in VBI in Picture mode.

This enables the extended picture format available in the MPEG 4:2:2 specification to be selected. When selected, the Encoder compresses and transmits the VBI data as part of the active picture. This mode requires up to 3 Mbit/s of bit-rate, depending on the amount and complexity of the VBI present. It may be necessary to increase the video bit-rate accordingly to maintain picture quality.

#### NOTE...

When encoding VBI in this way **3:2 Pulldown** should be switched off. If it is not, then occasionally fields may not be encoded because of the inverse pull-down process. This results in some VBI lines not being transmitted.

When this option is not selected (or when 4:2:0 format video is used), VBI data must be transmitted in its original digital form either in an independent data stream (in the case of Teletext) or in user data fields within the MPEG video transport stream.

*Table 4.47: VBI in Picture Options*

Selected Option	Description
On	VBI is coded as active video.
Off	
Off (Bit-rate too low)	Insufficient bit-rate.

<sup>9</sup> 4:2:2 is only available when software option M2/ESO2/422 is purchased.

### **Closed Caption Option**

This option controls the extraction and processing of closed caption data by the Encoder. Closed caption data can be obtained from: video line 21, video lines 21 and 284, or be received in accordance with SMPTE 333M on RS-232 and SMPTE 334M on HDSDI.

#### **NOTE...**

The Encoder automatically converts EIA608 to EIA708 format. The 'CC...' settings are used in this conversion.

### **CC Format Option**

This inserts the closed captions as user data in the video stream in the selected format.

This controls the format used to insert the closed captions as user data in the video stream. The options are ATSC (SD and HD), SCTE 20/21 (SD only) or a proprietary TANDBERG/NDS format (SD only).

### **CC Descriptor Option**

This option is only available if the CC format is set to ATSC. The option controls the CC Descriptor type that the Encoder generates. The options are 'Line 21 only', 'Line 21 and Advanced', and 'Advanced only'.

### **CC Font Option**

This option is only available if the CC Format is ATSC, and Closed Captions are being extracted from line 21 or lines 21 and 284. It defines the font to be used for displaying the closed caption text.

### **CC Pen Size**

This option is only available if the CC Format is ATSC, and Closed Captions are being extracted from line 21 or lines 21 and 284. It defines the pen size to be used for displaying the closed caption text.

### **CC Foreground Size**

This option is only available if the CC Format is ATSC, and Closed Captions are being extracted from line 21 or lines 21 and 284. It defines the foreground colour to be used for displaying the closed captions.

### **CC Background Size**

This option is only available if the CC Format is ATSC, and Closed Captions are being extracted from line 21 or lines 21 and 284. It defines the background colour to be used for displaying the closed captions.

### **Field 1 Captions**

This option sets the appropriate descriptors in the PSIP information. It allows the number of CC services, from the source, contained in Field 1 to be entered.

**Field 2 Captions**

This option sets the appropriate descriptors in the PSIP information. It allows the number of CC services, from the source, contained in Field 2 to be entered.

**SMPTE 333M Port Option**

This option is only displayed if the Closed Captions are set to SMPTE 333M input. It controls which RS-232 interface is used for receiving the closed caption data.

**CC Packet Size Option**

This option is only displayed if the Closed Captions are set to SMPTE 333M input. It controls the size of closed caption packet the Encoder requests from the closed caption server via the SMPTE 333M interface.

**Auto Detect VITC Option**

If this option is enabled the Encoder automatically detects the presence of Vertical Interval Time Code (VITC) data and extracts it.

**In SD mode**, the Encoder examines each VBI line, and its equivalent in the other field, for VITC signals. If it finds a VITC signal it stops searching and decodes VITC from that pair of lines. It does not look for VITC on VBI lines that are not configured to Off.

**In HD mode**, the timecode is extracted according to SMPTE RP188 from the HD SDI. It is always in Auto mode and, therefore, not shown in the menu structure. In this mode, if timecode data is found it is extracted and then put back into the video stream. If no timecode is found, a locally generated timecode is generated and inserted into the stream.

**VBI Line 'n' Option (SD only)****NOTE...**

To autodetect VITC the lines within the VBI line option must be set to VITC (SD only).

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). Refer to *Table 4.46* for the options available and also the notes below the table.

**Time Code in Userdata Option (HD Only)**

This option is used to insert a time code into userdata as defined by SMPTE 328. Only the time code section of SMPTE 328 is implemented, along with appropriate headers.

This option has the following selections: On/Off.

## 4.7 Audio Menu

### 4.7.1 Overview

The Encoder can process two stereo pairs as standard, but with the addition of Audio Option Cards it can process more. The control menu for each stereo pair is essentially the same, but the options available are dependent on the audio coding standard selected. See *Figure 4.12* for the menu structure.

### 4.7.2 Audio A / B Menus – MPEG Layer 2

#### Introduction

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.

#### Source Option

This option defines the audio source.

Table 4.48: Source Options

Selected Option	Description
Off	No audio packets are sent in the transport stream and audio is removed from the SI.
Mute	Audio silence.
Test Tone	An internally generated test tone is used as the audio source. The bit-rate automatically changes to 96 kbit/s.
Analogue	Analogue audio input on <b>AUDIO IN</b> connector.
Digital	Digital audio input on <b>AUDIO IN</b> connector.
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)

#### Coding Standard Option

This option controls the audio coding standard. The options available in the audio menu are dependent on the coding standard selected.

Table 4.49: Coding Standard Options

Selected Option	Description
MPEG Layer 2	MPEG Layer 2 audio coding standard.
AC-3 Pass-Thru	Pre-encoded (in Dolby Encoder) AC-3 audio coding standard. See <i>Annex F, Audio Modes</i> , for information.
Dolby E Pass-Thru	Dolby E audio coding standard (pre-encoded in Dolby Encoder). See <i>Annex F, Audio Modes</i> , for information mode.
Dolby Digital (AC-3)	Dolby Digital (AC-3) audio coding standard.
DTS Pass-Thru	DTS audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Linear PCM (Direct)	Linear PCM audio coding standard. See <i>Annex F, Audio Modes</i> , for information.
Linear PCM (Via SRC)	When selected, the audio passes through the sample rate converter before encoding. As a consequence, any user data bits in the incoming digital audio stream are lost. Audio passes through the SRC for all input sources i.e. Embedded, Digital, Analogue (though not really relevant for analogue).

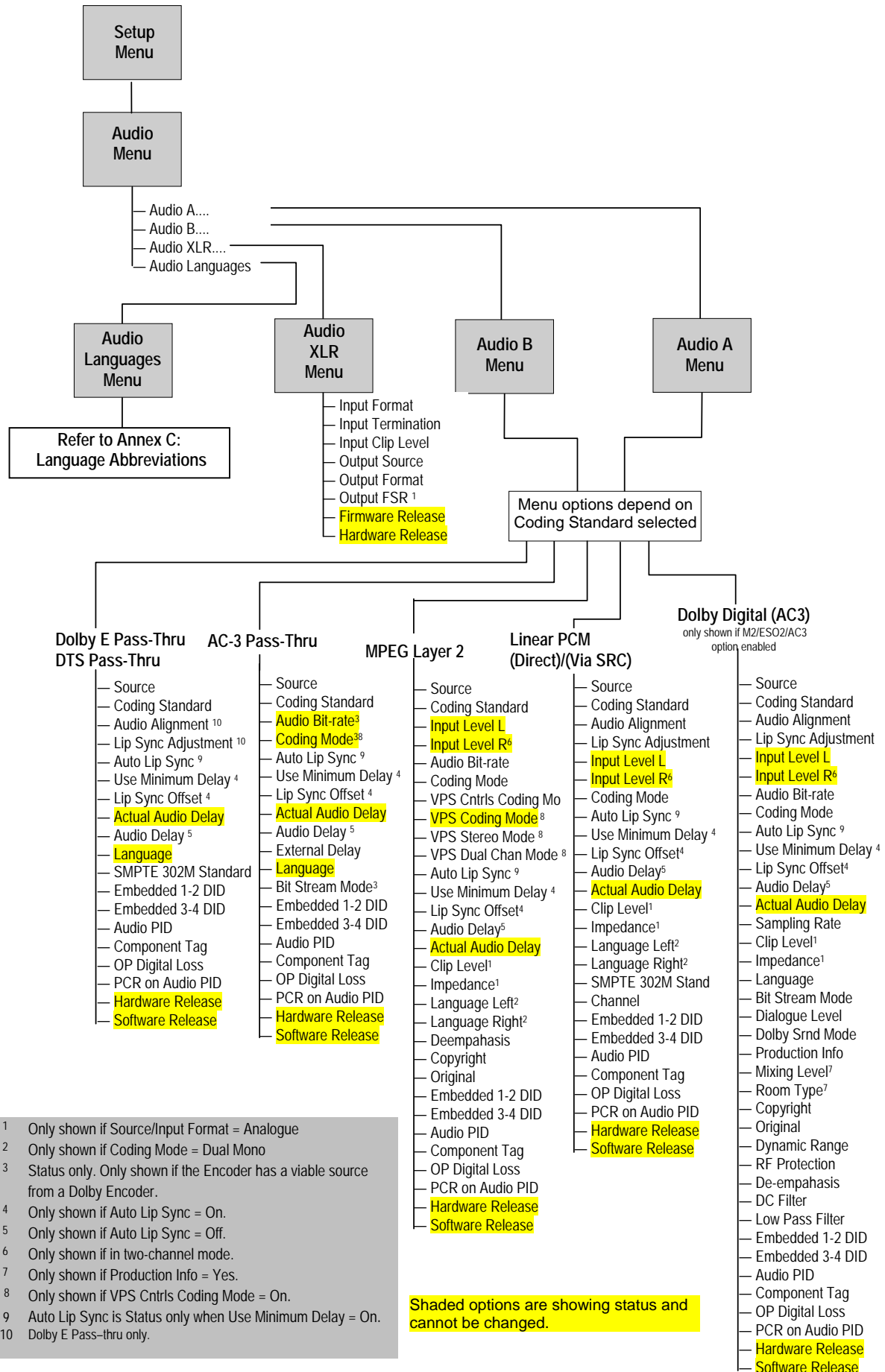


Figure 4.12: Menu Hierarchy – Setup/Audio Menu

### Input Level L Option

This indicates the input level of the left audio channel. It is for status only and cannot be changed.

### Input Level R Option

This indicates the input level of the right audio channel. It is for status only and cannot be changed.

### Audio Bit-rate Option

This option sets the audio bit-rate of this audio channel.

Table 4.50: Audio Bit-rate Options

Available Settings	MPEG Layer 2 Coding			
	Mono	Dual Mono	Stereo	Joint Stereo
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	✗	✗	✗	✗

### Coding Mode Option

This option sets the audio coding mode. If the current audio bit-rate is outside the bit-rate range supported by the new coding mode, the bit-rate is automatically changed to the lowest value within the supported range.

Table 4.51: Coding Mode Options (MPEG-2)

Selected Option	Description
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.

**NOTE...**

Audio Description is only available if the input source is either digital or SDI embedded.

### VPS Controls Coding Mode

When selected, this option allows the extraction of the Audio Coding Mode from Video Programming System (VPS).

### VPS Coding Mode

**NOTE...**

Only available if VPS Controls Coding Mode is set to On.

This is a read-only item. This menu displays what the motherboard has been able to extract from the VPS.

Table 4.52: Coding Mode Options (MPEG-2)

Selected Option	Description
Not detected	Not able to extract any information. In this case, the coding mode signalled shall revert to that set in the existing 'Coding Mode' menu..
Undefined	
Single Chan (Mono)	
Stereo	
Dual Chan	

### VPS Word 5

**NOTE...**

Only available if VPS Controls Coding Mode is set to On.

This displays the hex value extracted from the VPS. If it has not been able to extract any information, it displays 0xFF.

Table 4.53: VPS Bits

Incoming Signalling via Line 16				Encoding and Signalling Modes to be Performed by the Audio Encoder		
Video Programming System Word 5				ISO/IEC 11172-3 Mode Field in Header		Audio Encoding Mode
Bit 1	Bit 2	Bit 5	Bit 6	Bit 1	Bit 2	
0	0	X	X	1	0	Undefined, but will code Dual Channel
0	1	X	X	1	1	Single Channel (Mono left)
1	0	X	0	0	1	Joint Stereo
1	0	X	1	0	0	Stereo
1	1	0	X	1	0	Dual Channel
1	1	1	X	1	1	Single Channel (Mono left)

### VPS Stereo Mode

**NOTE...**  
 Only available if VPS Controls Coding Mode is set to On.

Table 4.54: VPS Stereo Mode Options

Selected Option	Description
Auto-Bit5	
Auto-Bit6	In auto modes, the corresponding bit in VPS Word5 controls whether stereo or joint stereo is coded.
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

**NOTE...**  
 Only available if VPS Controls Coding Mode is set to On.

Table 4.55: VPS Dual Chan Mode Options

Selected Option	Description
Auto-Bit5	
Auto-Bit6	In auto modes, the corresponding bit in VPS Word5 controls whether the dual or single channel is coded.
Auto-Bit7	
Auto-Bit8	
Dual	If either of these options is selected, the coding mode is forced to this when Dual channel is signalled in bits 1 and 2 (i.e. Bit1/2 is 1 1).
Single	



### Auto Lip Sync Option<sup>10</sup>

This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video. 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.

See the text underneath *Table 4.16* on *page 4-30* for use of this facility.

### Use Minimum Delay

This sets the lowest possible audio delay.

If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.

### Lip Sync Offset Option

This option is only available if the Auto Lip Sync option is set to On. It allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.

*Table 4.56: Lip Sync Offset Options*

Valid Input Range	Description
Min: -50 Max: 50	Lip Sync Offset in milliseconds.

### Audio Delay Option

This option is only available if the Auto Lip Sync option is set to Off. It sets the delay that should be applied to the audio.

*Table 4.57: Audio Delay Options*

Valid Input Range	Description
Min: 111 Max: 3540	Audio Delay in milliseconds.

### Actual Audio Delay

Shows the actual audio delay. It is for status only and cannot be changed.

### Clip Level Option

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 head room above 0 dBu prior to the audio being clipped.

**NOTE...**  
The clip levels available depend on the hardware issue of the Encoder.

<sup>10</sup> To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.

Table 4.58: Clip Level Options

Selected Option	Description
12 dB	12 dB audio clipping level.
15 dB	15 dB is only available with PCB issue 4 and later.
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.

### Impedance Option

This option is only displayed if the audio source is set to analogue. It enables the input impedance of the analogue audio input to be set to either 600 Ω or 20 kΩ.

### Language or Language Left/Right Option

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.

### De-emphasis Option

This option is turned on in order to de-emphasise pre-emphasised audio input into the Encoder.

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.

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.

### Copyright Option

This controls the Copyright flag in the bit-stream. If set to On the bit-stream is shown to be protected by copyright.

### Original Option

This controls the setting of the Original flag in the bit-stream. If set to On the bit-stream will be signalled as an original, if set to Off the bit-stream will be signalled as a copy of an original bit-stream.

### Embedded Source Option

This option defines the embedded source. Select HD-SDI or SD-SDI.

### Embedded 1-2 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

Table 4.59: Embedded 1-2 DID Options

Selected Option	Description
Min: 0	Off
Max: 1023	Select DID
Other: >1023	Default DID

### Embedded 3-4 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

### Audio PID Option

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 Option

This item defines the optional component tag to be assigned to this audio stream.

### PCR On Audio PID Option

This option controls whether PCR should be signalled on the audio PID. This may be necessary if an audio only service is being generated. The default setting is Off.

### OP Digital Loss

This option controls behaviour digital audio is not locked.

Table 4.60: OP Digital Loss Options

Selected Option	Description
Silence	Valid PES stream containing silence
No PID	No Audio PES stream (though stream is still referenced in SI)
No ASI O/P	The ASI output of the Encoder is turned off

### Hardware Release Option

This option indicates the hardware version of this audio encode channel. It is for status only and cannot be changed.

## Software Release Option

This option indicates the software version of this audio encoder channel. It is for status only and cannot be changed.

### 4.7.3 Audio (Dolby Digital (AC-3) Menu)

#### Source Option

This option defines the audio source.

Table 4.61: Source Options

Selected Option	Description
Off	No audio packets are sent in the transport stream and audio is removed from the SI.
Mute	Audio silence.
Test Tone	An internally generated test tone is used as the audio source. The bit-rate automatically changes to 96 kbit/s.
Analogue	Analogue audio input on <b>AUDIO IN</b> connector.
Digital	Digital audio input on <b>AUDIO IN</b> connector.
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)

#### Coding Standard Option

This option controls the audio coding standard. The options available in the audio menu are dependent on the coding standard selected.

Table 4.62: Coding Standard Options

Selected Option	Description
MPEG Layer 2	MPEG Layer 2 audio coding standard.
AC-3 Pass-Thru	Pre-encoded (in Dolby Encoder) AC-3 audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby E Pass-Thru	Dolby E audio coding standard (pre-encoded in Dolby Encoder). See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby Digital (AC-3)	Dolby Digital (AC-3) audio coding standard.
DTS Pass-Thru	Pre-encoded DTS audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Linear PCM (Direct)	Linear PCM audio coding standard. See <i>Annex F, Audio Modes</i> , for information.
Linear PCM (Via SRC)	When selected, the audio passes through the sample rate converter before encoding. As a consequence, any user data bits in the incoming digital audio stream are lost. Audio passes through the SRC for all input sources i.e. Embedded, Digital, Analogue (though not really relevant for analogue).

#### Audio Alignment

Setting this to **Aligned** ensures each PES packet contains an integral number of audio frames (which is required by some set-top boxes).

## Lip Sync Adjustment

**NOTE...**

This option is only available when the **Audio Alignment** option is enabled.

Using the Lip Sync Adjustment option, audio can be advanced by 1 or 2 frames to compensate for the audio encoder delay and 1 frame as the decoder expects the audio a frame before the video. *Table 4.63 shows the option.*

Table 4.63: Lip Sync Adjustment Options

Selected Option	Description
-1 frame	
0	When Audio Alignment is enabled, the audio delay can be nudged as indicated. The default is 0.
+1 frame	
+2 frames	

## Input Level L Option

This indicates the input level of the left audio channel. It is for status only and cannot be changed.

## Input Level R Option

This indicates the input level of the right audio channel. It is for status only and cannot be changed.

## Audio Bit-rate Option

This option sets the audio bit-rate of this audio channel.

Table 4.64: Audio Bit-rate Options (Dolby Digital (AC-3))

Available Settings	Dolby Digital	
	1/0(C)	2/0(L,R)
32 kbit/s	x	x
48 kbit/s	x	x
56 kbit/s	✓	x
64 kbit/s	✓	x
80 kbit/s	✓	x
96 kbit/s	✓	✓
112 kbit/s	✓	✓
128 kbit/s	✓	✓
160 kbit/s	✓	✓
192 kbit/s	✓	✓
224 kbit/s	✓	✓
256 kbit/s	✓	✓
320 kbit/s	✓	✓

Available Settings	Dolby Digital	
	1/0(C)	2/0(L,R)
384 kbit/s	✓	✓
448 kbit/s	✓	✓
512 kbit/s	✓	✓
576 kbit/s	✓	✓
640 kbit/s	✓	✓

### Coding Mode Option

This option sets the audio coding mode. If the current audio bit-rate is outside the bit-rate range supported by the new coding mode, the bit-rate is automatically changed to the lowest value within the supported range.

Table 4.65: Coding Mode Options

Selected Option	Description
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.
Joint Stereo	

### Auto Lip Sync Option<sup>11</sup>

This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video. 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.

See the text underneath *Table 4.16* on page 4-30 for use of this facility.

### Lip Sync Offset Option

This option is only available if the Auto Lip Sync option is set to On. It allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.

Table 4.66: Lip Sync Offset Options

Valid Input Range	Description
Min: -50 Max: 50	Lip Sync Offset in milliseconds.

<sup>11</sup> To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.

## Audio Delay Option

This option is only available if the Auto Lip Sync option is set to Off. It sets the delay that should be applied to the audio.

Table 4.67: Audio Delay Options

Valid Input Range	Description
Min: 111 Max: 3540	Audio Delay in milliseconds.

## Use Minimum Delay

This sets the lowest possible audio delay.

If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.

## Actual Audio Delay

Shows the actual audio delay. It is for status only and cannot be changed.

## Sampling Rate Option

This option controls the audio sampling rate.

## Clip Level Option

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 head room above 0 dBu prior to the audio being clipped.

### NOTE...

The clip levels available depend on the hardware issue of the Encoder.

Table 4.68: Clip Level Options

Selected Option	Description
12 dB	12 dB audio clipping level.
15 dB	15 dB is only available with PCB issue 4 and later.
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.

## Impedance Option

This option is only displayed if the audio source is set to analogue. It enables the input impedance of the analogue audio input to be set to either 600  $\Omega$  or 20 k $\Omega$ .

## Language Option

This enables the language of the audio channel to be set.

### Bit Stream Mode Option

This option sets the bit-stream mode that is signalled in the bit-stream. It is used to indicate the type of service the bit-stream conveys.

Table 4.69: Bit Stream Mode Options

Selected Option	Description
Complete Main	
Music & Effects	
Visually impaired	
Hearing impaired	
Dialogue	
Commentary	
Emergency	
Reserved	
Voice Over/Karaoke	In Dolby Digital when the coding mode is 1/0 this option appears as 'Voice Over' otherwise as 'Karaoke'.

### Dialogue Level Option

This option sets the dialogue level that the Encoder will signal in the bit-stream. The dialogue level indicates how far the average dialogue level is below digital 100%. It is not used by the AC-3 decoder, but may be used by other parts of the sound reproduction system.

Table 4.70: Dialogue Level Options

Selected Option	Description
-1 dB to -31 dB	Dialogue levels between -1 dB to -31 dB.

### Dolby Srnd Mode Option

This option is only available if the coding mode is 2/0(L,R). It determines whether the bit-stream is signalled as conveying a Dolby Surround encoded program or not. This information is not used by the AC-3 Decoder, but may be used by other parts of the sound reproduction system.

Table 4.71: Dolby Srnd Mode Options

Selected Option	Description
Not indicated	It is not known if the bit-stream is conveying a Dolby Surround encoded program.
Not Dolby Surround	The bit-stream is not conveying a Dolby Surround encoded program.
Dolby Surround	The bit-stream is conveying a Dolby Surround encoded program.

### Production Info Option

This option indicates whether the Mixing Level and Room Type parameters exist within the bit-stream.



## Mixing Level Option

This option is only available if the Production Info option is set to On. This parameter indicates the acoustic sound pressure level of the dialogue level during the final audio mixing session. 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.

Table 4.72: Mixing Level Options

Selected Option	Description
0 dB to 31 dB	Mixing levels between 0 dB to 31 dB.

## Room Type Option

This option is only available if the Production Info option is set to On. This parameter indicates the type and calibration of the mixing room used for the final audio mixing session. Refer to ATSC Doc. A52 for further details.

Table 4.73: Room Type Options

Selected Option	Description
Not Indicated	
Small, Flat Mon	Type and calibration of the mixing room used
Large, X Curve Mon	for the final audio mixing session.

## Copyright Option

This controls the Copyright flag in the bit-stream. If set to On the bit-stream is shown to be protected by copyright.

## Original Option

This controls the setting of the Original flag in the bit-stream. If set to On the bit-stream will be signalled as an original, if set to Off the bit-stream will be signalled as a copy of an original bit-stream.

## Dynamic Range Option

The dynamic range of audio material can vary according to its origin. This function determines which compression profile is applied to the encoding process.

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).

Table 4.74: Dynamic Range Options

Selected Option	Description
None	Program reproduction with the original dynamic range.
Film Standard	
Film Light	
Music Standard	
Music Light	
Speech	

### **RF Protection Option**

This option enables or disables RF Overmodulation Protection. It is used in situations where the audio signal of a decoded AC-3 bit-stream 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.

### **De-emphasis Option**

This option is turned on in order to de-emphasise pre-emphasised audio input into the Encoder.

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.

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.

### **DC Filter Option**

This option turns on or off a dc high pass filter in the input channel. Removing the dc 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.

### **Low Pass Filter Option**

This option is used to enable or disable a low-pass filter in the audio input which has a cut-off near the specified bandwidth of the audio channel.

### **Embedded Source Option**

This option defines the embedded source. Select HD-SDI or SD-SDI.

### Embedded 1-2 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

Table 4.75: Embedded 1-2 DID Options

Selected Option	Description
Min: 0	Off
Max: 1023	Select DID
Other: >1023	Default DID

### Embedded 3-4 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

### Audio PID Option

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 Option

This item defines the optional component tag to be assigned to this audio stream.

### PCR On Audio PID Option

This option controls whether PCR should be signalled on the audio PID. This may be necessary if an audio only service is being generated. The default setting is Off.

### OP Digital Loss

This option controls behaviour digital audio is not locked.

Table 4.76: OP Digital Loss Options

Selected Option	Description
Silence	Valid PES stream containing silence
No PID	No Audio PES stream (though stream is still referenced in SI)
No ASI O/P	The ASI output of the Encoder is turned off

### Hardware Release Option

This option indicates the hardware version of this audio encoder channel. It is for status only and cannot be changed.

### Software Release Option

This option indicates the software version of this audio encoder channel. It is for status only and cannot be changed.

## 4.7.4 Audio (Dolby (AC-3) Pass-thru, Dolby E Pass-thru and DTS Pass-thru) Menu

### Source Option

This option defines the audio source.

Table 4.77: Source Options

Selected Option	Description
Off	No audio packets are sent in the transport stream and audio is removed from the SI.
Digital	Digital audio input on <b>AUDIO IN</b> connector.
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)

### Coding Standard Option

This option controls the audio coding standard. The options available in the audio menu are dependent on the coding standard selected.

Table 4.78: Coding Standard Options

Selected Option	Description
MPEG Layer 2	MPEG Layer 2 audio coding standard.
AC-3 Pass-Thru	Pre-encoded (in Dolby Encoder) AC-3 audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby E Pass-Thru	Dolby E audio coding standard (pre-encoded in Dolby Encoder). See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby Digital (AC-3)	Dolby Digital (AC-3) audio coding standard.
DTS Pass-Thru	Pre-encoded DTS audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Linear PCM (Direct)	Linear PCM audio coding standard. See <i>Annex F, Audio Modes</i> , for information.
Linear PCM (Via SRC)	When selected, the audio passes through the sample rate converter before encoding. As a consequence, any user data bits in the incoming digital audio stream are lost. Audio passes through the SRC for all input sources i.e. Embedded, Digital, Analogue (though not really relevant for analogue).

### Audio Alignment (Dolby E only)

When checked, **Auto Lip Sync** is forced **On**, the delay can be 'nudged' using the **Lip Sync Adjustment** option.

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.

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.

## Lip Sync Adjustment

**NOTE...**

This option is only available when the **Audio Alignment** option is enabled.

Using the Lip Sync Adjustment option, audio can be advanced by 1 or 2 frames to compensate for the audio encoder delay and 1 frame as the decoder expects the audio a frame before the video. *Table 4.63 shows the option.*

*Table 4.79: Lip Sync Adjustment Options*

Selected Option	Description
-1 frame	
0	When Audio Alignment is enabled, the audio delay can be nudged as indicated. The default is 0.
+1 frame	
+2 frames	

## Audio Bit-rate Option

This option shows the audio bit-rate of this audio channel. It is for status only and cannot be changed.

## Auto Lip Sync Option<sup>12</sup>

This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video. 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.

See the text underneath *Table 4.16* on *page 4-30* for use of this facility.

## Use Minimum Delay

This sets the lowest possible audio delay.

If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.

<sup>12</sup> To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.

### Lip Sync Offset Option

This option is only available if the Auto Lip Sync option is set to On. It allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.

Table 4.80: Lip Sync Offset Options

Valid Input Range	Description
Min: -50 Max: 50	Lip Sync Offset in milliseconds.

### Audio Delay Option

This option is only available if the Auto Lip Sync option is set to Off. It sets the delay that should be applied to the audio.

Table 4.81: Audio Delay Options

Valid Input Range	Description
Min: 111 Max: 3540	Audio Delay in milliseconds.

### Actual Audio Delay

Shows the actual audio delay. It is for status only and cannot be changed.

### Language Option

This enables the language of the audio channel to be set.

### SMPTE 302M Standard Option

This option is only available if the coding standard is Dolby E Pass-thru. SMPTE 302M defines the mapping of AES3 data into an MPEG-2 transport stream. Problems may be experienced with some Receivers if the Encoder and Receiver are not using the same version of SMPTE 302M. This option allows the Encoder to be configured to work in either the 1998 or the 2000 version of SMPTE 302M.

Table 4.82: SMPTE 302M Standard Options

Selected Option	Description
1998 Standard	Refers to the 1998 SMPTE 302M standard.
2000 Standard	Refers to the 2000 SMPTE 302M standard.

### Channel Option

This option is only available if the coding standard is Dolby E Pass-thru. It controls the value written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.

Table 4.83: Channel Options

Valid Input Range	Description
Min: 0	This value is written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.
Max: 15	

### Embedded Source Option

This option defines the embedded source. Select HD-SDI or SD-SDI.

### Embedded 1-2 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

Table 4.84: Embedded 1-2 DID Options

Selected Option	Description
Min: 0	Off
Max: 1023	Select DID
Other: >1023	Default DID

### Embedded 3-4 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

### Audio PID Option

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 Option

This item defines the optional component tag to be assigned to this audio stream.

### PCR On Audio PID Option

This option controls whether PCR should be signalled on the audio PID. This may be necessary if an audio only service is being generated. The default setting is Off.

### OP Digital Loss

This option controls behaviour digital audio is not locked.

Table 4.85: OP Digital Loss Options

Selected Option	Description
Silence	Valid PES stream containing silence
No PID	No Audio PES stream (though stream is still referenced in SI)
No ASI O/P	The ASI output of the Encoder is turned off

### Hardware Release Option

This option indicates the hardware version of this audio encoder channel. It is for status only and cannot be changed.

### Software Release Option

This option indicates the software version of this audio encoder channel. It is for status only and cannot be changed.

## 4.7.5 Audio (Linear PCM [Direct][Via SRC]) Menu

### Source Option

This option defines the audio source.

Table 4.86: Source Options

Selected Option	Description
Off	No audio packets are sent in the transport stream and audio is removed from the SI.
Mute	Audio silence.
Test Tone	An internally generated test tone is used as the audio source. The bit-rate automatically changes to 96 kbit/s.
Analogue	Analogue audio input on <b>AUDIO IN</b> connector.
Digital	Digital audio input on <b>AUDIO IN</b> connector.
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF (SD), 0x2E7 (HD)
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD (SD), 0x1E6 (HD)

### Coding Standard Option

This option controls the audio coding standard. The options available in the audio menu are dependent on the coding standard selected.

Table 4.87: Coding Standard Options

Selected Option	Description
MPEG Layer 2	MPEG Layer 2 audio coding standard.
AC-3 Pass-Thru	Pre-encoded (in Dolby Encoder) AC-3 audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby E Pass-Thru	Dolby E audio coding standard (pre-encoded in Dolby Encoder). See <i>Annex F, Audio Modes</i> , for information when using this mode.
Dolby Digital (AC-3)	Dolby Digital (AC-3) audio coding standard.
DTS Pass-Thru	Pre-encoded DTS audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this mode.
Linear PCM (Direct)	Linear PCM audio coding standard. See <i>Annex F, Audio Modes</i> , for information when using this



	mode.
Linear PCM (Via SRC)	When selected, the audio passes through the sample rate converter before encoding. As a consequence, any user data bits in the incoming digital audio stream are lost. Audio passes through the SRC for all input sources i.e. Embedded, Digital, Analogue (though not really relevant for analogue).

### Audio Alignment

When checked, **Auto Lip Sync** is forced **On**, the delay can be ‘nudged’ using the **Lip Sync Adjustment** option.

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.

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.

### Lip Sync Adjustment

**NOTE...**  
This option is only available when the **Audio Alignment** option is enabled.

Using the Lip Sync Adjustment option, audio can be advanced by 1 or 2 frames to compensate for the audio encoder delay and 1 frame as the decoder expects the audio a frame before the video. *Table 4.63 shows the option.*

Table 4.88: Lip Sync Adjustment Options

Selected Option	Description
-1 frame	
0	When Audio Alignment is enabled, the audio delay can be nudged as indicated. The default is 0.
+1 frame	
+2 frames	

### Input Level L Option

This indicates the input level of the left audio channel. It is for status only and cannot be changed.

### Input Level R Option

This indicates the input level of the right audio channel. It is for status only and cannot be changed.

## Coding Mode Option

This option sets the audio coding mode. If the current audio bit-rate is outside the bit-rate range supported by the new coding mode, the bit-rate is automatically changed to the lowest value within the supported range.

Table 4.89: Coding Mode Options (Linear PCM [Direct]/via SRC])

Selected Option	Description
Dual Mono	Dual channel mono audio. Both mono channels are transmitted in the same PID.
Stereo	Dual channel stereo audio.

## Auto Lip Sync Option<sup>13</sup>

This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video. 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.

See the text underneath *Table 4.16* on page 4-30 for use of this facility.

## Lip Sync Offset Option

This option is only available if the Auto Lip Sync option is set to On. It allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.

Table 4.90: Lip Sync Offset Options

Valid Input Range	Description
Min: -50 Max: 50	Lip Sync Offset in milliseconds.

## Use Minimum Delay

This sets the lowest possible audio delay.

If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.

## Audio Delay Option

This option is only available if the Auto Lip Sync option is set to Off. It sets the delay that should be applied to the audio.

Table 4.91: Audio Delay Options

Valid Input Range	Description
Min: 111 Max: 3540	Audio Delay in milliseconds.

## Actual Audio Delay

Shows the actual audio delay. It is for status only and cannot be changed.

<sup>13</sup> To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.

### Clip Level Option

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 head room above 0 dBu prior to the audio being clipped.

**NOTE...**

The clip levels available depend on the hardware issue of the Encoder.

Table 4.92: Clip Level Options

Selected Option	Description
12 dB	12 dB audio clipping level.
15 dB	15 dB is only available with PCB issue 4 and later.
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.

### Impedance Option

This option is only displayed if the audio source is set to analogue. It enables the input impedance of the analogue audio input to be set to either 600 Ω or 20 kΩ.

### Language or Language Left/Right Option

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.

### SMPTE 302M Standard Option

SMPTE 302M defines the mapping of AES3 data in to an MPEG-2 transport stream. Problems may be experienced with some Receivers if the Encoder and Receiver are not using the same version of SMPTE 302M. This option allows the Encoder to be configured to work in either the 1998 or the 2000 version of SMPTE 302M.

Table 4.93: SMPTE 302M Standard Options

Selected Option	Description
1998 Standard	Refers to the 1998 SMPTE 302M standard.
2000 Standard	Refers to the 2000 SMPTE 302M standard.

### Channel Option

This option controls the value written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.

Table 4.94: Channel Options

Valid Input Range	Description
Min: 0 Max: 15	This value is written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.

### Embedded Source Option

This option defines the embedded source. Select HD-SDI or SD-SDI.

### Embedded 1-2 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

Table 4.95: Embedded 1-2 DID Options

Selected Option	Description
Min: 0	Off
Max: 1023	Select DID
Other: >1023	Default DID

### Embedded 3-4 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

### Audio PID Option

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 Option

This item defines the optional component tag to be assigned to this audio stream.

### PCR On Audio PID Option

This option controls whether PCR should be signalled on the audio PID. This may be necessary if an audio only service is being generated. The default setting is Off.

### OP Digital Loss

This option controls behaviour digital audio is not locked.

Table 4.96: OP Digital Loss Options

Selected Option	Description
Silence	Valid PES stream containing silence
No PID	No Audio PES stream (though stream is still referenced in SI)
No ASI O/P	The ASI output of the Encoder is turned off

### Hardware Release Option

This option indicates the hardware version of this audio encode channel. It is for status only and cannot be changed.

### Software Release Option

This option indicates the software version of this audio encoder channel. It is for status only and cannot be changed.

## 4.7.6 Audio Languages Menu

The Audio Languages Menu is selected from the Audio Menu. This menu permits the selection of languages used in the MPEG broadcast.

English is the default language and cannot be changed. Those other languages which have an asterisk (\*) next to them are selected for use, those without an asterisk are not. To select/deselect a language press the softkey nearest to it. The asterisk is turned on and off. There are over forty languages to choose from in addition to two User Defined Language options where the User can input and use their own three-letter codes.

## 4.7.7 Advanced Audio Coding (M2/EOM/ADVAUD)

### Overview

The Advanced Audio Coding Menu is selected from the Audio Menu. See *Figure 4.13* for the menu structure.

**NOTE...**

Further status information can be displayed when accessing the menus via a Tenet session.

### Input Source Option

This option defines the audio source.

*Table 4.97: Input Source Options*

Selected Option	Description
Off	No audio packets are sent in the transport stream and audio is removed from the SI.
Mute	Audio silence.
Test Tone	An internally generated test tone. The bit-rate automatically changes to 96 kbit/s.
Digital	Digital audio input on <b>AUDIO IN</b> connector.
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF.
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF.
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD.
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD.

These are default DIDs

### Coding Standard Option

This item is status only and has one value: AAC (Advanced Audio Coding).

### Bit-rate Option

This option sets the audio bit-rate of this audio channel.

*Table 4.98: Bit-rate Options*

Available Settings
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

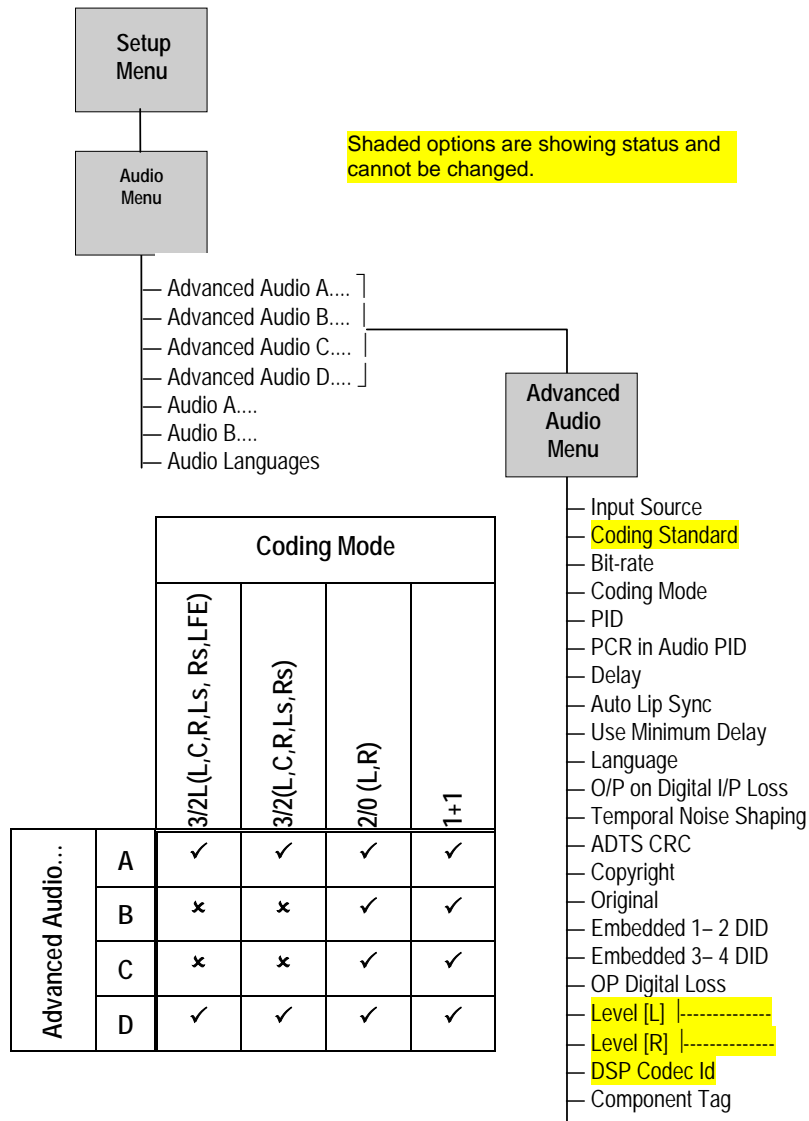


Figure 4.13: Advanced Audio Coding Menu

### Coding Mode Option

This option sets the audio coding mode. If the current audio bit-rate is outside the bit-rate range supported by the new coding mode, the bit-rate is automatically changed to the lowest value within the supported range.

Table 4.99: Coding Mode Options (AAC)

Selected Option	Description	Option Availability			
		A	B	C	D
2/0 (L,R)	Stereo: 64, 80, 96, 128, 192 kbit/s	✓	✓	✓	✓
3/2(L,C,R,Ls,Rs)	Multi-channel: 320, 384 kbit/s	✓	✗	✗	✗
3/2L(L,C,R,Ls, Rs,LFE)	Multi-channel: 320, 384 kbit/s	✓	✗	✗	✗
1+1	Mono: 64, 80, 96, 128, 192 kbit/s	✓	✓	✓	✓

When a multi-channel coding mode is selected, the channels are presented to the module inputs as follows:

Table 4.100: Coding Mode Options (AAC)

Coding Mode		
Input		Channel
5.1	7.1	
A	A	Front L+R
B	B	Center + Subwoofer
C	C	Surround L + R
-	D	Rear L + R

### 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.

### PCR On Audio PID Option

This option controls whether PCR should be signalled on the audio PID. This may be necessary if an audio only service is being generated. The default setting is Off.

### Delay

This option is only available if the Auto Lip Sync option is set to Off. It sets the delay that should be applied to the audio.

Table 4.101: Audio Delay Options

Valid Input Range	Description
Min: 111 Max: 3540	Audio Delay in milliseconds.

### Auto Lip Sync Option

This option controls whether the Encoder automatically adjusts the audio delay to maintain lip sync with the video. 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.

See the text underneath *Table 4.16* on *page 4-30* for use of this facility.

### Use Minimum Delay

This sets the lowest possible audio delay.

If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.



## Language or Language Left/Right Option

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.

## OP on Digital I/P Loss

This option controls behaviour digital audio is not locked.

Table 4.102: OP on Digital I/P Loss Options

Selected Option	Description
Silence	Valid PES stream containing silence
No PID	No Audio PES stream (though stream is still referenced in SI)
No ASI O/P	The ASI output of the Encoder is turned off

## Temporal Noise Shaping

This option is used to apply a filtering process to parts of the spectral data of each channel to control the temporal shape of the quantization noise.

## ADTS CRC

Write ADTS CRC (MPEG 2) - fixed to ON.

## Copyright Option

This controls the Copyright flag in the bit-stream. If set to On the bit-stream is shown to be protected by copyright.

## Original Option

This controls the setting of the Original flag in the bit-stream. If set to On the bit-stream will be signalled as an original, if set to Off the bit-stream will be signalled as a copy of an original bit-stream.

## Embedded 1-2 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

Table 4.103: Embedded 1-2 DID Options

Selected Option	Description
Min: 0	Off
Max: 1023	Select DID
Other: >1023	Default DID

## Embedded 3-4 DID Option

This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4. If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.

### **Level [L] Option**

This indicates the input level of the left audio channel. It is for status only and cannot be changed.

### **Level [R] Option**

This indicates the input level of the right audio channel. It is for status only and cannot be changed.

### **Component Tag Option**

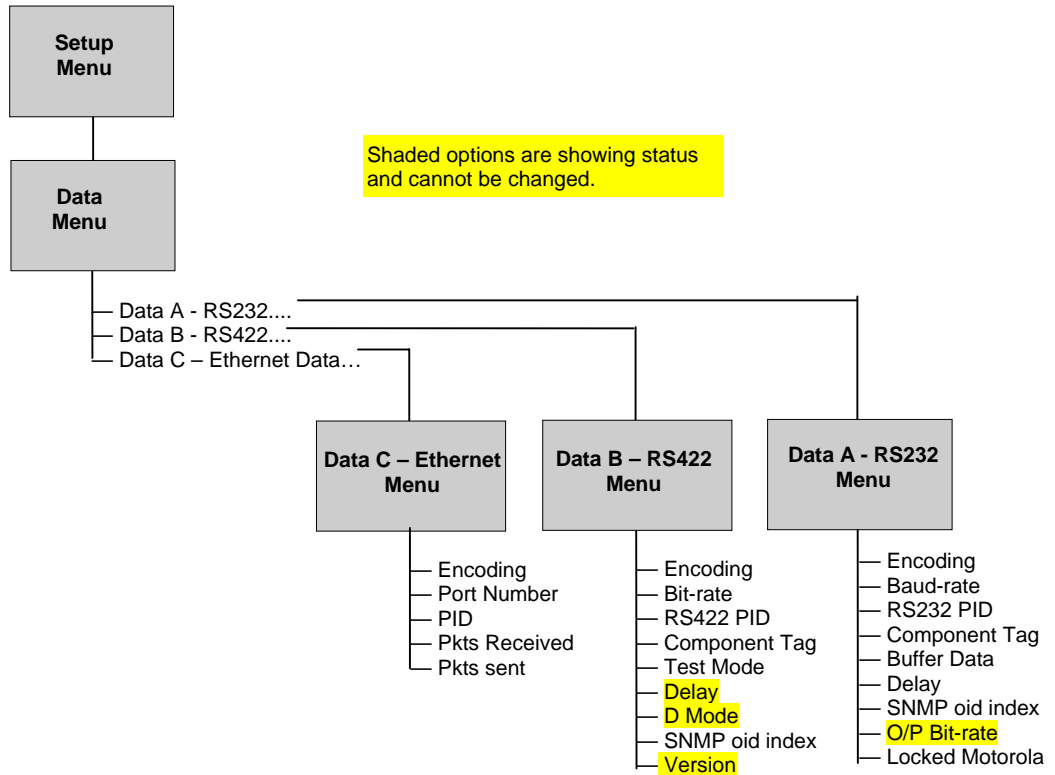
This item defines the optional component tag to be assigned to this audio stream.

## 4.8 Data Menu

### 4.8.1 Introduction

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.

See Figure 4.14 for the menu structure.



**NOTE...**

If Ethernet data is turned on it is not possible to turn RS232 data on, and vice-versa.

Figure 4.14: Menu Hierarchy – Setup/Data Menu

### 4.8.2 Data A - RS232 Menu

#### Encoding Option

This option enables the RS-232 asynchronous data channel to be switched On or Off. Table 4.104 shows the modes.

Table 4.104: Data A – RS232 Encoding Option Modes

Selected Option	Description
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.
On(Motorola)	If On (Motorola) is selected, the stream is identified in the PMT as a component of type 0xC0 with no descriptors. The RS232 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 optionj <b>Locked Motorola</b> 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 shall not be possible to turn RS232 data on.

### Baud Rate Option

This option enables the baud rate of the RS-232 asynchronous data channel to be set.

Table 4.105: Baud Rate Options

Selected Option	Description	Selected Option	Description
1200	1200 Baud rate.	9600	9600 Baud rate.
2400	2400 Baud rate.	19200	19200 Baud rate.
4800	4800 Baud rate.	38400	38400 Baud rate.

### RS232 PID Option

This option is used for entering or updating data PIDs. To be DVB compliant, PIDs below 32 are reserved. Therefore PIDs 32 to 8191 are available for use. In the event of a clash, one of the PIDs will be changed by the Encoder’s internal checking algorithm.

### Component Tag Option

This item defines the optional component tag to be assigned to this data stream.

### Buffer Data Option

Send immediately: Whenever data is available at the RS232 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.

**Delay Option**

This option enables the Delay to be set. The option cannot be changed.

**SNMP oid index Option**

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.

*Table 4.106: SNMP oid index Options*

Selected Option	Description
Min: 1	Oid index
Max: 7	

**O/P Bit-rate Option**

This option is for status only and indicates the output bit-rate.

**4.8.3 Data B - RS422 Menu**

**Encoding Option**

This option enables the RS-422 synchronous data channel to be switched On or Off.

**Bit-rate Option**

This option enables the bit-rate of the RS-422 synchronous data channel to be set.

*Table 4.107: Bit-rate Options*

Selected Option	Description
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 bit-rate.

### **RS422 PID Option**

This option is used for entering or updating data PIDs. To be DVB compliant, PIDs below 32 are reserved. Therefore PIDs 32 to 8191 are available for use. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.

### **Component Tag Option**

This item defines the optional component tag to be assigned to this data stream.

### **Test Mode Option**

This option is used for turning the test mode On and Off.

### **Delay Option**

The Delay option cannot be changed.

### **D Mode Option**

The D Mode option cannot be changed.

### **SNMP oid index Option**

See *Delay Option* on page 4-95 for details of this option.

### **Version Option**

This option indicates the version of the data. It is for status only and cannot be changed.

## **4.8.4 Data C – Ethernet Menu**

### **Licence Key**

This option is only available if the M2/EOM2/EthernetData licence key is purchased otherwise, packets arriving over the Ethernet are ignored.

It is only possible for the Encoder to accept either RS232 data or Ethernet data.

### **Encoding**

#### **NOTES...**

1. Delivery of packets is not guaranteed. The maximum data-rate is 100 kbit/s.
2. It is only possible to turn this option on if RS232 data is turned off.

Table 4.108: Encoding Options

Selected Option	Description
On(BissKeys)	Similar to <b>On(TSPkt Data)</b> , additionally, aCA descriptor is placed in the CAT. CA_System_ID=0x1001. The CA PID is set; there is no check that the PID entered corresponds to the PID of the packets being received over Ethernet.
On(VRNav Data)	The Encoder accepts data, as DCIIText messages containing VRNav data packets, coming in as UDP datagrams on its Ethernet port. The Encoder will packetise the data into Transport Packets and set TS header bits – Packet Start is set for each TS packet containing the start of a DCIIText packet.
On (TSPkt Data)	When selected, the Encoder expects pre-formed transport stream packets, one per UDP packet.
Off	

### Port Number

This is the IP Port number. Valid selections are in the range 0 to 65535 (the default is 1000).

### PID

Possible values are 0x0001 – 0x1FFE (the default is 0x100).

#### NOTE...

The PID option is not relevant for **On(TSPkt Data)**.

### Pkts Received

Shows the number of packets received on the port.

### Pkts Sent

Shows the number of packets put on to the transport stream.

### Alarm Screen

An Alarm is raised if Ethernet packets are discarded because the playout FIFO is full i.e. if incoming rate is too high. The default is that this is NOT masked.

## 4.9 Output Menu

### 4.9.1 Overview

The Output Menu is selected from the Setup Menu. This menu permits the selection of the output parameters. See *Figure 4.15* for the menu structure.

### 4.9.2 Output Format Option

Access the Output Format option from the Output Menu. The menus available depend upon which option cards are fitted to the unit.

If the Output Format option = ASI then the following menu option is **Delivery Descriptor**, otherwise it is the menu associated with the output format selected, i.e. satellite modulator, OFDM modulator or IP Output.

### 4.9.3 Delivery Descriptor Menu

Access the Delivery Descriptor Menu from the Output Menu. The screens in this menu vary according to the **Descriptor Type** selected.

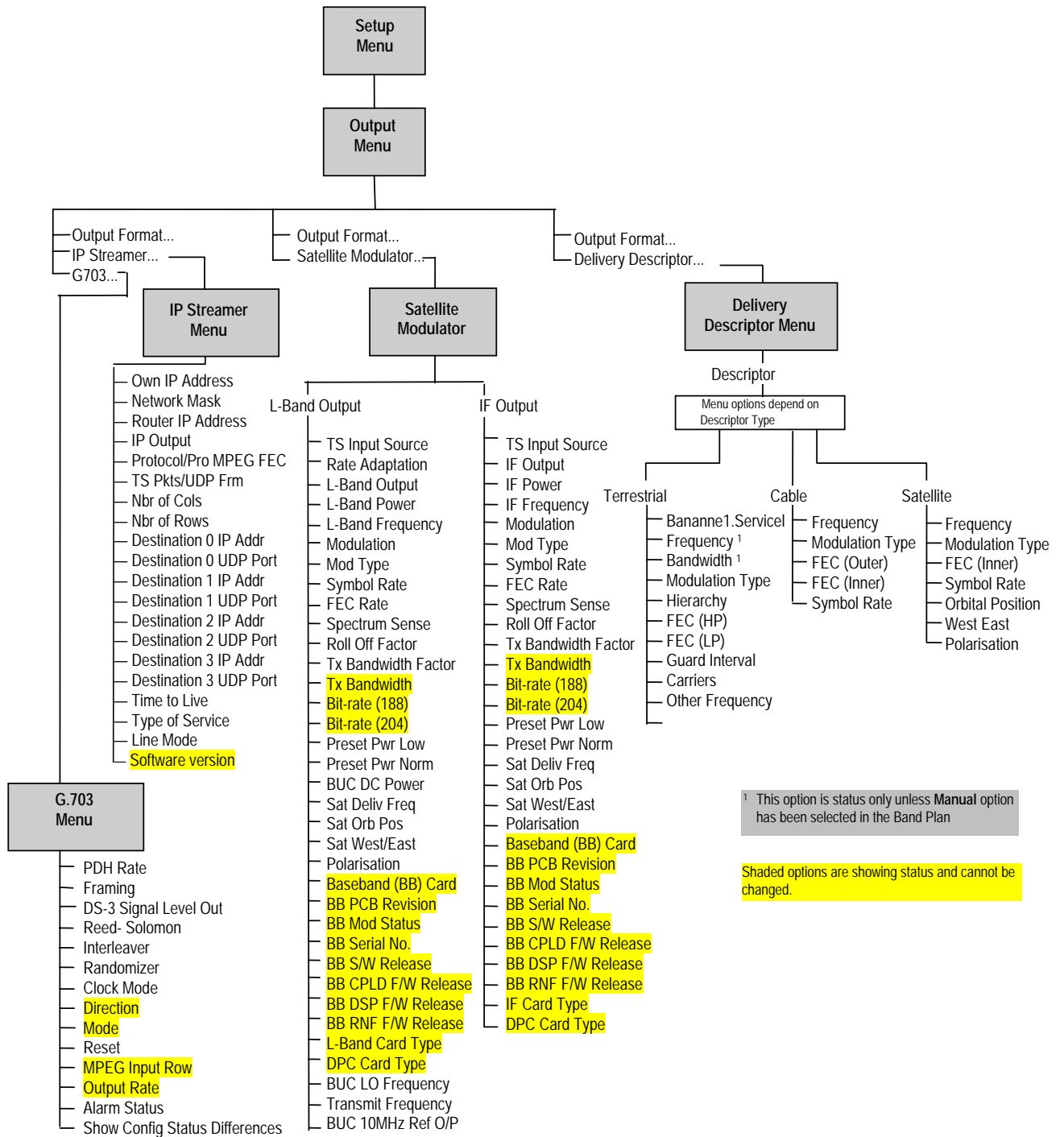
### 4.9.4 Descriptor Type Option

Access the Descriptor Type option from the Delivery Descriptor Menu. This enables the descriptor type to be specified.

Table 4.109: Descriptor Type Options

Selected Option	Description	Comments
Satellite	Descriptor type set to Satellite.	The type of delivery descriptor selected affects the remaining options shown on the Delivery Descriptor Menu.
Terrestrial	Descriptor type set to Terrestrial.	
None		
Cable	Descriptor type set to Cable.	





**NOTE...**  
Refer to Annex K for details of Pro MPEG FEC for IP Streaming in E57xx Encoders.

Figure 4.15: Menu Hierarchy – Setup/Output Menu

## 4.9.5 Descriptor Type = Terrestrial

### Band Plan Option

Access the Band Plan option from the Delivery Descriptor Menu.

Once a country has been selected then the required channel should be selected in the Channel option. Each channel number corresponds to a particular frequency (see *Annex E, Band Plans*).

Table 4.110: Band Plan Options

Selected Option	Selected Option
Australia	Ireland
Europe VHF	South Africa
Europe CATV	French Overseas PIA
Italy	France
Morocco	Japan
New Zealand	USA
China	CCIR <sup>14</sup>
OIRT <sup>15</sup>	Manual

### Channel Option

Access the Channel option from the Delivery Descriptor Menu. Each channel number corresponds to a particular frequency (see *Annex E, Band Plans*).

Table 4.111: Channel Options

Valid Input Range	Description
Depends upon the country selected.	See <i>Annex E, Band Plans</i> for the frequencies associated with particular countries.

### Frequency Option

Access the Frequency option from the Delivery Descriptor Menu. This enables the carrier frequency of the transmitter to be specified.

#### NOTES...

1. This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control.
2. This option is status only unless **Manual** has been selected in the Band Plan option.

<sup>14</sup> CCIR is now known as International Telecommunications Union-Radiocommunications Study Groups.

<sup>15</sup> Organisation that co-ordinated TV standards and programme interchange among the Eastern-block countries of Europe.

Table 4.112: Frequency Options

Selected Option	Description
Min: 0.0001 MHz Max: 42949.6729 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.

### Bandwidth Option

Access the Bandwidth option from the `Delivery Descriptor Menu`. This enables the channel spacing of the terrestrial transmitter to be specified.

**NOTE...**  
This option is status only unless **Manual** has been selected in the Band Plan option.

Table 4.113: Bandwidth Options

Selected Option	Description
6 MHz	Terrestrial transmitter channel spacing is 6 MHz.
7 MHz	Terrestrial transmitter channel spacing is 7 MHz.
8 MHz	Terrestrial transmitter channel spacing is 8 MHz.
10 MHz	Terrestrial transmitter channel spacing is 10 MHz.
12 MHz	Terrestrial transmitter channel spacing is 12 MHz.

### Modulation Type Option

Access the Modulation Type option from the `Delivery Descriptor Menu`. This enables the type of modulation used to be specified.

Table 4.114: Modulation Type Options

Selected Option	Description
QPSK	Terrestrial transmitter uses QPSK modulation.
16QAM	Terrestrial transmitter uses 16QAM modulation.
64QAM	Terrestrial transmitter uses 64QAM modulation.

### Hierarchy Option

Access the Hierarchy option from the `Delivery Descriptor Menu`. This screen enables the hierarchy of the terrestrial transmission to be specified.

Table 4.115: Hierarchy Options

Selected Option	Description
Non-Hierarchical	Terrestrial transmission is not hierarchical.
Alpha=1	Terrestrial transmission is hierarchical, and the $\alpha$ value = 1.
Alpha=2	Terrestrial transmission is hierarchical, and the $\alpha$ value = 2.
Alpha=4	Terrestrial transmission is hierarchical, and the $\alpha$ value = 4.

## FEC (HP) and FEC (LP) Options

Access the FEC (HP) or the FEC (LP) option from the `Delivery Descriptor Menu`. These screens enable the inner FEC schemes used by the terrestrial transmitter to be specified.

**NOTE...**

If the `Hierarchy` option is set to `Non-Hierarchical`, then only the `FEC Rate` parameter is used and shown on the display.

If the `Hierarchy` option is set to `Alpha=n`, then the **FEC (HP)** and **FEC (LP)** parameters provide two levels of modulation. Transmission starts with the code rate for the HP level of modulation and ends with the code rate for the LP level.

The screen for the FEC (LP) option is the same except that **(LP)** replaces **(HP)**.

Table 4.116: FEC (HP) and FEC (LP) Options

Selected Option	Description
1/2	Terrestrial transmitter FEC rate HP/LP is 1/2.
2/3	Terrestrial transmitter FEC rate HP/LP is 2/3.
3/4	Terrestrial transmitter FEC rate HP/LP is 3/4.
5/6	Terrestrial transmitter FEC rate HP/LP is 5/6.
7/8	Terrestrial transmitter FEC rate HP/LP is 7/8.

## Guard Interval Option

Access the Guard Interval option from the `Delivery Descriptor Menu`. This enables the guard interval of the terrestrial transmitter to be specified.

Table 4.117: Guard Interval Options

Selected Option	Description
1/4	Terrestrial transmitter guard interval is 1/4.
1/8	Terrestrial transmitter guard interval is 1/8.
1/16	Terrestrial transmitter guard interval is 1/16.
1/32	Terrestrial transmitter guard interval is 1/32.

## Carriers Options

Access the Carriers option from the `Delivery Descriptor Menu`. This enables the transmission mode (i.e. number of carriers in an OFDM frame) used by the terrestrial transmitter to be specified.

Table 4.118: Carriers Options

Selected Option	Description
2k Mode	Terrestrial transmitter uses 2k transmission mode (2k carriers in an OFDM frame).
8k Mode	Terrestrial transmitter uses 8k transmission mode (8k carriers in an OFDM frame).

### Other Frequency Option

Access the Other Frequency option from the Delivery Descriptor Menu. This enables the flag which specifies whether other frequencies are in use or not to be set.

Table 4.119: Other Frequency Options

Selected Option	Description
None	No other frequency is in use.
in use	One or more other frequencies are in use.

## 4.9.6 Descriptor Type = Cable

### Frequency Option

See *Frequency Option* on page 4-100.

### Modulation Type Option

Access the Modulation Type option from the Delivery Descriptor Menu. This screen enables the type of modulation used by the cable channel to be specified.

Table 4.120: Modulation Type Options

Selected Option	Description
16QAM	Cable channel uses 16QAM modulation.
32QAM	Cable channel uses 32QAM modulation.
64QAM	Cable channel uses 64QAM modulation.
128QAM	Cable channel uses 128QAM modulation.
256QAM	Cable channel uses 256QAM modulation.

### FEC (Outer) Option

Access the FEC (Outer) option from the Delivery Descriptor Menu. This screen enables the outer FEC rate used by the cable channel to be specified.

Table 4.121: FEC (Outer) Options

Selected Option	Description
No outer FEC coding	Cable channel does not use outer FEC.
RS(204/188)	

### FEC (Inner) Option

Access the FEC (Inner) option from the Delivery Descriptor Menu. This screen enables the inner FEC rate used by the cable channel to be specified.

Table 4.122: FEC (Inner) Options

Selected Option	Description
No conv. coding	Cable channel does not use inner FEC rate.
1/2	Cable channel uses inner FEC rate of 1/2.
2/3	Cable channel uses inner FEC rate of 2/3.
3/4	Cable channel uses inner FEC rate of 3/4.
5/6	Cable channel uses inner FEC rate of 5/6.
7/8	Cable channel uses inner FEC rate of 7/8.
8/9	Cable channel uses inner FEC rate of 8/9.

### Symbol Rate Option

Access the Symbol Rate option from the Delivery Descriptor Menu.

Table 4.123: Symbol Rate Options

Valid Input Range	Description
Min: 0.4688 Msym/s	Symbol rate.
Max: 30.0000 Msym/s	Changing the symbol rate affects the automatic Tx bandwidth, video bit-rate and video resolution calculations.
Step Size: 0.0001 Msym/s	

## 4.9.7 Descriptor Type = Satellite

### Frequency Option

See *Frequency Option* on page 4-100.

### Modulation Type Option

Access the Modulation Type option from the Delivery Descriptor Menu. This enables the type of modulation used by the satellite transponder to be specified.

Table 4.124: Modulation Type Options

Selected Option	Description
8PSK	Satellite transponder uses 8PSK modulation.
16QAM	Satellite transponder uses 16QAM modulation.
BPSK	Satellite transponder uses BPSK modulation.
QPSK	Satellite transponder uses QPSK modulation.

### FEC (Inner) Option

Access the FEC (Inner) option from the Delivery Descriptor Menu. This screen enables the inner FEC rate used by the satellite transponder to be specified. See *FEC (Inner) Option*, page 4-104 for further details.

## Symbol Rate

See *Symbol Rate Option* on page 4-104.

## Orbital Position Option

Access the Orbital Position option from the Delivery Descriptor Menu. This enables the orbital position of the satellite to be specified.

Table 4.125: Orbital Position Options

Valid Input Range	Description
Min: 0.0°	
Max: 360.0°	
Step Size: 0.1°	

If the specified orbital position is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

## West East Option

Access the West East option from the Delivery Descriptor Menu. This enables the satellite west/east flag to be specified to indicate whether the satellite position is in the western or eastern part of the orbit.

Table 4.126: West East Options

Selected Option	Description
West	Satellite position is in western part of the orbit.
East	Satellite position is in the eastern part of the orbit.

## Polarisation Option

Access the Polarisation option from the Delivery Descriptor Menu. This enables the polarisation of the satellite transponder to be specified.

Table 4.127: Polarisation Options

Selected Option	Description
Linear - Horizontal	Satellite transponder uses linear horizontal polarisation.
Linear - Vertical	Satellite transponder uses linear vertical polarisation.
Circular - Left	Satellite transponder uses circular left polarisation.
Circular - Right	Satellite transponder uses circular right polarisation.

## 4.9.8 Output Format = Satellite Modulator (IF Output)

### TS Input Source

This option determines the source of the transport stream.

Table 4.128: TS Input Source Options

Selected Option	Description
Backplane	
ASI1	
ASI2	

### IF Output Option

Access the IF Output option from the `Satellite Modulator Menu`. This enables the IF output to be switched On or Off.

### IF Power Option

Access the IF Power option from the `Satellite Modulator Menu`.

Table 4.129: IF Power Options

Valid Input Range	Description
Min: -20 dBm	
Max: 5 dBm	

### IF Frequency Option

Access the IF Frequency option from the `Satellite Modulator Menu`. This setting allows the centre frequency of the IF output to be changed.

Table 4.130: IF Frequency Options

Valid Input Range	Description
Min: 50 MHz	
Max: 180 MHz	

### Modulation Option

Access the Modulation option from the `Satellite Modulator Menu`. This enables the Modulation to be switched On or Off.

### Mod Type Option

Access the Mod(ulation) Type option from the `Satellite Modulator Menu`. This enables the type of modulation used by the Satellite Modulator to be specified.

Table 4.131: Modulation Type Options

Selected Option	Description
BPSK	Satellite modulator uses BPSK modulation.
QPSK	Satellite Modulator uses QPSK modulation.
8PSK	Satellite Modulator uses 8PSK modulation.
16QAM	Satellite Modulator uses 16QAM modulation.

#### NOTE...

The following software options must be purchased to enable the different modulation types; M2/ESO2/LSYM for BPSK, M2/ESO2/SM38PSK for 8PSK, M2/ESO2/SM316QAM for 16QAM.



## Symbol Rate Option

Access the Symbol Rate option from the Satellite Modulator Menu.

Table 4.132: Symbol Rate Options

Valid Input Range		Description
Min (Low Sym Rate):	0.3000 Msym/s	
Min:	1.0000 Msym/s	Minimum with low symbol rate option M2/ES02/LSYM.
Max:	30.0000 Msym/s	Changing the symbol rate affects the automatic Tx bandwidth, video bit-rate and video resolution calculations.
Step Size:	0.0001 Msym/s	

## FEC Rate Option

Access the FEC Rate option from the Satellite Modulator Menu.

Table 4.133: FEC Rate Options

Selected Option	Description
1/2	Satellite Modulator uses FEC rate of 1/2.
2/3	Satellite Modulator uses FEC rate of 2/3.
3/4	Satellite Modulator uses FEC rate of 3/4.
5/6	Satellite Modulator uses FEC rate of 5/6.
7/8	Satellite Modulator uses FEC rate of 7/8.
8/9	Satellite Modulator uses FEC rate of 8/9.

**NOTE...**

Only certain combinations of Modulation Type and FEC Rate are valid.

## Spectrum Sense Option

Access the Spectrum Invert option from the Satellite Modulator Menu. This allows the spectrum sense to be normal or inverted.

## Roll Off Factor Option

The Roll Off Factor option is to do with the bandwidth of the modulated output and how quickly the output level rolls off with frequency. There are two values, 25% and 35%. Only 35% is allowed for QPSK but both 25% and 35% are available in 8PSK and 16QAM.

In the L-band option, only 35% is allowed for QPSK and BPSK.

## Tx Bandwidth Factor Option

Access the Tx Bandwidth Factor option from the Satellite Modulator Menu. This option is used to calculate the Tx Bandwidth based upon the Symbol Rate.

Bandwidth = Factor x Symbol Rate

Table 4.134: Tx Bandwidth Factor Options

Valid Input Range	Description
Min: 1	
Max: 2	
Step Size: 0.01	

### Tx Bandwidth Option

The Tx Bandwidth option value cannot be updated. It should only be used as an approximate value as it depends on the performance of external equipment as well.

### Bit-rate (188) Option

The Bit-rate (188) option value cannot be updated.

### Bit-rate (204) Option

The Bit-rate (204) option value cannot be updated.

### Preset Pwr Low Option

Access the Preset Pwr Low option from the Satellite Modulator Menu.

Table 4.135: Preset Pwr Low Options

Valid Input Range	Description
Min: -20.0 dBm	
Max: 0.0 dBm	
Step Size: 0.1 dBm	

### Preset Pwr Norm Option

Access the Preset Pwr Norm option from the Satellite Modulator Menu.

Table 4.136: Preset Pwr Norm Options

Valid Input Range	Description
Min: -20.0 dBm	
Max: 5.0 dBm	
Step Size: 0.1 dBm	

### Sat Deliv Freq Option

Access the Sat Deliv Freq option from the Satellite Modulator Menu.

Table 4.137: Sat Deliv Freq Options

Valid Input Range	Description
Min: 0.0000 GHz	
Max: 999.9999 GHz	
Step Size: 0.0001 GHz	

## Sat Orb Pos Option

Access the Sat Orb Pos option from the Satellite Modulator Menu. This enables the orbital position of the satellite to be specified.

Table 4.138: Sat Orb Pos Options

Valid Input Range	Description
Min: 0.0°	
Max: 360.0°	
Step Size: 0.1°	

If the specified orbital position is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

## Sat West/East Option

Access the Sat West/East option from the Satellite Modulator Menu. This enables the satellite west/east flag to be specified, indicating whether the satellite position is in the western or eastern part of the orbit.

Table 4.139: Sat West/East Options

Selected Option	Description
West	Satellite position is in western part of the orbit.
East	Satellite position is in the eastern part of the orbit.

## Polarisation Option

Access the Polarisation option from the Satellite Modulator Menu. This enables the polarisation of the satellite transponder to be specified.

Table 4.140: Polarisation Options

Selected Option	Description
Linear - Horizontal	Satellite transponder uses linear horizontal polarisation.
Linear - Vertical	Satellite transponder uses linear vertical polarisation.
Circular - Left	Satellite transponder uses circular left polarisation.
Circular - Right	Satellite transponder uses circular right polarisation.

## Status Only Options for the Satellite Modulator Menu

The following options are status only and cannot be changed. They give information about the Baseband (BB) Card.

- Baseband (BB) Card Option
- BB PCB Revision Option
- BB Mod Status Option
- BB Serial No. Option
- BB S/W Release Option
- BB CPLD F/W Release Option
- BB DSP F/W Release Option

- BB RNF F/W Release Option
- IF Card Type Option
- DPC Card Type Option

### 4.9.9 Output Format = Satellite Modulator (L-Band Output)

#### TS Input Source

This option determines the source of the transport stream.

Table 4.141: TS Input Source Options

Selected Option	Description
Backplane	
ASI1	
ASI2	

#### Rate Adaptation Option

Function not currently available on 2/3 width modulator modules (S13716 and S13719).

#### L-Band Output Option

Access the L-Band Output option from the Satellite Modulator Menu. This enables the L-Band output to be switched On or Off.

#### L-Band Power Option

Access the L-Band Power option from the Satellite Modulator Menu.

Table 4.142: L-Band Power Options

Valid Input Range	Description
Min: -20.0 dBm	
Max: +5.0 dBm	

#### Frequency Option

Access the Frequency option from the Satellite Modulator Menu.

Table 4.143: Frequency Options

Valid Input Range	Description
Min: 950 MHz	
Max: 1750 MHz	

#### Modulation Option

Access the Modulation option from the Satellite Modulator Menu. This enables the modulation to be switched On or Off.

#### Mod Type Option

Refer to *Mod Type Option* on page 4-106 for details.

### **Symbol Rate Option**

Refer to *Symbol Rate Option* on page 4-107 for details. Exactly the same except that *Table 4.132* should only contain 2U values because L-Band output is only available in the 2U.

### **FEC Rate Option**

Refer to *FEC Rate Option* on page 4-107 for details.

### **Spectrum Invert Option**

Refer to *Spectrum Sense Option* on page 4-107 for details.

### **Roll Off Factor Option**

Refer to *Roll Off Factor Option* on page 4-107 for details.

### **Tx Bandwidth Factor Option**

Refer to Tx Bandwidth Factor Option on page for details.

### **Tx Bandwidth Option**

The Tx Bandwidth option value cannot be updated. It should only be used as an approximate value as it depends on the performance of external equipment as well.

### **Bit-rate (188) Option**

The Bit-rate (188) option value cannot be updated.

### **Bit-rate (204) Option**

The Bit-rate (204) option value cannot be updated.

### **Preset Pwr Low Option**

Refer to *Preset Pwr Low Option* on page 4-108 for details.

### **Preset Pwr Norm Option**

Refer to *Preset Pwr Norm Option* on page 4-108 for details.

### **BUC DC Power**

Access the BUC DC Power option from the Satellite Modulator Menu. This option allows the +24 Vdc power on the L-Band Modulator Main output to be either Enabled or Disabled.

#### **NOTE...**

The modulator provides d.c. power to drive an up-converter. Do not connect equipment to the main output which might be damaged by d.c. power without protecting with a suitable d.c. block.

### **Sat Deliv Freq Option**

Refer to *Sat Deliv Freq Option* on page 4-108 for details.

### **Sat Orb Pos Option**

Refer to *Sat Orb Pos Option* on Page 4-109 for details.

### **Sat West/East Option**

Refer to *Sat West/East Option* on page 4-109 for details.

### **Polarisation Option**

Refer to *Polarisation Option* on page 4-109 for details.

### **Status Only Options for the Satellite Modulator Menu**

The following options are for status only and cannot be changed.

- Baseband (BB) Card Option
- BB PCB Revision Option
- BB Mod Status Option
- BB Serial No. Option
- BB S/W Release Option
- BB CPLD F/W Release Option
- BB DSP F/W Release Option
- BB RNF F/W Release Option
- L-Band Output Card Type Option
- DPC Card Type Option

### **BUC LO Frequency**

This represents the overall translation frequency of the external up-converter.

### **Transmit Frequency**

Transmit Frequency refers to the frequency of the RF output from an external up-converter that is used in the satellite earth station to frequency up-convert the Modulator's IF output. The parameters IF Frequency and Uplink Freq are interrelated; when an Uplink Freq value is entered, the value of IF Frequency is calculated and set automatically. The allowable range of Uplink Freq is dependent upon the Modulator model, the UpConv Freq and IF Spectrum settings.

### **BUC 10 MHz Ref O/P Option**

This is used for switching On or Off the 10 MHz frequency reference which may be used by an external BUC.

## **4.9.10 Output Format = IP Streamer (M2/EOM2/IP/PROFEC Option Module)**

### **Own IP Address Option**

Access the Own IP Address option from the IP Streamer Menu. This is the local IP address associated with the 100 Mbit/s Ethernet video output interface.

## Network Mask Option

Access the Network Mask option from the IP Streamer Menu. This is the network mask setting corresponding to the Own IP address.

## Router IP Address Option

Access the Router IP Address option from the IP Streamer Menu. If the Destination IP Address setting indicates an IP address not residing on the local net segment, the video traffic is forwarded to this gateway.

## IP Output

This option allows the User to switch off or on the IP streamed video output.

## Protocol/Pro-MPEG FEC Option

This sets the protocol to be used for the IP Frame. It establishes the IP frame structure to be either: UDP, UDP plus the RTP Header or UDP, the RTP Header, the FEC Header and 16 Reed-Solomon Bytes after each 188 byte payload packets. The possible settings are: UDP, RTP, RTP/FEC0, RTP/FEC1, RTP/FEC2, RTP/FEC3 and RTP/FEC4.

## TS Pkts/UDP Frm Option

This configures how many 188-byte MPEG-2 Transport Stream packets are mapped into each UDP frame. Valid values are between 1 and 7. For bit-rates in excess of 15 Mbit/s it is recommended to use the maximum setting of 7 and limit the minimum to not less than 2.

## Nbr of Cols Option

This setting configures the number of Columns in the matrix, and determines the number of MPEG packets used when calculating the Row FEC packets.

## Nbr of Rows Option

This setting configures the number of Rows in the matrix, and determines the number of MPEG packets used when calculating the Column FEC packets.

## Destination x IP Address Option

In Smallcasting mode, up to four separate destination IP addresses can be assigned.

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.

### NOTE...

The maximum multiplexer output rate, which can be reliably streamed to each IP address, is reduced for each extra destination address that is added. i.e. if two destinations are specified, the maximum rate for each address is half of that for one address, and so on.

### **Destination x UDP Port Option**

Up to four separate UDP Ports can be assigned.

This configures the UDP destination port field in the outgoing UDP frames.

### **Time To Live Option**

This is the Time-to-Live setting as specified in RFC-791. The Time-to-Live setting is decremented by one for each Router hop the IP frame does. When 0 (zero) is reached, the packet is discarded by the network. A value greater than one is recommended.

### **Type of Service Option**

This option is 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 prioritisation. It depends on the Router honouring this field.

### **Line Mode**

This option allows the User to allow the IP Streamer card to automatically (Auto) negotiate the port speed and mode as the port automatically advertises its maximum capabilities. If set to Fixed, the line speed is fixed to 100 Mbits/s Full Duplex mode. Auto is the default and preferred setting.

## **4.9.11 Output Format = G.703 Output**

### **Introduction**

The G.703 Output Menu is selected from the Output Menu. The G.703 Interface Module enables a Broadcast Application to interface an Encoder to a G.703 Telecommunication Network. The card only provides a transmit source of a DVB service over a G.703 network. See *Figure 4.15* for the menu structure.

#### **NOTE...**

The G.703 card is only compatible with TANDBERG Television's MkII G.703 Input card.

### **PDH Rate Option**

This option sets the overall G.703 Interface Module's line rate at either the E3 (34.368 Mbit/s) or DS3 rate (44.736 Mbit/s).

### **Framing Option**

This option sets the G.703 Interface Module's E3 or DS-3 framing mode. The modes for E3 are None and G.832. The DS-3 modes are None, M13 or c-bit. The selectable modes are dependent upon what the PDH Rate is set to.

### **DS-3 Signal Level Out Option**

#### **NOTE...**

Only available for the DS-3 PDH Rate selection.



This option allows the output G.703 DS-3 signal level to be increased if the receiving end is placed some distance away (> 68 metres (225 Feet)). The receiving end could be the TT6120 as in a Test Application or a G.703 Repeater. If selected to High, the Transmitter preshapes the output signal amplitude.

### Reed-Solomon Option

**NOTE...**

Only available if the MUX rate has been set to 204 Byte Packet Mode.

Forward Error Correction requires 16 Bytes for Reed-Solomon encoding.

### Interleaver Option

**NOTE...**

Only available if Reed-Solomon is set to On.

The Reed-Solomon encoding pattern is arranged so that the information is read in Row format and then read out to the Framing stage in Column format.

### Randomizer Option

**NOTE...**

Only available if Reed-Solomon is set to On.

The Reed-Solomon encoded pattern is Randomised according to the DVB-C standard.

### Clock Mode Option

**NOTE...**

This option should be set to Slave and is the **ONLY** setting to be used in this application.

When sending MPEG-2 packets directly into Telecommunications framing, the output must be sent at a constant fixed rate. This can be performed using two methods.

**Master:** Generate an MPEG-2 transport rate that fits exactly into the Telecommunications rate.

**Slave:** Insert 'stuff' packets to fill up the Output Rate.

### Direction Option

This option cannot be altered and should always be displayed as Tx. This indicates that the G.703 card portion of the G.703 Interface Module is set to Tx mode.

### **Mode Option**

This option cannot be altered and should always be displayed as MKII. This indicates that the G.703 card portion of the G.703 Interface Module is set to MKII mode.

### **Reset Option**

This option is for TANDBERG use only and it is a method to reset the G.703 card of the G.703 Interface Module.

### **MPEG Input Row Option**

This option cannot be altered and should always be displayed as A. This indicates that the G.703 Interface Module is deriving the Transport Stream via the A Row of connectors of the G.703 card.

### **Output Rate Option**

This option cannot be altered. It displays a value for the line rate that has been selected by the PDH Rate option.

### **Alarm Status Option**

This option displays the current G.703 Interface Module Alarms. For an explanation of the alarm, selection of this parameter displays the current Alarm status and its meaning.

### **Show Config Status Differences Option**

If the G.703 Interface Module is no longer responding to the Encoder's commands, this option shows any disparities, if selected. Under normal modes of operation, there should be no disparities.

## **4.10 Mux Menu**

### **4.10.1 Overview**

Access the Mux Menu from the Setup Menu. This menu permits the selection of Multiplexer output parameters, Remux (if enabled), RAS scrambling options (if enabled) and BISS scrambling options (if enabled). See *Figure 4.16* for details when **Syntax = DVB**. See *Figure 4.17* for details when **Syntax = ATSC**.

### **4.10.2 Mux Output, no Remux Card**

To obtain various outputs when no Remux card is fitted:

- Basic mux output, no scrambling and no Remux – see *Section 4.10.4, Packet Length Option*, to *Section 4.10.12, BISS Firmware*.
- RAS scrambling – see basic mux output + *Section 4.10.13, RAS Options Enabled*.
- BISS scrambling – see basic mux output + *Section 4.10, Mux Menu*.

### 4.10.3 Mux Output, With Remux Card

To obtain an output when a Remux card is fitted, set the options in the following menus:

- *Host Bit-rate Option on page 4-136*
- *Remux Module menu – see Section 4.12.3, Remux Module Menu*
- *Host and Incoming Services – Section 4.12.4, 1.Service/2.Service Menu*

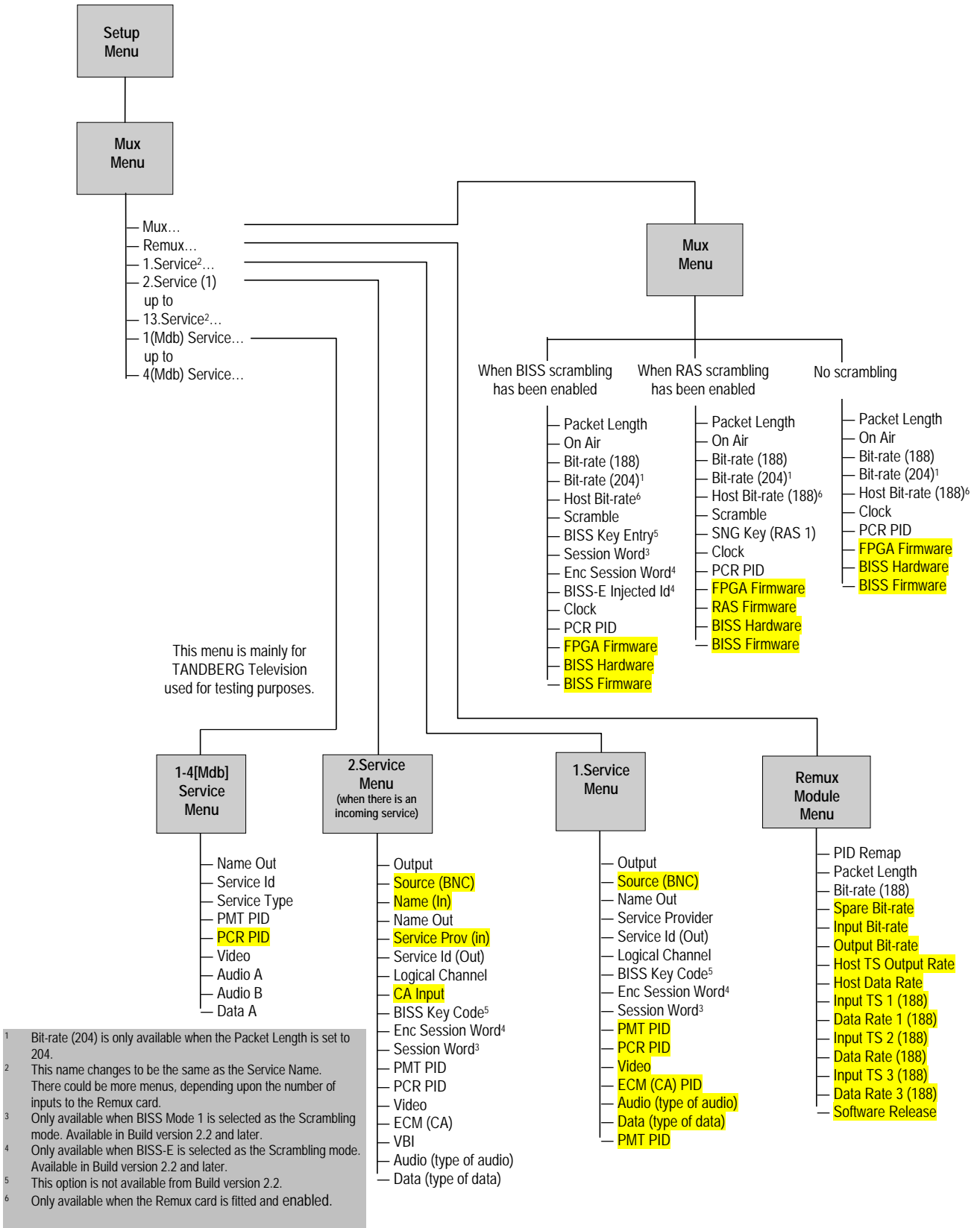


Figure 4.16: Menu Hierarchy – Setup/Mux Menu (DVB)

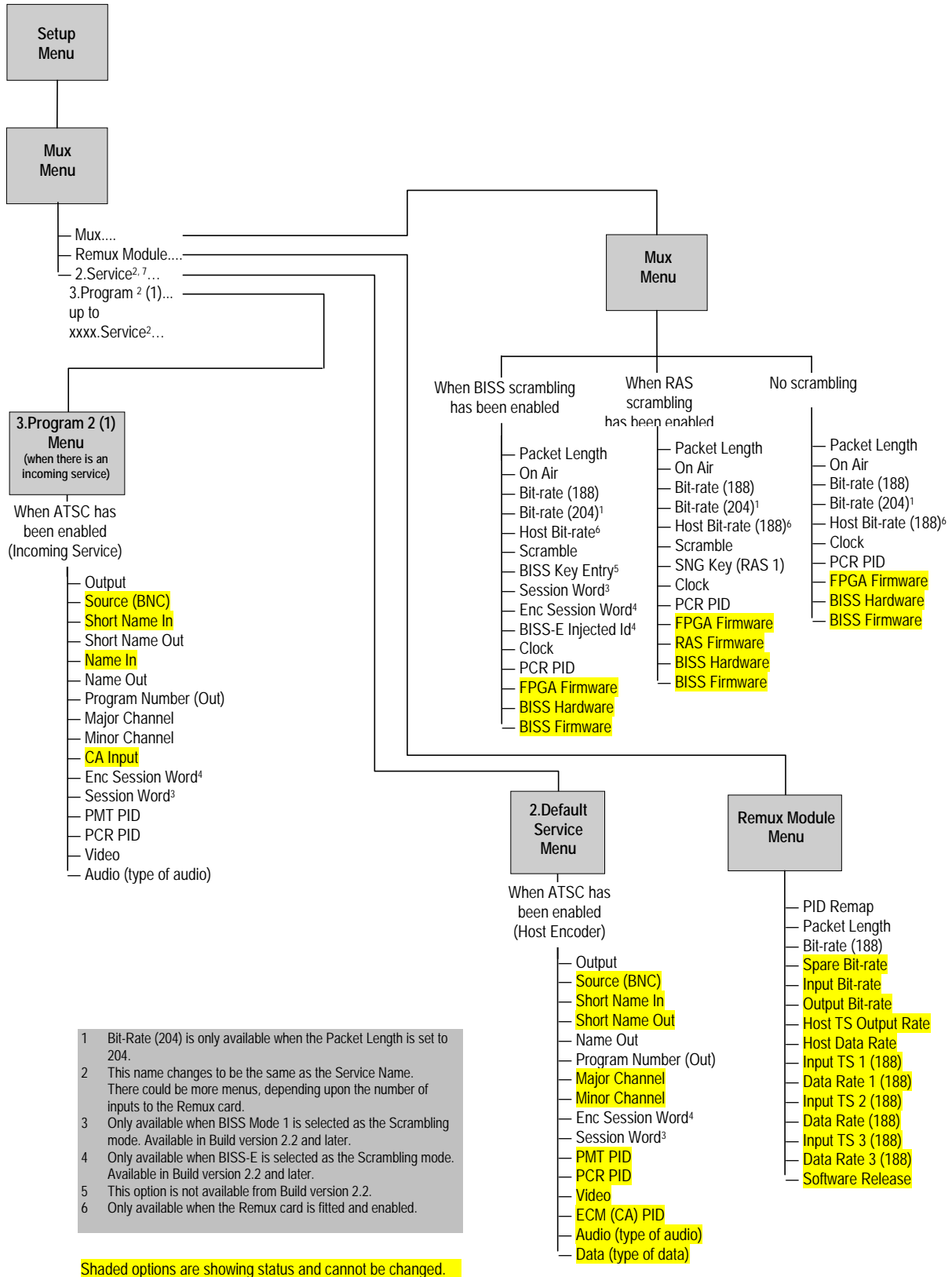


Figure 4.17: Menu Hierarchy – Setup/Mux Menu (ATSC)

### 4.10.4 Packet Length Option

This option enables the Packet Length to be set.

Table 4.144: Packet Length Options

Selected Option	Description
188 bytes	Uses 188 byte packet format.
204 bytes	Uses 204 byte packet format.

### 4.10.5 On Air Option

This option determines whether the output of the Encoder is sent to the Multiplexer.

Table 4.145: On Air Options

Selected Option	Description
On	Multiplexer output is switched on.
Off	Multiplexer output is switched off.

### 4.10.6 Bit-rate (188) and Bit-rate (204) Option

**NOTE...**  
 If the Packet Length option is set to 188 bytes then only the Bit-rate (188) option is displayed. If the Packet Length option is set to 204 bytes then both the Bit-rate (188) and Bit-rate (204) options are displayed.

Both the Bit-rate (188) and the Bit-rate (204) can be in the range of 0 Mbit/s to 110 Mbit/s.

Table 4.146: Bit-rate (188) and Bit-rate (204) Options

Selected Option	Description
<b>188 / 204</b>	Multiplexer output bit-rate when in baseband output format and ASI output mode.
Min: 0.0000 Mbit/s	
Max (without Remux): 110.0000 Mbit/s	
Max (with Remux): 50.0000 Mbit/s	Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.
Step Size: 0.0001 Mbit/s	

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

### 4.10.7 Clock

**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.

This option enables the Clock to be set.

Table 4.147: Clock Options

Selected Option	Description
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. Earlier versions of HD Encoder do not support this option and it is unavailable in the menu structure. A hardware modification is required to implement it.

### 4.10.8 PCR PID Option

This option shows the Program Clock Reference Packet Identifier.

Table 4.148: PCR PID Options

Selected Option	Description
Min:	1
Max:	8190 (1FFEh)
Step Size:	1

### 4.10.9 FPGA Firmware

This option indicates the version of the FPGA Firmware. It is for status only and cannot be changed.

### 4.10.10 RAS Firmware

This option indicates the version of the RAS Firmware. It is for status only and cannot be changed.

### 4.10.11 BISS<sup>16</sup> Hardware

This option indicates the version of the BISS Hardware. It is for status only and cannot be changed.

### 4.10.12 BISS Firmware

This option indicates the version of the BISS Firmware. It is for status only and cannot be changed.

### 4.10.13 RAS Options Enabled

#### Scramble Option

This option enables RAS1 security scrambling of the Encoder transmission to be switched on or off.

<sup>16</sup> BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Table 4.149: Scramble Options (RAS)

Selected Option	Description
Off	Encoder output is not scrambled.
RAS (Fixed 1)	Encoder output is scrambled using the fixed RAS key assigned by TANDBERG TV, and preprogrammed into the Encoder.
RAS (Fixed 2)	Encoder output is scrambled using the fixed second RAS key assigned by TANDBERG TV, and preprogrammed into the Encoder.
RAS (EBU Key)	Encoder output is scrambled using the fixed RAS key assigned to the EBU and preprogrammed into the Encoder.
RAS1 (SNG Key)	Encoder output is scrambled. Scrambling key used is entered using the <b>SNG Key (RAS1)</b> option.

**NOTE...**

RAS Fixed Keys and the EBU Key are only programmed into the Encoder if requested when the units are ordered.

### SNG Key (RAS1) Option

This option enables the scrambling key used in SNG Key scrambling mode to be set (see the Scramble option). The same scrambling code must be used at the receive end to unscramble the transmission.

Enter up to seven digits using the keypad, then press the **Enter** softkey to accept the scrambling code. If less than seven digits are entered, they are prefixed with 0's (zero) to give a seven-digit code.

## 4.10.14 BISS Options Enabled

### Overview

BISS Mode 1 uses a fixed scrambling key, known as the Session Word, to encrypt the transport stream. The same Session Word must be entered in the Receivers and the Encoder to enable the transport stream to be decrypted.

BISS-E adds an extra layer of security, as a unique key is required for each Encoder and Receiver. This is known as the Encrypted Session Word. Each Encoder and Receiver is assigned a unique BISS Injected ID, which should not be made generally known, and which cannot be read from the unit.

For a particular transmission a BISS Session Word is chosen, and then encrypted, using each unit's BISS Injected ID to produce an Encrypted Session Word for each unit. This means that if an unauthorised person obtains an Encrypted Session Word, it is useless unless they also know the BISS Injected ID for the unit that the Encrypted Session Word was intended.



## Scramble Option

Access the Scramble option from the `Mux Menu`. This enables security scrambling of the Encoder transmission to be switched on or off.

### NOTE...

If the scrambling is switched between BISS Mode 1 and BISS-E, the session word, or the encrypted session word must be re-entered.

Table 4.150: Scramble Options (BISS)

Selected Option	Description
BISS Mode 1	Encoder output is scrambled. Scrambling key used is entered using the <b>Session Word</b> option.
BISS-E	Encoder output is scrambled. Scrambling key used is entered using the <b>Enc Session Word</b> option.
Off	Encoder output is not scrambled.

## Session Word Option

Access the Session Word option from the `Mux Menu`. A Session Word is the 48-bit code used to generate the 64-bit Control Word that is used to encrypt and decrypt the transport stream.

The sender and receiver(s) of the transmission share the Session Word, so that only the intended parties receive the transmission. The same Session Word must be used at the receive end.

If the Session Words are the same, then the IRDs are able to decrypt the broadcast. If the Session Words are different, the broadcast is not received.

### NOTE...

Take precautions to avoid general knowledge of the Session Word.

The Session Word relates to the different types of BISS as follows:

- **BISS Mode 1:** All components are scrambled by a fixed control word, derived from a clear Session Word.
- **BISS-E:** All components are scrambled by a fixed control word, derived from an Encrypted Session Word.

## Enc Session Word Option

Access the Enc Session Word option from the `Mux Menu`. This is used with BISS-E. An Enc(rypted) Session Word is a 64-bit number that is transformed by the Encoder into a Session Word used to encrypt and decrypt the transport stream.

### NOTE...

Take precautions to avoid general knowledge of the Encrypted Session Word.

## BISS-E Injected Id Option

Access the BISS-E Injected Id option from the `Mux Menu`. This is only used with BISS-E and is an identifier for the unit, comprising a 56-bit hexadecimal word.

**NOTE...**

Take precautions to avoid general knowledge of the BISS-E Injected Id.

## 4.11 ATM Network Interface Option Module Menu

### 4.11.1 Overview

This menu permits the selection of the ATM parameters and is only available if one of the M2/EOM2/ATMS... ATM Network Interface Option Modules is fitted.

The ATM Menu is selected from the `Setup Menu` by pressing the **ATM** softkey (see *Figure 4.18* for menu structure).

### 4.11.2 Add Connection Option

The Add Connection option displays a list of valid profiles from which a connection can be made. This sets up a Switched Virtual Circuit (SVC) or Permanent Virtual Circuit (PVC) connection to the other end of the network to either transmit, receive or transmit and receive an MPEG-2 transport stream.

Select a profile and press the **Connect** softkey. This profile is used to attempt to make a connection and the menu returns to the list of valid profiles.

**NOTE...**

The profile defining the connection parameters must be in the Profile list. There can be one Tx connection and one Rx connection or one Tx/Rx connection active at any time.

*Table 4.151: Add Connection Options*

Selected Option	Description
Connect	Sets up SVC or PVC connection to the other end of the network.
Not Connected	No connection to the other end of the network.

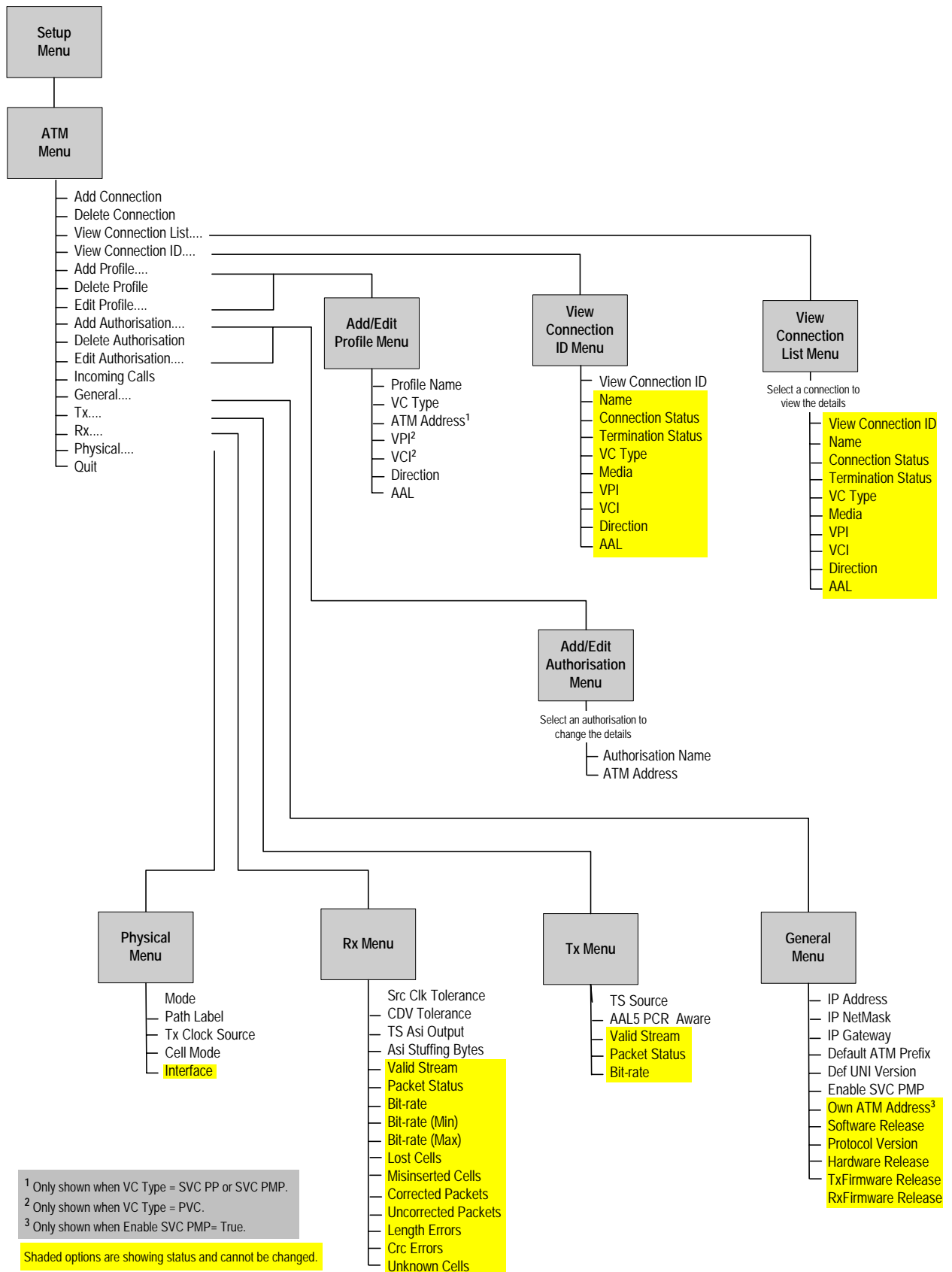


Figure 4.18: Menu Hierarchy – Setup/ATM Menu

### 4.11.3 Delete Connection Option

The Delete Connection option displays a list of currently active connections. The list may be empty if there are no active connections. This breaks the connection to the network and terminates the MPEG-2 transmission and/or reception. The Connection name is the specified profile name or authorisation name.

Table 4.152: Delete Connection Options

Selected Option	Description
Retain	Retains the connection to the other end of the network.
Delete	Removes the connection to the other end of the network.

### 4.11.4 View Connection List Menu

This displays a list of current connections whether active or inactive. Selecting a connection displays the connection details.

The following options (connection details) are status only and cannot be changed.

- View Connection ID
- Name
- Connection Status
- Termination Status
- VC Type
- Media
- VPI
- VCI
- Direction
- AAL

### 4.11.5 View Connection ID Menu

#### View Connection ID Option

Enter a number to view the details of that specific connection ID. They are status only and cannot be changed.

- Name
- Connection Status
- Termination Status
- VC Type
- Media
- VPI
- VCI
- Direction
- AAL

## 4.11.6 Add Profile Menu

### Overview

Access the **Profile Menu** from the **ATM Menu**. Then press the **Profile** softkey. Change the option to 'Active' and press the **Enter** softkey.

This shows a further set of options which define the connection parameters used to establish a connection to the network. Multiple profiles can be added to the list, defining different endpoint addresses or parameters.

Table 4.153: Add Profile Options

Selected Option	Description
Active	A new default Profile is created and the menu moves directly to the Edit screen for the new profile.
Not Active	

### Profile Name Option

Use the keypad to amend the profile name (if necessary) and press the **Enter** softkey.

### VC Type Option

This option enables the VC Type to be set.

Table 4.154: VC Type Options

Selected Option	Description
SVC <sup>17</sup> PP	Switched Virtual Circuit (SVC).Point to Point (PP). PP indicates transmission to a single Receiver.
SVC PMP	Switched Virtual Circuit (SVC). Point to Multipoint (PMP). PMP indicates simultaneous transmissions to several Receivers
PVC <sup>18</sup>	Permanent Virtual Circuit (PVC) connection.

### ATM Address Option

**NOTE...**

This option is only shown when VC Type = SVC PP or SVC PMP.

This option allows an ATM address value to be input.

<sup>17</sup> An SVC is a circuit which only exists for the duration of the session, after which it is usually disconnected. Also referred to as "Bandwidth on Demand". A connection established via signalling.

<sup>18</sup> A PVC is a circuit, equivalent to a dedicated leased line, yet over some form of packet switched network. A PVC is set up once, usually through the management system of the network supporting it, and continues to exist until it is removed, again via the management system.

Table 4.155: ATM Address Options

Selected Option	Description
0 to 255	Enter the ATM address value.

## VPI Option

**NOTE...**

This option is only shown when VC Type = PVC.

This option allows a Virtual Path Identifier value to be input.

Table 4.156: VPI Options

Selected Option	Description
0 to 255	Enter the Virtual Path Identifier (VPI) value.

## VCI Option

**NOTE...**

This option is only shown when VC Type = PVC.

This option allows a Virtual Channel Identifier<sup>19</sup> value to be input.

Table 4.157: VCI Options

Selected Option	Description
0 to 65535	Virtual Channel Identifier. Values less than 49 are reserved.

## Direction Option

This option enables the Direction to be set.

Table 4.158: Direction Options

Selected Option	Description
TX	Transmit direction.
RX	Receive direction.
TXRX	Bi-directional.

## AAL Option<sup>20</sup>

This option enables the selection of an ATM adaptation layer used with the MPEG transport stream.

<sup>19</sup> Virtual Channel Identifier – a unique numerical tag as defined by a 16 bit field in the ATM cell header that identifies a virtual channel, over which the ATM cell is to travel.

<sup>20</sup> ATM Adaptation Layer – the standards layer that allows multiple applications to have data converted to and from the ATM cell.

Table 4.159: AAL Options

Selected Option	Description
AAL1 FEC	ATM adaptation layer and Forward Error Correction, used with the MPEG transport stream.
AAL1	ATM adaptation layer without Forward Error Correction, used with the MPEG transport stream.
AAL5	ATM adaptation layer, used with the MPEG transport stream and ATM signalling.

### 4.11.7 Delete Profile Menu

The Delete Profile option lists the current active profiles. Select a Profile by pressing the associated softkey, select Delete and press the **Enter** softkey.

### 4.11.8 Edit Profile Option

Press the associated softkey to edit the selected Profile.

Further screens appear which are the same as those on *page 4-127*.

The Profile parameters available change according to VC Type (see *Figure 4.18 on page 4-125*).

### 4.11.9 Add Authorisation Menu

#### Overview

This authorises an ATM address from which SVC connections will be accepted. Press the **Auth** softkey. Change the option to 'Active' and press the **Enter** softkey.

Table 4.160: Add Authorisation Options

Selected Option	Description
Active	A new default Authorisation is created, and the menu moves directly to the Edit screen for the new Authorisation.
Not Active	A new default Authorisation is not created.

#### NOTE...

If **Incoming Calls** is set to *Authorisations* then any incoming connection requests from ATM addresses which are not in the authorisations list will be rejected.

More options appear.

#### Authorisation Name Option

Change the name and press the **Enter** softkey.

#### ATM Address Option

Change the ATM address and press the **Enter** softkey.

### 4.11.10 Delete Authorisation Menu

The Delete Authorisation Menu lists the current Authorisations. Select an authorisation by pressing the associated softkey. Change to 'Delete' and press the **Enter** softkey.

Table 4.161: Delete Authorisation Options

Selected Option	Description
Retain	Keeps the authorisation.
Delete	Deletes the authorisation.

### 4.11.11 Edit Authorisation Option

Press the associated softkey to edit the selected Authorisation.

Further screens appear which are the same as those on *page 4-129*.

### 4.11.12 Incoming Calls Option

This enables the Incoming Calls to be changed.

Table 4.162: Incoming Calls Options

Selected Option	Description
Permit All	Accepts calls from any ATM address.
Refuse All	No incoming calls accepted.
Authorisations	Only accepts calls which are in the authorisations list.

### 4.11.13 General Menu

#### IP<sup>21</sup> Address Option

This is a network address used to identify the ATM interface when plugged into an Ethernet network via the 10BaseT socket on the card. Use the keypad to amend the IP Address.

#### IP NetMask Option

Use the keypad to amend the IP NetMask.

#### IP Gateway Option

This option 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 network will be sent to this address.

#### Default ATM Prefix Option

This option is a 26 digit hexadecimal number identifying the ATM address prefix defined by the connected ATM network operator. This only needs to be specified if the ATM network does not support Integrated Layer Management Interface (ILMI) which normally sets this prefix automatically

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<sup>21</sup> Internet Protocol.



## Def UNI Version Option

This option is the default User to Network Interface (UNI) protocol version used to communicate with the ATM network, defined by the connected ATM network operator. This only needs to be specified if the ATM network does not support ILMI, which normally automatically negotiates the version to use. Use the softkeys to amend the Default UNI option.

Table 4.163: Def UNI Options

Selected Option	Description
UNI 3.0	Protocol versions used to communicate with the ATM network, defined by the connected ATM network operator.
UNI 3.1	
UNI 4.0	

## Enable SVC PMP Option

This enables the Enable SVC PMP to be changed.

Table 4.164: Enable SVC PMP Options

Selected Option	Description
TRUE	When set to TRUE a new status parameter, <b>Own ATM Address</b> , appears in the General menu.
FALSE	

## Status-only Options

The following options are status only and cannot be changed.

- Own ATM Address<sup>22</sup>
- Software Release
- Protocol Version
- Hardware Release
- TxFirmware Release
- RxFirmware Release

### 4.11.14 Tx Menu

#### TS Source Option

This option enables a choice of which MPEG transport stream source is to be transmitted.

Table 4.165: TS Source Options

Selected Option	Description
Encoder	Default setting.
ASI	External ASI BNC input.

<sup>22</sup> **Own ATM Address** only appears in the General menu when the **Enable SVC PMP** option is set to TRUE.

### AAL5 PCR Aware Option

This is an alternative AAL-5 transmission mode. Use the + and – softkeys to alternate between **On** and **Off** and then press **Enter** after selecting one of them. The option is usually set to **Off**.

Table 4.166: AAL5 PCR Aware Options

Selected Option	Description
On	AAL5 PCR Aware Option enabled.
Off	AAL5 PCR Aware Option disabled – default setting.

### Status-only Options

The following options are status only and cannot be changed.

- Valid Stream
- Packet Status
- Bit-rate

## 4.11.15 Rx Menu

### Srcce Clk Tolerance Option

This setting affects the reception clock recovery tolerance to the source transmitter clock accuracy, normally set to Normal. If the source clock is known to be accurately calibrated to either the PAL-I or ATSC specification then those settings can be used, resulting in less end-to-end delay.

Table 4.167: Srcce Clk Tolerance Options

Selected Option	Description
Normal +/- 30.0ppm	
PAL-I +/- 0.226ppm	PAL-I source
ATSC +/- 2.8ppm	ATSC source

### CDV<sup>23</sup> Tolerance Option

This setting affects the reception clock recovery tolerance to cell delay variation introduced by the ATM network. Configure it to a value greater than or equal to that specified by the network operator, to handle the worst case but to also achieve the minimum possible end-to-end delay.

**NOTE...**

Excessive end-to-end delay may cause annoyance when, for example, live reporting requires an interactive conversation with the studio. Long pauses may occur as the recipient waits for the reply.

<sup>23</sup> Cell Delay Variation – a component of cell transfer delay, induced by buffering and cell scheduling.

Table 4.168: CDV Tolerance Options

Valid Input Range	Description
Min: 0 μsec	The maximum ATM network Cell Delay Variation of the MPEG transport stream that can be tolerated (in micro (μ) seconds).
Max: 4000 μsec	
Step Size: 1 μsec	

### TS Asi Output Option

This enables the TS Asi Output to be changed.

Table 4.169: TS Asi Output Options

Selected Option	Description
Active	The transport stream ASI output is enabled.
Not Active	The transport stream ASI output is disabled.

### Asi Stuffing Bytes Option

This enables the Asi Stuffing Bytes to be changed.

Table 4.170: Asi Stuffing Bytes Options

Valid Input Range	Description
0	Byte mode
1-7	Bytes for Burst mode

### Status-only Options

The following options are status only and cannot be changed.

- Valid Stream
- Packet Status
- Bit-rate
- Bit-rate (Min)
- Bit-rate (Max)
- Lost Cells
- Misinserted Cells
- Corrected Packets
- Uncorrected Packets
- Length Errors
- Crc Errors
- Unknown Cells

## 4.11.16 Physical Menu

### Mode Option

Match the setting to that of the connected network, normally set to SDH.

Table 4.171: Mode Options

Marketing Code	Physical Interface	Description	Options
M2/EOM2/ATMS155SM	Monomode	Synchronous Digital Hierarchy - the ITU-TSS International standard for transmitting information over optical fibre.	SDH
M2/EOM2/ATMS155MM	Multimode	Synchronous Optical Network - an ANSI standard for transmitting information over optical fibre.	SONET
M2/EOM2/ATMS34	E3	The physical layer is E3 using duplex BNC (coaxial) interface.	G.823 ADM G.751 PLCP
M2/EOM2ATMS45	DS3	DS-3 is the third level in the PDH multiplex hierarchy found in North America.	C-bit Parity, ADM M23, ADM C-bit Parity, PLCP M23, PLCP
M2/EOM2ATMS155E	STM-1 Electrical Module	Synchronous multiplexing hierarchy, BNC (coaxial) interface. Rates of up to 155 Mbit/s.	SDH, SONET

### Path Label Option

The Path Signal Label is transmitted in STM-1/STS-3c frame and identifies to the Receiver that the SONET/SDH frames are carrying ATM cells.

**NOTE...**

This MUST be set to the default, which is 19. Do not change or the frames might not be recognised as carrying ATM cells.

Table 4.172: Path Label Options

Valid Input Range	Description
Min: 0	The path label which identifies ATM cells.
Max: 255	The input must be set to the default value, 19.
Step Size: 1	

### Tx Clock Source Option

This is the physical layer clock reference source used to transmit the data on the interface. It is normally set to 'Rx Recovered' when connected to a switch but when connected directly to another ATM card, one of the cards should be set to 'Local Oscillator'.

Table 4.173: Tx Clock Source Options

Selected Option	Description
Recovered Rx clock	Use when connected to a switch.
Local Clock	Use when connected directly to another ATM card.

### Cell Mode Option

This specifies how null cells should be flagged on the interface, normally 'Unassigned'.

*Table 4.174: Cell Mode Options*

Selected Option	Description
Idle	
Unassigned	Default setting.

### Interface Option

The Interface option is for status only and indicates the type of physical layer interface.

## 4.12 Remux Menu

### 4.12.1 Introduction

If the Remux option module M2/EOM2/REMUX is fitted, there is an additional item in the Mux Menu (see *Figure 4.16*) and a further Remux Module Menu and 1.Service Menu.

### 4.12.2 Addition to Mux Menu When Remux Fitted

#### Host Bit-rate Option

This option refers to the multiplex in the local (host) Encoder. The Host Bit-rate is shown in *Table 4.175*.

**NOTE...**

The host bit-rate cannot exceed the output rate (see *Table 4.175*).

*Table 4.175: Host Bit-rate Options*

Selected Option	Description
Min	0.0000 Mbit/s
Max (without Remux)	110.0000 Mbit/s
Max (with Remux)	65 Mbit/s
Step Size	0.0001 Mbit/s

Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.

The maximum bit-rate is 65 Mbit/s irrespective of packet size. To obtain 69 Mbit/s modulated output rate, set the packet size to 188 and bit-rate to 65 Mbit/s. The modulator automatically adds 16 Reed-Solomon bytes per packet.

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

### 4.12.3 Remux Module Menu

#### PID Remap

This options allows the action taken during PID Remapping to be tailored.

*Table 4.176: PID Remap Options*

Selected Option	Description
Update PIDs from I/Ps	In this mode, only changes at any of the Remux inputs (e.g. PID change, new component appears) will always be passed through to the output and the outgoing PSI tables will change accordingly.
Lock PID Mapping	In this mode, changes at the Remux inputs will not be recognised. The outgoing PSI tables will also not change. This can result in TS errors being flagged by an analyser, e.g. if a component disappears from an input. It will remain mapped through and referred in the PSI tables which will result in 'Packet Missing' warnings from the analyser.
PID Lock Power Up Delay Option	This option only appears in <b>Lock PID Mapping mode</b> , It is designed to give the Encoder time after power up to acquire the services at its Remux input before it is locked-down.
PID Remap Status	This option only appears in <b>Lock PID Mapping mode</b> . It indicates whether the power-up delay has expired and lock-down has occurred.

Selected Option	Description
New Services Default	This specifies whether new services detected on a Remux input will be ON (i.e. mapped through) or OFF by default. (If PID Remap Status has reached the LOCKED stage, new services will not be recognised at all.) A service is deemed to be new if, on power-up, the acquired PSI shows that there is any differences to the make up of the services. In a multi-level Remux system, if an upstream Encoder is power-cycled, the downstream Remux Encoder may detect the service as NEW due to the way the PSI is built during power-up. Therefore it is recommended that the New Services Default be set to ON unless there are particular concerns about services causing an overflow.

### Packet Length Option

This option indicates the packet length. See *Section 4.10.4, Packet Length Option* for details.

### Bit-rate Option

This option indicates the bit-rate. See *Section 4.10.6, Bit-rate (188) and Bit-rate (204) Option* for details.

### Status Only Options for the Remux Module Menu

The following options are status only and cannot be changed.

- Spare Bit-rate
- Input Bit-rate
- Output Bit-rate
- Host TS Output Rate
- Host Data Rate
- Input TS 1 (188)
- Data Rate 1 (188)
- Input TS 2 (188)
- Data Rate 2 (188)
- Input TS 3 (188)
- Data Rate 3 (188)
- Software Release

**NOTE...**

The maximum input bit-rate allowed on the Remux Module ASI inputs is 50 Mbit/s. If the input bit-rate exceeds 86 Mbit/s it will be incorrectly reported as a lower rate.

## 4.12.4 1.Service/2.Service Menu

### Output Option

This option enables the Output to be set.

Table 4.177: Output Options

Selected Option	Description
Off	The service is not included in the output.
On	The service is included in the output, unscrambled.
On (RAS)	The service is included in the output, scrambled and using RAS.
On (BISS Mux Key)	The service is included in the output, scrambled and the <b>Session Word</b> entered in the Mux Menu.
On (BISS Mode 1)	The service is included in the output, scrambled, using BISS Mode 1 and the <b>Session Word</b> entered in this menu.
On (BISS-E)	The service is included in the output, scrambled, using BISS-E and the <b>Enc(rypted) Session Word</b> entered in this menu.

### Source (BNC) Option

This option indicates the source of the input. It is for status only. Table 4.178 indicates what is shown for the various inputs.

Table 4.178: Source (BNC) Options

Selected Option	Description
0	Host Encoder.
1, 2, 3	Remux inputs 1 to 3.

### Short Name In Option

**NOTE...**

This option is only shown in ATSC mode.

This option allows the Short Name In to be changed.

### Short Name Out Option

**NOTE...**

This option is only shown in ATSC mode.

This option allows the Short Name Out to be changed.

### Name (In) Option

**NOTE...**

This option is only shown on an incoming Service menu (2-13.Service Menu).

This option indicates the input service name. It is status only and cannot be changed.



## Name Out Option

This option allows the service output name to be changed.

## Service Prov (In) Option

**NOTE...**

This option is only shown on an incoming Service menu (2-13.Service Menu).

This option indicates the input service provider's name. It is set for status only and cannot be changed.

## Service Provider Option

This option relates to the output service provider and allows the name to be changed.

## Service Id (Out) Option

This option enables the output Service Identity to be specified. It is the number at the start of the remuxxed services.

Table 4.179: Service Id (Out)Options

Selected Option	Description
Min: 1	Service identity number.
Max: 65535	
Step Size: 1	

## Program Number (Out) Option

**NOTE...**

This option is only shown in ATSC mode.

This option enables the output program number to be specified.

Table 4.180: Program Number (Out) Options

Selected Option	Description
Min: 1	Program Number.
Max: 65535	
Step Size: 1	

## Major Channel Option

**NOTE...**

This option is only shown in ATSC mode.

This option enables the major channel to be specified.

## Minor Channel Option

**NOTE...**

This option is only shown in ATSC mode.

This option enables the minor channel to be specified.

### Logical Channel Option

This option enables a number to be given to the Logical Channel.

### CA Input Option

**NOTE...**  
This option is only shown if there are incoming services.

This option indicates the type of CA present on the input. It is set for status only and cannot be changed.

### BISS Key Code Option

**NOTE...**  
This option is not available from Build version 2.2.

This option enables the scrambling key used in BISS scrambling mode to be set. The same scrambling code must be used at the receive end to unscramble the transmission.

Enter up to 12 digits. If less than seven digits are entered, they are prefixed with 0s (zero) to give a seven-digit code.

### Enc Session Word Option

Refer to *Enc Session Word Option* on page 4-123 for details.

### Session Word Option

Refer to *Session Word Option* on page 4-123 for details.

### PMT PID Option

**NOTE...**  
This option is status only for the Host Encoder but can be changed for incoming services.

This option shows the Program Map Table Packet Identifier.

*Table 4.181: PMT PID Options*

Selected Option	Description
Min: 32	Program Map Table Packet Identifier (PMT PID).
Max: 8190 (1FFEh)	
Step Size: 1	

### PCR PID Option

**NOTE...**  
This option is status only for the Host Encoder but can be changed for incoming services.

This option shows the Program Clock Reference Packet Identifier.

Table 4.182: PCR PID Options

Selected Option	Description
Min: 1	
Max: 8190 (1FFEh)	
Step Size: 1	

## Video Option

**NOTE...**

This option is status only for the Host Encoder but can be changed for incoming services.

This option shows the Video PID.

Table 4.183: Video Options

Selected Option	Description
Min: 1	
Max: 8190 (1FFEh)	
Step Size: 1	

## ECM (CA) PID Option

**NOTE...**

This option is status only for the Host Encoder but can be changed for incoming services.

This option shows the Entitlement Control Message (Conditional Access) Packet Identifier (PID).

Table 4.184: ECM (CA) PID Options

Selected Option	Description
Min: 1	
Max: 8190 (1FFEh)	
Step Size: 1	

## VBI PID Option

**NOTE...**

This option is status only for the Host Encoder but can be changed for incoming services. Available prior to Build version 2.2.0.

This option is used for entering or updating the VBI PID.

Table 4.185: VBI PID Options

Selected Option	Description
Min: 1	
Max: 8190 (1FFEh)	
Step Size: 1	

## Audio (Type of Audio) Option

**NOTES...**

1. This option is status only for the Host Encoder but can be changed for incoming services.
2. The option could be Audio (MPEG-2), Audio (Dolby Digital) etc. The words in the brackets change according to the type of audio that was previously selected.

This option is used for entering or updating audio PIDs.

To be DVB compliant, PIDs below 32 are reserved. Therefore PIDs 32 to 8191 are available for use. In the event of a clash, one of the PIDs will be changed by the Encoder’s internal checking algorithm

*Table 4.186: Audio (Type of Audio) Options*

Selected Option	Description
Min: 1	
Max: 8190 (1FFEH)	
Step Size: 1	

## Data (Type of Data) Option

**NOTES...**

1. This option is status only for the Host Encoder but can be changed for incoming services.
2. The option could be Data (RS-232), Data (RS-422) etc. The words in the brackets change according to the type of data that was previously selected.

This option is used for entering or updating data PIDs.

*Table 4.187: Data (Type of Data) Options*

Selected Option	Description
Min: 1	
Max: 8190 (1FFEH)	
Step Size: 1	

## Teletext Option

**NOTE...**

This option is status only for the Host Encoder but can be changed for incoming services.

This option is used for entering or updating Teletext PIDs.

*Table 4.188: Teletext Options*

Selected Option	Description
Min: 1	
Max: 8190 (1FFEH)	
Step Size: 1	

## 4.13 Digital Programme Insertion (DPI) Menu

### 4.13.1 Option Availability

This option is only available from the `Systems` Menu when the M2/ESO2/DPI licence key is purchased. DPI can be triggered either by GPI contact closure or by the DVS 525 protocol.

### 4.13.2 Overview

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

### 4.13.3 DPI Initiated by GPI

Only one of the card's eight inputs is used. This is configured to be a straight Open/Close switch. The switch is then able to activate/deactivate the splicing message insertion.

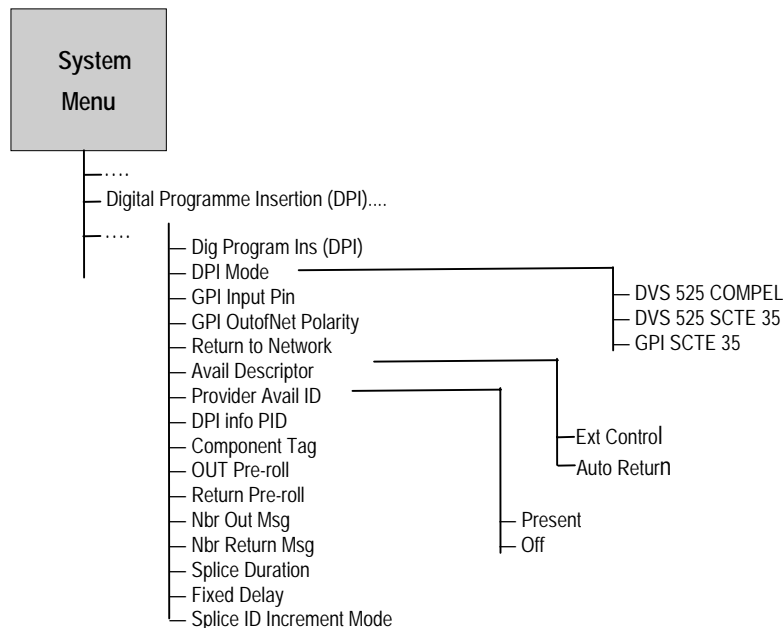
The GPI card is used as an interface between the Encoder and an Automation System. The System dictates when the Encoder is to send SCTE-35 messages by changing the state of the GPI card's input switch. Before the command can be executed, some Encoder parameters need to be set.

### 4.13.4 DPI Initiated by DVS 525

The number of options available through this method are shown in *Table 4.189*. In this mode, the Encoder responds to messages received via Ethernet adhering to the DVS 525 protocol.

### 4.13.5 Menu Structure

*Figure 4.19* shows the options available from the menu.



*Figure 4.19: Menu Hierarchy – Digital Programme Insertion DPI Menu (GPI Initiated)*

**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 4.189: DPI Options (DPI Mode= GPI SCTE 35)

Menu Item	GPI	DVS 525	Description	SD Mode	HD mode
DPI Program Ins (DPI)			On/Off	✓	
DPI Mode	✓		GPI SCTE 35: GPI card triggers SCTE 35 splice	✓	
		✓	DVS 525 SCTE 35: DVS 525 messages triggers SCTE 35 splice.	✓	✓
		✓	DVS 525 COMPEL: DVS 525 triggers splice. DVS 525 version compatible with Wegener Compel unit – Compel Control DPI Monitor version R3.15.32.	✓	
Return to Network	✓	✓	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 - FFFFFFFF	✓	
DPI info PID	✓	✓	PID in which the splice messages are carried.	✓	
Out Pre-roll	✓		0, 4 – 100 s (0 indicates immediate)	✓	
Return Pre-roll	✓		0, 4 – 100 s (0 indicates immediate)	✓	
Nbr Out Msg	✓		Only single is possible.	✓	
Nbr Return Msg	✓		Only single is possible.	✓	
Nbr Splice Msg		✓	Only single is possible.	✓	
Splice Duration	✓		If non-zero, 'Break duration' structure is included in the splice message.	✓	
Fixed Delay	✓	✓	Added to both Out and Return pre-roll.	✓	
Splice ID Increment mode	✓		Determines whether splice_event_id is incremented for each splice message or only for an out/return message pair.	✓	
TCP port		✓	Port number on which to receive DVS 525 messages.	✓	
Component Tag		✓	The value for component tag in the 'stream identification descriptor' in the PMT.	✓	
Synchronisation		✓	Sync to Alive/Do not sync. Most installations should choose 'Sync to Alive' so that splice times are accurate.	✓	
Pre-roll Adjuster		✓	[DVS 525 Compel mode] Compel protocol enables pre-roll in steps of one second only. Users can enter a constant milli-second offset here to get sub-second accuracy.	✓	
GPI Input Pin	✓		Physical pin on GPI connector to be monitored.	✓	
GPI OutofNet Polarity	✓		Whether an open or close will trigger Out of Network.	✓	

---

## 4.14 Errors Menu

### 4.14.1 Overview

The `Errors` Menu can be selected from the `Advanced` Menu.

New errors are reported to the front panel display approximately every 30 seconds.

### 4.14.2 Active Errors Option

Access the `Active Errors` option from the `Errors` Menu. This gives a list of any current errors. `Error Masks` Menu

#### Status of Error Masks

Access the `Error Masks` option from the `Error Masks` Menu. This 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 fail and alarm relays
- **Off** does not show the error message and does not trigger any relays

Press the softkey next to a message. As the key is pressed the status of the message changes.

### 4.14.3 Ignored Errors

Errors flagged as 'Ignored Errors' are displayed in the Ignored list and aren't passed onto to any other equipment. `Error Masks` Menu

#### Status of Error Masks

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 fail and alarm relays
- `Off` does not show the error message and does not trigger any relays

Press the softkey next to a message. As the key is pressed the status of the message changes.

#### Restore Defaults

Access the `Restore Defaults` option from the `Error Masks` Menu. This sets alarm, fail and error messages to the factory defaults.

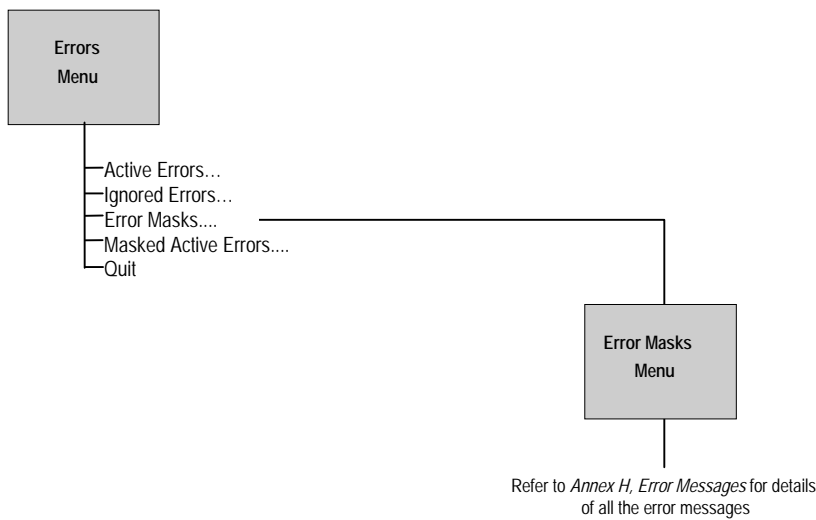


Figure 4.20: Menu Hierarchy – Error Masks Menu

#### 4.14.4 Masked Active Errors

If an active error is masked, it appears in the Masked list where the error is noted and may be passed to a controlling GUI but doesn't generate an error. Off and Masked are two of the same thing.

### 4.15 Diagnostics Menu

See *Chapter 6, Preventive Maintenance and Fault-finding* for information about the Diagnostics Menu.



## 4.16 Configs Menu

### 4.16.1 Accessing the Menu

The Configs Menu can be selected from the Summary Screen by pressing the **Cfgs** softkey or from the Advanced Menu by pressing the **Configs** softkey.

### 4.16.2 Overview

#### Types of Configuration

The Encoder has a set of 16 default configurations. 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 (it runs the Encoder)
- Sixteen user configurations (in the User FLASH)
- Sixteen backup configurations (in Backup FLASH)
- Sixteen HD factory default configurations

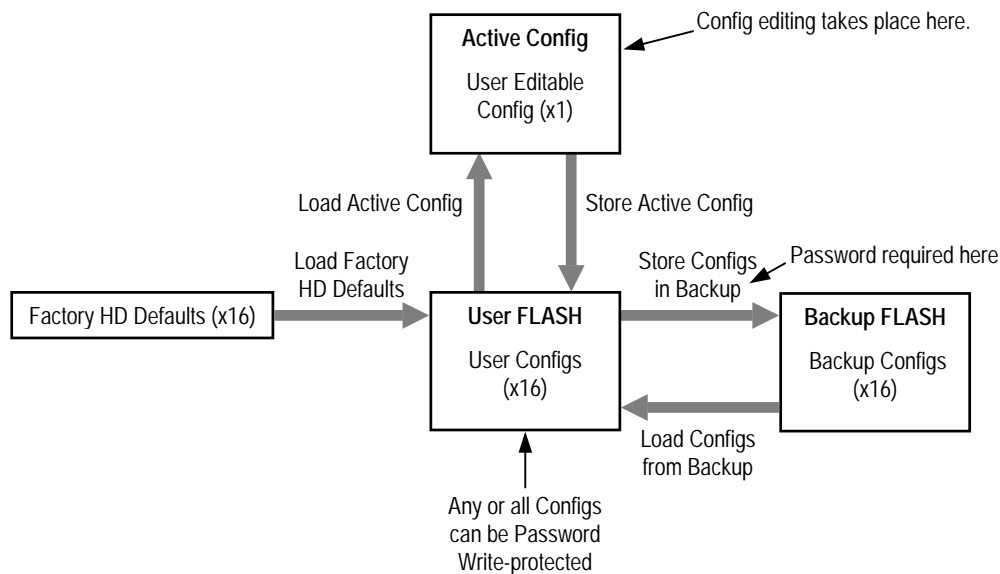


Figure 4.21: Configuration, Graphical Explanation.

#### Active Configuration

This is the configuration that the Encoder is currently using. It is loaded from one of the 16 user configuration locations (**Load Active Config**). It can be edited at any time and also stored back as one of the user configurations (**Store Active Config**).

## User Configurations

Configurations loaded into the user FLASH become user configurations. Any one of the user configurations can be loaded as an active configuration (**Load Active Config**). A modified active configuration can be copied back into one of the user FLASH locations (**Store Active Config**) where it can be password write-protected. A user configuration that is write-protected cannot be overwritten. The 16 user configurations can be saved in the backup FLASH (**Store Configs in Backup**).

**CAUTION...**

Any user configuration that is not write-protected, will be overwritten when Factory Default or Backup configurations are loaded to the user FLASH.

## Backup Configurations

Backup FLASH stores a copy of each of the 16 user configurations when you select **Store Configs in Backup**, you will be asked for the password here.

If unsure of the user configurations or they become inadvertently modified, the user configurations can be returned to a known state at any time by the command **Load Configs from Backup**. This loads the 16 backup configurations to the User FLASH, overwriting all user configurations that are not write-protected. Individual configurations cannot be selected for loading to the User FLASH.

The active (current) configuration is unaltered when you select **Load Configs from Backup**.

## Factory HD Default Configurations

There are 16 default configurations. 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 can be loaded to the user FLASH at any time by selecting **Factory HD Defaults**. This overwrites all user configurations that are not write-protected. Individual configurations cannot be selected for loading to the User FLASH.

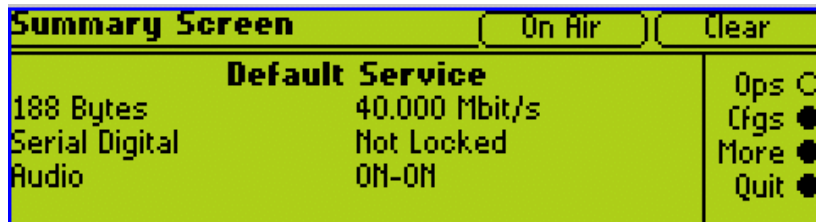
## Configuration, Write-Protection

Any or all of the 16 user configurations can be write-protected by selecting **Write Protect Configs**. A password is asked for. With the correct password entered, the question **Write protect Which Configs?** appears. Select which configurations to protect by pressing the associated softkey in each case. This toggles the write-protect condition (On or Off) for each individual configuration. The letter **R** when shown to the left of the config number, indicates that the configuration is read-only (write-protected).

Any configuration that is write-protected will be displayed as read-only if attempting to overwrite it.

### 4.16.3 Quick Configuration From the Summary Screen

The sixteen predefined user configurations are a quick and easy way to configure the Encoder without having to enter individual parameters. The Config Menu can be accessed directly from the summary screen by pressing the **Cfgs** softkey. Press the **Load Active Config** softkey (see Section 4.16.4) and a list of configurations is shown. Select the required one by pressing the associated softkey. Nothing more need be done. The Encoder is ready for use.



Press the Cfgs softkey for quick access to the Config menu

This menu provides options for loading and storing predefined configurations and updating and restoring backup configurations.

### 4.16.4 Load Active Config Option

Use the softkeys to select the required configuration to be loaded.

### 4.16.5 Store Active Config Option

Use the softkeys to select the position where the configuration is to be stored.

**NOTE...**

There is no confirmation screen, the configuration is overwritten immediately the softkey indicating the storage position is selected.

### 4.16.6 Load Configs From Backup Option

This option enables the 16 user configurations to be overwritten with the 16 backup configurations.

**NOTE...**

The 16 backup configurations are loaded immediately the **Load Configs from Backup** softkey is pressed although the current Encoder configuration remains unchanged.

### 4.16.7 Store Configs in Backup Option

This enables the 16 user configurations to be stored in the backup, and may be password protected.

**NOTE...**

The 16 backup configurations are stored immediately the **Store Configs in Backup** softkey is pressed.

### **4.16.8 Factory HD Defaults Option**

This option enables the 16 user configurations to be overwritten by the factory default settings.

# Chapter 5

## Web Browser Interface

### Contents

5.1	Introduction .....	5-3
5.2	How to Set Up Internet Explorer For the Web Browser Interface .....	5-3
5.3	Web Browser Interface Options .....	5-6
5.4	Fault Reporting.....	5-8
5.5	Cloning a File .....	5-9

### List of Figures

Figure 5.1: Internet Options Dialog Box .....	5-3
Figure 5.2: Settings Dialog Box .....	5-4
Figure 5.3: Connections Tab .....	5-4
Figure 5.4: Local Area Network (LAN) Settings Dialog Box .....	5-5
Figure 5.5: Proxy Settings Dialog Box.....	5-5
Figure 5.6: TFTP Protocol for Cloning a File.....	5-9

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## 5.1 Introduction

There is a range of diagnostic and other utilities that can be accessed via a web browser, such as Internet Explorer. Before these can be accessed it is important to ensure that the Internet Explorer is correctly set up for the web browser.

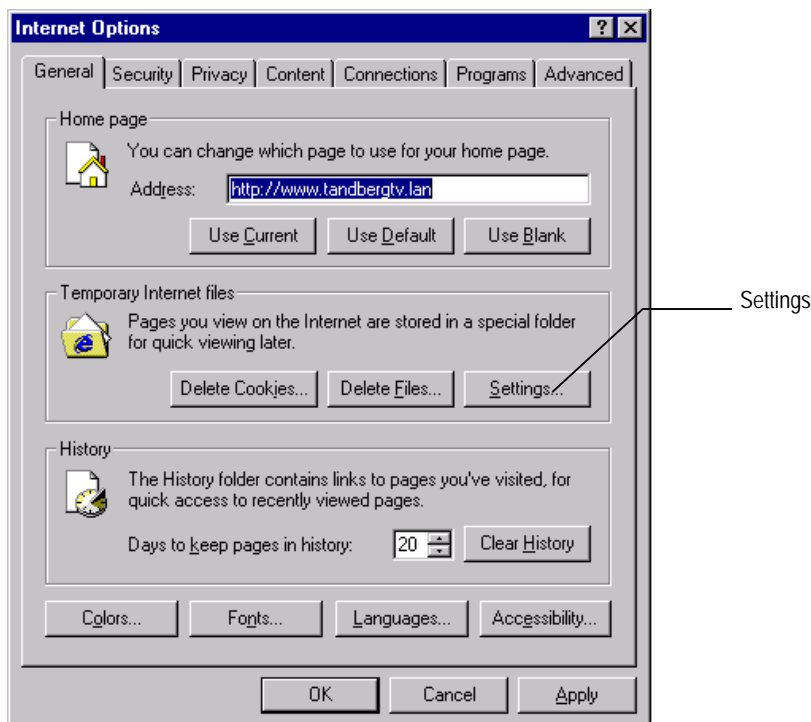
### NOTE...

Netscape not currently supported.

## 5.2 How to Set Up Internet Explorer For the Web Browser Interface

To set up Internet Explorer proceed as follows:

1. In Internet Explorer version 6, 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*).

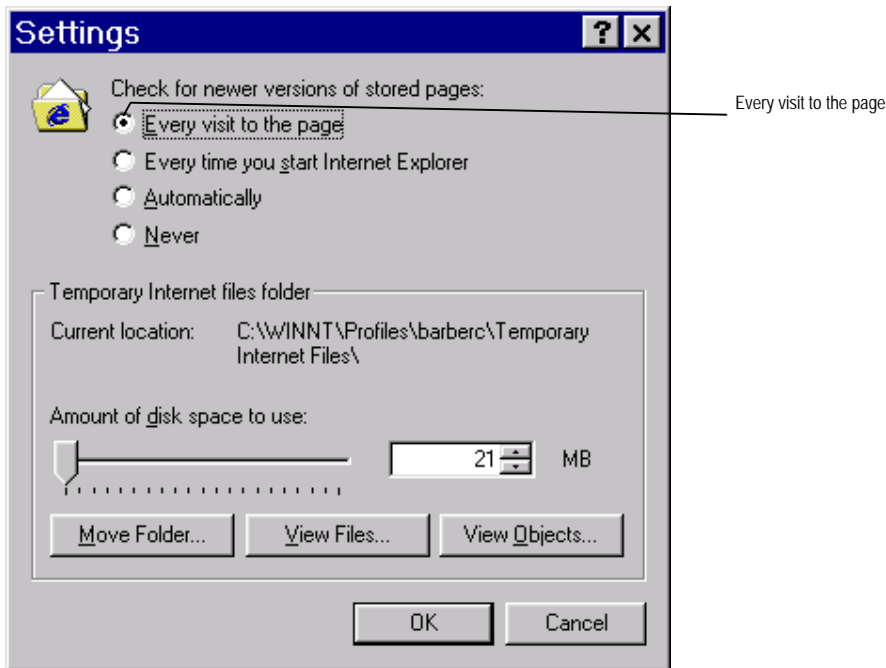


Figure 5.2: Settings Dialog Box

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).

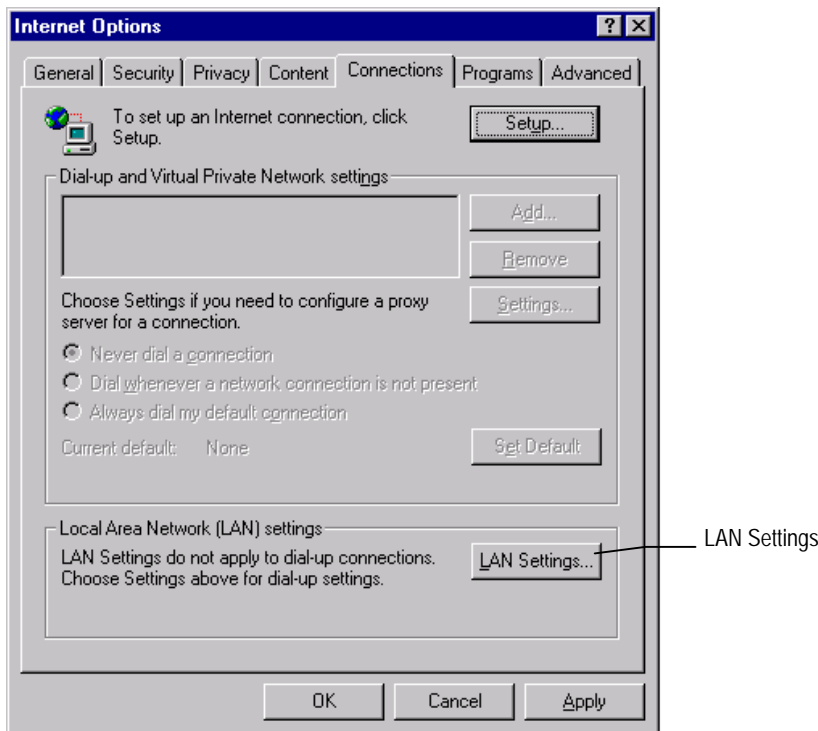
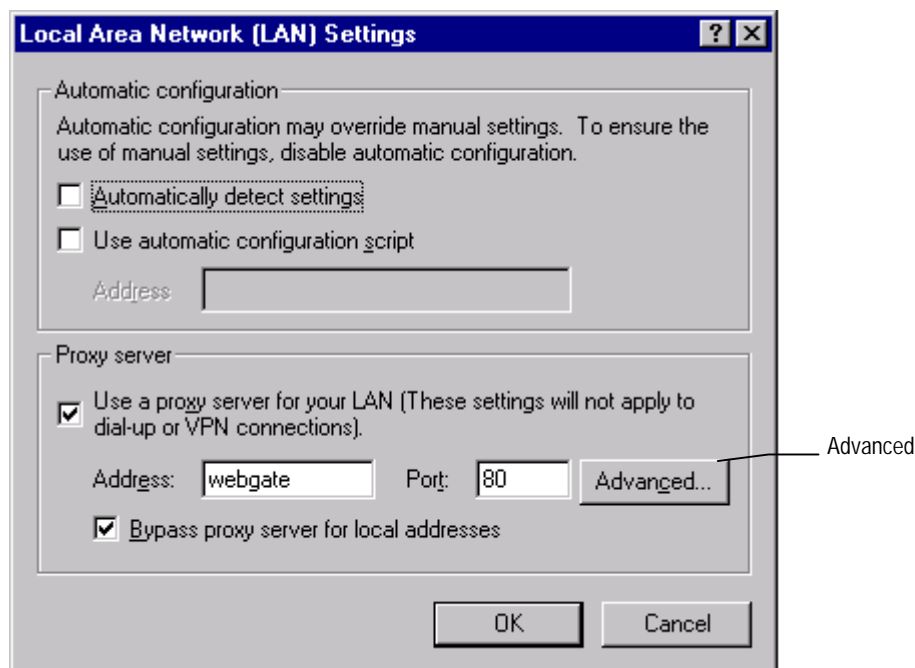


Figure 5.3: Connections Tab

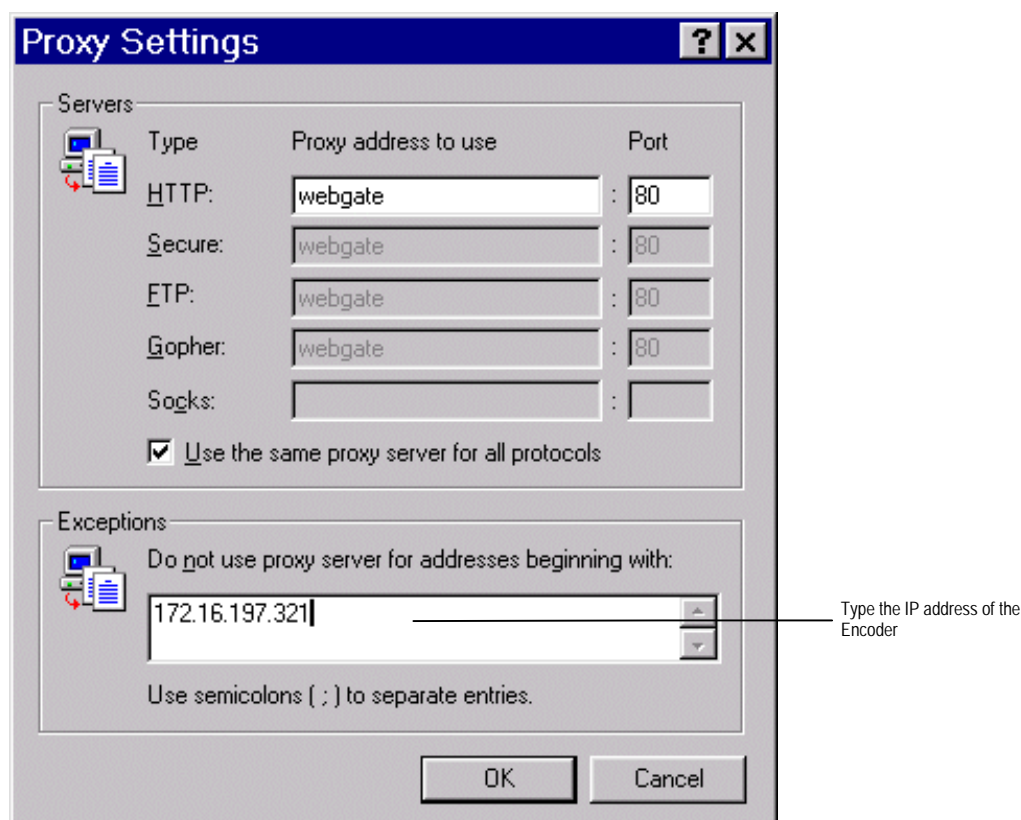


6. Click **LAN Settings** to open the **Local Area Network (LAN) Settings** dialog box (see *Figure 5.4*).



*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 4 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 welcome screen appears followed by a window.

## 5.3 Web Browser Interface Options

The **Web Browser** interface gives access to the following options via a menu tree on the left-hand side of the screen. Some options show diagnostic information for parts of the Encoder.

- **General**
  - ✧ **Version Info**

Gives full information on the build status of the Encoder
  - ✧ **Release Notes.**

The software releases are very useful in identifying any known defects and the various code releases which fixed them.
  - ✧ **Backplane Modes**

The various backplane modes are shown. These indicate all the combinations of option modules allowed.
  - ✧ **SNMP MIB**

This option is password protected. It allows the Simple Network Management Protocol (SNMP) Management Information Base (MIB<sup>1</sup>) 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).
  - ✧ **Customer Support**

There are contact details for Customer Services in various countries. Fault reporting methods are also given.
- **Status**
  - ✧ **Summary** – the current configuration of installed modules is shown.
  - ✧ **Licenced Features** – shows a list of all the features which 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 which have been performed since the Encoder was last switched on.

---

<sup>1</sup> 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.

- 
- ✧ **NV Event Log** - shows the actions which have been performed since the Encoder was last switched on
  - ✧ **External Control** – gives the IP addresses of external equipment which can control the Encoder.
  - **Utilities**
    - ✧ **Symbol Rate Calculator**

The Modulation Help allows you to see the difference that various parameters have upon the symbol rate and bandwidth.
    - ✧ **OFDM Bit-rate Calculator**

The Bit-rate Calculator allows you to enter various parameters and the optimal bit-rate (Mbit/s) is automatically calculated for 204 bytes and 188 bytes.
    - ✧ **Telnet**

Allows you to connect to a Telnet session.
    - ✧ **Video Monitor**

The Video Monitor displays the video input to the Encoder.
    - ✧ **Front Panel**

For TANDBERG Television use only.
    - ✧ **Encoder List**

Shows a list of the Encoders on the network together with various parameters.
    - ✧ **OSD**
      - Download Utilities – allows you to download an osd.zip file which 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 E, Creating and Downloading a Logo* for information on how to use the programs.
  - **Configure**

Shows all the menus relevant to the Encoder and allows it to be set up.
  - **Errors**
    - ✧ **Current Errors** - shows a list of Active Errors, Masked Active Errors and Latched Errors.
    - ✧ **Masks**
      - All Modules – allows you to set the alarm error masks to Masked, Alarm, Fail or Ignore.
      - Modules - allows you to set the alarm error masks for each individual module to Masked, Alarm, Fail or Ignore.
    - ✧ **Fault Reporting** – see *Section 5.4*.

- **Stored Configs**
  - ✧ **Load Config**

Gives a list of preconfigured settings.
  - ✧ **Save Config**

Saves the current setting to an existing prenamed configuration.
  - ✧ **Extract File**
    - 'config'
    - 'flashcfg'
    - 'clone'

## 5.4 Fault Reporting

Click **version nos.htm**, **event log.htm**, **event nv log.htm** and **Encoder Errors** to display the appropriate file. Save the files to a disk as follows:

1. Right-click the hyperlink **version nos.htm**, **event log.htm**, **event nv log.htm** and **Encoder Errors**.
2. From the shortcut menu click **Save Target As**.
3. Select the directory where you want to save the files and click **Save**.
4. Send to the files to TANDBERG Television.
5. Also, send a clone file of the Encoder configuration. See *Section 5.5, Cloning a File* for details.

## 5.5 Cloning a File

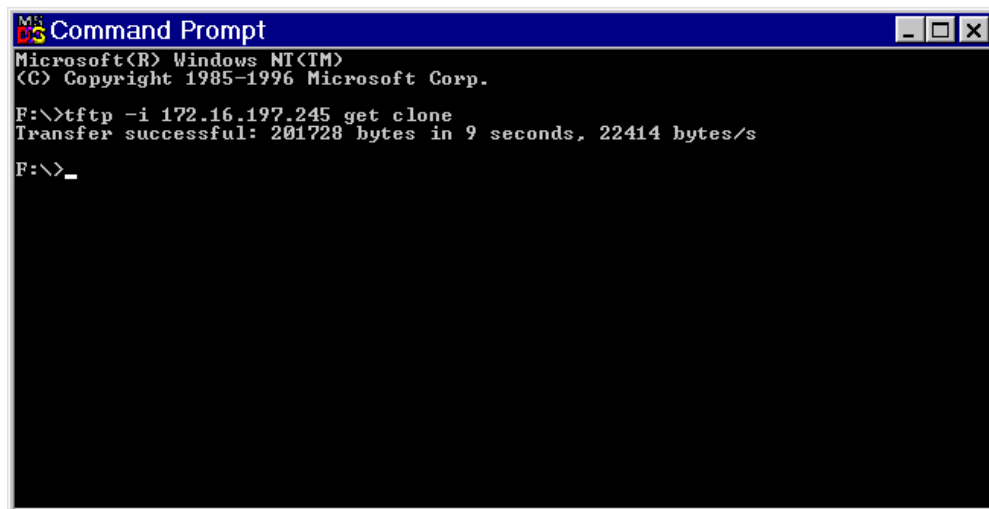
A particularly useful feature of the Encoder is the ability to extract a clone file. This can be sent to TANDBERG Television and used to configure other Encoders to exactly the same specification. It is very useful when trying to reproduce a fault and also for restoring a machine after repair. The file is extracted using TFTP protocol (see *Figure 5.6*).

To extract the file, open a Command Prompt window and type:

```
tftp -i `IP address of Encoder` get clone
```

For instance, `tftp -i 172.16.197.245 get clone`

The cloned file will be stored on the PC drive in the same directory that the command prompt is set to.



```
Microsoft Windows [Version 5.00.2600.5512]
Copyright (c) 2006 Microsoft Corporation. All rights reserved.

C:\>tftp -i 172.16.197.245 get clone
Transfer successful: 201728 bytes in 9 seconds, 22414 bytes/s

C:\>
```

*Figure 5.6: TFTP Protocol for Cloning a File*

### NOTE...

The clone file is read-only and must be deleted or renamed prior to downloading a second clone file on the computer.

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# Chapter 6

## Preventive Maintenance and Fault-finding

### Contents

6.1	Introduction .....	6-3		
6.2	Preventive Maintenance.....	6-3		
6.2.1	Routine Inspection - Cooling Fans .....	6-3		
6.2.2	Cleaning .....	6-3		
6.2.3	Servicing.....	6-3		
	Damage Requiring Service.....	6-3		
	Replacement Parts .....	6-4		
	Checks on Completion of Servicing.....	6-4		
6.3	Maintenance and Support Services .....	6-4		
6.3.1	Introduction.....	6-4		
6.3.2	Warranty.....	6-4		
6.3.3	Levels of Continuing TANDBERG Television Service Support.....	6-4		
6.4	Errors and Diagnostics Menus – When to Use Them .....	6-5		
6.4.1	Error Messages .....	6-5		
6.4.2	Diagnostics Menu .....	6-5		
	Introduction.....	6-5		
	LCD Display Test.....	6-6		
	Keyboard Test .....	6-6		
	Fail Relay Test.....	6-6		
	Alarm Relay Test.....	6-6		
	Alarm LED Test .....	6-6		
	Buzzer Test .....	6-6		
6.5	Fault-finding .....	6-7		
6.5.1	Fault-finding Philosophy .....	6-7		
6.5.2	Preliminary Checks.....	6-7		
6.5.3	AC User Accessible Fuse Replacement.....	6-8		
6.5.4	Video Fault-finding.....	6-9		
	Fault Symptoms .....	6-9		
	Breaks in Transmission.....	6-9		
	Noise Reduction.....	6-9		
6.5.5	Audio Fault-finding .....	6-9		
6.5.6	Mux Fault-finding.....	6-9		
6.6	Rate Buffer Setting (SD Only) .....	6-9		
6.7	Field/Frame Pictures (SD Only).....	6-10		
6.8	Power Supply Problems/Green LED on Front Panel Unlit .....	6-10		
6.8.1	Symptoms .....	6-10		
6.8.2	Power LED Unlit.....	6-10		
6.8.3	Fan(s) Not Working/Overheating .....	6-11		
6.9	Disposing of This Equipment.....	6-11		
6.9.1	General .....	6-11		
6.9.2	Lithium Batteries .....	6-12		

### List of Figures

Figure 6.1: Finding the Errors Menu .....	6-5
Figure 6.2: Finding the Diagnostics Menu.....	6-6
Figure 6.3: Orientation of Fuse Carrier .....	6-8

### List of Tables

Table 6.1: Video Fault-finding .....	6-9
Table 6.2: Rate Buffer Settings .....	6-10
Table 6.3: Power LED Unlit Fault-finding .....	6-10
Table 6.4: Fans Not Working/Overheating.....	6-11

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## 6.1 Introduction

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

## 6.2 Preventive Maintenance

### 6.2.1 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 which causes the alarm relay to be energised.

### 6.2.2 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.

### 6.2.3 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.

## 6.3 Maintenance and Support Services

### 6.3.1 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**.

### 6.3.2 Warranty

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

### 6.3.3 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.

**VOYAGER Advantage** is the truly mobile service solution. This provides a package specifically designed to keep you mobile and operational.

Call TANDBERG Sales for more details.

## 6.4 Errors and Diagnostics Menus – When to Use Them

### 6.4.1 Error Messages

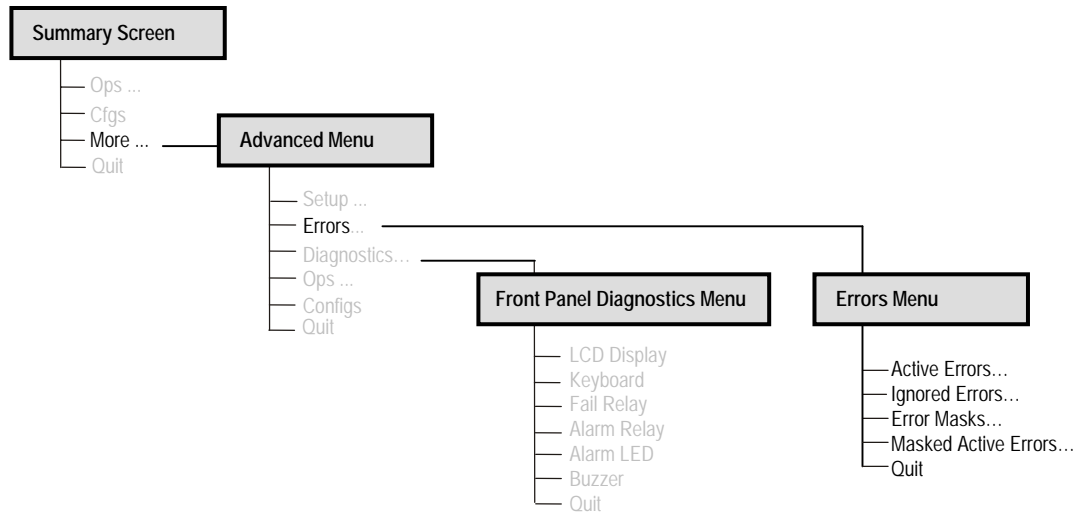


Figure 6.1: Finding the Errors Menu

Investigate any run-time errors by pressing the **Active Errors** softkey in the **Errors Menu** (see *Figure 6.1*). Current errors are displayed.

Refer to *Chapter 4, Operating the Equipment Locally* for further details of error messages.

#### NOTES...

1. This function can be used with the Encoder still in service.
2. If an error reoccurs within approximately 30 seconds then it does not 'interrupt' the front panel display. This avoids swamping the front panel display with error messages should an intermittent error occur.

#### 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.

### 6.4.2 Diagnostics Menu

#### Introduction

The **Diagnostics Menu** is selected from the **Advanced Menu** by pressing the **Diagnostics** softkey. This menu (see *Figure 6.2*) has a selection of diagnostic tests which allow the operator to test the individual component parts of the equipment.

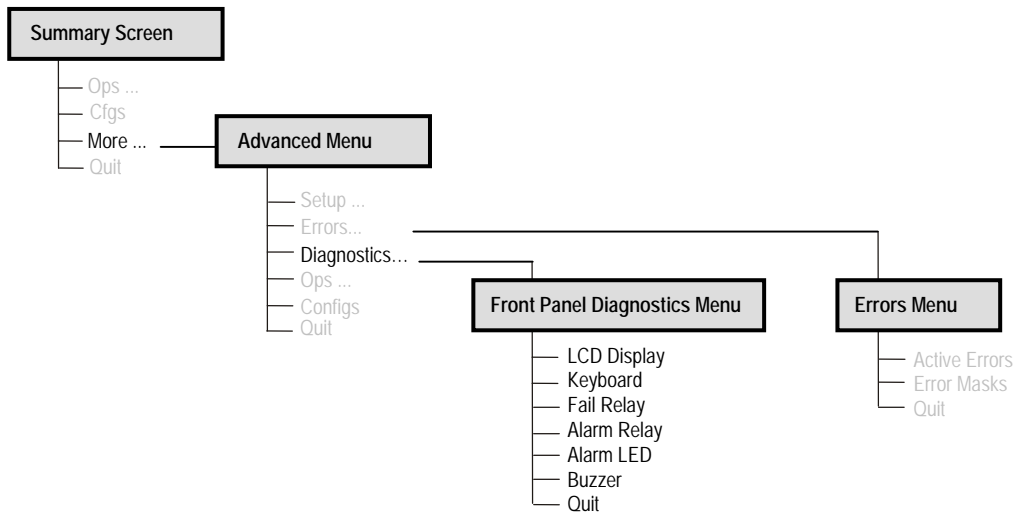


Figure 6.2: Finding the Diagnostics Menu

### 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.

### Keyboard Test

Press the **Keyboard** softkey to access the option and then press each softkey and keypad key in turn. The display shows the name of each key pressed. Press the **Quit** softkey to return to the menu.

### Fail Relay Test

Press the **Fail Relay** softkey to access the option and then press any key (except the **Quit** softkey) to toggle the fail relay on and off. Press the **Quit** softkey to return to the menu. 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 (except the **Quit** softkey) to toggle the alarm relay on and off. Press the **Quit** softkey to return to the menu. 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 (except the **Quit** softkey) to toggle the front panel Alarm LED on and off. Press the **Quit** softkey to return to the menu.

### Buzzer Test

Press the **Buzzer** softkey to access the option which immediately causes a buzzer to sound. Press any key (except the **Quit** softkey) to turn the buzzer off. Press the **Quit** softkey to return to the menu.

## 6.5 Fault-finding

### 6.5.1 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 which 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.

### 6.5.2 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 6.5.3, AC User Accessible Fuse Replacement*).

**NOTE...**

Only replace the fuse once. If it blows again 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 4, Operating the Encoder Locally*).
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.

### 6.5.3 AC 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.

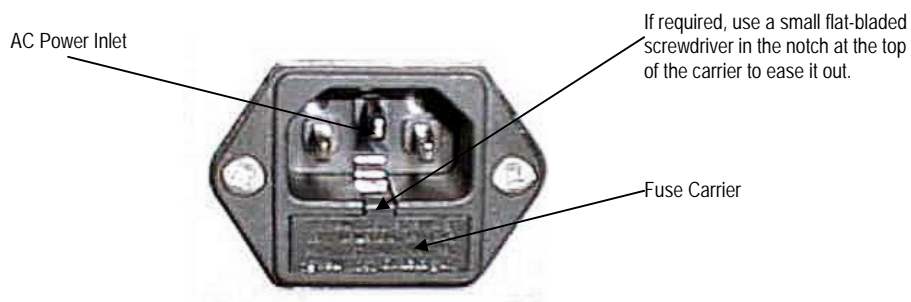


Figure 6.3: Orientation of Fuse Carrier

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

## 6.5.4 Video Fault-finding

### Fault Symptoms

Table 6.1: 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.
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 4, Operating the Equipment Locally*).

In the standard delay, low delay, very low delay and mega low delay the following are not seamless: encoding modes, bit-rate and GOP changes. This is because the Encoder tries to maintain minimal end-to-end delay (latency) and that means buffer sizes must be as small as possible. In the standard delay, low delay, very low delay and mega low delay encoding modes the buffer size is selected by the video bit-rate. Changing the bit-rate changes the buffer size, requiring a reset of the coding process.

For reflex operation video bit-rate changes must be seamless as the bit-rate varies continuously. All the seamless modes are seamless only for video bit-rate changes. However, for some GOP changes operation can be seamless, but this aspect is not guaranteed.

### Noise Reduction<sup>1</sup>

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 the front panel.

## 6.5.5 Audio Fault-finding

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

## 6.5.6 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.

## 6.6 Rate Buffer Setting (SD Only)

The Encoder, when running in 4:2:2<sup>2</sup> mode, has two software selectable rate buffer modes; small and medium.

<sup>1</sup> Licence M2/ESO2/NR or M2/ESO2/HDNR is needed for this feature.

<sup>2</sup> 4:2:2 is only available when software option M2/ESO2/422 is purchased.

When transmitting 4:2:2<sup>2</sup> mode into systems using the earlier System 3000 PRO IRD M2/PSR/3/422BAS then the rate buffer mode of the Encoder must be set to 'small'.

However, when operating into an Alteia the rate buffer mode of the Encoder must be set to 'medium' (default size).

When operating in mixed environments, both the Alteia and the Encoder must be changed to small buffer mode.

**NOTE...**  
Contact Customer Services for advice about changing the settings (see *Preliminary Pages*).

Table 6.2: Rate Buffer Settings

	E5710/E5720 Setting	Alteia Setting
PRO IRD	SMALL	-
Alteia only	MEDIUM	MEDIUM
Alteia and PRO IRD	SMALL	SMALL

## 6.7 Field/Frame Pictures (SD Only)

Some Receivers are unable to decode field pictures. Select **Frames** in the **Field/Frame Option**. Does the fault clear? If not, contact Customer Services.

## 6.8 Power Supply Problems/Green LED on Front Panel Unlit

### 6.8.1 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.

### 6.8.2 Power LED Unlit

If the Encoder Power LED is unlit, fault-find the problem as detailed in *Table 6.3*.

Table 6.3: Power LED Unlit Fault-finding

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	<u>Check the Stand-by Switch.</u> Is the 'I' at	The problem lies within the Encoder.	Rotate the Stand-by Switch so that the



Step	Action	If Result of Action is Yes...	If Result of Action is No...
	the top?		'I' is at the top. If the problem persists proceed to next step.
2	<b>Check Power LED.</b> Is the Encoder still working?	If the Encoder is clearly working normally then the <b>Power LED</b> itself is probably at fault. Call a Service Engineer.	Proceed to next step.
3	<b>Check Power Source.</b> 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.
4	<b>Check Power Cable and Fuse.</b> 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.
5	<b>Check PSU Module and Fuse.</b> 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 <i>Annex B Technical Specification</i> ). 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.

### 6.8.3 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 6.4*.

#### NOTE...

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

*Table 6.4: Fans Not Working/Overheating*

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	<b>Check Fan Rotation.</b> Inspect the fans located at the sides of the enclosure. Are the fans rotating? Check Base Board temperature and fan (see the <b>Build Menu</b> in <i>Figure 4.9</i> ).	Check that the Encoder has been installed with sufficient space allowed for air flow (see <i>Chapter 2, Installing the Equipment</i> ). 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.

## 6.9 Disposing of This Equipment

### 6.9.1 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.

## 6.9.2 Lithium Batteries

The equipment uses the Dallas Semiconductor NVRAM DS1746WP which 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.

# 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.

<b>µm</b>	<b>Micrometre</b> (former name - micron): a unit of length equal to one millionth (10 <sup>-6</sup> ) of a metre.
<b>3:2 pulldown</b>	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
<b>4:2:0</b>	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
<b>4:2:2</b>	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
<b>422P@ML</b>	<b>422 Profile at Main Level:</b> 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.
<b>5B6B</b>	<b>5 Binary Bits Encoded to 6 Binary Bits:</b> Block code.
<b>AC-3</b>	Audio Coding algorithm number 3 (See Dolby Digital).
<b>ACC</b>	<b>Authorisation Control Computer.</b>
<b>ADPCM</b>	<b>Adaptive Differential Pulse Code Modulation:</b> 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.
<b>ADT</b>	<b>Audio, Data And Teletext.</b>
<b>AFC</b>	<b>Automatic Frequency Control.</b>
<b>AFS</b>	<b>Automation File Server.</b>
<b>AGC</b>	<b>Automatic Gain Control.</b>
<b>AMOL I and II</b>	<b>Automatic Measure of Line-ups I and II:</b> Used by automated equipment to measure programme-viewing ratings.
<b>ASI</b>	<b>Asynchronous Serial Interface.</b>
<b>ASIC</b>	<b>Application-Specific Integrated Circuit:</b> A customised chip designed to perform a specific function.
<b>Async</b>	<b>Asynchronous.</b>
<b>ATM</b>	<b>Asynchronous Transfer Mode:</b> 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.
<b>ATSC</b>	<b>Advanced Television Standards Committee:</b> 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	<b>Bipolar with Three Zero Substitution:</b> 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	<b>Bouquet Association Table:</b> 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.
BER	<b>Bit Error Rate:</b> 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	<b>Basic Interoperable Scrambling System:</b> 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	<b>Bi-directionally Predictive Coded Picture/Frame:</b> 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	<b>Binary Phase Shift Keying:</b> A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.
BW	<b>Bandwidth:</b> 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	<b>Conditional Access:</b> 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.
CAT	<b>Conditional Access Table:</b> Part of the MPEG-2 Program Specific Information (PSI) data. Mandatory for MPEG-2 compliance if CA is in use.
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.
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 <b>composite-coded</b> 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 <b>component-coded</b> colour system, the two colour-difference signals (R-Y)(B-Y) usually referred to as $C_{RCB}$ (digital) or $P_{RPB}$ (analogue), are used to convey colour information. When $C_{RCB}$ ( $P_{RPB}$ ) is added to the luminance (Y), the complete picture information is conveyed as $YC_{RCB}$ ( $YP_{RPB}$ ).
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
CODE	Create Once Distribute Everywhere.
Codec	The combination of an <b>Encoder</b> and a complementary <b>Decoder</b> located respectively at the input and output of a transmission path.
COFDM	<b>Coded OFDM:</b> 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.
CrCb	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. <i>See:</i> 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 600Ω. 0 dBmV is 1 mV terminated in 75Ω.
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.
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.
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.
DPI	Digital Programme Insertion. Associated with the splicing of digital programme content into transport streams, for example, to provide local advertisements etc.
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 which 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-Professional Interfaces: TTV Lan search shows – DVB Physical Interfaces
Earth	<p><b>Technical Earth:</b> 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.</p> <p><b>Protective Earth:</b> Used for electric shock protection. This is sometimes known as a safety earth.</p>
EBU	<b>European Broadcast Union.</b>
ECM	<b>Entitlement Control Message.</b>
EDI	<b>Ethernet Data Input</b>
EIA	<b>Electronics Industries Association (USA).</b>
EIT	<p><b>Event Information Table: Equipment:</b> 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.</p> <p><b>System:</b> 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.</p>
Elementary Stream	A generic term for a coded bit-stream, be it video, audio or other.
EMC	<b>Electromagnetic Compatibility.</b>
EMM	<b>Entitlement Management Message.</b>
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.
EPG	<b>Electronic Programme Guide:</b> 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	<b>European Telecommunications Standard.</b>
ETSI	<b>European Telecommunications Standards Institute.</b>
FCC	<b>Federal Communications Commission.</b>
FDM	<b>Frequency Division Multiplex:</b> A common communication channel for a number of signals, each with its own allotted frequency.
FEC	<b>Forward Error Correction:</b> 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	<b>Fast Fourier Transformation:</b> A fast algorithm for performing a discrete Fourier transform.
FIFO	<b>First In, First Out:</b> 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	<b>File Transfer Protocol:</b> 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 which defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP	<b>Group of Pictures:</b> 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.
GPI	<b>General Purpose Interface.</b> A TANDBERGTV card used to control various specific functions of TTV encoders using a contact closure input. In addition contact closure outputs are provided.
GUI	<b>Graphical User Interface:</b> 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.
HDTV	<b>High Definition Television.</b>
HPA	<b>High Power Amplifier:</b> Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
HSYNC	<b>Horizontal (line) SYNCs.</b>
Hub	A device in a multipoint network at which branch nodes interconnect.

ICAM	<b>Integrated Conditional Access Module:</b> 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.
IEC	<b>International Electrotechnical Committee.</b>
IF	<b>Intermediate Frequency:</b> 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	<b>Internet Protocol:</b> 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	<b>Intracoded Picture/Frame:</b> 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	<b>Impulse Pay Per View:</b> One-time events, purchased at home (on impulse) using a prearranged SMS credit line.
IRD	<b>Integrated Receiver Decoder:</b> 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	<b>Institute of Radio Engineers:</b> 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	<b>Integrated Services Digital Network:</b> 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 <b>bonding</b> , 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	<b>International Standards Organisation.</b>
ISOG	<b>Inter-union Satellite Operations Group.</b>
ITS	<b>Insertion Test Signal:</b> A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	<b>Invitation To Tender.</b>
ITU-R	<b>International Telecommunications Union - Radiocommunications Study Groups (was CCIR).</b>
ITU-T	<b>International Telecommunications Union - Telecommunications Standardisation Sector (was CCITT).</b>
JPEG	<b>Joint Photographic Experts Group:</b> 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).
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	<b>Local Area Network:</b> A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
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	<b>Light Emitting Diode.</b>
LNB	<b>Low Noise Block Down-Converter:</b> 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.
LSB	Least significant bit.
Luminance	The television signal representing brightness, or the amount of light at any point in a picture. The Y in YCrCb.
LVDS	<b>Low Voltage Differential Signal:</b> 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	<b>Multiplex Control Computer:</b> 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	<b>Multiple Channels Per Carrier.</b>
MEM	<b>Multiplex Element Manager:</b> 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	<b>Multichannel Microwave Distribution System:</b> 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	<b>Main Profile at Main Level:</b> 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	<b>Main Profile at High Level:</b> 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	<b>Moving Pictures Experts Group:</b> 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.
MSB	Most significant bit.
Msymbol/s	(Msym/s) Mega (million) Symbols per second (10 <sup>6</sup> 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	<b>Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing:</b> An audio bit-rate reduction system relying on sub-band coding and psychoacoustic masking.
Mux	<b>Multiplexer:</b> 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 cypher 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	<b>Near Instantaneously Companded Audio Multiplex:</b> 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	<b>Network Information Table:</b> 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	<b>Nanometre:</b> a unit of length equal to one thousand millionth ( $10^{-9}$ ) of a metre.
NTSC	<b>National Television Systems Committee:</b> 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	<b>Near Video On Demand:</b> 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	<b>Non-volatile Random Access Memory:</b> 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	<b>Orthogonal FDM:</b> 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.
OPPV	<b>Order ahead Pay Per View:</b> An advance purchase of encrypted one-time events with an expiry date.
OSD	<b>On-screen display:</b> 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	<b>Phase Alternating Line:</b> 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	<b>Program Association Table:</b> 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	<b>Pulse Code Modulation:</b> 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	<b>Program Clock Reference:</b> A time-stamp in the transport stream from which the Decoder timing is derived.
PDC	<b>Programme Delivery Control (VBI):</b> 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	<b>Picture Element:</b> 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	<b>Packetised Elementary Stream:</b> 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	<b>Packet Identifier:</b> The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
PIN	<b>Personal Identification Number:</b> 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	<b>PIX (picture) Element:</b> 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	<b>peak to peak:</b> Measurement of a signal or waveform from its most negative point to its most positive point.
PLL	<b>Phase-Locked Loop.</b> 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	<b>Program Map Table:</b> 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	<b>Parts per million.</b>

PPV	<b>Pay Per View:</b> 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 <sub>R</sub> P <sub>B</sub>	Analogue Colour difference signals. Refer to C <sub>R</sub> C <sub>B</sub> for an explanation.
PROM	<b>Programmable Read-Only Memory:</b> 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	<b>Program Stream:</b> A combination of one or more PESs with a common timebase.
PSI	<b>Program Specific Information:</b> Consists of normative data, which is necessary for the demultiplexing of transport streams and the successful regeneration of programs. ( <i>See also:</i> SI).
PSIP	<b>Program System Information Protocol:</b> The ATSC equivalent of SI for DVB.
PSK	<b>Phase Shift Keying:</b> A method of modulating digital signals particularly suited to satellite transmission.
PSR	<b>Professional Satellite Receiver:</b> <i>See also:</i> IRD.
PSU	<b>Power Supply Unit.</b>
PTS	<b>Presentation Time Stamp (ATSC).</b>
QAM	<b>Quadrature Amplitude Modulation:</b> A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK	<b>Quadrature Phase Shift Keying:</b> A form of phase shift keying modulation using four states.
QSIF	<b>Quarter Screen Image Format.</b>
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	<b>Random Access Memory:</b> 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	<b>Remote Authorization System:</b> A TANDBERG TV proprietary public-key encryption system used to prevent unauthorized viewing of a TV programme or programmes.
RF	<b>Radio Frequency.</b>
ROM	<b>Read Only Memory:</b> 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	<b>Reed-Solomon coding:</b> 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	<b>Run Length Coding:</b> Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character <i>x</i> <i>y</i> times'.
SCPC	<b>Single Channel Per Carrier.</b>
SCTE	<b>Society of Cable and Telecommunications Engineers.</b> SCTE 35 defines a means for inserting digital cue tones into an Encoder's output so affiliates can trigger switches from the network feed to a local content.
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.
SDI	<b>Serial Digital Interface.</b>
SDT	<b>Service Description Table:</b> Provides information in the SI stream about the services in the system; for example, the name of the service, the service provider, etc.
SELV	<b>Safety Extra Low Voltage (EN 60950).</b>

STB	<b>Set-Top Box:</b> 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	<b>System Time Table (ATSC).</b>
SFN	<b>Single Frequency Network:</b> 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	<b>Service Information:</b> 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	<b>Satellite Mast Antenna Television:</b> 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	<b>Society of Motion Picture and Television Engineers.</b>
SMS	<b>Subscriber Management System:</b> 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	<b>Satellite News-Gathering.</b>
SNMP	<b>Simple Network Management Protocol.</b>
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	<b>Synchronous Parallel Interface.</b>
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	<b>Transparent Asynchronous Tx / Rx Interface:</b> A proprietary high-speed data interface.
TCP / IP	<b>Transmission Control Protocol/Internet Protocol:</b> A set of communications protocols that may be used to connect different types of computers over networks.
TDM	<b>Time Division Multiplex:</b> One common, communications channel carrying a number of signals, each with its own allotted time slot.
TDT	<b>Time and Date Table:</b> 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	<b>Time Offset Table:</b> 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 $\pm 12$ 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.

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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	<b>Uninterruptable Power Supply:</b> 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 <b>write back cache</b> 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).
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: <i>See:</i> ITS.
VPS	Video Programming System: A German precursor to PDC
WSS	Wide Screen Switching: 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.

# Annex B

## Technical Specification

### Contents

B.1	Inputs .....	B-3	B.5	Data .....	B-16
B.1.1	Video .....	B-3	B.5.1	RS-232 Data .....	B-16
	SDI.....	B-3	B.5.2	RS-422 Data .....	B-17
	HD IN.....	B-3	B.6	AC Power Supply .....	B-18
	H SYNC.....	B-4	B.7	Physical Details .....	B-18
	Analogue Video Specification .....	B-4	B.8	Environmental Conditions.....	B-19
	Encoder Settings for PAL/NTSC Video		B.9	Compliance.....	B-19
	Performance Figures .....	B-4	B.9.1	Safety.....	B-19
	PAL Video Performance Figures .....	B-5	B.9.2	EMC .....	B-20
	NTSC Video Performance Figures .....	B-6	B.9.3	Shock and Vibration .....	B-20
	Teletext Extraction.....	B-6	B.9.4	CE Marking .....	B-21
	International Television Standards .....	B-6	B.9.5	C-Tick Mark.....	B-21
	Video Coding Resolutions .....	B-7	B.10	Cable Types .....	B-21
B.1.2	Audio .....	B-7	B.11	Option Modules .....	B-22
	Analogue and Digital Audio .....	B-7	B.11.1	M2/EOM2/AUDLIN2 Additional Audio and	
	Embedded Audio (Via SDI) .....	B-9		Linear PCM Option Module.....	B-22
	Embedded Audio (Via HD SDI) .....	B-10	B.11.2	M2/EOM2/REMUX Remux Option	
	MPEG-1 Audio Encoding Bit-rates .....	B-10		Module .....	B-22
	Dolby Digital Audio Encoding Bit-rates.....	B-11		Connectors.....	B-22
B.1.3	L-Band Input .....	B-11		LEDs .....	B-23
B.2	Test Tones .....	B-12	B.11.3	M2/EOM2/ATMS155... ATM Network	
B.3	Outputs .....	B-12		Interface Module .....	B-24
B.3.1	IF Outputs.....	B-12		Variants of The ATM Network Interface	
B.3.2	L-Band Outputs .....	B-13		Module .....	B-24
B.3.3	Reference Frequency Output .....	B-15		DVB-ASI Copper Output .....	B-24
B.3.4	ASI Out 1, ASI Out 2, ASI Out 3 Outputs ...	B-15		DVB-ASI Copper Input.....	B-24
B.4	Control and Monitoring.....	B-15		10BaseT Ethernet Connector .....	B-25
B.4.1	Remote Control - Ethernet 1 and 2.....	B-15		Multimode Fibre Optic Connector .....	B-25
B.4.2	Local Control .....	B-15		Monomode Fibre Optic Connector.....	B-25
B.4.3	Alarm .....	B-16		M2/EOM2/ATMS34 PDH/E3 Connector ...	B-26
B.4.4	Remote Control .....	B-16		M2/EOM2ATMS45 PDH/DS3 Connector...	B-27

M2/EOM2ATMS155E STM-1 Electrical  
 Module ..... B-28  
 B.11.4 M2/EOM2/IP, IP Output Card Option ..... B-28  
 B.11.5 General Purpose Interface Card  
 (M2/EOM2/GPI) ..... B-29

**List of Tables**

Table B.1: Serial Digital Video Specification ..... B-3  
 Table B.2: H SYNC Specification ..... B-4  
 Table B.3: Analogue Video Specification ..... B-4  
 Table B.4: Encoder Settings for PAL/NTSC Video  
 Performance Figures..... B-5  
 Table B.5: PAL System Video Performance Figures ..... B-5  
 Table B.6: NTSC System Video Performance Figures ..... B-6  
 Table B.7: International Television Standards ..... B-6  
 Table B.8: Video Coding Resolutions ..... B-7  
 Table B.9: Analogue and Digital Audio Specification ..... B-7  
 Table B.10: MUSICAM Analogue Test Specification..... B-8  
 Table B.11: Embedded Audio Specification ..... B-10  
 Table B.12: Embedded Audio Specification ..... B-10  
 Table B.13: MPEG-1 Audio Encoding Bit-rates..... B-10  
 Table B.14: Dolby Digital Audio Encoding Bit-rates ..... B-11  
 Table B.15: L-BAND IN Specification ..... B-11  
 Table B.16: Test Tones Specification ..... B-12  
 Table B.17: IF OUT MAIN Specification ..... B-12  
 Table B.18: IF OUT MONITOR Specification ..... B-13  
 Table B.19: L-BAND OUT MAIN Specification ..... B-13  
 Table B.20: L-BAND OUT MONITOR Specification ..... B-14  
 Table B.21: Reference Frequency Output Specification ..... B-15

Table B.22: ASI Out Specification ..... B-15  
 Table B.23: Ethernet Specification ..... B-15  
 Table B.24: Alarm Specification ..... B-16  
 Table B.25: Remote Control Specification ..... B-16  
 Table B.26: RS-232 Asynchronous Data Input Specification ..... B-16  
 Table B.27: RS-422 Data Specification ..... B-17  
 Table B.28: AC Power Supply Specification ..... B-18  
 Table B.29: Physical Details ..... B-18  
 Table B.30: Environmental Specification ..... B-19  
 Table B.31: Suitable Signal Cable Types ..... B-21  
 Table B.32: DVB ASI In 1, 2 and 3 Connector ..... B-22  
 Table B.33: DVB ASI Out 1 Connector (Disabled) ..... B-22  
 Table B.34: DVB ASI In 1, 2 and 3 - LED Indications..... B-23  
 Table B.35: DVB ASI Out 1 - LED Indications ..... B-23  
 Table B.36: B-ISDN Networks Supported ..... B-24  
 Table B.37: DVB Copper Output Connection ..... B-24  
 Table B.38: DVB Copper Input Connection ..... B-24  
 Table B.39: Ethernet Connector ..... B-25  
 Table B.40: Multimode Fibre Optic Connector ..... B-25  
 Table B.41: Monomode Fibre Optic Connector ..... B-26  
 Table B.42: E3 Input Connector ..... B-26  
 Table B.43: E3 Output Connector ..... B-26  
 Table B.44: DS3, G.703 Input Connector ..... B-27  
 Table B.45: DS3, G.703 Output Connector ..... B-27  
 Table B.46: SDH (STM-1E) Copper Input Connector..... B-28  
 Table B.47: SDH (STM-1E) Copper Output Connector..... B-28  
 Table B.48: Ethernet Port (IP Output Card)..... B-28  
 Table B.49: GPI Connector ..... B-29

## B.1 Inputs

### B.1.1 Video

#### SDI

Table B.1: Serial Digital Video Specification

Item	Specification
Safety status	SELV
Connector designation	SDI IN
Connector type	75 $\Omega$ 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 $\pm 10\%$
Return loss	Better than 15 dB, 10 MHz - 270 MHz
Input impedance	75 $\Omega$ (powered-down impedance = 75 $\Omega$ )

#### HD IN

Table B.2: High Definition Serial Digital Video Specification

Item	Specification
Safety status	SELV
Connector designation	HD IN
Connector type;	BNC 75 $\Omega$ female
Input standard	SMPTE 292M Bit Serial Digital Interface for High Definition Television Systems
Cable length	100 m, maximum
Input level	800 mV pk-pk nominal $\pm 10\%$
Return loss	>15 dB, 1.5 GHz

## H SYNC

Table B.2: 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.3: Analogue Video Specification

Item	Specification
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.

## Encoder Settings for PAL/NTSC Video Performance Figures

The Encoder settings for the PAL/NTSC video performance figures are shown in *Table B.4*.

**NOTE...**

The PAL and NTSC video performance figures are measured when the Encoder is connected to a calibrated Receiver.



Table B.4: Encoder Settings for PAL/NTSC Video Performance Figures

Item	Specification
Noise reduction	Off
Video bit-rate	8 Mbit/s
Resolution	720 x 576
GOP	IBBP
Profile	422P@ML
Packet length	188
Mux Bit-rate	40 Mbit/s

## PAL Video Performance Figures

Table B.5: PAL System Video Performance Figures

Pattern	Item	Specification
	Input return loss	30 dB
VITS Line 17	Bar amplitude ref (bp)	700 mV ± 7 mV
VITS Line 17	Jitter	5 ns pk-pk
VITS Line 17	Luminance bar tilt	±0.2%
VITS Line 17	2T pulse K-rating	±1.0% KF
VITS Line 17	Pulse/bar K-rating	± 0.5% KF
VITS line 17	P-B ratio	99% - 101%
VITS Line 17	Chrom/lum delay	±20 ns
VITS Line 17	Chrom/lum gain	95 – 105%
100% Luma Ramp	Luma noise weighted Filters: tilt null, unified weighting, 5 MHz LPF, Fsc trap, 100 kHz HP	≤ -60 dB
5-step staircase - modulated	Differential gain	± 1.5%
5-step staircase - modulated	Differential phase	± 1°
5-step staircase - no modulation	Luma non-linearity	≤ 5%
Flat field Red 75%	Chroma noise AM Chroma noise PM  Filters: HPF - 10 kHz, LPF 500 kHz Reference – fixed; single line, Field 1	≤ -58 dB ≤ -58 dB
Multiburst VITS line 18	Frequency response	0.5 MHz ±0.2 dB 1.0 MHz ±0.2 dB 2.0 MHz ±0.2 dB 4.0 MHz ±0.2 dB 4.8 MHz ±0.5 dB 5.8 MHz - 0 to -2.5 dB

## NTSC Video Performance Figures

Table B.6: NTSC System Video Performance Figures

Pattern	Item	Specification
	Input return loss	30 dB
NTC-7 Composite	Jitter	± 5 ns
NTC-7 Composite	Bar amplitude ref (bp)	100 ±1.5 IRE
NTC-7 Composite	2T pulse K-rating	±1% KF
NTC-7 Composite	Chrom/lum delay	± 20 ns
NTC-7 Composite	Chrom/lum gain	90 - 110%
100% Luma Ramp	Luma noise weighted Filters: tilt null, unified weighting, 5 MHz LPF, Fsc trap, 100 kHz HP	≤ -60 dB
5-step staircase - modulated	Differential gain	±1.5%
5-step staircase - modulated	Differential phase	±1°

## Teletext Extraction

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

## International Television Standards

Table B.7 shows television standards appropriate to the Encoder.

Table B.7: International Television Standards

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

## Video Coding Resolutions

Table B.8: Video Coding Resolutions

Selected Option	SHD Mode	Description
<b>625 Line Modes</b>	<b>525 Line Modes</b>	
Auto (720x576)	Auto (720x480)	Relates to the number of pixels across the screen and the number of lines down the screen (pixels x lines).
720 x576	720 x480	
704 x576	704x480	
640 x576	640x480	
544 x576	544x480	
528 x576	528 x576	
480 x576	480x480	
352x576	352x480	
352x288 (SIF)	352x240 (SIF)	
<b>HD</b>		
1080 x 1920/1440/1280/960pSF 23.976		Relates to the number of lines down the screen and number of pixels across the screen (lines x pixels).
1080 x 1920/1440/1280/960pSF 24		
1080 x 1920/1440/1280/960i 25		
1080 x 1920/1440/1280/960pSF 25		
1080 x 1920/1440/1280/960i 29.97		
1080 x 1920/1440/1280/960i 30		
720 x 1280/960p 50		
720 x 1280/960p 59.94		
720 x 1280/960p 60		
576 x 720/704p 50		
480 x 720/704p 59.94		
480 x 720/704p 60		

In Auto, pixel value in brackets varies with bit-rate that is set.

### 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
<b>Input standard (analogue)</b>	Balanced analogue
Clip level	12 dB, 15 dB or 18 dB (15 dB available with PCB issue 4 and later)
Sampling rate	32/48 kHz (selectable)
Input impedance	600 Ω or 20 kΩ (selectable). 20 kΩ = default
<b>Input standard (digital)</b>	AES/EBU digital
Termination	110 Ω
Sampling rate	32/48 kHz (selectable)
Input rate	32, 44.1, 48 kHz

Item	Specification
Output (digital) ref	AES/EBU digital
Impedance	75 $\Omega$
Sampling rate	48 kHz
<b>Coding Standards</b>	
Coding standard	MPEG-1 Layer 2 (ISO/IEC 11172)
Supported coding modes	Single Mono, Dual Mono, Joint Stereo, Stereo
Supported coded data rate	32 kbit/s - 384 kbit/s
Coding standard	Dolby Digital (AC-3) (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	Dolby Digital AC-3 Pass-through (ATSC A/52, DVB TR 102 154) (see <i>Note 1</i> , after Table)
Coding standard	Linear PCM/Dolby E Pass-through (SMPTE 302M) (see <i>Note 1</i> , after Table)
Coding Standard	DTS Pass-through (see <i>Note 1</i> , after Table))

**NOTES...**

1. Refer to *Annex F, Audio Modes* when using these coding standards.
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  $\Omega$  termination.

*Table B.10: MUSICAM Analogue Test Specification*

Item	Specification
<b>Set-up of Alteia Receiver</b>	
Audio Format	MPEG
Output	Analogue
Clip Level	18 dB
<b>Set-up of Audio Encoder</b>	
Input	Analogue
Clip Level	18 dB
Sampling Frequency	48 kHz
Coding Standard	MUSICAM, MPEG 1 (Layer 2)
Coding Mode	Stereo
Bit-rate	384 k bit/s
<b>Set-up of Lindos Audio Oscillator</b>	
Sequence	TPBDLKZ
Test	Tolerance for Left and Right Legs for Channel (A) and Channel (B)
<i>Test Level</i>	T
1 kHz @ 0 dB	$\pm 0.2$ dB
<i>Sweep</i> 20 Hz - 20 kHz @ -20 dB	P

Item	Specification
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
<b>Crosstalk @ 0 dBs</b>	B
100 Hz	72 dB
1 kHz	74 dB
6.3 kHz	67.5 dB
10 kHz	63 dB
<b>Distortion + noise @ +8 dB</b>	D
100 Hz	68 dB
1 kHz	70 dB
<b>Noise RMS</b>	L
A-weighted	68 dB
Unweighted	68 dB
<b>User Levels @ 1 kHz (0 to 50 dB)</b>	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
-50 dB	0 to -2 dB
<b>Phase @ 0 dBs</b>	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 SDI)

Audio embedded on the serial digital interface can also be extracted. Up to four stereo pairs of audio can be extracted from the SDI. The Encoder can extract two DIDs at once, giving four stereo pairs.

Table B.11: Embedded Audio Specification

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

### Embedded Audio (Via HD SDI)

Audio embedded on the HD serial digital interface can also be extracted. Up to eight stereo pairs of audio can be extracted from the HD SDI but the Encoder can only extract two DIDs at once, giving four stereo pairs.

Table B.12: Embedded Audio Specification

Item	Specification
<b>HD Serial Digital Interface</b>	
Safety status	SELV
Connector designation	HD SDI IN
Connector type	BNC female connector
Input standard	SMPTE 299M

### MPEG-1 Audio Encoding Bit-rates

Table B.13: MPEG-1 Audio Encoding Bit-rates

Bit-rate (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 Bit-rates

Table B.14: Dolby Digital Audio Encoding Bit-rates

Bit-rate (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 L-Band Input

This input provides a carrier combining facility for summing an externally generated carrier into the L-band output.

Table B.15: L-BAND IN Specification

Item	Specification
Safety status:	SELV
Connector type:	SMA female 50 Ω
Connector designation:	L-BAND IN
Input impedance:	50 Ω
Gain to L-BAND OUT MAIN output:	0 dB ±2 dB
Input power:	+5 dBm max
Return loss:	>14 dB, 950-1750 MHz

## B.2 Test Tones

Table B.16: Test Tones Specification

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

## B.3 Outputs

### B.3.1 IF Outputs

Table B.17: IF OUT MAIN Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC female 75 Ω
Connector designation:	IF OUT MAIN
Output impedance:	75 Ω
Output power:	-20 dBm to +5 dBm in 0.1 dB steps
Power level stability:	±0.5 dB
Return loss:	>20 dB, 50-180 MHz
Modulation format:	BPSK as per ETSI TR 101 198 QPSK as per EN 300 421 (DVB-S) 8PSK and 16QAM as per EN 301 210 (DVB-DSNG) (HOM option)
FEC rate:	1/2, 2/3, 3/4, 5/6 and 7/8 with QPSK 2/3, 5/6 and 8/9 with 8PSK 3/4, and 7/8 with 16QAM
Symbol rate:	1 to 48 Msymbol/s (Standard) 0.2 to 66 Msymbol/s (Extended symbol rate option)
<p><b>NOTE...</b></p> <p>For certain combinations of modulation format, FEC code rate and input packet size, the maximum symbol rate may be limited to lower values than indicated above due to an input bit-rate limitation of 213 Mbit/s imposed by the ASI input interface.</p>	
Spectrum roll-off factor:	20%, 25%, 30%, 35% selectable
Spectrum sense:	Normal / inverted
Transmission modes:	Modulation on/off Carrier on/off
Carrier frequency:	50-180 MHz, tuneable in 1 kHz steps
Carrier frequency error:	< ±1 kHz (all causes over 10 years)
Carrier ON/OFF ratio:	>60 dB
Carrier suppression:	>40 dB



Item	Specification
Phase noise (continuous):	< -66 dBc/Hz at 100 Hz offset < -76 dBc/Hz at 1 kHz offset < -86 dBc/Hz at 10 kHz offset < -96 dBc/Hz at 100 kHz offset < -120 dBc/Hz at 1 MHz offset and above
Phase noise (discrete sidebands):	< -70 dBc
Spurious outputs (modulated carrier):	< -60 dBc/4 kHz over the frequency range 0 to 500 MHz but excluding the frequency range of the wanted output signal (equal to $\pm 1.06 \times$ Symbol Rate about the carrier frequency, as defined by the spectrum mask <i>Figure A.1</i> in EN 300 421)
Spurious outputs (unmodulated carrier):	< -55 dBc, each component
Noise floor (No/C):	< -120 dBc/Hz
Main / monitor output isolation (both directions):	>30 dB, 50-180 MHz

Table B.18: IF OUT MONITOR Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC female 75 $\Omega$
Connector designation:	IF OUT MONITOR
Output impedance:	75 $\Omega$
Output power:	-20 dB $\pm$ 2 dB relative to main IF output power
Return loss:	>20 dB, 50-180 MHz

## B.3.2 L-Band Outputs

Table B.19: L-BAND OUT MAIN Specification

Item	Specification
Safety status:	SELV
Connector type:	SMA female 50 $\Omega$
Connector designation:	L-BAND OUT MAIN
Output impedance:	50 $\Omega$
Output power:	-20 dBm to +5 dBm in 0.1 dB steps
Output power ramp rate:	9 dB/s over operational power level range
Power level stability:	$\pm$ 0.5 dB
Return loss:	>14 dB, 950-1750 MHz
Modulation format:	BPSK as per ETSI TR 101 198 QPSK as per EN 300 421 (DVB-S) 8PSK and 16QAM as per EN 301 210 (DVB-DSNG) (HOM option)
FEC rate:	1/2, 2/3, 3/4, 5/6 and 7/8 with QPSK 2/3, 5/6 and 8/9 with 8PSK 3/4, and 7/8 with 16QAM

Item	Specification
Symbol rate:	1 to 48 Msymbol/s (Standard) 0.2 to 66 Msymbol/s (Extended symbol rate option)
<p><b>NOTE...</b></p> <p>For certain combinations of modulation format, FEC code rate and input packet size, the maximum symbol rate may be limited to lower values than indicated above due to an input bit-rate limitation of 213 Mbit/s imposed by the ASI input interface.</p>	
Spectrum roll-off factor:	20%, 25%, 30%, 35% selectable
Spectrum sense:	Normal / inverted
Transmission modes:	Modulation on/off Carrier on/off
Carrier frequency:	950-1750 MHz, tuneable in 1 kHz steps
Carrier frequency error:	< ±35 Hz versus temperature < ±1 kHz ageing over 10 years
Carrier ON/OFF ratio:	>60 dB
Carrier suppression:	>35 dB
Phase noise (continuous):	< -46 dBc/Hz at 10 Hz offset < -66 dBc/Hz at 100 Hz offset < -76 dBc/Hz at 1 kHz offset < -86 dBc/Hz at 10 kHz offset < -96 dBc/Hz at 100 kHz offset < -120 dBc/Hz at 1 MHz offset and above
Phase noise (discrete sidebands):	< -70 dBc
Spurious outputs (modulated carrier):	< -60 dBc/4 kHz over the frequency range 500 MHz to 2500 MHz but excluding the frequency range of the wanted output signal (equal to $\pm 1.06 \times$ Symbol Rate about the carrier frequency, as defined by the spectrum mask <i>Figure A. 7</i> in EN 300 421)
Spurious outputs (unmodulated carrier):	< -55 dBc over the frequency range 500 MHz to 2500 MHz, each component
Noise floor (No/C):	< -120 dBc/Hz
Main / monitor output isolation (both directions):	>30 dB, 950-1750 MHz

Table B.20: L-BAND OUT MONITOR Specification

Item	Specification
Safety status:	SELV
Connector type:	F-type female 75 Ω
Connector designation:	L-BAND OUT MONITOR
Output impedance:	75 Ω
Output power:	-30 dB nominal relative to main L-band output power
Return loss:	>10 dB, 950-1750 MHz

### B.3.3 Reference Frequency Output

A reference frequency output is provided via the L-BAND OUT MAIN connector, intended for use by an external frequency up-converter.

Table B.21: Reference Frequency Output Specification

Item	Specification
Output power:	0 dBm $\pm$ 3 dB sine-wave into 50 $\Omega$ load Switchable on/off
Frequency:	10 MHz
Frequency stability:	< $\pm$ 0.2 Hz versus temperature < $\pm$ 1 Hz ageing over 1 year < $\pm$ 5.5 Hz ageing over 10 years
Phase noise:	-110 dBc/Hz at 10 Hz offset -135 dBc/Hz at 100 Hz offset -155 dBc/Hz at 1 kHz offset -160 dBc/Hz at 10 kHz offset

### B.3.4 ASI Out 1, ASI Out 2, ASI Out 3 Outputs

Table B.22: ASI Out Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC 75 $\Omega$
Connector designation:	ASI OUT 1, ASI OUT 2, ASI OUT 3

## B.4 Control and Monitoring

### B.4.1 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.4.2 Local Control

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

### B.4.3 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)
<b>Relay Contact Rating</b>	
Maximum switching power	30 W
Maximum switching voltage	110 V
Maximum switching current	1 A

### B.4.4 Remote Control

This connector provides an RS-232/RS-485 user interface control port that allows the unit to be controlled by an external master.

Table B.25: Remote Control Specification

Item	Specification
Safety status	SELV
Connector designation	REMOTE CONTROL
Connector type	9-way D-type male

## B.5 Data

### B.5.1 RS-232 Data

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

Table B.26: 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.5.2 RS-422 Data

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

Table B.27: 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 bit-stream are arbitrary.

## B.6 AC Power Supply

This equipment is fitted with a 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.28: AC 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 which 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	4 A (100-120 Vac range) 2 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	100 W maximum (NO options fitted) 250 W maximum (WITH options fitted)
Stand-by power	15 W typically

## B.7 Physical Details

Table B.29: Physical Details

Item	Specification
Height	88.9 mm chassis
Width	442.5 mm excluding fixing brackets
Overall width	482.6 mm including fixing brackets
Depth	545 mm excluding rear connector clearance
Approximate weight	11.5 kg (25.3 lbs)

## B.8 Environmental Conditions

Table B.30: Environmental Specification

Item	Specification
<b>Operational</b>	
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 2U	Front section: Cool air input from front panel, exhaust from right side of unit Rear section: Cool air input from left side of unit, exhaust from right side of unit See <i>Chapter 2, Installing the Equipment, Figure 2.2.</i>
Handling/movement	Designed for stationary or fixed use when in operation
<b>Storage/Transportation</b>	
Temperature	-20°C to +70°C (-4°F to 158°F)
Relative humidity	0% to 90% (non-condensing)

## B.9 Compliance<sup>1</sup>

### B.9.1 Safety

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

EN 60950	European	Safety of information technology equipment.
IEC 60950	International	Safety of information technology equipment.

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

UL 60950	USA	Safety of information technology equipment.
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<sup>1</sup> The version of the standards shown is that applicable at the time of manufacture.

## B.9.2 EMC<sup>2</sup>

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 <sup>3</sup>	European	Electromagnetic Compatibility (EMC), Part 3 Limits; Section 2. Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase).
EN 61000-3-3 <sup>3</sup>	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 $\leq 16$ 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.9.3 Shock and Vibration

The Encoder and Receiver chassis complies with the requirements of ETS 300-019-2-5 Table 2, for both non-operational and operational states, without any special mounting or casing requirements over and above the standard mounting requirements specified.

ETS 300-019-2-5	European	Equipment Engineering (EE): Environmental conditions and environmental tests for telecommunications equipment Part 2-5: Specification of environmental tests Ground Vehicle Installations. Table 2.
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<sup>2</sup> The EMC tests were performed with the Technical Earth attached, and configured using recommended cables (see Table B.31).

<sup>3</sup> Applies only to models of the Encoder using mains (ac) power sources.



## B.9.4 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 2004.

## B.9.5 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 2004.

## B.10 Cable Types

The signal cable types (or similar) in *Table B.31* are those recommended by TANDBERG Television in order to maintain product EMC compliance.

*Table B.31: Suitable Signal Cable Types*

Signal Type	Connector	Cable
RS-232	9-way D-type Male	Belden 8162 CM 2PR24 shielded E108998 (typical)
Ethernet	RJ-45	Alcatel Data Cable FTP 7 x 0.16
ASI Outputs	BNC	Canford Audio BBC 1/3 PSF (type 2 Video cable)
SD SDI In (Video Input)	BNC	Canford Audio BBC 1/3 PSF
HD SDI In (Video Input)	BNC	Canford Audio BBC 1/2 PSF or Belden 1694A
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.11 Option Modules

### B.11.1 M2/EOM2/AUDLIN2 Additional Audio and Linear PCM Option Module

See Section B.1.2 for details.

### B.11.2 M2/EOM2/REMUX Remux Option Module

#### Connectors

Table B.32: DVB ASI In 1, 2 and 3 Connector

Item	Specification
Safety status	SELV
Connector designation	DVB ASI IN 1, DVB ASI IN 2, DVB ASI IN 3
Connector type	BNC
Connector impedance	75 $\Omega^4$
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface) <sup>5</sup>

Table B.33: DVB ASI Out 1 Connector (Disabled)

Item	Specification
Safety status	SELV
Connector designation	DVB ASI OUT 1
Connector type	BNC
Connector impedance	75 $\Omega^4$
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface) <sup>5</sup>

<sup>4</sup> 75  $\Omega$  terminator must be fitted when this interface is not in use.

<sup>5</sup> Byte mode and single packet burst mode only.

## LEDs

Table B.34: DVB ASI In 1, 2 and 3 - LED Indications

Item	Specification
<b>Red LED</b>	Input ASI lock
On	No lock on ASI (8B/10B coding)
Off	Input ASI lock OK
<b>Green LED</b>	Packet size
Off	Not locked to MPEG packets
Flash (1:3 mark:space)	188 byte packets
Flash (3:1 mark:space)	204 byte packets

Table B.35: DVB ASI Out 1 - LED Indications

Item	Specification
<b>Red LED</b>	
On	Output disabled
Off	Output enabled
<b>Green LED</b>	
Off	Output not in use
Flash (1:3 mark:space)	188 byte packets output
Flash (3:1 mark:space)	204 byte packets output

## B.11.3 M2/EOM2/ATMS155... ATM Network Interface Module

### Variants of The ATM Network Interface Module

To provide the interface to the B-ISDN Telecommunications network, a Physical Layer Module must be installed according to the type of network required. Refer to *Table B.36* for the types of B-ISDN networks which are supported.

*Table B.36: B-ISDN Networks Supported*

Physical Layer	Physical Layer Bandwidth	Marketing Code
SDH STM-1 / SONET STS-3c Multimode Optical	155.520 Mbit/s	M2/EOM2/ATMS155MM
SDH STM-1 / SONET STS-3c Monomode Optical	155.520 Mbit/s	M2/EOM2/ATMS155SM

### DVB-ASI Copper Output

*Table B.37: DVB Copper Output Connection*

Item	Specification
Safety status	SELV
Connector designation	DVB ASI
Connector Impedance	75 Ω
Packet Size	188 / 204 bytes
Data coding	8B 10B
Data rate	0.5 Mbit/s to 60 Mbit/s
Channel rate	270 Mbit/s

### DVB-ASI Copper Input

*Table B.38: DVB Copper Input Connection*

Item	Specification
Safety status	SELV
Connector designation	DVB ASI
Connector Impedance	75 Ω
Packet Size	188 / 204 bytes
Data coding	8B 10B
Data rate	0.5 Mbit/s to 60 Mbit/s
Channel rate	270 Mbit/s

## 10BaseT Ethernet Connector

Table B.39: Ethernet Connector

Item	Specification
Safety status	SELV
Connector designation	Ethernet
Channel rate	10 Mbit/s
Data coding	Manchester Coding
Specification	Complies with IEEE Standard 802.3i 1990 for Twisted Pair Ethernet
Max cable length	Typically 100 metres (CAT-5 UP)

## Multimode Fibre Optic Connector

**WARNING...**  
**LED: CLASS I LASER PRODUCT.**

**NOTE...**  
 The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

Table B.40: Multimode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MULTI)
Data Rate	155.520 Mbit/s
Centre Wavelength	1270 nm (min) 1310 nm (typ) 1380 nm (max)
Emitter type	LED, InGaAsP
Emitter output power	-20 dBm (min) -14 dBm (max)
Detector type	PIN diode
Detector input power	-31 dBm (min) -14 dBm (max)
Optic Fibre type	62.5/125 µm
Typical max fibre length	2000 metres

## Monomode Fibre Optic Connector

**WARNING...**  
**LASER: CLASS I LASER PRODUCT.**

**NOTE...**  
 The Class 1 Laser warning is as defined in paragraph 5.2 of EN 60825-1 1994.

Table B.41: Monomode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MONO)
Data Rate	155.520 Mbit/s
Centre Wavelength	1261 nm (min) 1360 nm (max)
Emitter type	LASER, InGaAsP
Emitter output power	-15 dBm (min) -8 dBm (max)
Detector type	PIN diode
Detector input power	-28 dBm (min) -7 dBm (max)
Optic Fibre type	62.5/125µm
Typical max fibre length	20000 metres

## M2/EOM2/ATMS34 PDH/E3 Connector

Table B.42: E3 Input Connector

Item	Specification
Connector Type	BNC, female
Connector Impedance	75 Ω
Connector Designation	ATM-PDH-E3 IN
Data-rate	34.368 Mbit/s ±20ppm
Data Coding	HDB3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Loss of Signal Detect	ITU-T G.775
Over-voltage Protection	ITU-T G.703 Annex B
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transit Timing Source	Recovered Clock or Local Clock

Table B.43: E3 Output Connector

Item	Specification
Connector Type	BNC, female
Connector Impedance	75 Ω
Connector Designation	ATM-PDH-E3 OUT
Data-rate	34.368 Mbit/s ±20ppm
Data Coding	HDB3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Over-voltage Protection	ITU-T G.703 Annex B
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transit Timing Source	Recovered Clock or Local Clock

## M2/EOM2ATMS45 PDH/DS3 Connector

Table B.44: DS3, G.703 Input Connector

Item	Specification
Connector Type	75 $\Omega$ BNC, female
Connector Designation	ATM-PDH-DS3 IN
Data-rate	44.736 Mbit/s
Data Coding	BZD3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Loss of Signal Detect	ITU-T G.775
Over-voltage Protection	ITU-T G.703 Annex B DS3 and E3
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transmit Timing Source	Recovered Clock or Local Clock

Table B.45: DS3, G.703 Output Connector

Item	Specification
Connector Type	75 $\Omega$ BNC, female
Connector Designation	ATM-PDH-DS3 OUT
Data-rate	44.736 Mbit/s
Data Coding	BZD3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Over-voltage Protection	ITU-T G.703 Annex B
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transmit Timing Source	Recovered Clock or Local Clock

## M2/EOM2ATMS155E STM-1 Electrical Module

Table B.46: SDH (STM-1E) Copper Input Connector

Item	Specification
Safety Status	SELV
Connector Designation	ATM-SDH-STM1/E IN
Connector Type	BNC, female
Connector Impedance	75 Ω
Line-rate	155.520 Mbit/s
Data Coding	HDB3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Loss of Signal Detect	ITU-T G.775
Over-voltage Protection	ITU-T G.703 Annex B
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transit Timing Source	Recovered Clock or Local Clock

Table B.47: SDH (STM-1E) Copper Output Connector

Item	Specification
Safety Status	SELV
Connector Designation	ATM-SDH-STM1/E OUT
Connector Type	BNC, female
Connector Impedance	75 Ω
Line-rate	155.520 Mbit/s
Data Coding	HDB3
Physical/Electrical Characteristics	ITU-T G.703
Jitter Tolerance	ITU-T G.823
Over-voltage Protection	ITU-T G.703 Annex B
ATM Direct Cell Mapping	ITU-T G.804
PLCP Mapping	ETSI T/NA(91) and T/NA(91)18
Supported Frame Modes	ITU-T G.751 and ITU-T G.832.
Transit Timing Source	Recovered Clock or Local Clock

### B.11.4 M2/EOM2/IP, IP Output Card Option

Table B.48: Ethernet Port (IP Output Card)

Item	Specification
Safety Status:	SELV
Connector Type:	8-way RJ-45
Connector Designation:	10/100 BT
Signal Type:	10/100BaseT Ethernet (IEEE 802.3/802.3u)
Transport Stream Rate:	1.5 – 80 Mbit/s



## B.11.5 General Purpose Interface Card (M2/EOM2/GPI)

Table B.49: GPI Connector

Item	Specification
Safety status	SELV
Connector designation	GPI
Connector type	D-type, 15-way, Male
Input	1: Open-circuit 0: Pulled low to between 0.8 V and 0.0 V Limit over-voltage, under-voltage and excess current.
Input function	Application-specific, tailored by software. Contacts are debounced as required.
Output	Open-circuit or connected to common output pin.

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# Annex C

## Language Abbreviations

Languages are shown in alphabetical order.

LANGUAGE	ABBREVIATION
Afrikaans	afr
Albanian	alb
Arabic	ara
Auxiliary	two
Basa	bas
Basque	baq
Bengali	ben
Breton	bre
Bulgarian	bul
Burmese	bur
Catalan	cat
Chinese	chi
Czech	cze
Danish	dan
Dutch	dut
English	eng
Estonian	est
Finnish	fin
French	fre
Fulani	ful
Gaelic (Scots)	gae
German	ger
Greek	gre
Gujarati	guj
Hausa	hau
Hindi	hin
Hungarian	hun
Ibo	ibo

LANGUAGE	ABBREVIATION
Icelandic	ice
Indonesian	ind
Irish	iri
Italian	ita
Japanese	jpn
Javanese	jav
Kannada	kan
Korean	kor
Latvian	lav
Lithuanian	lit
Macedonian	mac
Main	one
Malayalam	mal
Malay	msa
Marathi	mar
Miscellaneous	mis
Multiple languages	mul
Ndebele (North)	nde
Norwegian	nor
Oriya	ori
Persian	per
Polish	pol
Portugese	por
Punjabi	pan
Romanian	rum
Russian	rus
Serbo-Croat	SCR
Slovak	slk
Somali	som
Spanish	spa
Swahili	swa

LANGUAGE	ABBREVIATION
Swedish	swe
Tagalog	tgl
Tamil	tam
Telugu	tel
Thai	tha
Tibetan	tib
Turkish	tur
Ukrainian	ukr
Undefined	und
Urdu	urd
Vietnamese	vie
Welsh	cym
Xhosa	xho
Yoruba	yor
Zulu	zul

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 or 2 entry in the menu. Once this has been carried out, the code appears against the User Defined 1 or 2 options and it is these entries that are used for language code insertion.

# Creating and Downloading a Logo

## Contents

D.1	Introduction .....	D-3
D.2	Summary of Features .....	D-3
D.3	OSD Programs Built Into the Encoder .....	D-3
D.4	Creating a Logo Using OSD Creator .....	D-5
D.5	Using OSD Creator .....	D-5
D.5.1	Overview.....	D-5
D.5.2	Loading a .bmp File.....	D-6
D.5.3	Creating Transparency.....	D-6
Overview.....	D-6	
Adding Transparency Manually .....	D-7	
Adding Transparency Using a Key File .....	D-7	
Editing the Palette .....	D-8	
Palette Reallocation.....	D-8	
D.5.4	Downsampling.....	D-8
D.5.5	Saving the .osd File.....	D-8
D.6	Downloading a Logo Using OSD Loader .....	D-9
D.7	Using the OSD Loader .....	D-9
D.7.1	Start-up.....	D-9
D.7.2	Download an .osd File.....	D-10
D.7.3	Show and Hide Regions .....	D-12
D.7.4	Multiple Regions .....	D-12
D.7.5	Region Interference .....	D-12
D.8	Fault-finding .....	D-13

## List of Tables

Table D.1: Resolution Modes .....	D-10
-----------------------------------	------

## List of Figures

Figure D.1: Web Browser Interface .....	D-4
Figure D.2: File Download Dialogue Box.....	D-4
Figure D.3: Files for OSD Creator and Loader .....	D-5
Figure D.4: OSD Creator Screen Showing Example Logo.....	D-6
Figure D.5: OSD Loader Screen Showing Example Logo.....	D-9
Figure D.6: 625 Line, OSD Co-ordinates in Active Picture (SD Example) .....	D-11
Figure D.7: 525 Line, OSD Co-ordinates in Active Picture (SD Example) .....	D-11

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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. 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.

### NOTE...

In HD, large OSDs can take a very long time to download due to the data size.

## 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**.

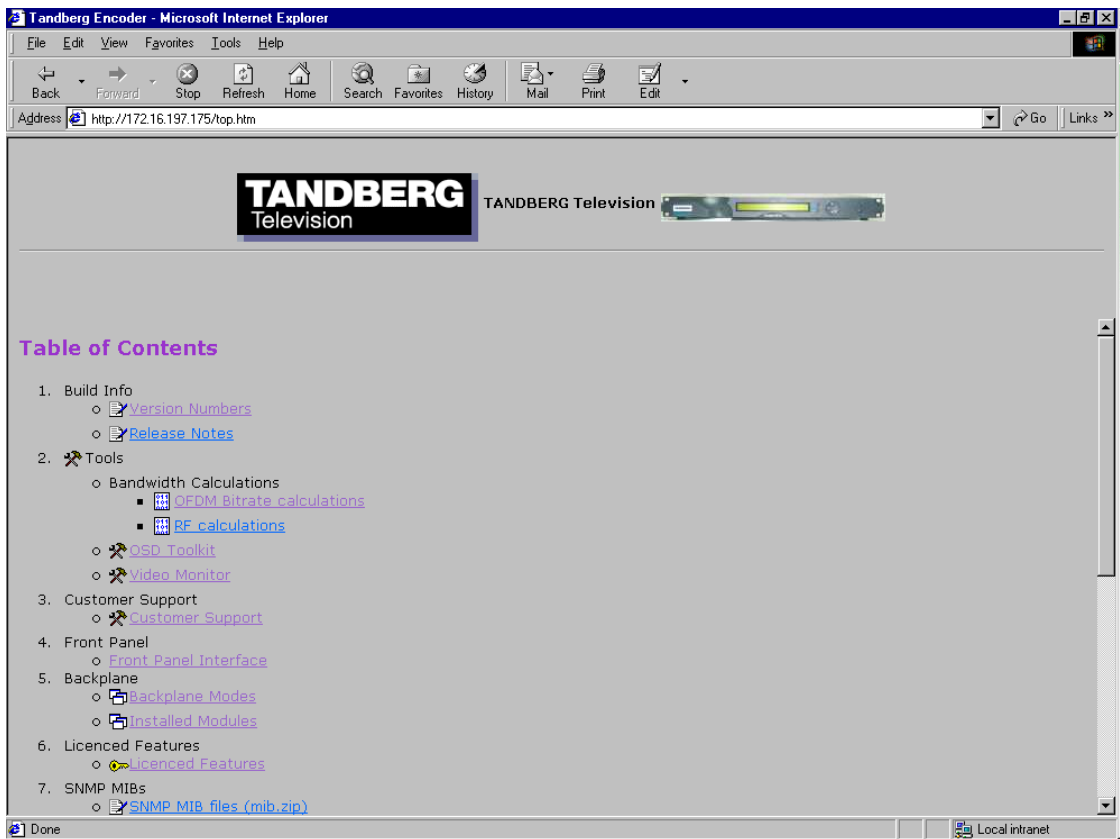


Figure D.1: Web Browser Interface

The dialog box, see Figure D.2, will be displayed.

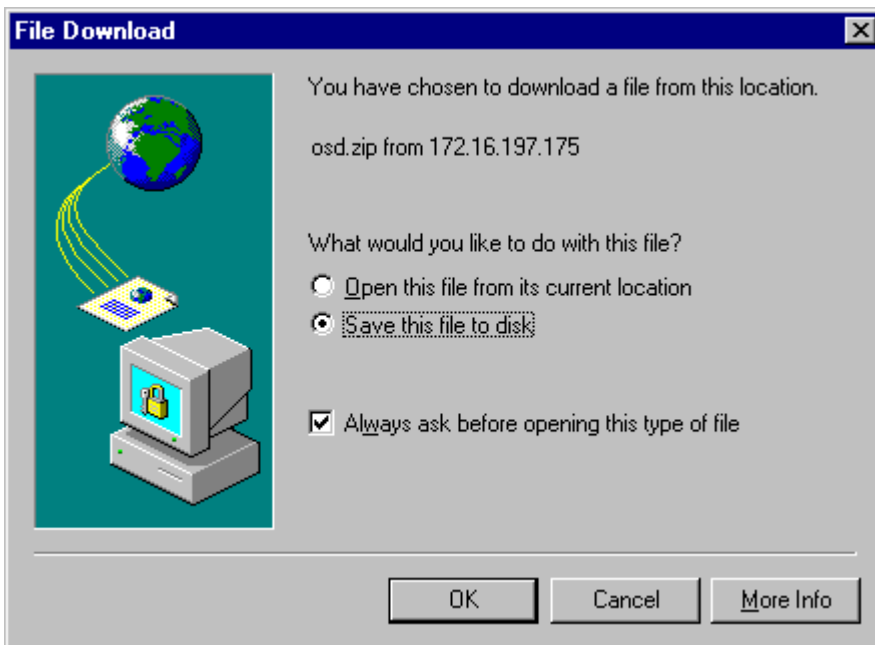


Figure D.2: File Download Dialogue Box

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.



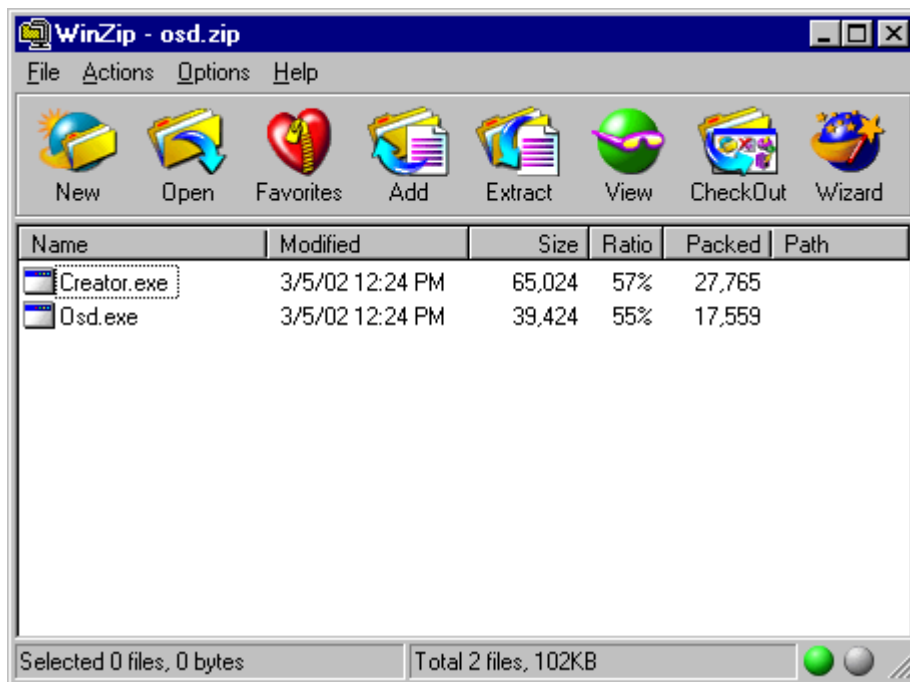


Figure D.3: Files for OSD Creator and Loader

## 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 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*.

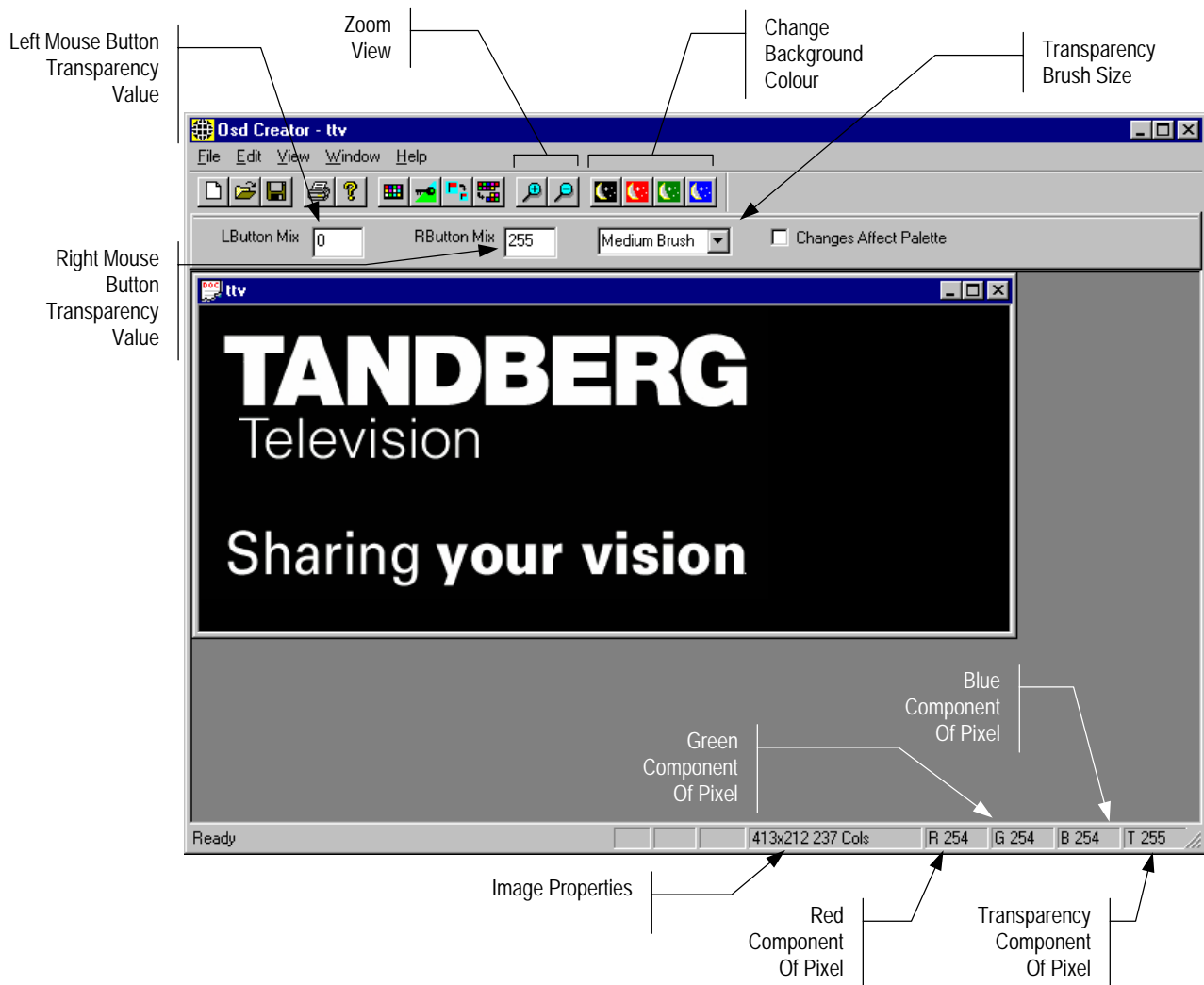


Figure D.4: OSD Creator Screen Showing Example Logo

## 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 **LButton Mix** and the right mouse button will apply the transparency value set for the **RbuttonMix**. At start-up these are set so **LButton Mix** is 0, to make an area transparent, and **RButton Mix** 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 NT. A network connection is required. The target Encoder's IP address must be **visible** 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*.

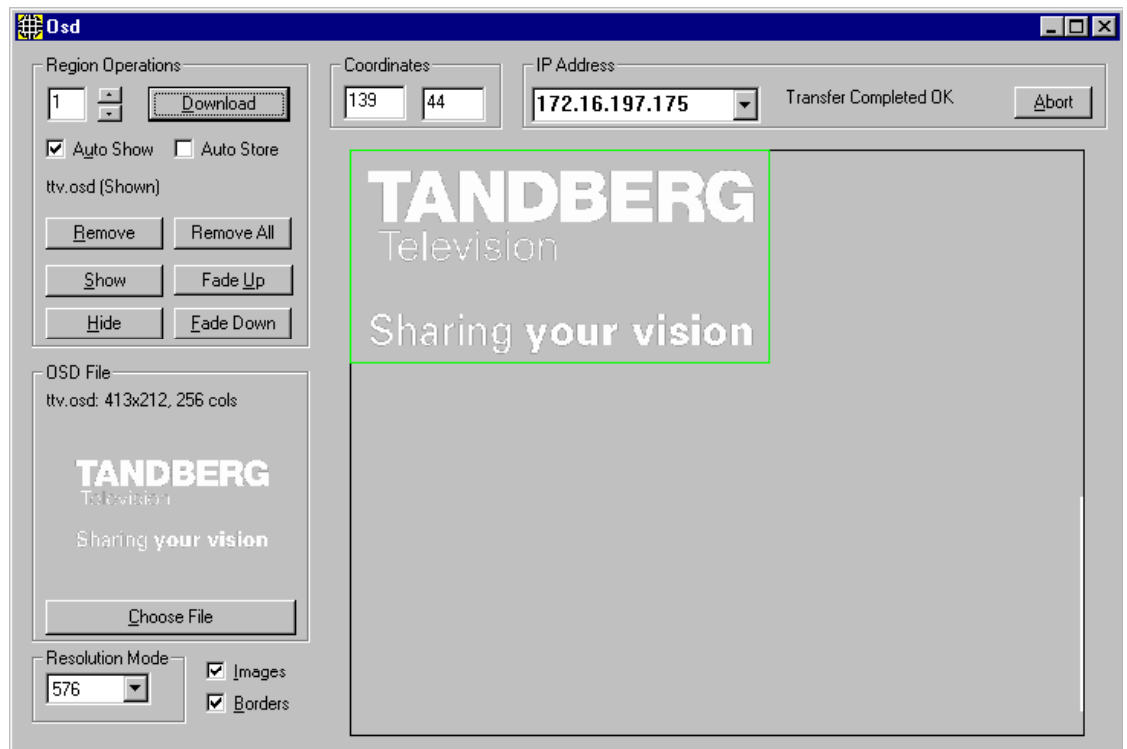


Figure D.5: OSD Loader Screen Showing Example Logo

## 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	High Definition
576p	High Definition
720p	High Definition
1080i	High Definition

### 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 for SD mode.

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.

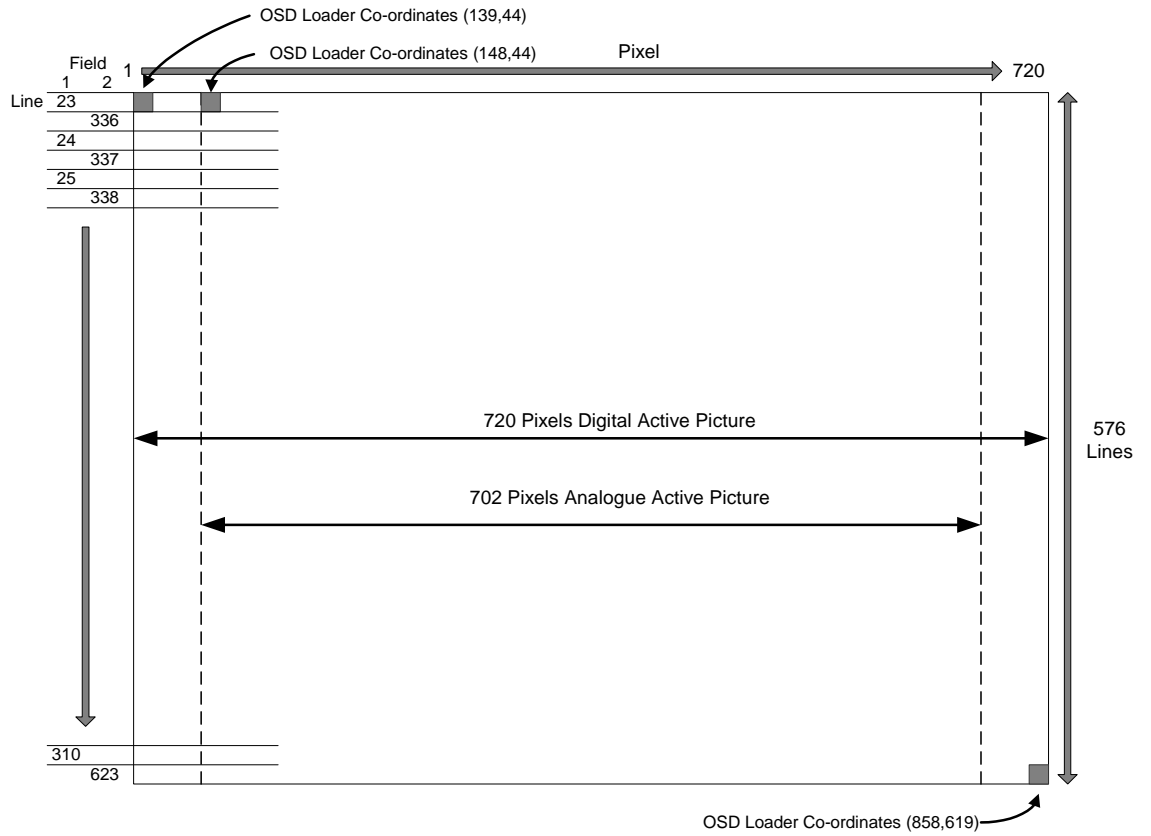


Figure D.6: 625 Line, OSD Co-ordinates in Active Picture (SD Example)

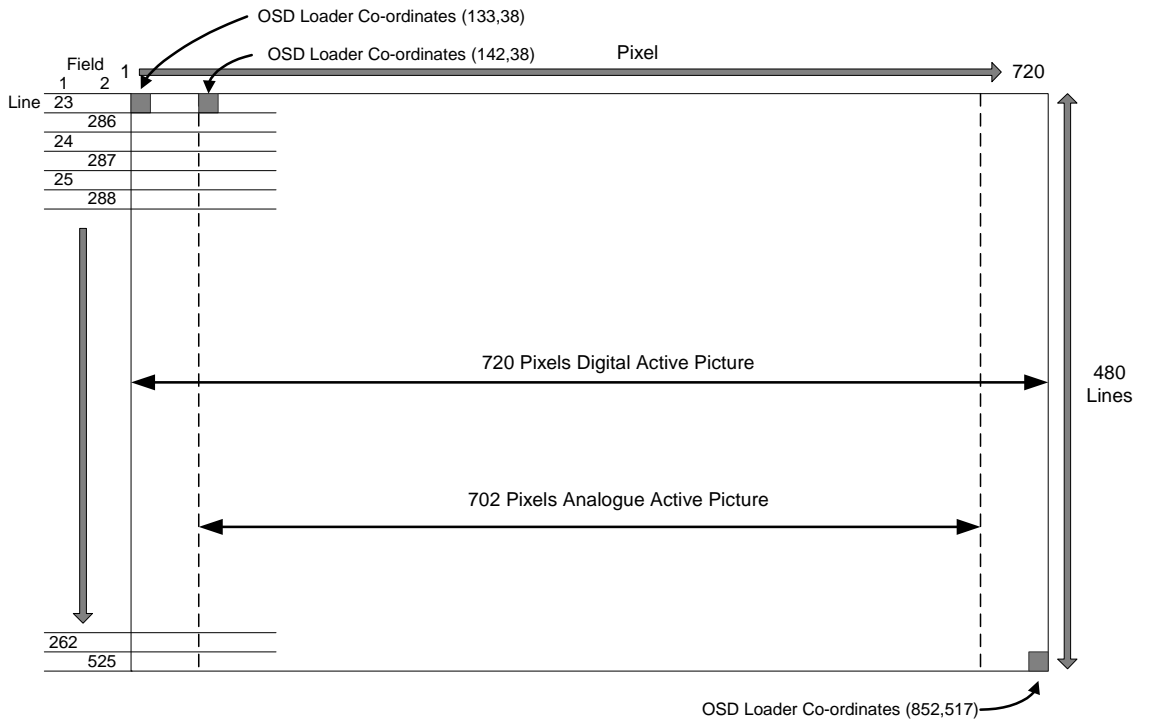


Figure D.7: 525 Line, OSD Co-ordinates in Active Picture (SD Example)

### 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 **Downloaded** 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**.

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# Annex E

## Band Plans

### Contents

E.1 Channels and Centre Frequencies .....	E-3
---	-----

#### List of Tables

Table E.1: Australia .....	E-3
Table E.2: Europe VHF .....	E-4
Table E.3: EuropeCATV .....	E-4
Table E.4: Italy .....	E-4
Table E.5: Morocco .....	E-4
Table E.6: New Zealand .....	E-5
Table E.7: China .....	E-5

Table E.8: OIRT .....	E-5
Table E.9: Ireland .....	E-6
Table E.10: South Africa .....	E-6
Table E.11: French Overseas PIA .....	E-6
Table E.12: France .....	E-7
Table E.13: Japan .....	E-7
Table E.14: USA .....	E-8
Table E.15: CCIR .....	E-8

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## E.1 Channels and Centre Frequencies

The `Output` Menu has options called **Band Plan** and **Channel** (see *Chapter 4, Operating the Equipment Locally*).

Once a country has been selected in the **Band Plan** option then the required channel should be selected in the **Channel** option. Each channel number corresponds to a particular frequency.

### NOTE...

Only those frequencies associated with a channel number can be selected.

This Annex contains the channel IDs and centre frequencies for the band plans in the `Output` Menu.

If the **Manual** band plan option is selected then the required frequency must be selected manually.

Table E.1: Australia

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
0	48.500	32	557.500	52	697.500
1	59.500	33	564.500	53	704.500
2	66.500	34	571.500	54	711.500
3	88.000	35	578.500	55	718.500
4	97.500	36	585.500	56	725.500
5	104.500	37	592.500	57	732.500
5A	140.500	38	599.500	58	739.500
6	177.500	39	606.500	59	746.500
7	184.500	40	613.500	60	753.500
8	191.500	41	620.500	61	760.500
9	198.500	42	627.500	62	767.500
9A	205.500	43	634.500	63	774.500
10	212.500	44	641.500	64	781.500
11	219.500	45	648.500	65	788.500
12	226.500	46	655.500	66	795.500
27	523.500	47	662.500	67	802.500
28	529.500	48	669.500	68	809.500
29	536.500	49	676.500	69	816.500
30	543.500	50	683.500		
31	550.500	51	690.500		

Table E.2: Europe VHF

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
E 2	50.500	E 8	198.500
E 3	57.500	E 9	205.500
E 4	64.500	E 10	212.500
E 5	177.500	E 11	219.500
E 6	184.500	E 12	226.500
E 7	191.500		

Table E.3: EuropeCATV

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
S 4	128.500	S 13	247.500
S 5	135.500	S 14	254.500
S 6	142.500	S 15	261.500
S 7	149.500	S 16	268.500
S 8	156.500	S 17	275.500
S 9	163.500	S 18	282.500
S 10	170.500	S 19	289.500
S 11	233.500	S 20	296.500
S 12	240.500		

Table E.4: Italy

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
A	56.000	F	194.500
B	64.500	G	203.500
C	84.500	H	212.500
D	177.500	H <sub>1</sub>	219.500
E	186.000	H <sub>2</sub>	226.500

Table E.5: Morocco

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
M 4	165.500	M 8	197.500
M 5	173.500	M 9	205.500
M 6	181.500	M 10	213.500
M 7	189.500		

Table E.6: New Zealand

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
1	47.500	6	191.500
2	57.500	7	198.500
3	64.500	8	205.500
4	177.500	9	212.500
5	184.500	10	219.500

Table E.7: China

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
1	52.500	18	514.000	35	690.000	52	826.000
2	60.500	19	522.000	36	698.000	53	834.000
3	68.500	20	530.000	37	706.000	54	842.000
4	80.000	21	538.000	38	714.000	55	850.000
5	88.000	22	546.000	39	722.000	56	858.000
6	171.000	23	554.000	40	730.000	57	866.000
7	179.000	24	562.000	41	738.000	58	874.000
8	187.000	25	610.000	42	746.000	59	882.000
9	195.000	26	618.000	43	754.000	60	890.000
10	203.000	27	626.000	44	762.000	61	898.000
11	211.000	28	634.000	45	770.000	62	906.000
12	219.000	29	642.000	46	778.000		
13	474.000	30	650.000	47	786.000		
14	482.000	31	658.000	48	794.000		
15	490.000	32	666.000	49	802.000		
16	498.000	33	674.000	50	810.000		
17	506.000	34	682.000	51	818.000		

Table E.8: OIRT<sup>1</sup>

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
R I	52.500	R VII	186.000
R II	62.000	R VIII	194.000
R III	80.000	R IX	202.000
R IV	88.000	R X	210.000
R V	96.000	R XI	218.000
R VI	178.000	R XII	226.000

<sup>1</sup> Organisation that co-ordinated TV standards and programme interchange among the Eastern-block countries of Europe.

Table E.9: Ireland

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
I A	48.500	I F	194.000
I B	56.500	I G	202.000
I C	64.500	I H	210.000
I D	178.000	I J	218.000
I E	186.000		

Table E.10: South Africa

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
4	178.000	9	218.000
5	186.000	10	226.000
6	194.000	11	234.000
7	202.000	(12)	242.000
8	210.000	13	250.180

Table E.11: French Overseas PIA

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
4	178.000	7	202.000
5	186.000	8	210.000
6	194.000	9	218.000



Table E.12: France

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
A	45.000	2	186.750
B	53.000	3	194.750
C	61.000	4	202.750
C1	57.750	5	210.750
1	178.750	6	218.750

Table E.13: Japan

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
J 1	93.000	18	503.000	35	605.000	52	707.000
J 2	99.000	19	509.000	36	611.000	53	713.000
J 3	105.000	20	515.000	37	617.000	54	719.000
J 4	173.000	21	521.000	38	623.000	55	725.000
J 5	179.000	22	527.000	39	629.000	56	731.000
J 6	185.000	23	533.000	40	635.000	57	737.000
J 7	191.000	24	539.000	41	641.000	58	743.000
J 8	195.000	25	545.000	42	647.000	59	749.000
J 9	201.000	26	551.000	43	653.000	60	755.000
J 10	207.000	27	557.000	44	659.000	61	761.000
J 11	213.000	28	563.000	45	665.000	62	767.000
J 12	219.000	29	569.000	46	671.000	63	773.000
13	473.000	30	575.000	47	677.000		
14	479.000	31	581.000	48	683.000		
15	485.000	32	587.000	49	689.000		
16	491.000	33	593.000	50	695.000		
17	497.000	34	599.000	51	701.000		

Table E.14: USA

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
A 02	57.000	23	527.000	44	653.000	65	779.000
A 03	63.000	24	533.000	45	659.000	66	785.000
A 04	69.000	25	539.000	46	665.000	67	791.000
A 05	79.000	26	545.000	47	671.000	68	797.000
A 06	85.000	27	551.000	48	677.000	69	803.000
A 07	177.000	28	557.000	49	683.000	70	809.000
A 08	183.000	29	563.000	50	689.000	71	815.000
A 09	189.000	30	569.000	51	695.000	72	821.000
A 10	195.000	31	575.000	52	701.000	73	827.000
A 11	201.000	32	581.000	53	707.000	74	833.000
A 12	207.000	33	587.000	54	713.000	75	839.000
A 13	213.000	34	593.000	55	719.000	76	845.000
14	473.000	35	599.000	56	725.000	77	851.000
15	479.000	36	605.000	57	731.000	78	857.000
16	485.000	37	611.000	58	737.000	79	863.000
17	491.000	38	617.000	59	743.000	80	869.000
18	497.000	39	623.000	60	749.000	81	875.000
19	503.000	40	629.000	61	755.000	82	881.000
20	509.000	41	635.000	62	761.000	83	887.000
21	515.000	42	641.000	63	767.000		
22	521.000	43	647.000	64	773.000		

Table E.15: CCIR<sup>2</sup>

UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz	UHF Channel	Centre Frequency in MHz
21	474.000	38	610.000	55	746.000
22	482.000	39	618.000	56	754.000
23	490.000	40	626.000	57	762.000
24	498.000	41	634.000	58	770.000
25	506.000	42	642.000	59	778.000
26	514.000	43	650.000	60	786.000
27	522.000	44	658.000	61	794.000
28	530.000	45	666.000	62	802.000
29	538.000	46	674.000	63	810.000
30	546.000	47	682.000	64	818.000
31	554.000	48	690.000	65	826.000
32	562.000	49	698.000	66	834.000
33	570.000	50	706.000	67	842.000
34	578.000	51	714.000	68	850.000
35	586.000	52	722.000	69	858.000
36	594.000	53	730.000		
37	602.000	54	738.000		

<sup>2</sup> CCIR is now know as International Telecommunications Union-Radiocommunications Study Groups.

# Annex F

## Audio Modes

### Contents

F.1	Analogue Audio.....	F-3
F.2	Digital Audio.....	F-3
F.3	Embedded Audio on the SDI.....	F-4
F.4	Detail of Encoder Operation.....	F-4

### List of Figures

Figure F.1:	Analogue Audio Modes.....	F-3
Figure F.2:	Digital Audio Modes.....	F-3
Figure F.3:	Embedded Audio and Stereo Pairs.....	F-5

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## F.1 Analogue Audio

Figure F.1 shows the coding methods that may be used with the analogue audio input.

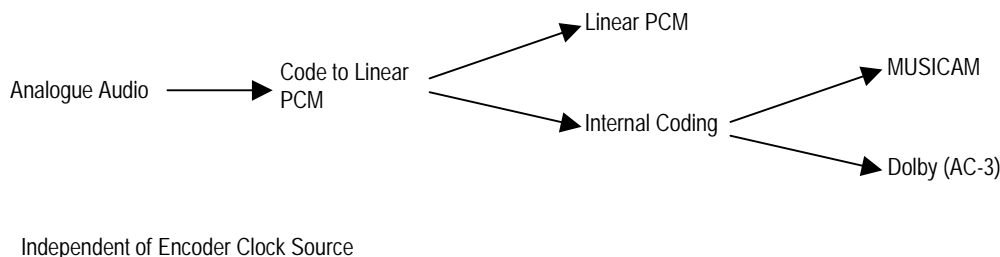


Figure F.1: Analogue Audio Modes

## F.2 Digital Audio

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. Figure F.2 shows the clock source that is appropriate for a given audio coding mode. The two main clock sources are internal and external (derived from the H SYNC input).

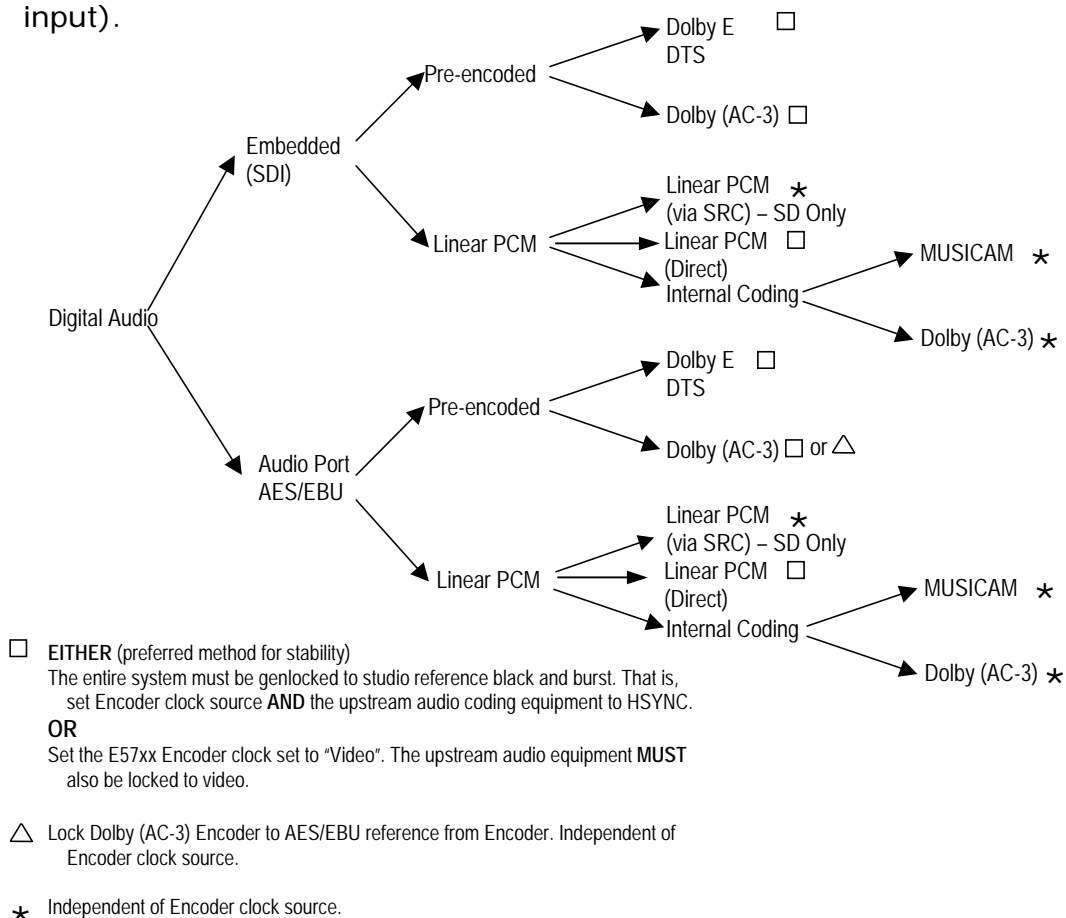


Figure F.2: Digital Audio Modes

### F.3 Embedded Audio on the SDI

Figure F.3 shows the audio signal flow on the Base Board. While eight audio stereo pairs are available, only two stereo pairs can be processed by the Base Board at any one time.

Audio can be embedded on a SDI video feed. The specified groups are: 1, 2, 3, 4. Each group contains two stereo pairs, hence each SDI can carry a maximum of  $2 \times 4 = 8$  stereo pairs, or 16 mono channels.

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

	<b>SD</b>	<b>HD</b>
• Group 1 =	0x2FF	0x2E7
• Group 2 =	0x1FD	0x1E6
• Group 3 =	0x1FB	0x1E5
• Group 4 =	0x2F9	0x2E4

### F.4 Detail of Encoder Operation

The Encoder can de-embed any two DIDs 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 (SD) 2FFh or (HD) 0x2E7 (Group 1).

The default DID for embedded audio 3-4 is (SD) 1FDh or (HD) 0x1E6 (Group 2).

The DIDs are located in ancillary packets in the data stream.

**NOTE...**  
Default DIDs are selected when a DID value  $\geq 1024$  is set.

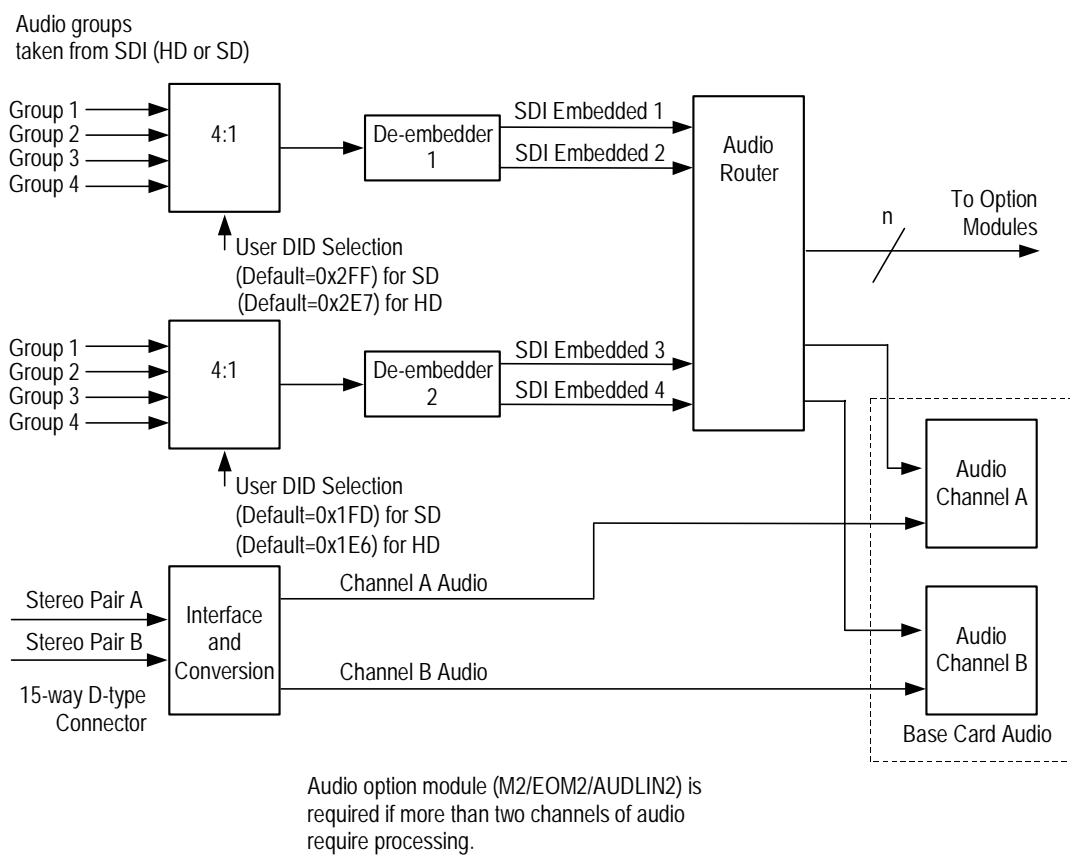


Figure F.3: Embedded Audio and Stereo Pairs

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## 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  $\pm 30$  ppm.

An oven-controlled crystal oscillator (OCXO) within this equipment achieves the  $\pm 30$  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 sub-carrier. Many different specifications are in common use and a required accuracy in the range  $\pm 0.2$  ppm to  $\pm 2$  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 sub-carrier 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 sub-carrier 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  $\pm 0.2$  ppm during manufacture, but due to natural ageing of the OCXO, regular calibration is required to keep the OCXO within  $\pm 0.2$  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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# Annex H

## Use of Remux Card in ATSC

### Contents

- H.1 Remux Card In ATSC With Internal PSIP .....H-3
- H.2 Remux Card In ATSC With External PSIP.....H-3

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## H.1 Remux Card In ATSC With Internal PSIP

The Encoder automatically remuxes ATSC streams arriving at its inputs, as in DVB. The Encoder uses the PAT (Program Association Table) and PMT (Program Map Table) to work out all the associated PIDs (Packet Identifier), and attempt to extract the short name, the long name, and the Service Type from the VCT (Virtual Channel Table).

### NOTE...

If more than one program is present on any input the Encoder may be unable to extract any information from the VCT on that input.

The Encoder then maps the PIDs using the program paradigm based upon the program number. If possible, the program number of the input is preserved. In Intelligent mode the Encoder automatically remaps the program number/PIDs if a clash occurs. If an active program is overwritten by another, the program number/PIDs of the first program are changed to non-clashing values. In Dumb mode the Encoder requires a user to remap clashing program numbers/PIDs to prevent overwriting an active program.

The Encoder generates all PSIP (Program System Information Protocol) tables for the output stream. It generates a minimum set of tables containing a minimum amount of data. The tables constructed are the:

- MGT (Master Guide Table)
- CVCT (Cable Virtual Channel Table) or
- TVCT (Terrestrial Virtual Channel Table)
- STT (System Time Table)
- RRT (Rating Region Table)
- EIT (Event Information Table) 0, 1, 2, and 3
- PAT
- CAT (Conditional Access Table)
- PMT

The program paradigm is applied to any input program which has a program number of less than 256. If the program number is greater than 255 any PID may be used for each stream. If a non-ATSC service is detected then that may also be passed through the Remux card as an ATSC program. The program paradigm will be applied to such a service if possible and if the program number is less than 256.

## H.2 Remux Card In ATSC With External PSIP

The Encoder only provides a minimum amount of information within the PSIP tables. If more sophisticated tables are required then the PSIP may be fed in externally using an ASI input on the Remux card. The user is able to specify a PID range via a minimum and maximum PID. The user then selects a port to use and chooses a Service Info level of 'On (Ext. PSIP)'. All PIDs between the maximum and minimum are then mapped directly to the output.

In this configuration the Encoder generates the PAT, CAT and PMT for all programs but it is the responsibility of the user to provide all the PSIP for the associated programs. Any programs present on the same input as the external PSIP are not detected and are not referenced in the PAT.

This mode may be also be used for passing data through the Remux card.

**NOTE...**

It can take a long time to map a range of PIDs using the Remux card, and for usability the range should be kept to a minimum. For instance, it takes approximately 80 seconds to map 4000 PIDs.

If the External PSIP input port is changed, the Encoder may fail to correctly map the PIDs on the new port. This can be resolved by rebooting the Encoder.

# EDH Capability for E57xx Encoders (SD Only)

## Contents

I.1 EDH Capability for E57xx Encoders ..... I-3

### List of Tables

Table I.1: EDH Capability Matrix for E57xx Encoders ..... I-3

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## I.1 EDH Capability for E57xx Encoders

Table I.1 contains EDH capability for different mux firmware versions. To find the mux firmware version for a particular Encoder refer to Summary Screen/More/Advanced/Setup/System/Build Menu.

Table I.1: EDH Capability Matrix for E57xx Encoders

	Mux F/W V14 and below		Mux F/W V15	
	Base Card Not Modified	Base Card Modified	Base Card H/W Mod Strike 11 and below	Base Card H/W Mod Strike 12 and above
Software versions 2.0.0 and above (excluding 3.0.1)	EDH does not work, no errors reported <ul style="list-style-type: none"> <li>Software aware that EDH is not supported</li> </ul>		EDH works, but unreliably <ul style="list-style-type: none"> <li>EDH support only partially implemented in software</li> </ul>	EDH works, but unreliably <ul style="list-style-type: none"> <li>EDH support only partially implemented in software</li> </ul>
Software versions 3.0.1 and above	EDH does not work, no errors reported <ul style="list-style-type: none"> <li>Software aware that EDH is not supported</li> <li>Various EDH status flags available in the menus (all inactive)</li> <li>UES (Unknown Error Status) flags active</li> </ul>		EDH works partially, converts edh errors to eda, does not report all errors <ul style="list-style-type: none"> <li>Gennum chip modifies EDH data in incoming SDI stream</li> <li>If EDH is not present in incoming stream, Gennum chip inserts it; therefore the Encoder thinks EDH was there all along. Error detection in this case is unreliable as the CRCs and checksums are calculated AFTER the errors have occurred.</li> <li>If EDH is present in incoming stream (the most likely scenario) the Gennum chip detects CRC and checksum errors (edh), turns those errors into edas and recalculates CRCs. In this case the Encoder reports the wrong type of errors, which would make fault-finding very confusing for an operator trying to find a fault in the SDI chain.</li> </ul>	EDH works as per specifications

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# Setting of the Remux Card for Data/PSIP and DVB-Subtitles Input

## Contents

J.1	Setting the Remux Card Inputs .....	J-3
J.2	The DVB-Subtitles Input Mode.....	J-3
J.2.1	Overview.....	J-3
J.2.2	The Setting Sequence .....	J-4
J.3	The DATA Input Mode .....	J-4
J.3.1	Overview.....	J-4
J.3.2	The Setting Sequence .....	J-5
J.4	The PSIP Input Mode.....	J-5
J.4.1	Overview.....	J-5
J.4.2	The Setting Sequence .....	J-6
J.4.3	The Setting Sequence when an Encoder is Upgraded from an Earlier Build Version ...	J-6
J.5	Examples of Complex Setups.....	J-7
J.5.1	Example 1 - Everything on One ASI Input ....	J-7
J.5.2	Example 2 – PSIP and data on different inputs .....	J-7

## List of Tables

Table J.1: DVB-Subtitles Descriptors .....	J-3
Table J.2: Sourcing the PSIP/PSI Tables.....	J-5
Table J.3: Example 1 - Everything on One ASI Stream .....	J-7
Table J.4: Example 2 - PSIP on one ASI Input, Data on Other Inputs.....	J-8

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## J.1 Setting the Remux Card Inputs

All the required settings are applied from a single menu, the **Service Info** sub-menu on the **System** menu.

Each input mode of one Remux card is selected independently using: **Remux input # in mode** (where the character: '#' is a placeholder for the numbers: 1, 2 and 3).

### NOTES:

1. The transition between 'SERVICE' and data modes (namely: 'DATA', 'PSIP', 'Off' and 'DVB-Subtitles') requires that the Encoder's PID-mapping features are fully operational. The same is required by a change of: **SI Level**. In such circumstances, the value of: **PID Remap** (under the **Remux module** sub-menu on the **Mux** menu) cannot be: 'Lock PID Mapping'
2. It is not possible to set all remux inputs to 'Off'. This setting is reserved for the special 'SCPC' mode available in Voyager units.

## J.2 The DVB-Subtitles Input Mode

### J.2.1 Overview

The DVB-Subtitles input mode allows adding a maximum of four DVB-Subtitles elementary streams to the Encoder host service.

Each DVB-Subtitles elementary stream will be linked to one stream-identifier descriptor and one subtitling-descriptor in the PMT table of the Encoder host service.

Also one component-descriptor will be added in the EIT table for each DVB-Subtitles elementary stream.

The content of the descriptors must be manually specified.

### CAUTION...

It is the user's responsibility to ensure that the DVB-Subtitles elementary streams match the content of the descriptors.

*Table J.1: DVB-Subtitles Descriptors*

Input:	Description:
DVB-Subt. PID #	The PID value for the elementary stream.
Subt.Lang.#	The ISO 639-2 three-character language code for the elementary stream.
Type #	The subtitling type for the elementary stream.
DVB-Subt. Tag #	The DVB component tag for the elementary stream.
Comp. page ID #	The composition page ID for the elementary stream.

**NOTES...**

1. The 'DVB-subtitles' input mode will be available only when the syntax is: DVB.
2. Only one Remux card input can be in 'DVB-Subtitles' mode at any time.
3. The 'DVB-Subtitles' elementary streams will be output only if every configured PID value differs from 0. The set of the allowed PID values includes 0 and the range of values from 32 to 8190.
4. The 'stream identifier descriptor' will be generated only if the value of: 'DVB-Subt. Tag #' differs from 0.

By default, the Ancillary page ID for each DVB-Subtitles elementary stream equals the value of the Composition page ID.

## J.2.2 The Setting Sequence

1. Identify the Remux card input which will supply the **DVB-Subtitles** elementary streams
2. For the selected input, change **Remux input # in mode** to **Off**.
3. Configure the value of **DVB-Subtitles** (up to four streams are possible).
4. Configure the descriptors for all the selected **DVB-Subtitles** elementary streams.
5. Finally, change **Remux input # in mode** to **DVB subt**.

## J.3 The DATA Input Mode

### J.3.1 Overview

The DATA input mode allows the mapping a set of elementary streams directly to the output of the Remux card.

The set of elementary streams is defined, for each Remux card input, by a range of PID values.

**NOTES...**

1. The 'DATA' input mode will be available when the syntax is: DVB and ATSC.
2. Any Remux card input can be in DATA mode at any time.
3. The set of the allowed PID values ranges from 0 to 8190.
4. The Encoder will not reference any data streams in its internally generated PSI. If this is required, switch internal PSI off by setting SI Level to Off

**CAUTION...**

It is the user's responsibility to supply PSI on a Remux input.

### J.3.2 The Setting Sequence

1. Identify the Remux card input that will be used to supply the **DATA** elementary streams.
2. For the selected input, change: **Remux input # in mode** to **Off**.
3. Configure the values of **DATA # Min PID** and **DATA # Max PID** to include the set of the supplied elementary streams.
4. Finally, change **Remux input # in mode** to **Data**.

## J.4 The PSIP Input Mode

### J.4.1 Overview

The PSIP mode can be used to source PSIP and PSI tables from an external generator via a remux input, rather than the Encoder itself generating these tables. If this generator also produces other elementary streams, these too can, optionally, be passed through the Encoder.

The relevant menu entries in the Service info menu are:

- Remux input <X> in mode: the particular remux input chosen to source the stream must be set to PSIP.
- SI Level: This defines which PSIP and PSI tables are sourced from the Remux input and which are generated internally by the Encoder, as shown in *Table J.2*.

*Table J.2: Sourcing the PSIP/PSI Tables*

SI Level value:	Input source for the PSIP tables (MGT, STT, TVCT, CVCT)	Input source for the PSI tables (PAT, CAT, PMT)
On (PSIP).	Encoder motherboard	Encoder motherboard
On (Ext.PSIP)	PSIP input	Encoder motherboard
Off (Ext.PSIP/PSI)	PSIP input	PSIP input

- PSIP Min PID/PSIP Max PID: These two entries define what additional elementary streams are passed through. Any streams with PIDs falling within this range are passed through.

**NOTE...**

When sourcing PSI from the PSIP input this range must include the PMT and EIT PIDs.

- PSIP PID Status: This shows the PIDs which are actually passed through and would normally correspond to the min/max range set, once the SI Level has been set to one of the ext.PSIP modes.

**NOTES...**

1. The 'PSIP' input mode will be available only when the syntax is: ATSC.
2. Only one Remux card input can be in 'PSIP' mode at any time.
3. The set of the allowed PID values ranges from 2 to 8190.
4. The mapping of the PSI/PSIP elementary streams does not take place until '*SI Level*' is configured.

## J.4.2 The Setting Sequence

1. Identify which Remux card input will supply the **PSIP** elementary streams.
2. For the selected input, change **Remux input # in mode** to **Off**.
3. Change the value of **SI Level** to **Off**.
4. Configure the values of **PSIP Min PID** and **PSIP Max PID** to include all the externally supplied PMT, EIT tables and elementary streams.
5. Change the value of **Remux input # in mode** to **PSIP**.
6. Finally, change the value of **SI Level** to **On (Ext.PSIP)** or **Off (Ext.PSIP/PSI)** according to *Table J.2*.

## J.4.3 The Setting Sequence when an Encoder is Upgraded from an Earlier Build Version

If the Encoder was running a version prior to V3.8.0 and was already setup to source PSIP via the Remux card, it is necessary to make some minor adjustments once the software upgrade is complete.

The entry **Ext. PSIP Source** has been substituted by the three entries **Remux input # in mode**. All that is required is to set the appropriate input in the menu.

### NOTE...

If the Encoder is not behaving as expected, a complete re-setup can be done by following the sequence in *Para J.4.1*.



## J.5 Examples of Complex Setups

### J.5.1 Example 1 - Everything on One ASI Input

In this example, an external generator provides both PSIP, PSI tables and other data on other elementary streams on one ASI input.

**NOTE...**

This was already possible on Encoder builds prior to 3.8.0. where the SI level setting **Off (Ext.PSIP/PSI)** was available.

Assume the PID map shown in *Table J.3*.

*Table J.3: Example 1 - Everything on One ASI Stream*

PSI data	PMT PID = 0x20 (program number 2 is being used)	The Encoder's SI is switched off to allow external PSI insertion.
	Video PID = 0x21	
	Audio 1 PID = 0x24	
	Audio 2 PID = 0x25	
PSIP	EIT, ETT, MGT, VCT follow the ATSC standard.	
Other data	PID range from 500 to 1300, typically only 5 active PIDs at a time but the PID values change regularly.	

In this case, the setting sequence is as follows:

1. The host service is configured in order to match the requested PID values for: PCR, Video, Audio-1 and Audio-2.
2. Assuming that the Remux card input number 1 is the only active input, set **Remux input # in mode** to **PSIP** and the other two input modes to **Off**.
3. Set the **SI Level** to **Off**.
4. Set the value of **PSIP Min PID** to **32** and the value of **PSIP Max PID** to **8147**.  
(The data PID range is from 500 to 1300 and the PMT pid value and the default EIT range is from 8144 to 8147.)
5. Set the **SI Level** to **Off (Ext.PSIP/PSI)**.

### J.5.2 Example 2 – PSIP and data on different inputs

This example can be considered an evolution of the previous one in *para J.5.1*.

The Remux card input number 1 is used for PSI/PSIP data, number 2 and 3 are both used for other data.

**NOTE...**

This was not possible on Encoder builds prior to 3.8.0.

Assume the following PID map:

Table J.4: Example 2 - PSI on one ASI Input, Data on Other Inputs

Port 1	PSI data	PMT PID = 0x10 (program number 2 is being used)	The Encoder's SI is switched off to allow external PSI insertion.
		Video PID = 0x11	
		Audio 1 PID = 0x14	
		Audio 2 PID = 0x15	
	PSIP	EIT, ETT, MGT, VCT follow the ATSC standard	
Port 2	ACAP data	PID range from 8000 to 8100, typical use of 5 active PIDs at a time. The PID values change regularly.	
Port 3	Net data	PID range 6656-6911 and bandwidth is 200 k – 500 kbit/.	

In this case, the setting sequence is:

1. Configure the host service to match the requested PID values for: PCR, Video, Audio-1 and Audio-2.
2. Set the **SI Level** to **Off**.
3. Set the value of **DATA 2 Min PID** to **8000** and the value of **DATA 2 Max PID** to **8100**.  
(The ACAP-data PID range is from 8000 to 8100.)
4. Set the value of **DATA 3 Min PID** is set to **6656** and the value of **DATA 3 Max PID** is set to **6911**.  
(The Net-data PID range is from 6656 to 6911.)
5. The value of **PSIP Min PID** is set to 16 while the value of **PSIP Max PID** is set to 8147. It is assumed that ETT, MGT, VCT are on the PID number 8187.
6. Set the entry **Remux input 1 in mode** to **PSIP**.
7. Set the entry **Remux input 2 in mode** to **DATA**.
8. Set the entry **Remux input 3 in mode** to **DATA**.
9. Set the **SI Level** to **Off (Ext.PSIP/PSI)**.

**CAUTION...**

In this example, the pid values of port-1 and port-2 are partially overlapped. Care must take to avoid any conflict.

## Pro-MPEG FEC Support for IP Streaming in E57xx Encoders

### Contents

K.1	Introduction .....	K-3
K.2	Pro-MPEG FEC .....	K-3
K.2.1	Introduction .....	K-3
K.2.2	Configuring Pro-MPEG FEC .....	K-4
Protocol/Pro-MPEG FEC Option .....	K-4	
Nbr of Columns (L) Option .....	K-4	
Nbr of Rows (D) Option .....	K-4	
K.2.3	Pro-MPEG FEC Constraints .....	K-4
K.2.4	Recommendations for use of Pro-MPEG FEC .....	K-5
Overview .....	K-5	
Column-Only Mode Performance .....	K-5	
Row and Column Mode Performance .....	K-5	
Size of the Matrix .....	K-5	

### List of Figures

Figure K.1: Columns and Rows .....	K-3
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## K.1 Introduction

With the V3.8.1 software release of the E57xx encoder, IP streaming corresponding to the Pro-MPEG FEC protocol is possible.

This annex provides supplementary information on setting up Pro-MPEG FEC only.

### NOTES...

1. The current IP streamer option card is NOT capable of being upgraded to support Pro-MPEG FEC. A new card must be installed (M2/EOM2/IP/PROFEC).
2. Only one IP streamer card may be installed in an E57xx encoder.

## K.2 Pro-MPEG FEC

### K.2.1 Introduction

The Pro-MPEG Forward Error Correction(FEC) scheme is designed to recover lost or corrupted packets caused when transferring MPEG-2 transport streams, or newer MPEG standards encapsulated as an MPEG-2 transport streams, over an IP network.

The Pro-MPEG FEC scheme has been implement to the **Pro-MPEG Code of Practice #3 release 2**.

FEC packets are generated for every column and *optionally* for every row. To generate the FEC packets, RTP frames based on their Sequence Numbers are arranged in a rectangle of dimensions  $D * L$ . The Payload of the FEC packet generated is the ExOR of the row/column it protects.

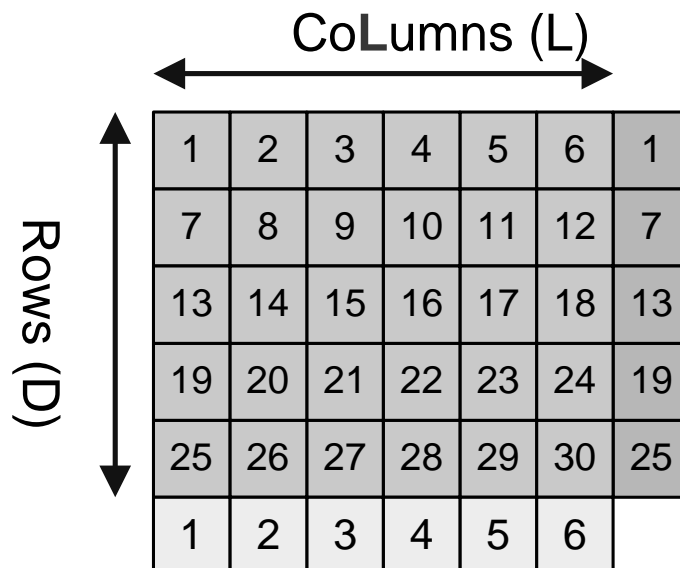


Figure K.1: Columns and Rows

## K.2.2 Configuring Pro-MPEG FEC Protocol/Pro-MPEG FEC Option

When Pro-MPEG FEC is enabled this setting allows the IP output of the E57xx to be configured to work in FEC Column only mode or FEC Row and Column mode.

When either of these settings is selected the MPEG transport stream is set to operate in RTP mode.

If FEC Column only mode is selected a FEC stream is sent out on the same IP address as the MPEG transport stream but with the UDP destination port set to + 2 from the MPEG transport stream.

If FEC Row and Column mode is selected two FEC streams are sent out on the same IP address as the MPEG transport stream but with the Column FEC stream's UDP destination port number set to + 2 and the Row FEC stream's UDP destination port number set to + 4 from the MPEG transport stream.

### Nbr of Columns (L) Option

This setting configures the number of Columns in the matrix, and determines the number of MPEG packets used when calculating the Row FEC packets.

### Nbr of Rows (D) Option

This setting configures the number of Rows in the matrix, and determines the number of MPEG packets used when calculating the Column FEC packets.

## K.2.3 Pro-MPEG FEC Constraints

### Matrix Limitations in Columns only mode:

$$L * D \leq 100$$

$$1 \leq L \leq 20$$

$$4 \leq D \leq 20$$

### Matrix Limitations in Rows and Columns mode:

$$L * D \leq 100$$

$$4 \leq L \leq 20$$

$$4 \leq D \leq 20$$

### Column only Overheads:

$$\text{Overhead} = \frac{L + (D * L)}{(D * L)} = \frac{1}{D} + 1$$

$$\text{Worst case is 4 rows} = (1/4) + 1 = 25\%$$

$$\text{Best case is 20 rows} = (1/20) + 1 = 5\%$$

### Row and Column Overheads:

$$\text{Overhead} = \frac{D + L + (D * L)}{(D * L)}$$

$$\text{Worst case is 4x4} = (4+4+16) / 16 = 50\%$$

Best case is  $10 \times 10 = (10 + 10 + 100) / 100 = 5\%$

## K.2.4 Recommendations for use of Pro-MPEG FEC

### Overview

There are no official recommendations within the Pro-MPEG Code of Practice #3 release 2 regarding which parameters give the best results.

The first decision to be made is which Encapsulation mode to use, as this has a large effect on the added overhead. Column only or Row and Column mode, this decision will be determined by the packet loss characteristics of the network and the importance of data integrity over the network. This information will be different for every network and service provider, therefore TANDBERG Television cannot offer recommendations in this reference guide.

The following information has been added to help demonstrate the difference in data protection provided by each FEC scheme.

### Column-Only Mode Performance

For every 10 fold improvement in Channel Packet Loss Ratio (PLR) there is approximately a 100 fold improvement in the outgoing PLR.

### Row and Column Mode Performance

For every 10 fold improvement in Channel PLR there is approximately a 1000 fold improvement in the outgoing PLR.

### Size of the Matrix

The final decision to be made is the size of matrix to be used. Simply by adding a Column only FEC scheme, irrespective of dimension reduces the Mean Time To Failure (MTBF) massively. The difference in coding gain between a small matrix and a big matrix is small compared to the massive gain of actually adding a FEC scheme. A large matrix would therefore probably be preferred for most service providers as the IP packet overhead is lower. However using a large matrix means that the latency to decode the transport stream is increased. Using a small matrix will reduce the latency of the system but will obviously significantly increase the overhead.

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# Annex L

## Alarm List

The following table lists the alarm and failure identifiers generated within the Encoder.

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
00000000	LCD Not Found	Failed to initialise the LCD Front Panel.	Alarm	General
00000004	Temp Sensor Busy	No response from Temperature Sensor Device	Alarm	General
00000005	Temp Sensor Comms	"Incorrect Data, or failure in CRC read from Device"	Alarm	General
00000009	FPGA Boot Fail	Failed to boot the internal FPGA/Mux.	Alarm	General
00000010	Over Temperature	Over 55° Centigrade	Alarm	General
00000011	Under Temperature	Under 0° Centigrade	Alarm	General
00000014	Invalid Option Modules	"The combination of option modules fitted, does not match any of the allowed configurations for the Backplane."	Fail	General
00000015	Test Error	For Debug use only	Alarm	General
00000016	Video Module	The encoder was unable to either detect or initialise the MPEG-2 Video Module.	Alarm	General
00000017	Audio A Module	The encoder was unable to either detect or initialise the Motherboard Audio A Module.	Alarm	General
00000018	Audio B Module	The encoder was unable to either detect or initialise the Motherboard Audio B Module.	Alarm	General
00000019	Option Slot 1	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000020	Option Slot 2	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000021	Option Slot 3	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000022	Option Slot 4	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000023	Option Slot 5	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000024	Option Slot 6	"Valid Dual Port RAM found, but the option module is either unknown, or was not booted successfully."	Alarm	General
00000025	Duplicate PMT PID	The selected PID value clashes with another.	Alarm	General
00000026	Invalid PMT PID	The selected PID value is out of range.	Alarm	General
00000027	Duplicate PCR PID	The selected PID value clashes with another.	Alarm	General

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
00000028	Invalid PCR PID	The selected PID value is out of range.	Alarm	General
00000029	System Clock Not Locked	Input clock not locked to the External Sync Source.	Alarm	General
00000030	Mux PCR not incrementing	The internal PCR counter is not incrementing. The FPGA/Mux has stopped running.	Fail	General
00000031	FPGA (Mux) Code Missing From Flash	The FPGA/Mux code is not in Flash Memory. Unable to initialise the Device.	Fail	General
00000032	NVRam Battery Fault	NVRam battery low or disconnected.	Fail	General
00000035	PCR/VITC Ethernet Send	Failed sending the MHP/VITC data over UDP/IP.	Alarm	General
00000036	Invalid Firmware Version	The FPGA/Mux code is not valid for the option modules detected. Please upgrade the firmware to the latest version.	Fail	General
00000037	Duplicate Splice (SCTE-35) PID	The selected PID value clashes with another.	Alarm	General
00000038	Invalid Splice (SCTE-35) PID	The selected PID value is out of range.	Alarm	General
00000041	SNMP Undo Fail	Error when processing an SNMP SET command and error restoring the Encoder configuration.	Alarm	Remote Control
00000042	SNTP Server Not Found	No reply received from the SNTP Server.	Alarm	Remote Control
00000080	SI Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000081	VBI Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000082	Audio 1 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000083	Audio 2 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000084	Video Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000085	Backplane Stream 1 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000086	Backplane Stream 2 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000087	Backplane Stream 3 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000088	Backplane Stream 4 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000089	Backplane Stream 5 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000090	Backplane Stream 6 Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000091	RS232 Data (Mbd) Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000092	RS422 Data (Mbd) Packet Error	Incomplete packet detected by the internal Mux.	Alarm	Mux
00000120	Comms Error	"Not set in normal operation. For use with MEM controller, to force a new config download as a result of an error."	Alarm	Video Source
00000121	Video Lock(Composite)	Composite video input unlocked.	Alarm	Video Source
00000122	Video Lock (SDI)	Digital video input unlocked.	Alarm	Video Source
00000123	Video Line Standard	Incorrect video line-standard.	Alarm	Video Source
00000124	EDH Full Field Error	Error on the video (SDI) input.	Alarm	Video Source
00000125	EDH Full Field Unknown Error	Error on the video (SDI) input.	Masked	Video Source
00000126	EDH Full Field Internal	Error on the video (SDI) input.	Alarm	Video Source

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
	Error Already			
00000127	EDH Full Field Error Already	Error on the video (SDI) input.	Alarm	Video Source
00000128	EDH Picture Error	Error on the video (SDI) input.	Alarm	Video Source
00000129	EDH Picture Unknown Error	Error on the video (SDI) input.	Masked	Video Source
00000130	EDH Picture Internal Error Already	Error on the video (SDI) input.	Alarm	Video Source
00000131	EDH Picture Error Already	Error on the video (SDI) input.	Alarm	Video Source
00000132	EDH Anc. Data Error	Error on the video (SDI) input.	Alarm	Video Source
00000133	EDH Anc. Data Unknown Error	Error on the video (SDI) input.	Masked	Video Source
00000134	EDH Anc. Data Internal Error Already	Error on the video (SDI) input.	Alarm	Video Source
00000135	EDH Anc. Data Error Already	Error on the video (SDI) input.	Alarm	Video Source
00000136	Composite Input Calibration	The composite video input is not calibrated.	Alarm	Video Source
00000137	Freeze Frame on Input	The number of still video frames exceeds the configured value of Video Source/Max Still Period.	Alarm	Video Source
00000138	Freeze Frame and Audio Silence	Freeze frame on the input combined with audio silence.	Alarm	Video Source
00000139	Video Lock (HD SDI)	Digital video input (HD) unlocked.	Alarm	Video Source
00000140	SD Video Loss (HD)	Digital video input unlocked (HD).	Masked	Video Source
00000160	Duplicate VBI PID	The selected PID value clashes with another.	Alarm	VBI/Userdata
00000161	Invalid VBI PID	The selected PID value is out of range.	Alarm	VBI/Userdata
00000162	Duplicate Teletext PID	The selected PID value clashes with another.	Alarm	VBI/Userdata
00000163	Invalid Teletext PID	The selected PID value is out of range.	Alarm	VBI/Userdata
00000164	Closed Caption (Line 21) Detection	Detection failure on the configured video line/s.	Masked	VBI/Userdata
00000165	Closed Caption (Field 2) Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000166	Nielsen/AMOL I Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000167	Nielsen/AMOL II Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000168	VPS Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000169	WSS Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000170	VITC Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000171	Video Index Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000172	No Teletext Data Detected	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000173	No Inverted Teletext Data Detected	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000174	VBI PID Delay too long	Insufficient space in the buffers to delay the VBI. The maximum VBI delay is 120 frames.	Alarm	VBI/Userdata
00000175	VITC Different on each field	Each field of a video frame has a different time code. This prevents the Splice Point insertion from working correctly.	Alarm	VBI/Userdata
00000176	Serial Closed Captions Data	Serial interface errors.	Alarm	VBI/Userdata

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
00000177	Too many Monochrome 4:2:2 lines	A maximum of 2 lines per frame are permitted.	Alarm	VBI/Userdata
00000178	Video Index/WSS-AFD not set in VBI	"The AFD is configured in the Video Module, but the Encoder is not configured to decode AFD from the VBI."	Alarm	VBI/Userdata
00000179	Gemstar2x Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000180	NABTS Data Detection	Detection failure on the configured video line/s.	Alarm	VBI/Userdata
00000181	VITC CRC Error	CRC error on the VITC stream.	Alarm	VBI/Userdata
00000200	Comms Error	"Not set in normal operation. For use with MEM controller, to force a new config download as a result of an error."	Alarm	Video Encoder
00000201	Config Update	Mismatch between the requested and the actual configuration of the Video Encoder.	Alarm	Video Encoder
00000202	VCM Stopped	Option card general failure.	Alarm	Video Encoder
00000203	Bad Parameters	At least one configuration parameter is incorrect.	Alarm	Video Encoder
00000204	Duplicate PID	The selected PID value clashes with another.	Alarm	Video Encoder
00000205	Invalid PID	The selected PID value is out of range.	Alarm	Video Encoder
00000206	"VBI, Bit-rate too low"	The Video bit-rate is less than 4.5 Mbits/s. This may cause errors when passing VBI information as part of the picture.	Alarm	Video Encoder
00000207	"VBI, Hor Res too low"	The Video is less than full resolution. This may cause errors when passing VBI information as part of the picture.	Alarm	Video Encoder
00000208	Mux Bit-rate too low	"The output bit-rate is too low. The Video Encoding will be switched off, until the output bit-rate is high enough to allow for the minimum video bit-rate."	Alarm	Video Encoder
00000209	No Interrupt	Error reported by the Video Module.	Alarm	Video Encoder
00000210	DSP Overrun	Error reported by the Video Module.	Alarm	Video Encoder
00000211	Boot Fail	Error reported by the Video Module.	Alarm	Video Encoder
00000212	Bad Frame Rate	Error reported by the Video Module.	Alarm	Video Encoder
00000213	Rate Buffer OF/UF	Error reported by the Video Module. Overflow or Underflow.	Alarm	Video Encoder
00000214	DSP Health	Error reported by the Video Module.	Alarm	Video Encoder
00000215	Bad Filter Coeffs	Error reported by the Video Module.	Alarm	Video Encoder
00000216	Repeated PCR Resync	Error reported by the Video Module.	Alarm	Video Encoder
00000217	Coding Mode Error	Error reported by the Video Module.	Alarm	Video Encoder
00000218	PCR Error	The Video Module detected discontinuity in the PCR count.	Alarm	Video Encoder
00000219	No PowerUp Tests	Error reported by the Video Module.	Alarm	Video Encoder
00000220	No Reflex Messages	"While in reflex mode, the period between consecutive messages is longer than 1 second."	Alarm	Video Encoder
00000221	Invalid Reflex Bit-Rate	"While in reflex mode, the reflex bit-rate is too low."	Alarm	Video Encoder
00000222	"Reflex Msgs, Not Enabled"	The licenced reflex feature is not enabled while receiving valid messages.	Alarm	Video Encoder
00000223	"Reflex Msgs, No VBR Licence"	The reflex feature is not licenced while receiving valid messages.	Alarm	Video Encoder
00000280	Module Fault	Applies to the Motherboard modules only. The audio module has failed to boot.	Alarm	Audio A
00000281	Comms Error	"Not set in normal operation. For use with MEM controller, to force a new config download as a result of an error."	Alarm	Audio A
00000282	Config Update	The audio module is not responding correctly to the requested config.	Alarm	Audio A
00000284	Incorrect Parameters	One or more parameters are incorrect.	Alarm	Audio A

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
00000285	PCR Error	Unable to read the internal PCR count.	Alarm	Audio A
00000286	Silence Timeout Left	The audio level of the left channel was below the silence threshold longer than the programmed timeout.	Alarm	Audio A
00000287	Silence Timeout Right	The audio level of the right channel was below the silence threshold longer than the programmed timeout.	Alarm	Audio A
00000288	Level Clipping Left	The audio level of the left channel is above the clipping threshold.	Alarm	Audio A
00000289	Level Clipping Right	The audio level of the right channel is above the clipping threshold.	Alarm	Audio A
00000290	Embedded Source 1	The embedded audio input source is missing.	Alarm	Audio A
00000291	Embedded Source 2	The embedded audio input source is missing.	Alarm	Audio A
00000292	Embedded Source 3	The embedded audio input source is missing.	Alarm	Audio A
00000293	Embedded Source 4	The embedded audio input source is missing.	Alarm	Audio A
00000294	AC-3 Input Invalid	No input stream when the coding is Dolby digital AC3 pass-thru.	Alarm	Audio A
00000295	No Digital Input	Too many errors on the digital audio input.	Alarm	Audio A
00000296	Mux FIFO Overflow	Error on the internal Mux input. The audio channel will be reset.	Alarm	Audio A
00000297	Duplicate PID	The selected PID value clashes with another.	Alarm	Audio A
00000298	Invalid PID	The selected PID value is out of range.	Alarm	Audio A
00000299	Mux Bit-rate too low	The output bit-rate is too low. The audio output will be switched off.	Alarm	Audio A
00000300	Audio Un-Calibrated	The analog audio input is not calibrated.	Alarm	Audio A
00000301	Lip Sync Error	The requested delay exceeds the maximum value allowed for the current coding standard and hardware.	Alarm	Audio A
00000302	Invalid Sampling Rate	The sampling frequency is incompatible with the coding mode Dolby digital AC3 pass-thru.	Alarm	Audio A
00000303	ADS Input Invalid	Unable to detect valid MPEG-2/Audio Descriptor Service on input.	Alarm	Audio A
00000304	DTS Input Invalid	Unable to detect a valid DTS Audio stream on input.	Alarm	Audio A
00000320	Module Fault	Applies to the Motherboard modules only. The audio module has failed to boot.	Alarm	Audio B
00000321	Comms Error	"Not set in normal operation. For use with MEM controller, to force a new config download as a result of an error."	Alarm	Audio B
00000322	Config Update	The audio module is not responding correctly to the requested config.	Alarm	Audio B
00000324	Incorrect Parameters	One or more parameters are incorrect.	Alarm	Audio B
00000325	PCR Error	Unable to read the internal PCR count.	Alarm	Audio B
00000326	Silence Timeout Left	The audio level of the left channel was below the silence threshold longer than the programmed timeout.	Alarm	Audio B
00000327	Silence Timeout Right	The audio level of the right channel was below the silence threshold longer than the programmed timeout.	Alarm	Audio B
00000328	Level Clipping Left	The audio level of the left channel is above the clipping threshold.	Alarm	Audio B
00000329	Level Clipping Right	The audio level of the right channel is above the clipping threshold.	Alarm	Audio B
00000330	Embedded Source 1	The embedded audio input source is missing.	Alarm	Audio B
00000331	Embedded Source 2	The embedded audio input source is missing.	Alarm	Audio B
00000332	Embedded Source 3	The embedded audio input source is missing.	Alarm	Audio B
00000333	Embedded Source 4	The embedded audio input source is missing.	Alarm	Audio B
00000334	AC-3 Input Invalid	No input stream when the coding is Dolby digital AC3 pass-thru.	Alarm	Audio B
00000335	No Digital Input	Too many errors on the digital audio input.	Alarm	Audio B
00000336	Mux FIFO Overflow	Error on the internal Mux input. The audio channel will be reset.	Alarm	Audio B

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
00000337	Duplicate PID	The selected PID value clashes with another.	Alarm	Audio B
00000338	Invalid PID	The selected PID value is out of range.	Alarm	Audio B
00000339	Mux Bit-rate too low	The output bit-rate is too low. The audio output will be switched off.	Alarm	Audio B
00000340	Audio Un-Calibrated	The analog audio input is not calibrated.	Alarm	Audio B
00000341	Lip Sync Error	The requested delay exceeds the maximum value allowed for the current coding standard and hardware.	Alarm	Audio B
00000342	Invalid Sampling Rate	The sampling frequency is incompatible with the coding mode Dolby digital AC3 pass-thru.	Alarm	Audio B
00000343	ADS Input Invalid	Unable to detect valid MPEG-2/Audio Descriptor Service on input.	Alarm	Audio B
00000344	DTS Input Invalid	Unable to detect a valid DTS Audio stream on input.	Alarm	Audio B
00000440	Duplicate PID	The selected PID value clashes with another.	Alarm	Data C - Ethernet Data
00000441	Invalid PID	The selected PID value is out of range.	Alarm	Data C - Ethernet Data
00000442	PID MissMatch	The selected PID value clashes with another.	Alarm	Data C - Ethernet Data
00000443	Mux FIFO Full	No space left in the mux FIFO.	Alarm	Data C - Ethernet Data
01000000	Overflow on Input 1	Input overflow (ASI external input).	Alarm	Remux Module
01000001	Overflow on Input 2	Input overflow (ASI external input).	Alarm	Remux Module
01000002	Overflow on Input 3	Input overflow (ASI external input).	Alarm	Remux Module
01000003	Overflow Motherboard O/P	Input overflow (backplane internal input).	Alarm	Remux Module
01000004	Remux Card Stopped	Option card general failure.	Alarm	Remux Module
01000005	Motherboard O/P TS	The input effective bandwidth exceeds the output.	Alarm	Remux Module
01000006	Motherboard O/P to Remux Not Locked	The output from the option module cannot lock to the motherboard reference bit-rate.	Alarm	Remux Module
01000007	Remux ASI Input 1 Not Locked	The service input is unlocked.	Alarm	Remux Module
01000008	Remux ASI Input 2 Not Locked	The service input is unlocked.	Alarm	Remux Module
01000009	Remux ASI Input 3 Not Locked	The service input is unlocked.	Alarm	Remux Module
01000010	PSIP/DATA Input 1 Not Locked	The external PSIP/DATA input is unlocked.	Alarm	Remux Module
01000011	PSIP/DATA Input 2 Not Locked	The external PSIP/DATA input is unlocked.	Alarm	Remux Module
01000012	PSIP/DATA Input 3 Not Locked	The external PSIP/DATA input is unlocked.	Alarm	Remux Module
01000360	Comms Error	"Not set in normal operation. For use with MEM controller, to force a new config download as a result of an error."	Alarm	Data A - RS232
01000361	Config Update	The data module is not responding correctly to the requested config.	Alarm	Data A - RS232
01000362	Processor Stopped	Too many configuration errors.	Alarm	Data A - RS232
01000363	Duplicate PID	The selected PID value clashes with another.	Alarm	Data A - RS232
01000364	Invalid PID	The selected PID value is out of range.	Alarm	Data A - RS232
01000365	Mux Bit-rate too low	The output bit-rate is too low. The mux stream is not active.	Alarm	Data A - RS232
01000366	Mux FIFO Full	No space left in the mux FIFO.	Alarm	Data A - RS232
01000400	Comms Error	"Not set in normal operation. For use with MEM controller, to force	Alarm	Data B - RS422

Alarm Id	Alarm Name	Alarm Description	Level	Source Module
		a new config download as a result of an error."		
01000401	Config Update	The data module is not responding correctly to the requested config.	Alarm	Data B - RS422
01000402	Processor Stopped	Too many configuration errors.	Alarm	Data B - RS422
01000403	Duplicate PID	The selected PID value clashes with another.	Alarm	Data B - RS422
01000404	Invalid PID	The selected PID value is out of range.	Alarm	Data B - RS422
01000405	Mux Bit-rate too low	The output bit-rate is too low. The mux stream is not active.	Alarm	Data B - RS422
01000406	Data Overflow	Input overflow in the data module.	Alarm	Data B - RS422
01000407	Data Underflow	Input underflow in the data module.	Alarm	Data B - RS422
01000408	Input not Locked	The data input was unlocked longer than 5 seconds.	Alarm	Data B - RS422
05000001	IRD TS Lock	Input source not locked.	Masked	IRD Module
05000002	IRD Demod Lock	Demod. input source not locked.	Masked	IRD Module
05000003	IRD BER	The BER of the demod. input source is above the configured threshold.	Masked	IRD Module
05000004	IRD Video	Video not running or video source missing.	Masked	IRD Module
05000005	IRD Audio1	Audio not running or audio source stream missing.	Masked	IRD Module
05000006	IRD Audio2	Audio not running or audio source stream missing.	Masked	IRD Module
05000007	IRD Sync Data	Sync. data source missing.	Masked	IRD Module
05000008	IRD Async Data	Async. data source missing.	Masked	IRD Module
05000009	IRD Subtitles	Subtitles source stream missing.	Masked	IRD Module
05000010	IRD Teletext	Teletext source stream missing.	Masked	IRD Module
05000011	IRD VBI	VBI source stream missing.	Masked	IRD Module
05000012	IRD Demod Tracking	While in tracking mode the modulation type or the FEC scheme do not match the demod. hardware.	Masked	IRD Module
05000013	IRD Demod ASI Lock	The demod. ASI input is not locked.	Masked	IRD Module
07000033	CA Module Not Present	CA feature enabled and the CA module is absent.	Masked	General
07000034	CA Module Boot Fail	The download of the CA module has failed.	Alarm	General
XXXXX10	E4 No Response	Error reported by the E4 Module.	Alarm	Video Encoder
XXXXX11	Initialisation Error	Error reported by the E4 Module.	Alarm	Video Encoder
XXXXX12	PCR Error	The Video Module detected discontinuity in the PCR count.	Alarm	Video Encoder
XXXXX13	Rate Buffer OF/UF	Error reported by the Video Module. Overflow or Underflow.	Alarm	Video Encoder
XXXXX14	Rate Buffer Empty	Error reported by the E4 Module.	Alarm	Video Encoder
XXXXX15	E4 Has Reset	Error reported by the E4 Module.	Alarm	Video Encoder
XXXXX16	HD MultiPass Error	HD configuration failure.	Alarm	Video Encoder
XXXXXX0	ATM Interface	Internal error with the module interface.	Alarm	ATM Module
XXXXXX0	Tx Loss of Sync	No response error.	Fail	G.703 Output
XXXXXX0	No Response	Internal error with the module interface.	Alarm	IP Streamer
XXXXXXX1	Link Down	No valid network detected at the output of the IP Streamer option module.	Alarm	IP Streamer
XXXXXXX2	ARP Unresolved	Error reported by the option module.	Masked	IP Streamer
XXXXXXX3	Out Of Sync	Error reported by the option module.	Alarm	IP Streamer
XXXXXXX4	Packets Discarded	Error reported by the option module.	Alarm	IP Streamer
XXXXXXX9	E4 Comms Sequence Number	Error reported by the E4 Module.	Alarm	Video Encoder

