TANDBERG television
Part of the Ericsson Group

ST.RE.E10074.5
Issue 5
ENGLISH (UK)

REFERENCE GUIDE

for the

E5710, E5720, E5770 and E5775 Range of Encoders

Build Version 3.11.0 and later

1U Encoder

2U Encoder

evolution5000

ENGLISH (UK)

READ THIS FIRST!

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

Also, translation into any EC official language of this manual can be made available, at your cost.

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Vi kan også for Deres regning levere en dansk oversættelse af denne håndbog.

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Αν δεν καταλάβετε το περιεχόμενο αυτού του βοηθήματος/εγχειριδίου
ΜΗΝ ΛΕΙΤΟΥΡΓΗΣΕΤΕ ΑΥΤΟΝ ΤΟΝ ΕΞΟΠΛΙΣΜΟ.

Επίσης, αυτό το εγχειρίδιο είναι διαθέσιμο σε μετάφραση σε αυτή τη γλώσσα και μπορείτε να το αγοράσετε.

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Si no entiende el contenido de este manual
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Podemos asimismo suministrarle una traducción de este manual al (idioma) previo pago de una cantidad adicional que deberá abonar usted mismo.

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TANDBERG TELEVISION LTD

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SO30 4DA
UNITED KINGDOM

Registered Company Number 03695535

List of Contents

About this Reference Guide

This Reference Guide provides instructions and information for the installation and operation of the 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 on the relevant documentation.

Issues of this Reference Guide are listed below:

Issue	Date	Build Version	Comments
1	June 2003	3.2	Initial release.
2	April 2004	3.5 and later	Updated to reflect build version 3.5 and the inclusion of the E5710, E5770 and E5775 Encoders.
3	January 2005	3.6.0 and later	Include functionality of SV 3.6.0. Delete obsolete options. Add GPI option card.
3r1	October 2005	3.6.0 and later	Revised chassis, air-flow details and TUV requirements added
4	January 2006	3.9.0 and later	Includes functionality of SVs 3.7.0, 3.8.0 and 3.9.0. New option modules.
5	June 2007	3.11.0 and later	Includes functionality of SVs 3.10.0 and 3.11.0.

> NOTE...
> The Build Version in the table refers to an overall number which encompasses all the various software/firmware versions of video, audio, etc in the Base Board.

The following Publications are also associated with this equipment:

- ST.US.E10074: User Guide
- 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.

Acknowledgements

General

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

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Warnings, Cautions and Notes

Heed Warnings

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

Read Instructions

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

Follow Instructions

All operating and use instructions should be followed.

Retain Instructions

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

WARNINGS....

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

CAUTIONS...

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

NOTES...

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

EMC Compliance

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

Contact Information

TANDBERG Television Customer Services

Support Services

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

Warranty

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

Levels of Continuing TANDBERG Television Service Support

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

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

Call TANDBERG Sales for more details.

Where to Find Us

Europe, Middle East and Africa:	+44 (0) 23 8048 4455 Fax: +44 (0) 23 8048 4467 support@tandbergtv.com
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China:	+86 10 6856 0260 (Beijing) +852 2530 3215 (Hong Kong) fieldservice-asia@tandbergtv.com
Australia/NZ:	+612 8923 0450 fieldservice-australia@tandbergtv.com
Internet Address:	http://www.tandbergtv.com

Technical Training

Training Courses

TANDBERG Television provides a wide range of training courses on the operation and maintenance of our products and on their supporting technologies. TANDBERG can provide both regularly scheduled courses and training tailored to individual needs. Courses can be run either at your premises or at one of our dedicated training facilities.

Where to Find Us

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

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

Customer Services and Technical Training Postal Address

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

Return of Equipment

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

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

Technical Publications

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

Chapter 1

Introduction to the Basic Encoder

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1.1 Scope of This Reference Guide

1.1.1 Who Should Use This Reference Guide

This Reference Guide is intended for operators/users of the E5710 (1U) and E5720 (2U) Encoders. Also included are their associated multi-pass Encoders E5770 (1U) and E5775 (2U). It is written 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.

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. This Guide focuses on operating the Encoder via the Front Panel and highlights some specific aspects of the Web browser control. It does not cover the Engineering menu or the use of a Telnet session.

1.1.2 Build Version

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

Table 1.1: Build Version

	E5710, E5720	E5770, E5775
Build Version	3.11.1 and later	3.11.1 and later

The Build version indicates the status of the Encoder and refers to an overall number which 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

Figure 1.1: E5710/E5770 Encoder Front View

Figure 1.2: E5720/E5775 Encoder Front View

Table 1.2: Equipment Model Descriptions

Model Number	Part Number	Marketing Code	Description
E5710 Encoder	E10074	M2/ENC/E5710	1U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation. Available with the Reflex[2] option.
E5710 Encoder (-48 V version)	E10113	M2/ENC/E5710/48V	An M2/ENC/E5710 Encoder with –48 Vdc input.
E5720 Encoder	E10075	M2/ENC/E5720	2U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation. Available with the Reflex[2] option.
E5720 Encoder (-48 Vdc version)	E10115	M2/ENC/E5720/48V	An M2/ENC/E5720 Encoder with –48 Vdc input.
E5770 Encoder	E10158	M2/ENC/E5770	1U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation. Available with the Reflex[2] option. Also has multi-pass encoding capability for improved performance.
E5775 Encoder	E10165	M2/ENC/E5775	2U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation. Available with the Reflex[2] option. Also has multi-pass encoding capability for improved performance.

1.2 Summary of Features

1.2.1 Video Encoding

MPEG-2 Encoding

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

- The MPEG-2 Main profile @ Main level (MP@ML) specification (ISO/IEC 13818)
- The MPEG-2 4:2:2[1] profile @ Main Level (422P@ML) specification (ISO/IEC 13818)

Multi-pass Encoding

Encoders fitted with the optional M2/EOM2/MPM module are capable of multi-pass encoding. This includes E5770 and E5775 Multi-pass Encoders, and upgraded versions of the E5710 and E5720 Encoders.

[1] 4:2:2 is only available when software option M2/ESO2/422 is purchased.
[2] Reflex is only available when software option M2/ESO2/VBR 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.

The video signal in a Multi-pass Encoder is analysed and compressed at several pre-processing stages before the actual encoding takes place. E5770/E5775 Encoders are referred to as 'multi-pass' because the M2/EOM2/MPM module operates in addition to the existing forward analysis of a 'standard' E5710/E5720 Encoder. This additional analysis is used to generate more accurate bitrate predictions and so further increase the efficiency gains achieved by Reflex.

Multi-pass Encoders have an option which will allow the de-interlacing of slow-moving material to provide better coding efficiencies. Top/bottom smoothing is a first step to border processing and helps eliminate half-lines at the top and bottom of a picture. Half-lines produce disturbances when processing pictures edges.

Multi-pass Encoders also include a despeckle filter which complements the adaptive noise reduction on the motherboard so it can be used in conjunction to remove different types of noise. It is ideally suited for removing bit errors (median filtering) and film grain noise.

Video Encoding Modes

Either the 4:2:0 or 4:2:2[1] 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)

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).
  EIA 708 Closed Captions can be extracted from the SDI (SMPTE 334)
- Internal test pattern function

Serial Digital Video Input Error Detection and Handling (EDH)

The serial digital video input supports error detection and handling (EDH)[3] 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[1] standard coding modes
- Selectable bitrate operation, <1.5 Mbit/s - 50 Mbit/s (see *Table 1.3*)[4]

[3] Error detection and handling is not supported in software version 2.0.0.
[4] Bit-rates lower than 1.5 Mbit/s are only available when the software option M2/ESO2/PU is purchased.

- Support for the standard set of video picture resolutions (720, 704, 640, 544, 480, 352) in both 625 and 525 line operation. 352 supports full and half-vertical resolution in both 625 and 525 line operation
- Fully exhaustive motion estimation
- An internal frame synchroniser (see *Internal Frame Synchroniser* on *page 1-6*)
- Support for Active Format Descriptor (AFD) (see *Chapter 4, Operating the Equipment Locally, Table 4.34*)
- Support for a variety of Group of Pictures (GOP) structures with a variable number of B frames
- Built-in patented adaptive noise reduction circuitry[5]
- A logo overlay facility whereby the Encoder is able to overlay broadcasters trademarks/logos onto the active video
- On the E5770 and E5775, 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

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.

Variable Video Bitrate

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

Table 1.3: Video Bitrate Range [6]

Video Encoding Mode	
4:2:0	4:2:2[7]
1.5 Mbit/s - 15 Mbit/s	1.5 Mbit/s - 50 Mbit/s

NOTE...
Minimum bitrate is 0.25 Mbit/s when software option M2/ESO2/PU is purchased.

Coding Resolutions

To provide optimum picture quality over the full range of supported bitrates, the encoded picture resolution is controlled automatically according to the video bitrate. 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[8] used by the Encoder.

[5] Noise reduction is only available when software option M2/ESO2/NR is purchased.
[6] The video bit-rate depends on the Multiplexer bit-rate which is set.
[7] 4:2:2 is only available when software option M2/ESO2/422 is purchased.
[8] To ensure broadcast quality it is recommended that the studio reference is fed to HYSNC.

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)
- A freeze frame (with or without ident text)
- Cut to a black screen (with or without ident text)
- Drop the video PID
- Turn off the ASI output of the Encoder
- Display Stored OSD (Only available if the Encoder has an OSD loaded)

1.2.2 Audio Encoding

Coding Standards

Audio can be encoded to:

- MPEG-1 Audio (layer 2) standard (sampling rate 32 kHz or 48 kHz).
- Dolby Digital[9] (sampling rate 32 kHz or 48 kHz).

  Output bitrate 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 coding mode selectable between 1/0 and 2/0.
- Dolby Digital Pass-thru
  When a Dolby Digital input is applied to the audio input, the encoder will automatically detect the input standard (either Dolby Digital or Dolby Digital Plus) and output the stream in the correct format.
  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) [SMPTE 302M].
- Linear PCM (Via SRC) [sample rate converter]
- Dolby E Pass-thru.
- DTS Pass-thru.

> 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 Ω digital reference output.
- Alternatively, audio can be input embedded as AES/EBU on the serial digital interface (**SDI**). 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.

[9] Dolby Digital (AC-3) is only available when software option M2/ESO2/AC3 is purchased.

Audio Channels

The Encoder Base Board is capable of processing two stereo pairs, from any of the following[10]:

- SDI Embedded source
- Digital source AES/EBU
- Analogue source, termination impedance 600 Ω or 20 kΩ

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

Output on Digital Audio Loss

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

- Code an audio stream of silence
- Drop the audio PID
- Turn off the ASI output of the Encoder

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 - the signal is output to both XLR connectors at the receiving end. Not available in Linear PCM.
- **Dual mono:** the left and right signals are encoded and carried in the transport stream as a single Packetised Elementary Stream (PES) data stream. The way that the left and right signals are output from the Receiver is dependent on how the routing is set-up on the Receiver. Both the left and the right may be output, or the left only, or the right only. This is typically used for multilingual services. 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 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 Bitrate

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

[10] See *Annex F, Audio Modes* for details of setting up the audio.

Dolby Digital

Dolby Digital audio encoding incorporates digital normalisation, pre-processing (filtering), dynamic range compression and the addition of bitstream information. Dolby Pro Logic audio can be carried as stereo audio through the Encoder as long as a suitably high bitrate is selected (see *Annex B, Technical Specification*).

MPEG-2 Audio

The Encoder has an option (Align to PES) which enables MPEG-2 audio packets to be aligned to PES packets. When enabled, the MPEG PES packet contains an integer number of MPEG audio access units that are aligned to the start of the PES packet.

1.2.3 Vertical Blanking Interval (VBI) Line Processing Modes

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 bitrate, 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 Pull-down is active.

VBI User Data

Closed Caption data (525 and 625 lines), 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[11] (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.

[11] VITC (EBU and SMPTE), only timecode is extracted.

- 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
- Teletext Data
- Wide Screen Signalling (WSS) (line 23) ETS 300 294
- Gemstar2x
- EIA516 (NABTS)
- ARIB Data to ARIB standard - ARIB STD-B40 ver.1.0 and ARIB technical report - ARIB TR-B23 ver.1.1
- Video Index (for Pan Scan, Aspect Ratio and Active Format Descriptor)
- Video Index and other VBI data type from the same line
- 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

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.

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 options have been implemented from V3.10:

- Send Teletext Data in VBI PID
- Set Teletext Descriptors.

The following Teletext services are extractable:

- System B (WST) Teletext
- Video Programming Teletext (VPT), PDC (Packet 8/30 format 2)
- Inverted Teletext
- EIA516 (NABTS)

1.2.4 Data Channels

The basic Encoder supports two data channels, an asynchronous RS-232 and a synchronous RS-422. 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 RS-232 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.

1.2.5 Outputs

Three ASI-C (copper) outputs supplying a DVB and ATSC[12] MPEG-2 transport stream are supplied as standard.

[12] ATSC internal PSIP generation is not supported in Build versions 2.1.0 and 2.2.0.

1.2.6 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.

1.2.7 Options and Upgrades

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

1.3 Guided Tour

1.3.1 Enclosure

There are two sizes of enclosure, 1U and 2U versions. The enclosure can be freestanding or mounted in a 19-inch rack. All inputs and outputs are via rear panel connectors.

1.3.2 Front Panel Description

Front Panel Display, Navigation Keys, Softkeys, Keyboard

The E5710/E5770 Encoder provides navigation keys to access and input data. The E5720/E5775 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 1.3* and *Figure 1.5*).

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.

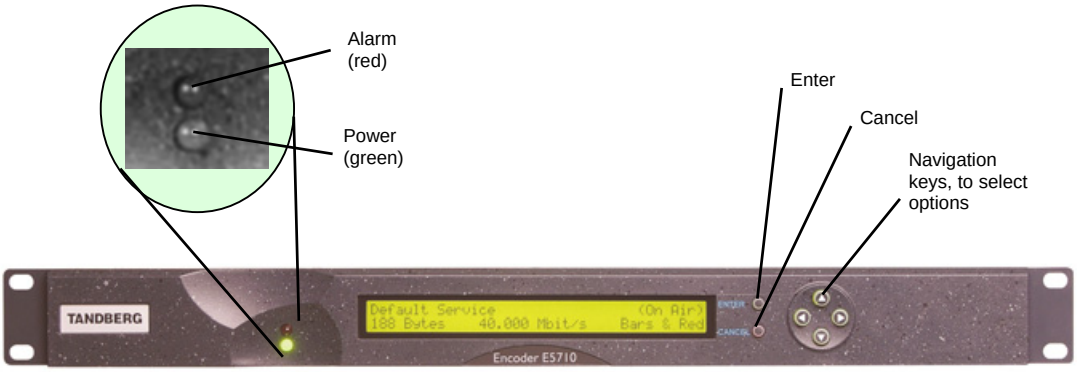


Figure 1.3: E5710/E5770 Front Panel Indicators

Power Supply Standby Switch

The use of this switch puts the Encoder into standby 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 1.4*).

> NOTE...
> Current versions of the 1U Encoder do not have this switch fitted.

WARNING...
THIS IS NOT A MAINS SWITCH AND WILL NOT ISOLATE THE ENCODER FROM THE POWER SUPPLY.

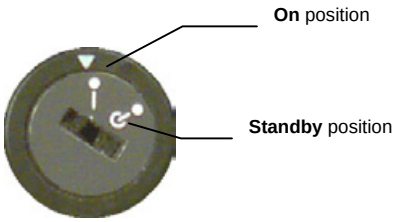


Figure 1.4: Standby Switch

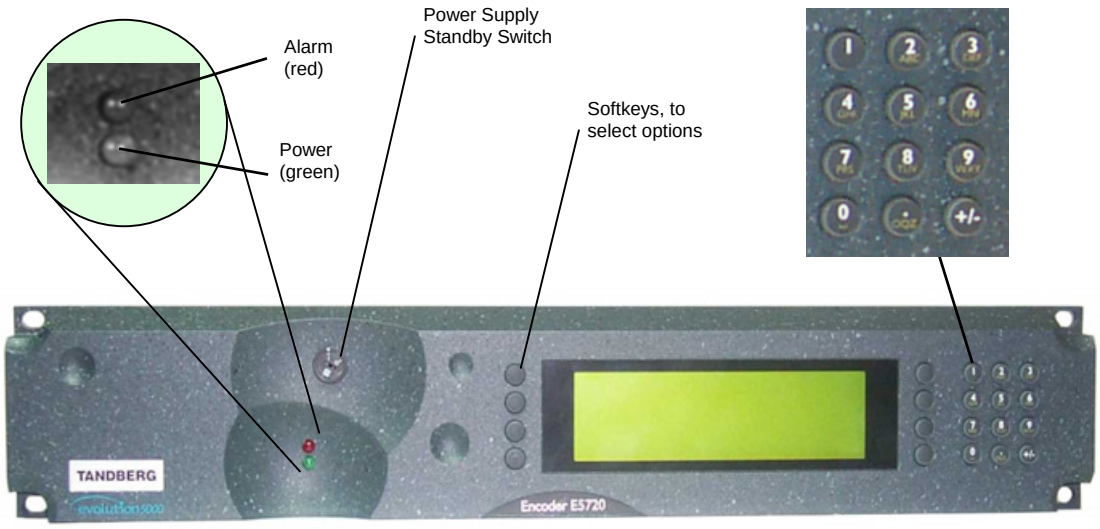


Figure 1.5: E5720/E5775 Front Panel Indicators

1.3.3 Rear Panel Description

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

Chapter 2

Installing the Equipment

Contents

List of Figures

List of Tables

2.1 Introduction

2.1.1 Read This First!

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

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

2.1.2 Site Requirements

Power Supplies

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

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

Models EN8030/BAS/48V SD Encoder and EN8090/BAS/48V HD Encoder operate from a –48 Vdc supply.

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 RE-APPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

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

2.1.3 EMC Compliance Statements[1]

EN 55022 / AS/NZS 3548

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

FCC

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

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

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

CAUTIONS...

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

Figure 2.1: Fitting the Encoder into a Rack (1U Encoder Shown)

> NOTE...
> Current versions are not fitted with the Standby switch.

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

Warnings and Cautions

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.

Introduction

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.

Model Types

Some versions of the 1U Encoder use a forced air-flow path, with fans on the side of the unit. With both 1U and 2U units it is important not to block the front air intake on the bottom-left corner of the front panel (see *Figure 2.2*).

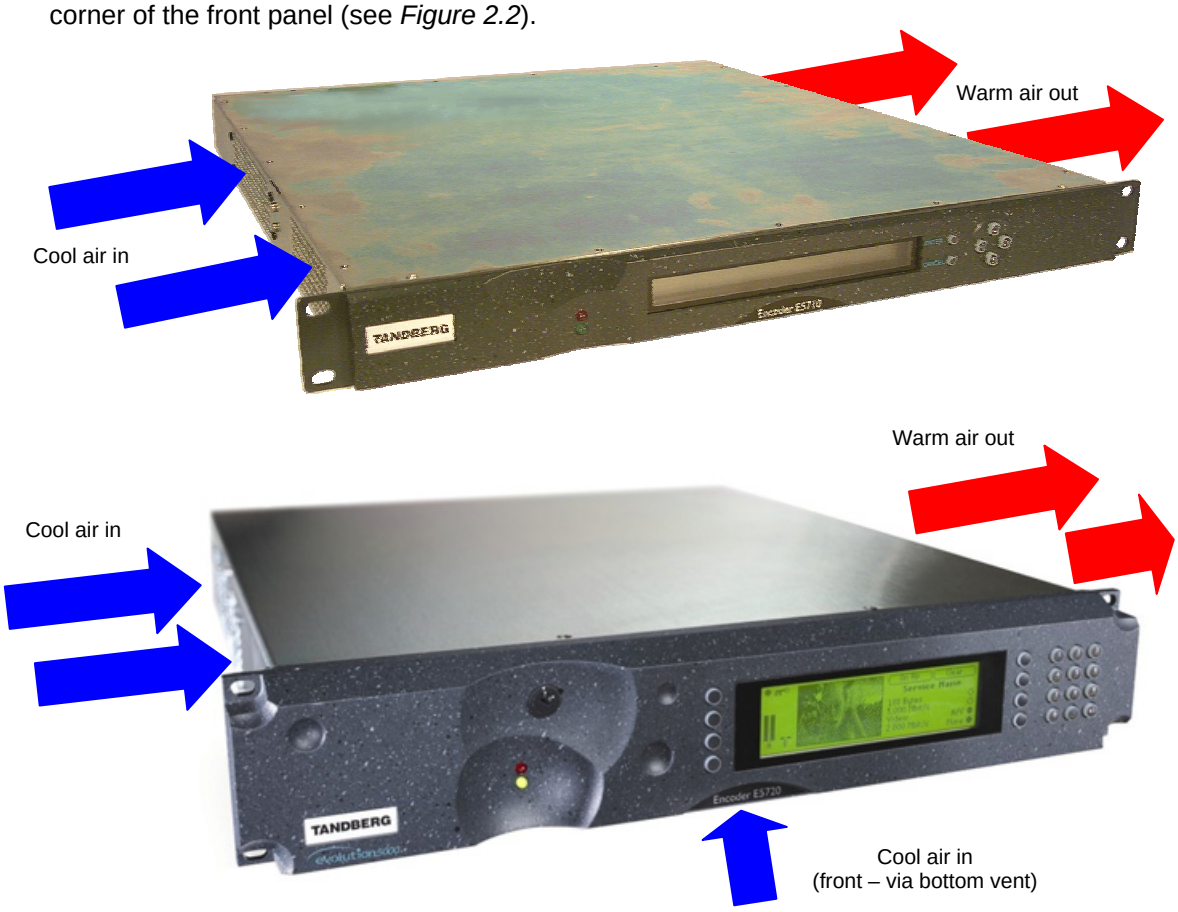


Figure 2.2: Air Path Through the 1U and 2U Enclosure

NOTE...

Later version of the Encoder does not have a front panel vent, air is taken in and expelled via the side panels.

2.4 A.C. Mains Operating Voltage and Earthing

2.4.1 A.C. Power Supply

CAUTION...

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

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

Protective Earth/Technical Earth

WARNINGS...

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

The unit has a Technical earth terminal (marked with ⏚) located at the rear panel (see *Figure 2.3, Figure 2.4* and *Figure 2.5*). 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 THE FOLLOWING:

1U ENCODER - M4 X 10 mm LONG POZIDRIV PANHEAD.

2U ENCODER - M5 X 12mm LONG POZIDRIV PANHEAD.

USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

Connecting the Encoder to the A.C. Power Supply

WARNINGS...

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

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

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

2.5 -48 Vdc Power Supply

2.5.1 D.C. Power Supply

NOTE...

Only models M2/ENC/E5710/48V and M2/ENC/E5720/48V use a d.c. power supply.

CAUTION...

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

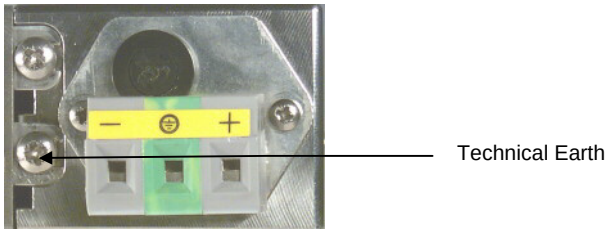
This product uses a –48 Vdc power supply source (see *Annex B, Technical Specification)* for a full power supply specification.

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

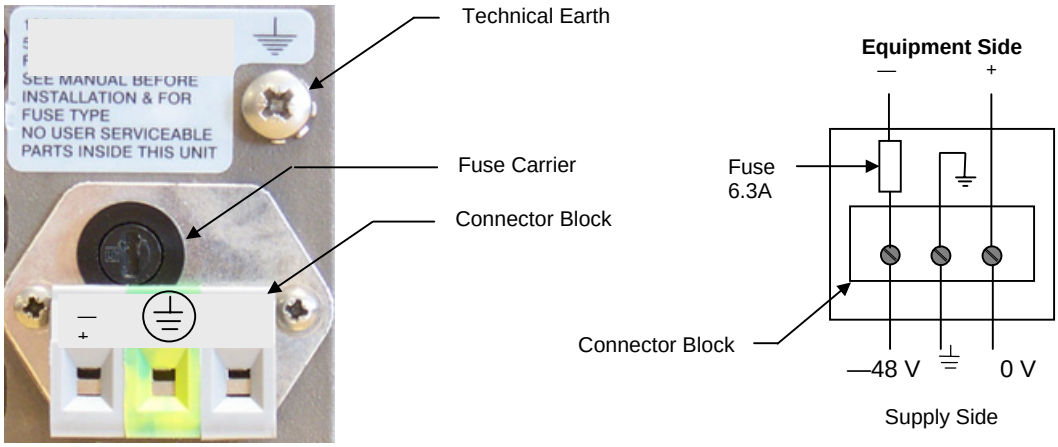
2.5.2 Location of the D.C. Input Connector

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

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



1U Encoder



2U Encoder

Figure 2.3: Connector Block for -48 Vdc Input

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

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

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

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

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

2.5.4 Protective Earth/Technical Earth

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

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

WARNING...
IF THE TERMINAL SCREW HAS TO BE REPLACED, USE THE FOLLOWING:
1U ENCODER - M4 X 10 mm LONG POZIDRIV PANHEAD.
2U ENCODER - M5 X 12mm LONG POZIDRIV PANHEAD.
USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

2.6 Signal Connections For the Basic Unit

2.6.1 Introduction

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

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

NOTE...
Figure 2.4 and *Figure 2.5* show the E5710 and E5720 Encoders respectively.
The E5770 and E5775 Encoders are similar but have the M2/EOM2/MPM module fitted in Option Slot 2 and 5 respectively. The module has a different rear panel configuration to that shown. The connectors associated with this module are not for use by the customer.

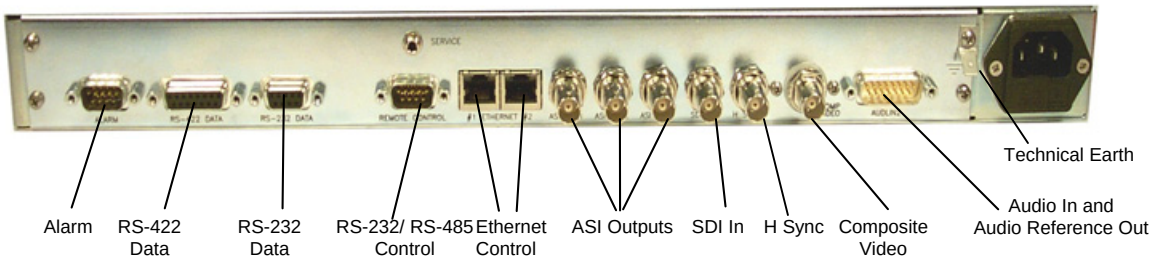


Figure 2.4: E5710 (1U) Rear Panel Component Parts and Connectors

NOTE...
Later version of the Encoder may have a different arrangement for the Technical Earth.

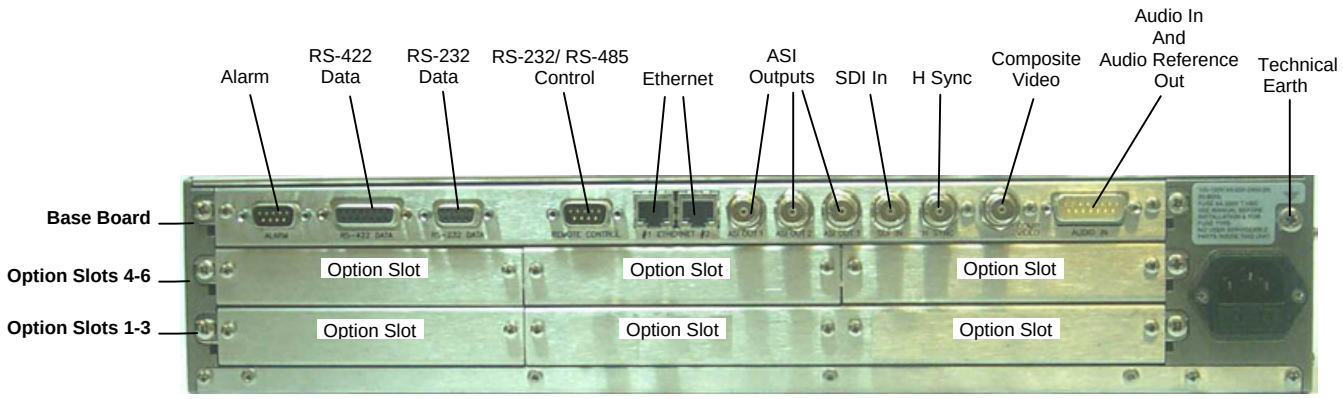


Figure 2.5: E5720 (2U) Rear Panel Component Parts and Connectors

2.6.2 Connecting Up the Basic Encoder

Once the unit has been installed in its intended operating position, it is ready to be connected up to the rest of the system equipment
(see *Figure 2.6*), providing it too has been installed (see *page 2-12* onwards for pin-out details of the connectors).

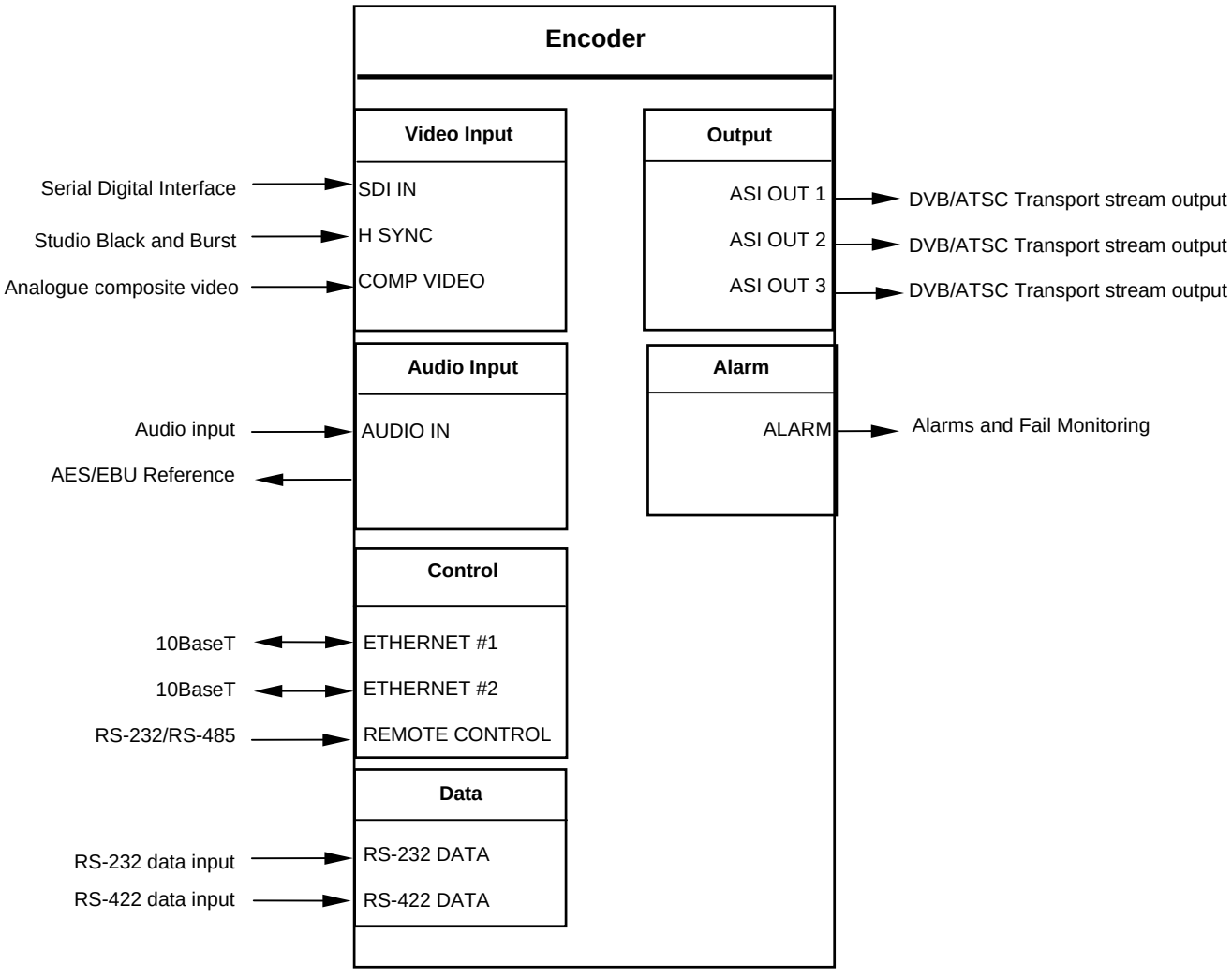


Figure 2.6: Equipment Connections for the Basic Unit

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

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

2.6.3 Power Supply

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

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

2.6.4 Technical Earth

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

2.6.5 Video Inputs

SDI IN

A 75 Ω BNC connector provides a serial digital video input to the unit. See *Chapter 4, Operating the Equipment Locally, Video Input Option* on *page 4-30* for the types of video and selection method. This input is terminated in 75 Ω.

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

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

Table 2.2: SDI Connector

Pin	Signal
Centre	Video Input
Screen	Ground
Impedance	75 Ω

H SYNC

Studio Black and Burst should be fed to the 75 Ω BNC connector (H SYNC). This will then genlock the Encoder to the Studio system. This method may be required with some audio formats, or for locking Encoders to an evolution *5000* Multiplexer. For details on the genlocking system see *Annex F, Audio Modes*.

Table 2.3: H SYNC Connector

Pin	Signal
Centre	Video Input
Screen	Ground
Impedance	75 Ω

COMP VIDEO

A 75 Ω BNC connector provides a high quality analogue video input to the unit. See *Chapter 4, Operating the Equipment Locally, Video Input Option* on *page 4-30* for the types of video and selection method.

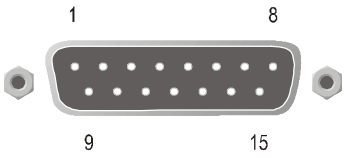
> NOTE...
> The input is differential to prevent 50 Hz/60 Hz hum.

Table 2.4: COMP VIDEO Connector

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

2.6.6 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 2.5: 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 kΩ or 600 Ω.
2. In AES/EBU mode termination is 110 Ω.
3. When the Encoder is powered down the digital channel is selected with 110 Ω termination.
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.

2.6.7 ASI OUT 1, 2 and 3 Outputs

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

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

Table 2.6: ASI OUT 1, 2 and 3 Connectors

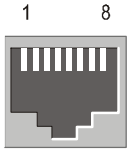
Pin	Signal
Centre	Signal
Screen	Ground

2.6.8 Control Interfaces

Connection

Operation of the Encoder from a TANDBERG Television control system is via the 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



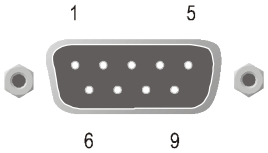
An 8-way, RJ-45 connector provides a 10BaseT Ethernet interface for communications with the MEM for control and monitoring. The Encoder has a single switched Ethernet channel. Ethernet#1 is selected as default at power-up. If a carrier is not detected on Ethernet#1 then the input switches to Ethernet#2.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

Table 2.7: 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.

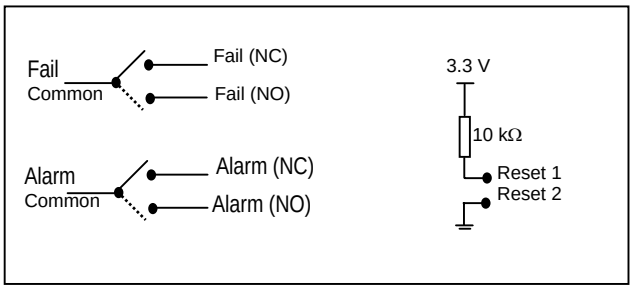


A 9-way, D-type male connector provides an alarm relay interface which can be used to send a signal to remote equipment.

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 2.8: Alarm Connector

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



NOTE...

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

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* on *page 4-23*). This connector is wired as a DTE.

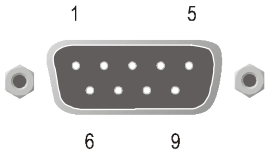


Table 2.9: Remote Control Connector (RS-232/ RS-485)

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...

1. 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.
2. A null modem connection must be used when connecting DTE together.

2.6.9 Data

RS-232 Connector

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

Table 2.10: 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.

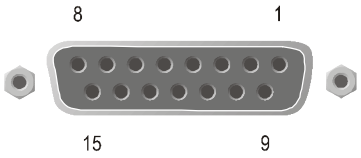


Table 2.11: RS-422 Data Connector (Base Board) - Synchronous

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.

2.7 Powering Up/Down

2.7.1 Before Powering Up

Before powering up the Encoder, check that:

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

2.7.2 Powering Up

To power up the Encoder:

1. Turn on the local power supply. The Encoder executes a series of power-up initialisation and self-test routines.
2. Confirm that the green Power LED is lit and that the red Alarm LED is unlit.
3. Ensure that the Stand-by switch is set to On (see *Chapter 1, Introduction, Figure 1.4*).

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

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

2.7.3 Powering Down

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

2.8 Setting the Encoder IP Address

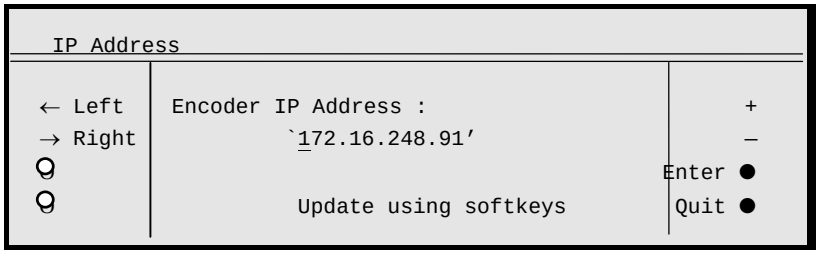
2.8.1 Methods of Changing the Encoder IP Address

If, for any reason, the IP address has to be changed, this can be achieved via the front panel menus (see *Section 4.5.4 Remote Control Menu*). The user may also set the network mask.

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

2.8.2 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.



Chapter 3

Options and Upgrades

Contents

List of Figures

List of Tables

3.1 What's Available

3.1.1 Hardware Options

The basic Encoder functionality can be enhanced with the inclusion of options, hardware and software. The tables in *Section 3.1* refer to 1U and 2U Encoders. These relate to the rack height of the equipment. *Table 3.1* lists the equipment against rack height for reference.

Table 3.1: Equipment Rack Heights

1U Height		2U Height	
E5710	1U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation.	E5720	2U MPEG-2 Encoder with 4:2:0/4:2:2[1] video encoding mode and fully exhaustive motion estimation.
E5770	As E5710 but also has multi-pass encoding capability for improved performance.	E5775	As E5720 but also has multi-pass encoding capability for improved performance.

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 3.2*.

When the appropriate software option has been purchased it is enabled in the Encoder, which resets and displays the appropriate menu items. See *Table 3.3* and *Table 3.4* for the software options.

Table 3.2: Hardware Option Module Positions

Marketing Code	Name	Assembly Part No	Card Part No	Slot No. in 1U	Slot No. in 2U	Max No. of Cards in 2U	Comments
Daughter Card Options							
M2/EDCOM2/BISS	BISS[2] scrambling option - Mode 0, 1 and BISS-E only - with secure key entry	S12284	S11484	—	—		
Hardware Options							
M2/EOM2/ASI-OPT	ASI Optical Output	S13514	S13330 + S13331	1	3, 6	1	Not fitted if M2/EOM2/ SSI-US fitted
M2/EOM2/ATMS34	PDH/E3 Module	S12510	S11906 + S11366		5, 4 or 6		Only one may be fitted.
M2/EOM2ATMS45	PDH/DS3 Module	S12509	S11906 + S11365		5, 4 or 6		
M2/EOM2/ATMS155MM	STM-1 OC3 Multimode Physical Interface Module (SDH STM-1/SONET STS-3c Multimode Optical)	S12494	S11906 + S8063		5, 4 or 6		
M2/EOM2/AUDLIN2	Additional Audio	S13181	S13167	1, 2	1, 4, 2, 5	3	Each card requires a separate AC-3 licence

[1] 4:2:2 is only available when software option M2/ESO2/422 is purchased.
[2] BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Marketing Code	Name	Assembly Part No	Card Part No	Slot No. in 1U	Slot No. in 2U	Max No. of Cards in 2U	Comments
M2/EOM2/GPI	GPI Card	S13586		1, 2	1, 2, 3, 4, 5, 6	1	
M2/EOM2/G703	G.703 Interface Card	S12915	S12914	1	3, 6 (pref)	1	
M2/EOM2/IP	IP Output Card	S12794	S12822	1	3, 5, 6	1	Not fitted if M2/EOM2/IP/PROFEC fitted
M2/ENC/MPM	Multi-pass Encoder Card	S13548	S13806 + S13346	2	5 and 6 (takes both slots)	1	Standard in E5770 and E5775
M2/EOM2/IP/PROFEC	IP Card Pro-MPEG FEC	S14121	S14150	1	3,5 or 6	1	Not fitted if M2/EOM2/IP fitted
M2/EOM2/IPTSDUAL	Dual GigE IP NIC	S14019		1	3,5 or 6	1	
M2/EOM2/REMUX	Remux Option Module	S12449	S10655	2	1	1	Remux related items added to menus
M2/EOM2/SSI-US	SMPTE 310 (SSI) Output	S12807	S10724	1	3, 6	1	Not fitted if M2/EOM2/ASI-OPT fitted

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

3.1.2 Purchasable Software Options for Standard Definition Mode

Table 3.3 lists the purchasable options which are associated with the Standard Definition Mode. Contact Customer Services for details.

Table 3.3: Purchasable Software Options

Marketing Code	Name	1U	2U	Additional menu items
M2/ESO2/NR	Noise Reduction	✓	✓	video source> noise reduction
M2/ESO2/PU	Performance Upgrade/Bitrate <1.5 Mbit/s	✓	✓	video encoder > long gops
M2/ESO2/VBR	Enables the variable bitrate encoding functionality	✓	✓	video encoder > reflex enable
M2/ESO2/422	4:2:2 video encoding mode	✓	✓	vbi/userdata> vbi in picture
M2/ESO2/RAS	RAS (Remote Authorisation System) mode	✓	✓	
M2/ESO2/ACON	Auto Concatenation	✓	✓	video encoder > concatination
M2/ESO2/AC3	Dolby Digital (AC-3) audio	✓	✓	
M2/ESO2/MHP	MHP timing Events	✓	✓	
M2/ESO2/DTS	DTS Audio	✓	✓	
M2/ESO2/525VBIDATA	NABTS and GEMSTAR 2.0 VBI extraction	✓	✓	
M2/ESO2/DPI	Allows the GPI purchasable option module to provide SCTE35 splicing.	✓	✓	system> dig program insertion (dpi) menu
M2/ESO2/EthernetData	Enables the reception of fully formed 188-byte transport packets on the Ethernet port coming in as UDP datagrams.	✓	✓	

3.1.3 Enabled Software Options

These models have some software options enabled as part of their configuration. These are listed in *Table 3.4*.

Table 3.4: Enabled Software Options

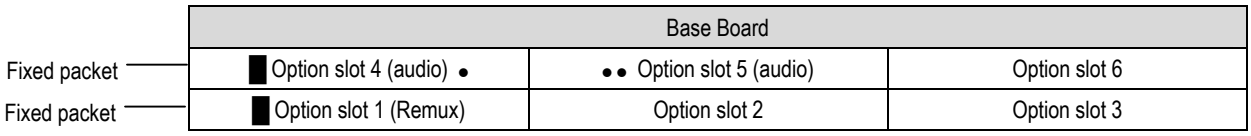
Option	Description	Availability	
		1U	2U
M2/EOM2/MPM M2/ESO2/PU	Ethernet socket in slot 4, MPM card in slot 5. PU licence key is enabled as standard.	—	E5775
	MPM fitted as standard in slot 2. PU licence key is enabled as standard.	E5770	—

3.1.4 Limitations on Number of Option Modules (E5720 Only)

There are six packet sources on the backplane for the use of option modules: one fixed packet source on each of option slots one and four; four floating packet sources for use in any of the option slots.

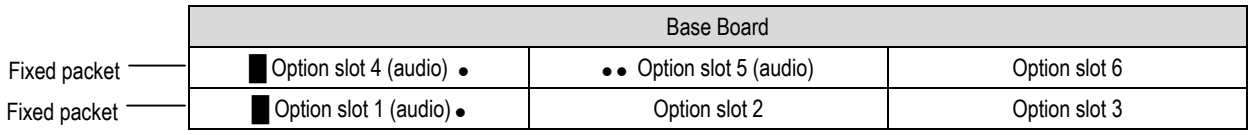
The additional audio (M2/EOM2/AUDLIN2) option uses two packet sources, whilst the Remux option (M2/EOM2/REMUX) uses none. However, because the Remux option can only go in option slot 1 then the fixed packet in that slot is not used.

If the Remux option is fitted then there can be a maximum of two other modules, leaving one spare packet source.



> NOTE...
> The packet sources are represented by squares for fixed packets, circles for floating ones.

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



3.1.5 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.

If the multi-pass module is fitted (M2/EOM2/MPM) then the only allowed additional option is Audio (M2/EOM2/AUDLIN2).

3.1.6 How to See Which Options are Fitted/Enabled

The Encoder has a number of hardware and software options (see *Sections 3.1.1 – 3.1.3)*. To see which are fitted/enabled refer to the Build Menu (see *Chapter 4, Operating the Equipment Locally*, *Figure 4.9*).

3.2 Bitrate Limits With Reflex Licence and/or Performance Upgrade

3.2.1 Minimum Bitrates

A user with a REFLEX licence (M2/ESO2/VBR) but no Performance Upgrade (M2/ESO2/PU) will be able to get lower bitrates than 1.5 Mbit/s. This only occurs in Seamless modes. However, because the Performance Upgrade has not been bought the picture quality will be reduced (see *Table 3.5*).

Table 3.5: Minimum Bitrates With and Without Performance Upgrade

Performance Upgrade	Reflex Licence	Bmin Non-seamless Modes	Bmin Seamless Modes (Front Panel, SNMP)	Bmin Seamless Modes (Reflex, MEM)
×	×	1.5 Mbit/s	1.5 Mbit/s[3]	Not Possible
×	✓	1.5 Mbit/s	1.5 Mbit/s[3]	Depends on Coding Mode
✓	×	0.256 Mbit/s	Depends on Coding Mode	Not Possible
✓	✓	0.256 Mbit/s	Depends on Coding Mode	Depends on Coding Mode

NOTE...
Bmin is the minimum bitrate that can be set.

3.2.2 Basic Interoperable Scrambling System - BISS (M2/EDCOM2/BISS)

With the appropriate configuration, the Encoder can use the Basic Interoperable Scrambling System (BISS[4]) to scramble the outgoing transport stream. This system has been developed by the European Broadcasting Union (EBU) as an open scrambling system.

BISS has three 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.

The BISS Module (M2/EDCOM2/BISS) comprises Assembly S12284 and Card S11484.

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*).

[3] 1.5 Mbit/s, but possibly higher if limited by Coding Mode.
4 BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to EBU Tech 3292 May 2002.

3.3 ASI Optical Output Option Module (M2/EOM2/ASI-OPT)

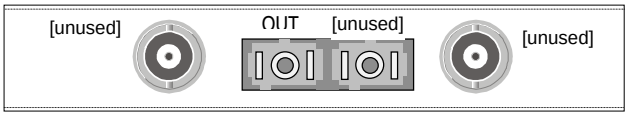
3.3.1 Overview

The module allows the Encoder to output MPEG-2 transport streams in ASI (optical) format. There are two ASI multimode optical outputs which conform to the DVB document A010 (Section 4.4 and Annex B). 188 and 204-byte packet modes are available but the Mux rate does not exceed 40 Mbits/s.

3.3.2 Assembly

Rear Panel

The ASI Optical Output Option Module comprises Assembly S13514. This option module can only be installed in slot 1 (1U Encoder), slot 3 or 6 (2U Encoder).



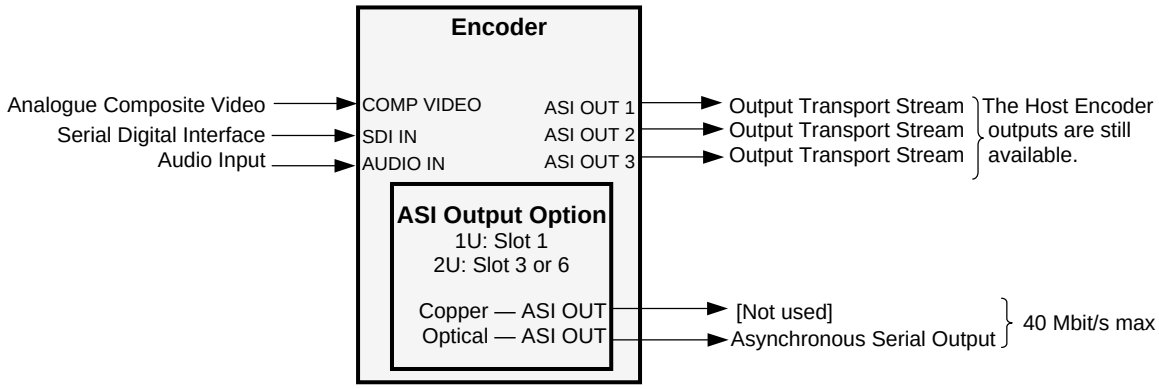


Figure 3.1: ASI Optical Output Option Modules (M2/EOM2/ASI-OPT)

> NOTE...
> The only valid connection to this card is via the Optical ASI Out port. The other connectors are not supported.

ASI OUT Optical Connector

Provides a DVB compliant ASI optical output giving a usable data rate of 40 Mbit/s.

Table 3.6: 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.

DVB-ASI Copper Output

A BNC, female 75 Ω connector provides a DVB-PI compliant copper connection giving a usable data rate of 40 Mbit/s.

Table 3.7: DVB-ASI Copper Output Connector

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

3.3.3 ASI Optical Output Option Module Bitrate

The ASI Optical Output Option Module can be set to provide a 188 or 204 Byte Transport Stream O/P and is available from the STM type optical connector. The two female BNC connectors provided are not used and should not be connected.

3.3.4 Technical Specification

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 3.8: ASI Out Connector

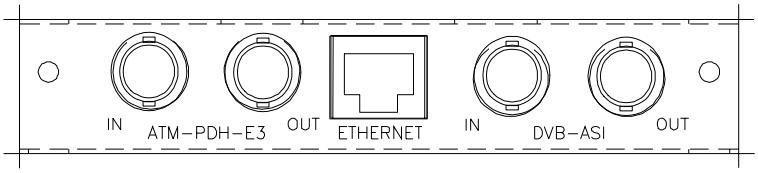
Item	Specification
Connector type	SC type
Connector designation	ASI Out 1, 2
Data Rate	270 Mbit/s
Centre Wavelength	1280 nm (min) 1300 nm (typ) 1380 nm (max)
Emitter type	LED, InGaAsP
Emitter output power	-20 dBm (min) -14 dBm (max)
Optic Fibre type	62.5/125 µm
Typical max fibre length	2000 metres

3.4 M2/EOM2/ATMS34 PDH/E3 Module

3.4.1 Assembly

The PDH/E3 Physical Interface Module comprises Assembly S12510 and cards S11906 + S11366. For 2U Encoders, this option module can be installed in slots 5 (preferred), 4 or 6 (when available).

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.6.3, Common Connectors* on *page 3-11*.



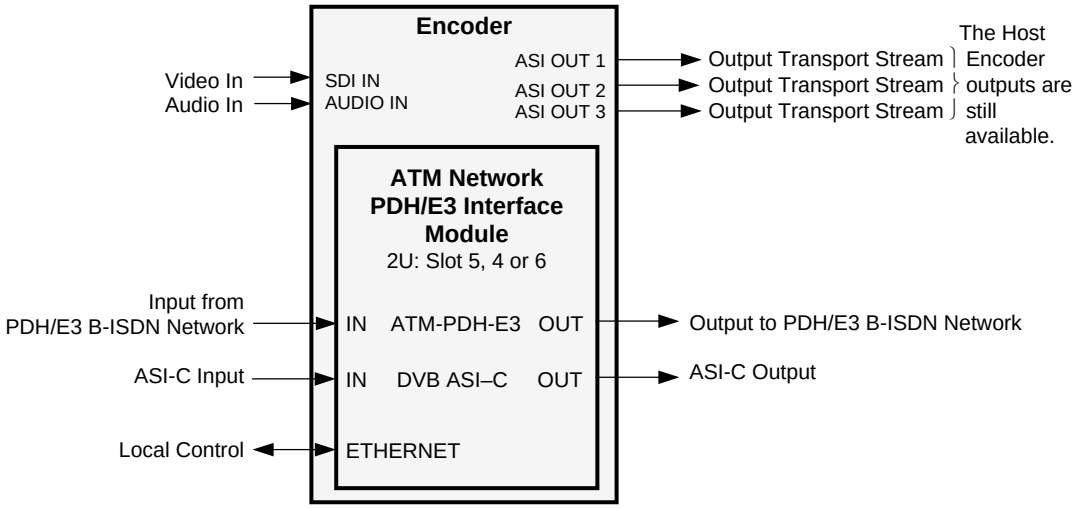


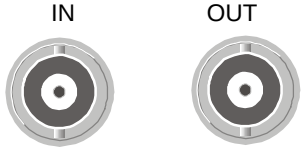
Figure 3.2: Rear Panel Connectors (M2/EOM2/ATMS34 ATM PDH/E3 Module)

3.4.2 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 3.9: PDH/E3 Connector

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



3.5 M2/EOM2/ATMS45 PDH/DS3 Module

3.5.1 Assembly

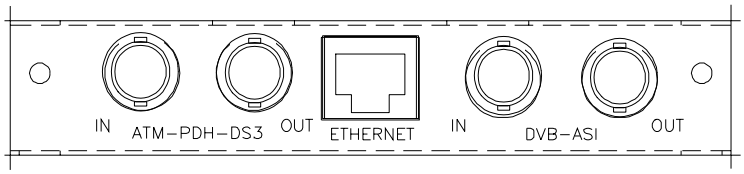
The PDH/DS3 Physical Interface Module comprises Assembly S12509 and cards S11906 + S11365. For 2U Encoders, this option module can be installed in slots 5 (preferred), 4 or 6 (when available).

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.6.3, Common Connectors* on *page 3-11*.

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



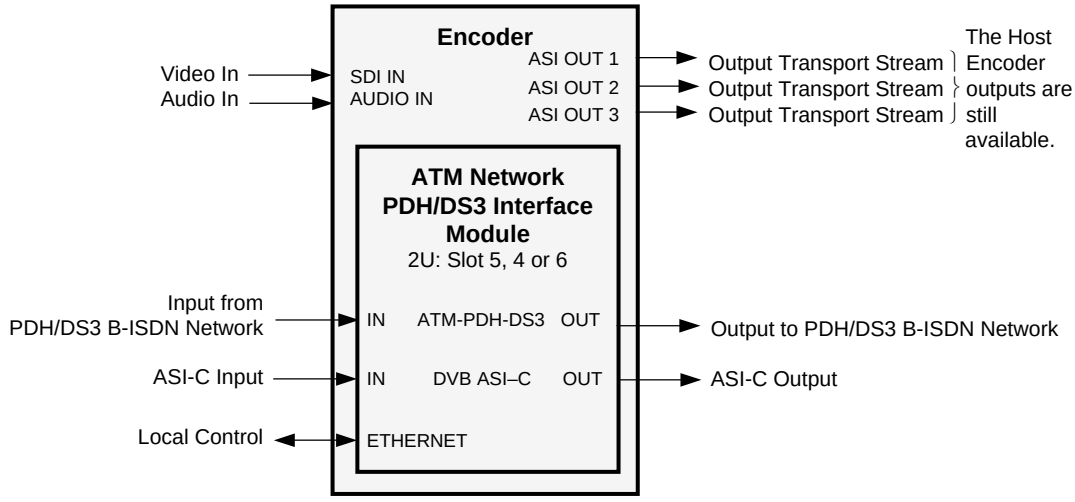


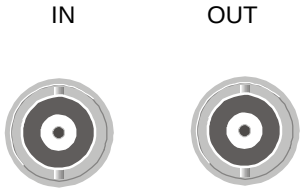
Figure 3.3: Rear Panel Connectors (M2/EOM2/ATMS45 ATM PDH/DS3 Module)

3.5.2 Connectors

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

Table 3.10: PDH/DS3 Connector

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



3.6 ATM Network Interface Option Module (M2/EOM2/ATMS155_…)

3.6.1 Overview

The ATM[5] 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 the S11906 ATM Network Interface (common to all models) and a Physical Layer Module suitable for the application required. Refer to *Table 3.2* for details of the variants.

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

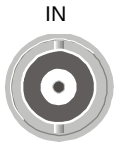
3.6.2 Assembly

The ATM Network Interface Module comprises an Assembly containing cards S11906 + Physical Layer Module.

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 3.13.3, Technical Specification* on *Page 3-34*.

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.

3.6.3 Common Connectors



DVB-ASI Copper Input

Not for operator use.

DVB-ASI Copper Output

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

Table 3.11: DVB-ASI Copper Output Connector

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

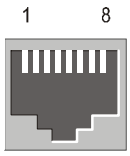
10BaseT Ethernet Connector

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.

[5] ATM is the abbreviation for Asynchronous Transfer Mode.

Table 3.12: Ethernet Connector

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



3.6.4 Technical Specification

Variants of The ATM Network Interface Module

The basic ATM Network Interface is part number S11906. 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 3.13* for the types of B-ISDN networks which are supported.

Table 3.13: B-ISDN Networks Supported

Physical Layer	Physical Layer Module	Physical Layer Bandwidth	Marketing Code
SDH STM-1 / SONET STS-3c Multimode Optical	S8063	155.520 Mbit/s	M2/EOM2/ATMS155MM

DVB-ASI Copper Output

Table 3.14: 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 3.15: 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 3.16: 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)

Multi-mode 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 3.17: Multi-mode 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

M2/EOM2/ATMS34 PDH/E3 Connector

The M2/EOM2/ATMS34 PDH/E3 module comprises S11906 + S11366.

Table 3.18: E3 Input Connector

Item	Specification
Safety status	SELV
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 3.19: E3 Output Connector

Item	Specification
Safety status	SELV
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

The M2/EOM2ATMS45 PDH/DS3 module comprises S11906 + S11365.

Table 3.20: DS3, G.703 Input Connector

Item	Specification
Safety status	SELV
Connector Type	75 Ω 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 3.21: DS3, G.703 Output Connector

Item	Specification
Safety status	SELV
Connector Type	75 Ω 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

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

3.7.1 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, Linear PCM, Dolby Digital Pass-thru, Dolby E Pass-thru and DTS Pass-thru. 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.

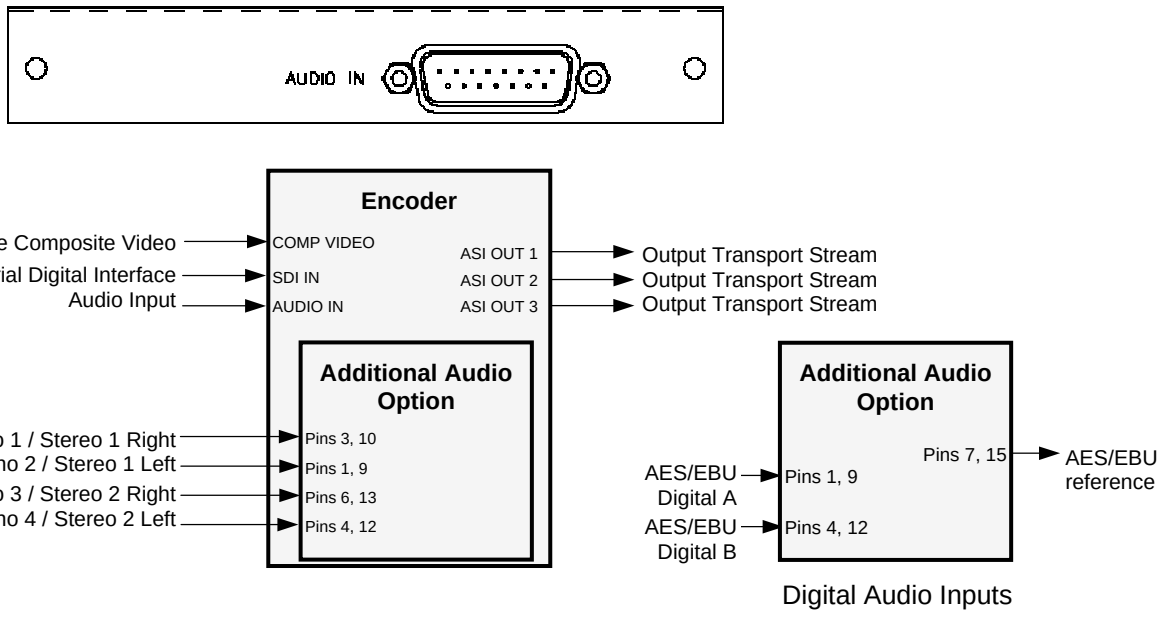
Alternatively, any two of the four pairs of embedded AES/EBU channels extracted from the video can be routed to the module for encoding. This option supports all the standard bitrates and encoding modes associated with each compression standard.

M2/EOM2/AUDLIN2 supports 12 dB, 15 dB and 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 4.7.* 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.

3.7.2 Rear Panel



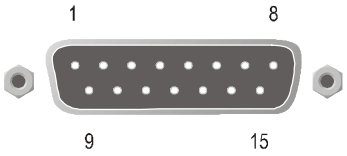
NOTE...

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

The Additional Audio option module comprises Assembly S13181 and Card S13167. See *Table 3.2* for the slots that it can be installed in.

3.7.3 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 3.22: 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 kΩ or 600 Ω.
2. In AES/EBU mode termination is 110 Ω (default).
3. When the Encoder is powered down the digital channel is selected with 110 Ω termination.
4. The digital audio input does not support SPDIF.

CAUTION...

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

3.7.4 Technical Specification

See *Annex B, Section B.1.2* for details.

3.8 GPI Card (M2/EOM2/GPI)

3.8.1 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

3.8.2 Assembly (1U Panel Version Shown)

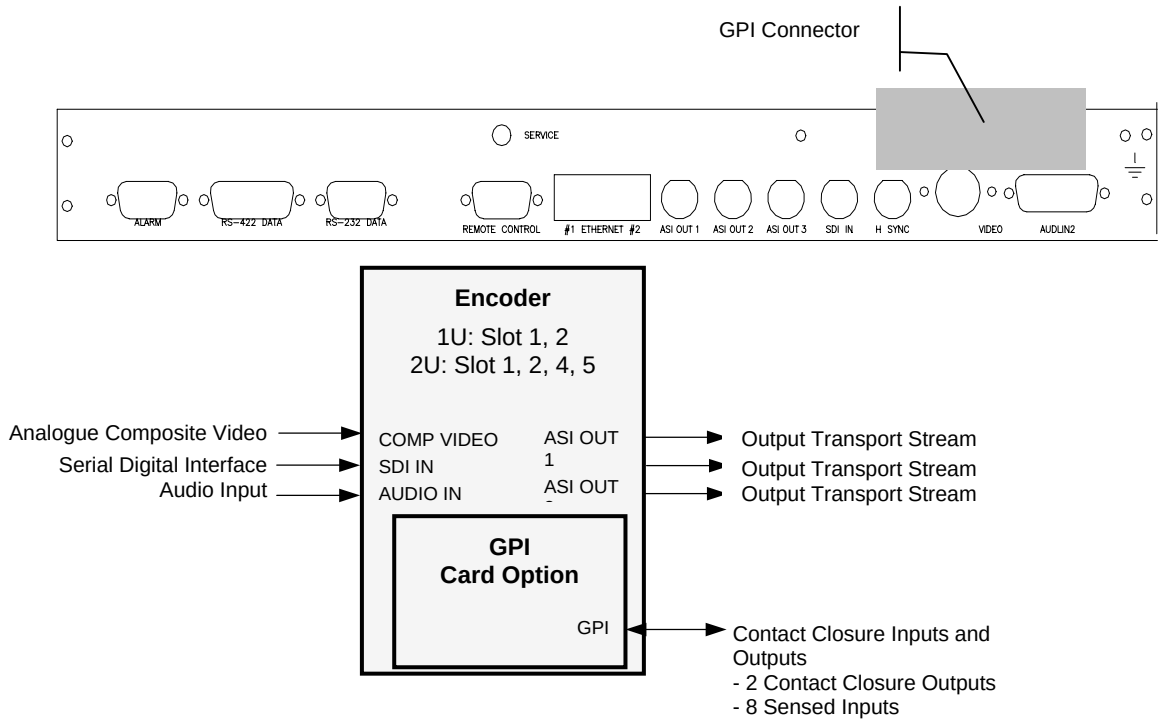


Figure 3.5: General Purpose Interface M2/EOM2/GPI

3.8.3 Connector

Table 3.23: 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			

3.8.4 Technical Specification

Table 3.24: 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.

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

3.9.1 Overview

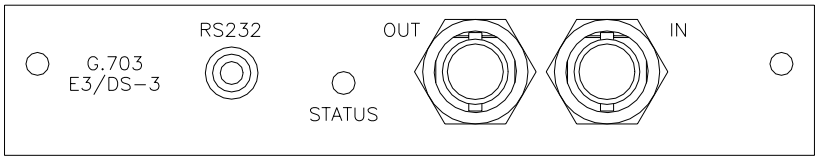
The G.703 Interface Card provides a G.703 adapted Encoder Transport Stream Output at a maximum rate of either:

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

See *Table 3.2* for the slots that it can be installed in.

3.9.2 Assembly

Rear Panel



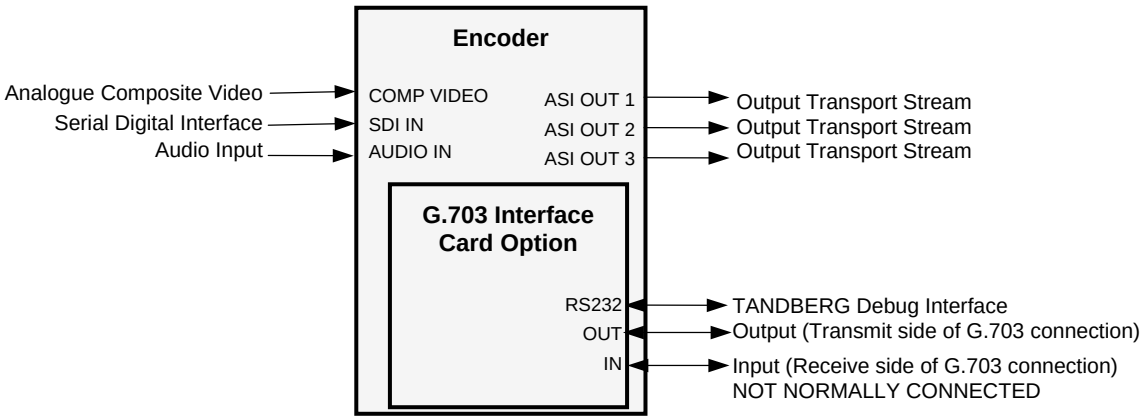


Figure 3.6: G.703 Interface Card Option M2/EOM2/G703

OUT Connector

A 75 Ω female BNC connector provides a G.703 transport stream output.

Table 3.25: Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

IN Connector

> NOTE...
> This is not normally connected.

A 75 Ω female BNC connector provides a G.703 transport stream input.

Table 3.26: In Connector

Pin	Signal
Centre	Signal
Screen	Ground

RS-232 Connector

A 3.5 mm socket provides a TANDBERG debug interface.

3.10 IP Output Card (M2/EOM2/IP) IP Card ProMPEG FEC (M2/EOM2/IP/PROFEC)

3.10.1 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 80 Mbit/s.

The mapping of MPEG-2 transport stream packets into IP data frames is done according to the protocol stack shown in *Figure 3.7.*

> 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.

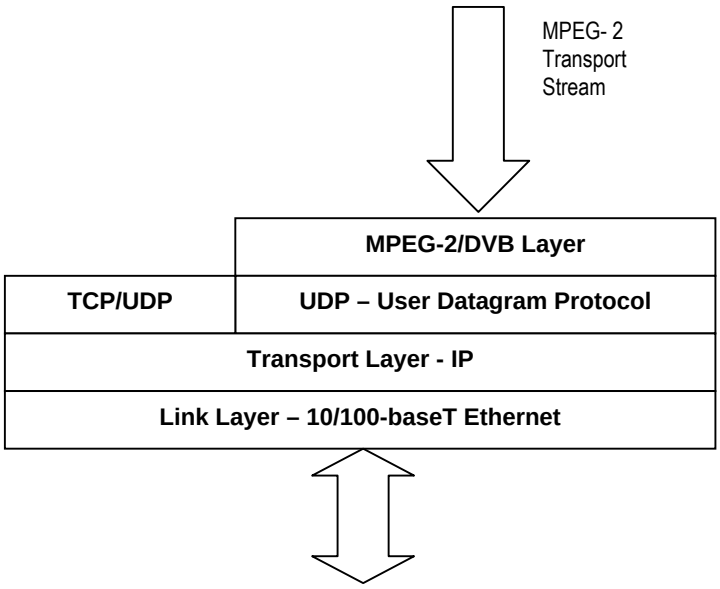


Figure 3.7: IP Output Protocol Stack

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).

3.10.2 Support for ProMPEG FEC

Using this option provides support for ProMPEG FEC in place of DVB FEC. See *Annex K* for details.

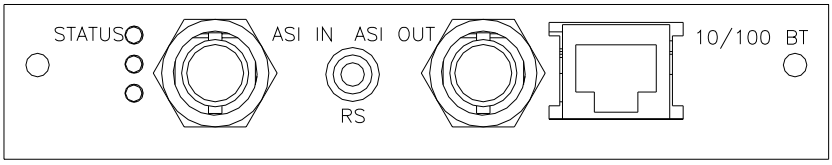
3.10.3 Smallcasting Mode

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.

3.10.4 Assembly

Rear Panel



ASI In

A 75 Ω female BNC connector provides an ASI input.

> NOTE...
> This connector is not used.

Table 3.27: 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 three-way 3.5 mm socket provides an RS-232 Control interface.

> NOTE...
> This connector is for TANDBERG Television use only.

Table 3.28: RS Connector

Item	Specification
Connector Type	Three-way 3.5 mm socket
Connector designation	RS

ASI Out

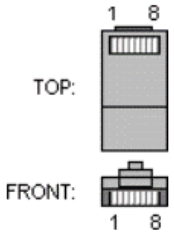
A 75 Ω female BNC connector provides an ASI output.

> NOTE...
> This connector is not used.

Table 3.29: ASI Out Connector

Item		Specification
Connector Type		75 Ω 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 3.30: 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

3.11 Dual Output IP/Ethernet Option (EN5900/HWO/IPTSDUAL)

3.11.1 Read This First!

The Single Output IP/Ethernet Option (EN5900/HWO/IPTS) option has been superseded by this dual output version. However systems with a mixture of the two options are not supported due to the differences in operation.

The Dual IP/Ethernet card provides two separate 100/1000 BaseT Ethernet ports to allow direct connection to a redundant IP/Ethernet network. The transport stream generated by the Encoder can be encapsulated into UDP/IP packets according to RFC2250 with an optional RTP header and transmitted at up to 65 Mbit/s. Additionally the card is capable of splitting the multi-program transport stream into its individual constituent services and transmitting each service with its own set of parameters.

The mapping of MPEG-2 transport stream packets into IP data frames is done according to the protocol stack shown in *Figure 3.8.*

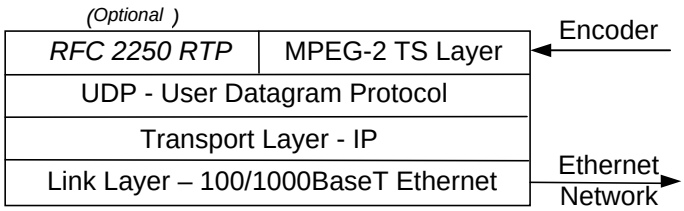


Figure 3.8: Encoder Protocol Stack

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 100/1000 Mbit/s, twisted pair, via RJ-45 connector).

3.11.2 Assembly

The option card has 2 RJ-45 connectors called “Ge 1” and “Ge 2” as shown in *Figure 3.9*. Viewed from the back of the encoder, “Ge 1” is on the left and “Ge 2” is on the right.

Rear Panel

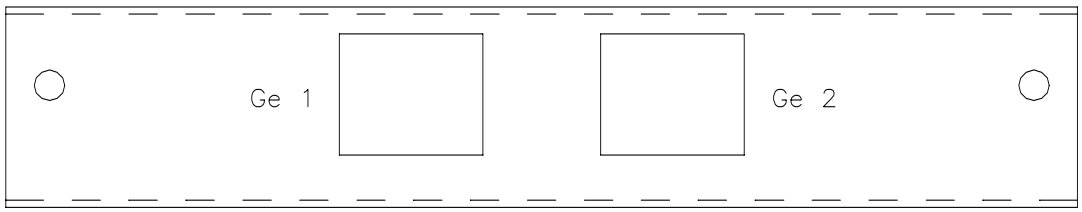


Figure 3.9: View from Back of Encoder

Ethernet Output Connector

An RJ-45 connector provides a 100/1000BaseT Ethernet port.

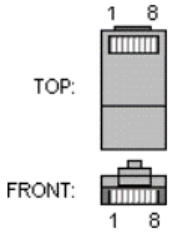


Table 3.31: RJ-45 Connector

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

Table 3.32: 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

3.11.3 Dual Control

This menu appears if the card EN5900/HWO/IPTSDUAL is installed in the encoder. This allows direct connection to a redundant IP/Ethernet network as it has two separate Ethernet connections. The menu structure is shown in *Figure 3.10*. The menu is in two parts:

- Dual IPNIC control: specifies the parameters associated with the card such as the IP address of the ports.
- Dual IPNIC TS: there is a menu associated with each Transport Stream output. At the moment, there is only the capability for a single Transport Stream output but dividing the Transport Stream into its component services is on the roadmap.

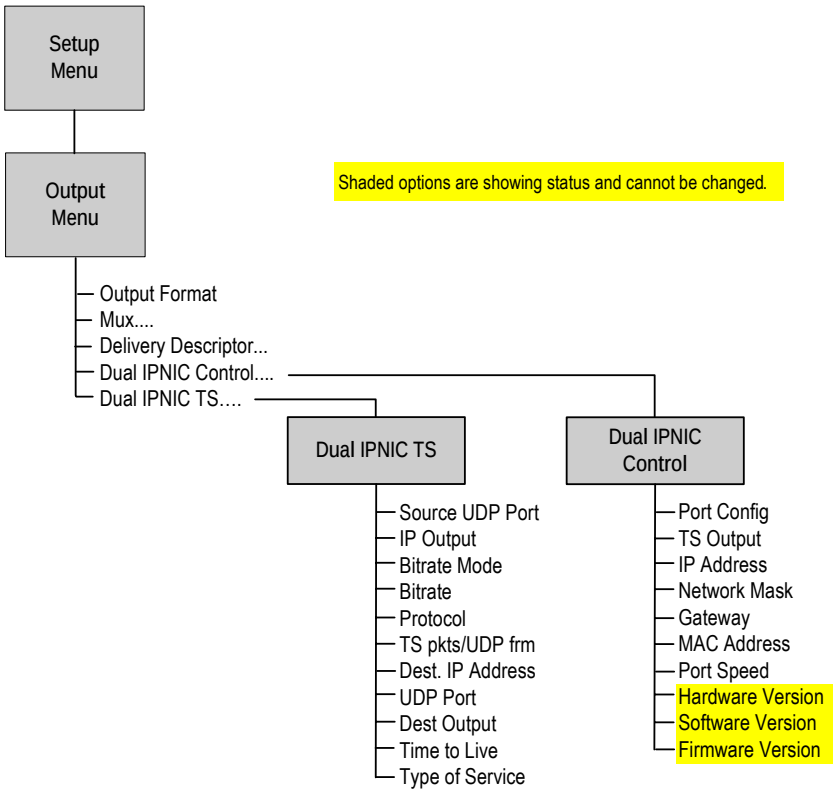


Figure 3.10: Menu Hierarchy – Setup/Output/Dual Control Menu

The Dual IPNIC Control menu specifies the parameters associated with the card such as the IP address of the ports (see *Table 3.33* for details).

Table 3.33: Dual IPNIC Control Option Descriptions

Selected Item	Options	Description
Port Config: Allows the operator to select in what mode the card will operate.	Different Subnets	The two outputs have complete separate parameters to the extent that they must be on different subnets as defined by the netmask.
	Same Address	The IP address and netmask for the 2 outputs are identical so that the source address on the IP packets will be identical. However the MAC addresses remain at the factory default and are different.
	Mirrored MAC	All parameters for 2 outputs including MAC address are identical.
	The network topology and method for redundancy switching will define which is the correct option.	
TS Output: Allows the operator to determine how many different Transport Streams are generated.	Single TS	
	Multi TS	
IP Address [1][2]: Allows the operator to modify the source IP address associated with the IP/Ethernet output. Network Mask [1][2]: Allows the operator to modify the network mask setting associated with the IP address.		

Selected Item	Options	Description
Gateway [1][2]: Allows the operator to modify the address of the router for transmission of IP packets to other networks.		If the Destination IP Address setting indicates an IP address not residing on the local network segment, the video traffic is forwarded to this gateway address. If an address of 0.0.0.0 is used, then no video traffic is forwarded to another network. Hence, it is advisable that an address is included if possible.
MAC Address [1][2]: Displays the MAC address of the associated IP/Ethernet output. This value is set at production and cannot be changed.		This option is for status only and cannot be changed.
Port Speed [1][2]: Displays the connection status of the associated IP/Ethernet output.		
Port Status [1][2]:		This option is for status only and cannot be changed.
Reset on Failure:		
Hardware Version: Displays the hardware version of the option card.		This option is for status only and cannot be changed.
Software Version: Displays the version of the software code in the option card.		This option is for status only and cannot be changed.
Firmware Version: Displays the version of firmware code in the option card.		This option is for status only and cannot be changed.

3.12 Multi-pass Encoder Card (M2/ENC/MPM)

3.12.1 Overview

This is fitted as standard in E5770 (1U) and E5775 (2U) Multi-pass Encoders. It also an option on E5710 and E5720 Encoder range. This module enables the Encoder to be used in multi-pass mode which gives improved video compression performance. Although the card has connecters on its rear panel, they are not used. Inputs and outputs are connected as for the standard Encoder.

The performance upgrade license must also be installed for multi-pass encoding to work. This is installed as standard on E5770/E5775 Encoders.

> NOTES...
>
> 1. It is not possible to disable multi-pass encoding on an Encoder fitted with the MPM option card via the front panel nor the web interface. The control system, however, has options for setting up the mode of the whole reflex group
> 2. Other than for a short period after power-up, the LED should always be green.

3.12.2 Assembly

The components of the Multi-pass Encoder card are integrated with other rear panel items. The only user relevant item is the status LED.

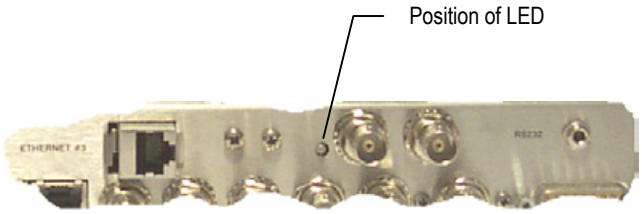


Figure 3.11: Position of LED on M2/ENC/MPM Rear Panel

3.12.3 Technical Specification

There are no user connectors associated with this module.

3.13 Remux Option (M2/EOM2/REMUX)

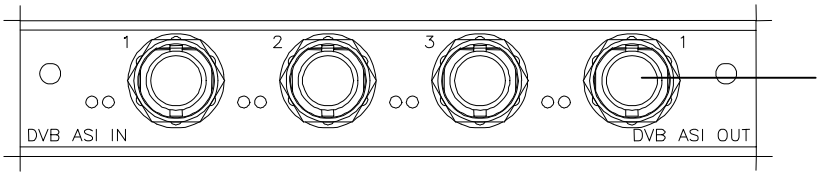
3.13.1 Overview

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 50 Mbit/s. For a specification of this interface see *Annex B, Technical Specification*.

3.13.2 Assembly

Rear Panel

The Remux option module comprises assembly S12449 and Card S10655. See *Table 3.2* for the slots that it can be installed in.



CAUTION...

When re-multiplexing, be aware that both PIDs and Service Names will be remapped according to the Host Encoder input used.

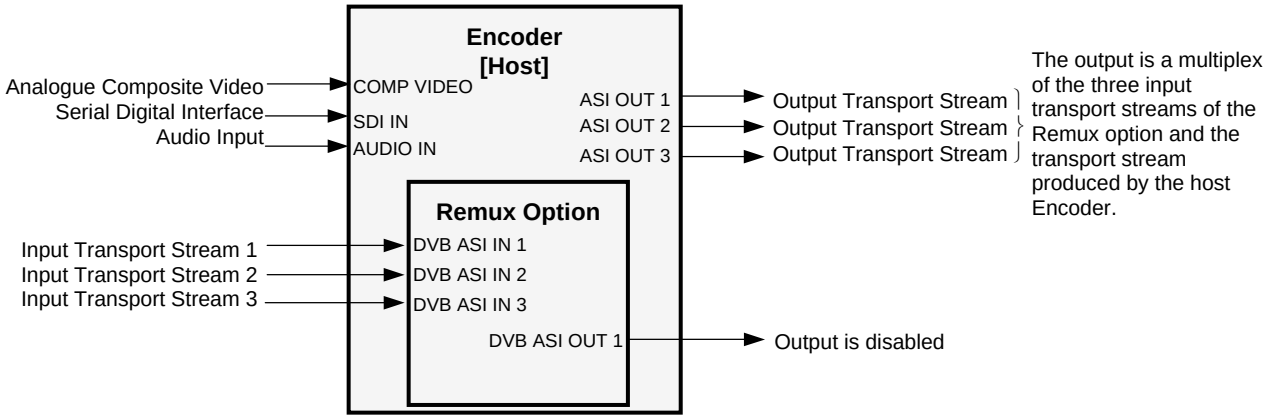


Figure 3.12: Remux Option (M2/EOM2/REMUX)

DVB ASI IN 1 Connector

A 75 Ω BNC connector provides an input to the unit.

Table 3.34: 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 Ω BNC connector provides an output to the unit.

Table 3.35: DVB ASI Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

3.13.3 Technical Specification

Connectors

Table 3.36: 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 Ω[6]
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface)[7]

[6] 75 Ω terminator must be fitted when this interface is not in use.
[7] Byte mode and single packet burst mode only.

Table 3.37: DVB ASI Out 1 Connector (Disabled)

Item	Specification
Safety status	SELV
Connector designation	DVB ASI OUT 1
Connector type	BNC
Connector impedance	75 Ω[6]
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface)[7]

LEDs

Table 3.38: DVB ASI In 1, 2 and 3 - LED Indications

Item	Specification
Red LED	Input ASI lock
On	No lock on ASI (8B/10B coding)
Off	Input ASI lock OK
Green LED	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 3.39: DVB ASI Out 1 - LED Indications

Item	Specification
Red LED	
On	Output disabled
Off	Output enabled
Green LED	
Off	Output not in use
Flash (1:3 mark:space)	188 byte packets output
Flash (3:1 mark:space)	204 byte packets output

3.14 SMPTE 310 (SSI) Output Option Module (M2/EOM2/SSI-US)

3.14.1 Overview

The module allows the Encoder to output MPEG-2 transport streams in SMPTE 310M – 1988 (electrical) format. There are three copper SI outputs that conform to the SMPTE Standard 310M Level 2.

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

3.14.2 Assembly

Rear Panel

The SMPTE 310 (SSI) Output Option Module comprises Assembly S11147 and Card S10724. This option module 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.

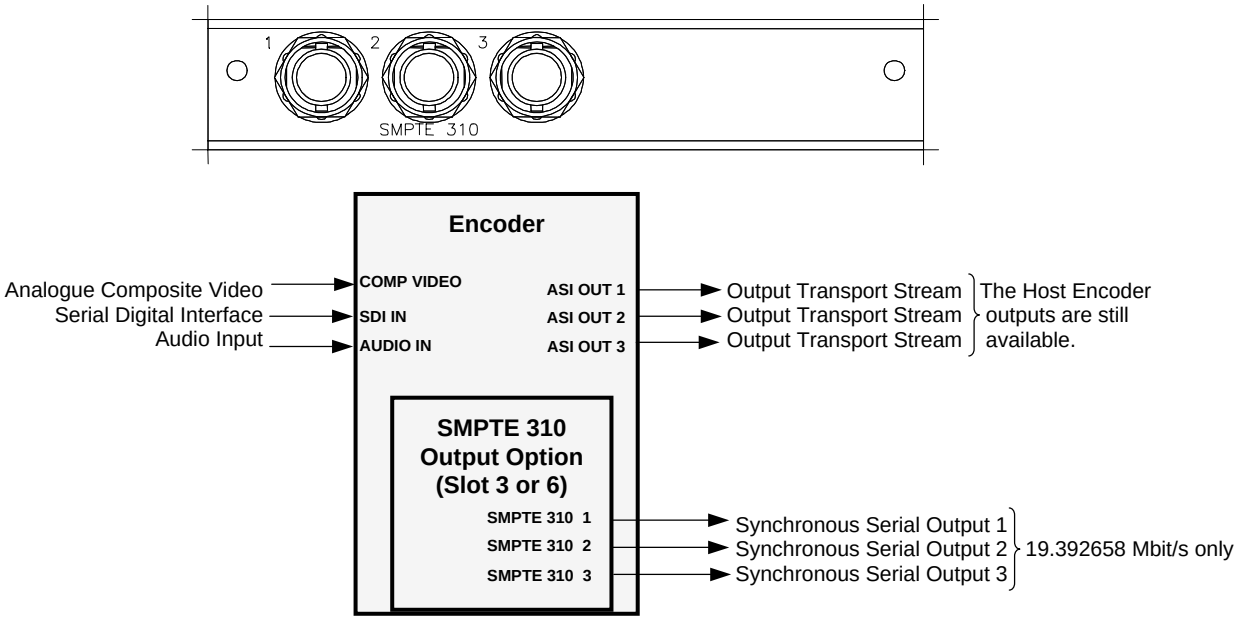


Figure 3.13: SMPTE 310 (SSI) Output Option Module (M2/EOM2/SSI-US)

SMPTE 310 1, 2 and 3 Connectors

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

Table 3.40: SMPTE 310 Connector

Pin	Signal
Centre	Signal
Screen	Ground

3.14.3 Technical Specification

Table 3.41: SMPTE 310 Connector

Item	Specification
Safety status	SELV
Connector designation	SMPTE 310 1, 2, 3
Connector type	BNC, Female
Connector impedance	75 Ω
Packet size	188 bytes (without RS coding), 204 bytes
Data coding	Biphase Mark
Data rate	Typically 19.392658 Mbit/s but will accommodate all currently available receiving equipment

3.15 STM-1 OC3 Multi-mode Physical Interface Module (M2/EOM2/ATMS155MM)

3.15.1 Assembly

The STM-1 OC3 Multi-mode Physical Interface Module comprises Assembly S12494 and cards S11906 + S8063. For 2U Encoders, this option module can be installed in slots 5 (preferred), 4 or 6 (when available). For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.6.3, Common Connectors* on *Page 3-11*.

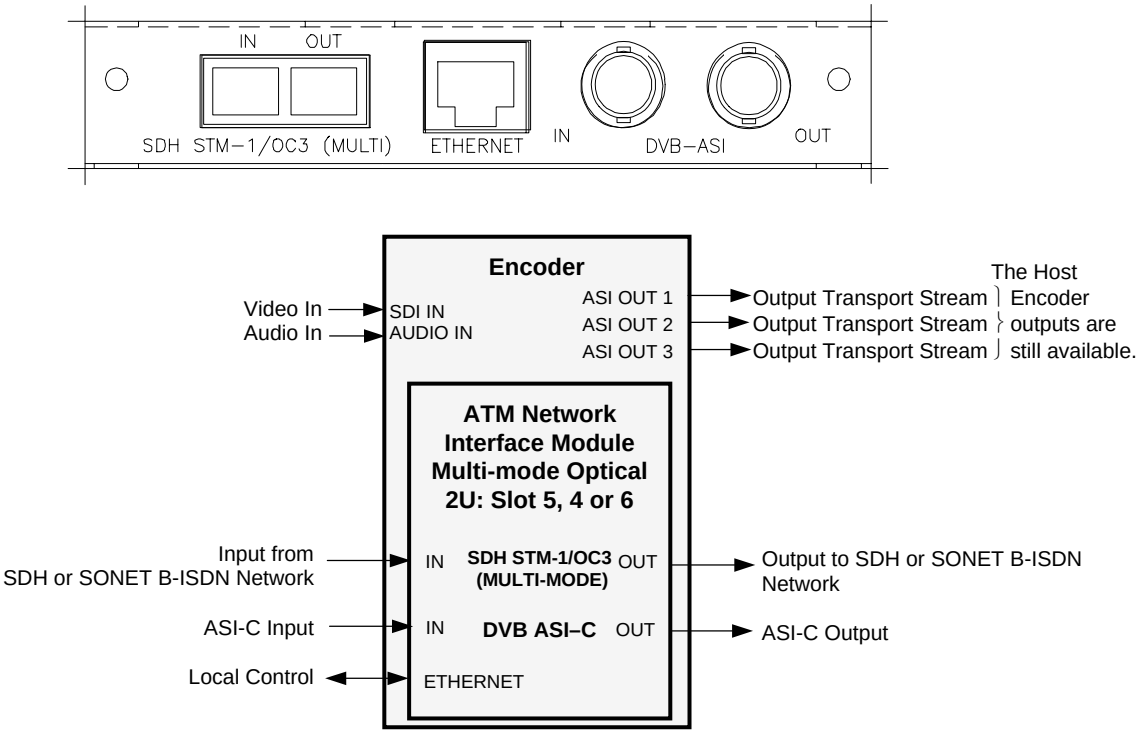


Figure 3.14: ATM Network Interface Module, Multi-mode Optical (M2/EOM2/ATMS155MM)

3.15.2 Multi-mode Fibre Optic Connector

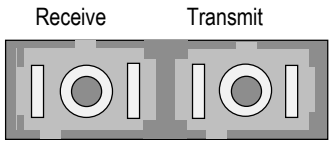
WARNING...
LED: CLASS I LASER PRODUCT
DO NOT LOOK INTO THE APERTURE.
LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

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 Multi-mode 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 3.42: Multi-mode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MULTI-MODE)
Wavelength	1300 nm Multi-mode (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.

Chapter 4

Operating the Equipment Locally

Contents

List of Figures

List of Tables

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4.1 Introduction

The front panel display and keypad may be used to configure, control and monitor the Encoder when an evolution *5000* Multiplex Element Manager (MEM) is not used.

4.2 Local Control (E5710/E5770)

4.2.1 Introduction

At switch-on the Encoder runs through a boot sequence (boot time without any option modules is approximately 45 seconds). The `Summary Screen` is displayed.

4.2.2 Navigating the Display Screens (E5710/E5770)

The menu items on the display are selected and amended by one of the four navigation keys (shown as left, right, up and down arrows) and **Enter** and **Cancel** buttons (see *Figure 4.1*). Most of the screens displayed in this manual are for the E5720/E5775 2U Encoder and are accessed in a different way (see *Section 4.3.2, Navigating the Display and Menu Screens (E5720/E5775)*) but the menu options are the same for both the 1U and 2U Encoders.

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

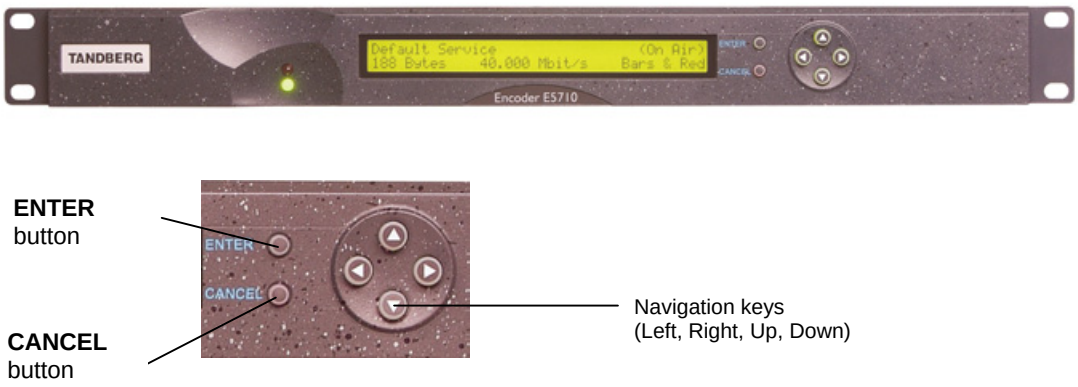


Figure 4.1: E5710/E5770 Navigation Keys and Buttons

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

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

4.2.3 Navigating the Menus (E5710/E5770)

To navigate the menus, valid keys are:

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

4.2.4 Changing a Setting (E5710/E5770)

For Multiple Choice Entry

Valid keys are:

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

For Text or Numeric Entry

The character list for text entry contains the following characters:

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

For numeric entry only 0-9 are displayed.

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

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

4.2.5 A(udio)/V(ideo) Menu (E5710/E5770)

The A/V Menu is designed to give the user fast access to basic audio and video input settings, and operates in a slightly different way to other menus.

The menu gives a list of video and audio settings and the audio input levels. Any of the settings can be changed by pressing ENTER to cycle through the options. Each time ENTER is pressed the new setting is updated and actioned immediately by the Encoder.

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

4.3 Local Control (E5720/E5775)

4.3.1 Introduction

At power-on the Encoder runs through a boot sequence (boot time without any option modules is approximately 45 seconds). An initial Input Monitor screen is shown.

4.3.2 Navigating the Display and Menu Screens (E5720/E5775)

Each of the menu items on the display has a connection to a softkey (see *Figure 4.2*). 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 Reference Guide are only representations - there might be differences between equipment, depending upon the options chosen.

> NOTE...
> In the E5720/E5775 2U Encoder menus when it states that you may 'update using softkeys' you can use both softkeys and keyboard keys for some options.

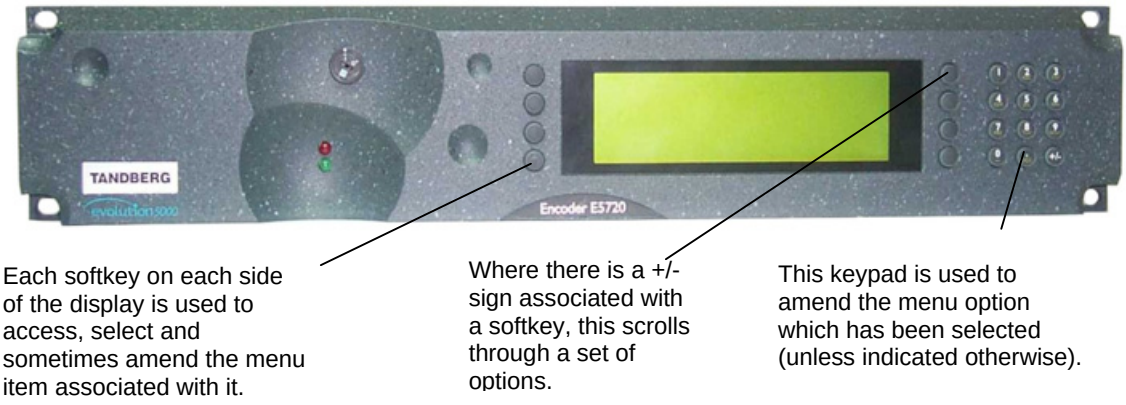


Figure 4.2: E5720/E5775 Keypad and Display Functions

4.3.3 How to Use the Keypad

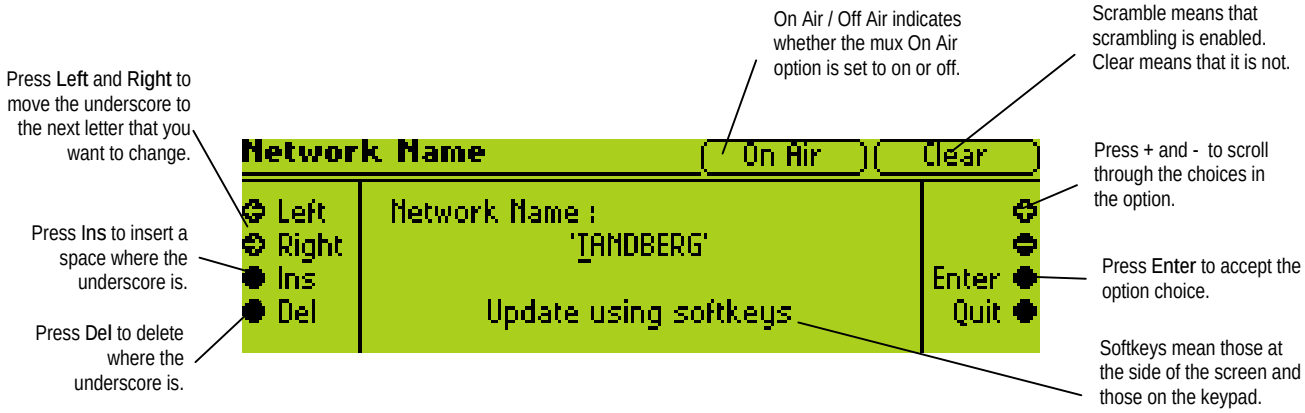
Each key on the keypad has more than one inscription. One press of a key makes the number appear on the display screen, two quick presses make the first letter appear etc. All keys are cyclic, displaying their assigned characters in sequence. In certain options only letters or numbers may be available.

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
	+	+	/	-	+

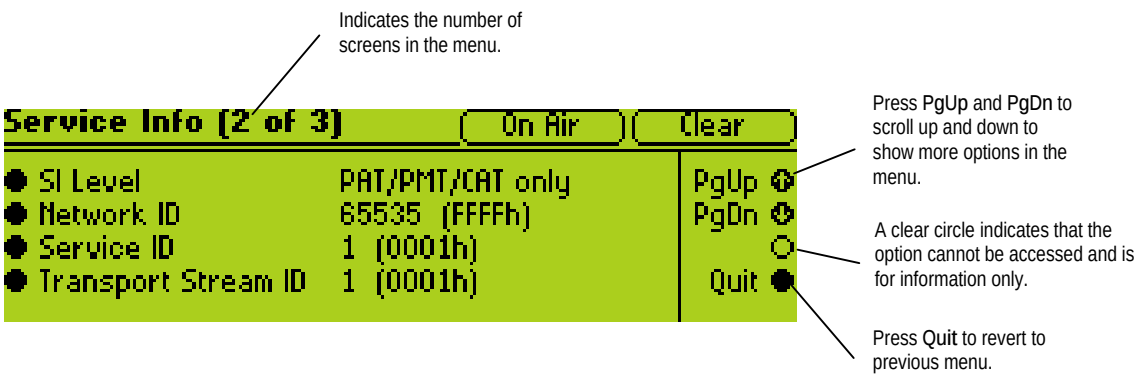
4.3.4 How to Use the Functions Associated with Softkeys

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.



4.3.5 A(udio)/V(ideo) Menu

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

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

4.3.6 Keyboard Lock (E5720/E5775)

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.

4.3.7 Summary Screen and Advanced Menus

See *Figure 4.4*, for the top-level menu hierarchy. Press the **More** softkey in the Summary Screen to access the Advanced Menu. The Advanced Menu provides options for configuring and testing the Encoder.

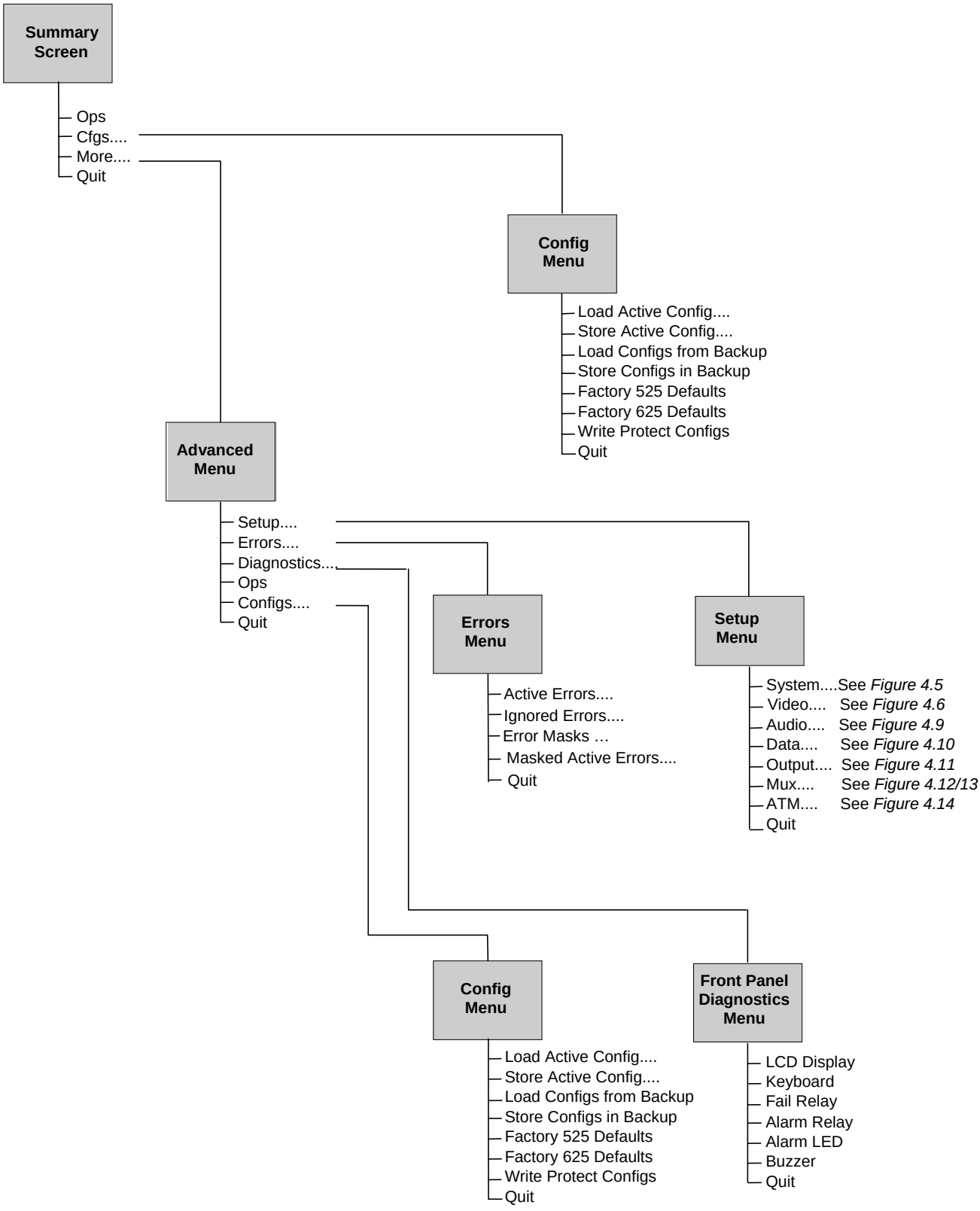


Figure 4.4: Menu Hierarchy – Summary Screen and Advanced Menus

4.4 Setup Menu

The `Setup Menu` can be selected from the `Advanced Menu` by pressing the **Setup** softkey. 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 *Table 4.7*) 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` by pressing the **System** softkey (see *Figure 4.5* for menu structure).

This menu permits the selection of system information.

Path: Summary Screen [More]> Setup> System

Table 4.2: System Menu Options

Selected Item	Description	Comments	Refer To page...	
			ATSC	DVB
Service Info	Provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream	Syntax option set in this menu.	4-13	4-15
Remote Control	Provides options for configuring the Encoder to 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.		4-17	4-17
General	Provides options for configuring the general parameters of the Encoder such as the time and date, screen savers, and fan control		4-19	4-19
Advanced	Provides options for the advanced parameters of the Encoder.	No. Services set in this menu.	4-20	4-20
Dig. Program Insertion (DPI)		Only available when the M2/ESO2/DPI Licence key is purchased		
Mbd Services	The menu has an entry for each service, to allow the service to be configured.	Only displayed if Syntax = DVB; No. Services >1	N/A	4-21
Build	The `Build Menu` shows the status of the options.	This is for status only.	4-21	4-21

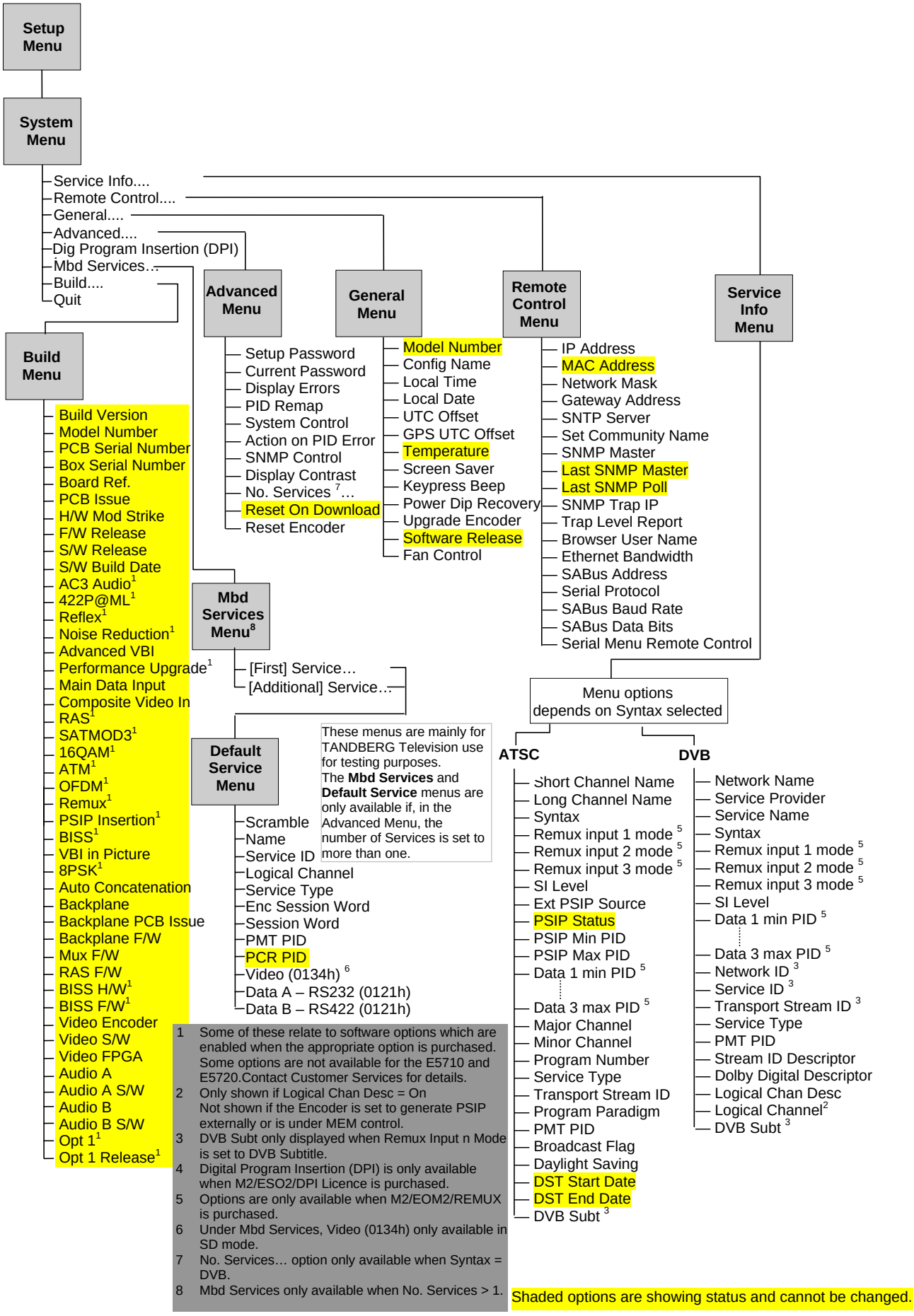


Figure 4.5: Menu Hierarchy – Setup/System Menu

4.5.2 Service Info Menu (Syntax = ATSC[1])

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 4.5* for the menu structure and *Table 4.3* for the option descriptions 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.

Path: Summary Screen [More]> Setup> System> Service Info

Table 4.3: Service Info Menu (Syntax = ATSC) Option Descriptions

Selected Item	Options	Description	
Short Channel Name: This option is associated with the field *short_name* for the channel	Seven character name	The information is included in the Virtual Channel Table (VCT).	
Long Channel Name: Gives the full name of the channel.		This is associated with the field *extended_channel_name*.	
Syntax: Enables the syntax to be specified.	ATSC	Advanced Television Standards Committee.	
	DVB	Digital Video Broadcasting (see *page 4-15*).	
Remux Input n: 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. Only available when M2/EOM2/REMUX is purchased.	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 DVB Subtitle option.	
	Data	If at least one input is set for Data, 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 is receiving all PSI and PSIP.	
	If selected for input n, two menu entries appear Input n PIDmin and Input n PIDmax. Defaults are 0x1FD0 and 0x1FFE. This specifies the range of PIDs that is mapped through for that input.		
SI Level: This enables the service information level to be specified.	Off	Elementary streams only.	
	PAT/PMT/CAT only	Program Association Table/ Program Map Table/ Conditional Access Table.	
	PAT/PMT only	Program Association Table/ Program Map Table.	
	On (PSIP)	PAT/PMT/CAT/TDT/SDT/NIT/EIT – minimum DVB.	
	On (No EIT)	PAT/PMT/CAT/STT/VCT/MGT/RRT	
	On (Ext. PSIP)	PAT/PMT/CAT/TDT/SDT/NIT.	
	Off (Ext.PSIP/PSI)	Elementary streams only. PIDs 0 (PAT), 1 (CAT) and 0x1FFB (ATSC tables) passed through remux card, in addition to PID range set up by PSIP min/max PID.	(Needs Remux option.)
Ext. PSIP Source: Specifies the Remux input through which the external PSIP is to be received.		Only applies if the SI level has been set to On (Ext. PSIP).	
PSIP Status: Reports the range of PIDs passed through the external PSIP input.		Only available if the SI level has been set to On (Ext. PSIP).	

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

Selected Item	Options	Description
PSIP Min PID: Sets the min PID value passed through the external PSIP input.		Only available if the SI level has been set to On (Ext. PSIP).
PSIP Max PID: Sets the max PID value passed through the external PSIP input.		Only available if the SI level has been set to On (Ext. PSIP).
Data n min/max: Enables a PIDmin and PIDmax range to be selected for a specified input [n].		Only available when M2/EOM2/REMUX is purchased. 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. 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. 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:		Associated with the field *major_channel_number* and is used to group all channels identified as belonging to a particular broadcast corporation.
Minor Channel:		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: Enables the Program Number to be specified.		Used as the basis of the PMT PID (same as Service ID in DVB). It is included in the Program Association Table (PAT), Program Map Table (PMT) and VCT. Not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control.
Service Type: The Service Type identifies the type of service carried in this virtual channel.	Analog TV ATSC Digital TV ATSC Audio only ATSC Data Broadcast	
Transport Stream Id: Sets the Transport Stream ID value for the transport stream output from the Encoder.		Not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control.
Program Paradigm: Selects whether PIDs are assigned in accordance with the ATSC Program Paradigm or not.		
PMT PID: Shows the Program Map Table Packet Identifier.		
Broadcast Flag		When set to 'on', the Redistribution Control Descriptor is put in to the PMT and EIT. When set to 'off', the descriptor is not generated.
Daylight Saving: Enables daylight saving.	Observed NOT Observed	Enable Daylight Saving. Disregard Daylight Saving.
DST Start Date: DST End Date:		Sets 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`.

Selected Item	Options	Description
DVB Subtitles: DVB Subtitle mode is provided for subtitles to be added to the locally encoded service only.	Off	Only available when M2/EOM2/REMUX is purchased and option Remux Input n = DVB Subt. The Encoder includes 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. 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. It is not possible to add subtitles to services arriving on a remux input. Only available when Remux Input n Mode is set to DVB Subt.
	On streams 1, 2, 3, 4	
	On streams 1, 2, 3	
	On streams 1, 2	
	On stream 1	

4.5.3 Service Info Menu (Syntax = DVB)

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 4.5* for the menu structure and *Table 4.4* for option descriptions 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.

Path: Summary Screen [More]> Setup> System> Service Info

Table 4.4: Service Info Menu (Syntax = DVB) Options

Selected Item	Options	Description
Network Name: Enter the Network name.		The information is included in the Network Information Table (NIT).
Service Provider: Enter the Service Provider name.		The information is included in the Service Description Table (SDT).
Service Name: Enter the Service Name.		The information is included in the Service Description Table (SDT).
Syntax: Specify the syntax.	ATSC	Advanced Television Standards Committee.
	DVB	Digital Video Broadcasting.
Remux Input n in: 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. Only available when M2/EOM2/REMUX is purchased.	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 DVB Subtitle option.
	Data	If selected for input n, two menu entries appear Input n PIDmin and Input n PIDmax. 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 Data, ensure that the PSI and SI information is correct. Usually, this means turning the "SI Level" to "Off (Ext.PSIP/PSI)" and one of the remux inputs would be receiving all PSI and PSIP.

Selected Item	Options	Description
SI Level: Enables the service information level to be specified.	PAT/PMT/CAT only	Program Association Table/ Program Map Table/ Conditional Access Table.
	PAT/PMT only	Program Association Table/ Program Map Table.
	Off	
	On	
	On (No EIT)	
Data n min/max: Select a PIDmin and PIDmax range for a specified input [n].		Only available when M2/EOM2/REMUX is purchased. 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: Specify the Network Identity.		The information is included in the NIT. This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control.
Service Id: Specify the Service Identity.		This option ties the SDT to the PMT and is the same as the Program Number in ATSC. The information is included in the PAT, PMT, SDT, EIT and NIT. This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control.
Transport Stream Id: Set the Transport Stream ID value for the transport stream output from the Encoder.		This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control.
Service Type: Identifies the type of service carried.	Analog TV	The information is included in the Service Description Table (SDT).
	Digital TV	
	Digital Radio	
	Teletext,	
	Data Broadcast	
PMT PID: Shows the Program Map Table Packet Identifier.		
Stream ID Descriptor: Turns on or off the insertion of a stream identifier descriptor within the PMT.		
Dolby Digital Descriptor: Specify the descriptors for use with audio streams.	DVB and ATSC	Both the ATSC and DVB descriptors are used with the audio streams.
	DVB only	Only the DVB descriptors are used with the audio streams.
	ATSC only	Only the ATSC descriptors are used with the audio streams.
	It is necessary because the ATSC descriptor existed prior to the DVB descriptor and some Decoders (e.g. early Alteias) used the Dolby Digital descriptor for identifying Dolby Digital streams. Only available when the syntax is set to DVB.	
Logical Chan Desc: Turn the Logical Channel Descriptor On or Off.		The information is included in the NIT (for Australia mainly).
Logical Channel: Enter a Logical Channel number.		Only shown if the Logical Chan Desc option is set to On.

Selected Item	Options	Description
DVB Subtitles This option is only available when Remux Input n Mode is set to DVB Subt.	Off On streams 1, 2, 3, 4 On streams 1, 2, 3 On streams 1, 2 On stream 1	The Encoder includes 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. 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. 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

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 4.5* for the `Remote Control Menu` structure and *Table 4.5* for a description of the options.

Path: Summary Screen [More]> Setup> System> Remote Control

Table 4.5: Remote Control Menu Option Descriptions

Selected Item	Options	Description
IP Address: Enter the IP Address.		
MAC Address:	00 20 AA 0F 29 AD	The MAC Address cannot be changed.
Network Mask: Enter the Network Mask.		
Gateway Address: Enter 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.
SNTP Server: Set the IP address of a SNTP server.		The Encoder synchronises its clock to the SNTP server specifed. If the SNTP Server is set to 000.000.000.000 the Encoder will not try and access an SNTP server.
Set Community Name: Enter the SNMP Community Name.		
SNMP Master: Set 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: This gives the last SNMP Master's IP address.		It cannot be changed.
Last SNMP Poll:		The Last SNMP Poll option cannot be changed.
SNMP Trap IP: Sets the IP address to which the trap messages will be sent.		SNMP Traps are a way of reporting status information to a control system, but not all control systems can handle them. If it is set to 000.000.000.000 then the trap messages will be sent to the last SNMP master.

Selected Item	Options	Description
Trap Level Report: This enables the type of events reported via SNMP traps.	Start Msgs only	
	Fail and Start Msgs	
	All Traps	All failures, warnings and start messages will be reported.
Browser User Name: Set the web browser user name.		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.
Browser Password: Set the web browser password.		Only available from the front panel. To prevent unauthorised knowledge of the password it cannot be read back from the Encoder.
Ethernet Bandwidth: Set a low and a high network bandwidth setting.		Problems can be experienced with Ethernet control of the Encoder if the available network bandwidth is low. The low bandwidth setting limits the packet size, which can prevent problems with low bandwidth networks, but at the cost of speed of communications.
SABus Address: Set the SABus address of the Encoder.	49 to 127	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.
Serial Protocol: This selects how the Encoder responds to commands.	RS-232 interface	
	RS-485 interface	
SABus Baud Rate: Set the SABus Baud Rate.	1200 Baud	
	2400 Baud	
	4800 Baud	
	9600 Baud	
	19200 Baud	
	38400 Baud	
SABus Data Bits:		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 password on the RS232 port is either disabled by the user by setting “Setup Password” to “Off” on the front panel.	Off	Port functions as before (i.e. respond to command as described in the “Remote Control Protocol (RCP)”.
	RS232 Remote Control Port	The existing RS232 9-pin D-type port labelled “Remote Control” provides a menu interface to control the Encoder.
	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). When selected, it is not possible to set SMPTE 333-M Port option to Remote. 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”.) The port is configured as follows: - Serial Protocol: must be set to RS232 - SA Bus Baud-rate and SA Bus Data Bits: must be set to correspond to the settings on the serial terminal connected to the port.	

4.5.5 General Menu

The `General Menu` provides options for configuring the general parameters of the Encoder such as the time and date, screen savers, and fan control. See *Figure 4.5* for the `General Menu` structure and *Table 4.6* for the option descriptions.

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

Table 4.6: General Menu Options

Selected Item	Options	Description
Model Number: The model number of the Encoder is reported.		The model number of the Encoder 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: Assign a name to the current Encoder configuration.		It is this name that is used if the configuration is stored (see *Section 4.15, Configs Menu*).
Local Time: Sets the Encoder local time.		
Local Date: Sets the Encoder local date.		
UTC Offset: The Universal Time Co-ordinate (UTC is effectively the same as Greenwich Mean Time (GMT).	Min: –12 Hours Max: 15 Hours Step Size: 1 Hour	UTC offset. A positive value indicates East of Greenwich, and a negative value indicates West of Greenwich. If the specified UTC offset is outside the valid input range, a confirmation screen is displayed which shows the minimum/maximum value allowed. When including SI in the output transport stream the Encoder is required to output a Time and Date Table (TDT). This uses UTC. Therefore, as the local time is input on the front panel a UTC offset is needed so that the UTC time for the TDT table is generated.
GPS UTC Offset:	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		The Temperature option indicates the current internal temperature.
Screen Saver: Set the Screen Saver.	Top Level Menu Van Service Name Off	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.
Keypress Beep: Set the Keypress Beep.	On Off	A beep sounds every time that a front panel key is pressed. There is silence every time that a front panel key is pressed.
Power Dip Recovery: Set the Power Dip Recovery.	On Off It determines the state of the satellite modulator outputs (if fitted).	The outputs are restored following a power dip. The outputs are not restored following a power dip.
Upgrade Encoder: Shows the box serial number.	The serial number is in the range of 0 to 65535	There are a number of features which are not enabled by default. Refer to *Chapter 3, Options and Upgrades, Table 3.1* for details. These software options must be purchased before a software licence key can be sent. Send the serial number to TANDBERG Television Customer Services to obtain a software licence key to enter via the front panel to enable the features.
Software Release		The software release cannot be changed.
Fan Control	Auto (Temp. control) On	The fans are activated automatically when a defined temperature is reached. The fans are activated all the time.

4.5.6 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.

Path: Summary Screen [More]> Setup> System> Digital Programme Insertion

4.5.7 Advanced Menu

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 4.5* for the Advanced Menu structure and *Table 4.7 f*or the option descriptions.

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

Table 4.7: Advanced Menu Options

Selected Item	Options	Description
Setup Password: .		Only available from the front panel. If the Setup Password option is set to On then a password is required to change any parameters. CAUTION... Only set this option if you know the password! The default is: 0123456789
Current Password: Enter the current password.		Only available from the front panel when Setup Password = Off For forgotten passwords, contact Customer Services.
Display Errors: Enable or disable the display of error or alarm messages on the front panel.		
O/P Status	Off-line	Switches the output.
	On-line	
System Control: Sets the type of system control specified in the SI.	MEM/nCC	Control of the video/audio delay (lip sync) is via the MEM or nCompass Control.
	Local	Control of the video/audio delay (lip sync) is within the Encoder.
	External (SNMP)	Control of the video/audio delay (lip sync) is via the SNMP protocol.
	If the control equipment is a TT7000 System Manager, ensure that the Auto Lip Sync option is turned on (see Auto Lip Sync in *Table 4.16*). The TT7000 does not have a lip sync function therefore the Encoder has to provide this.	
Action On PID Error:	Raise Alarm	An error message is displayed if a PID error is found.
	Auto Correct	If a PID error is found it is automatically corrected.
SNMP Control: This option enables the SNMP Control to be set.	Wait for Initialisation	No SNMP reply during initialisation.
	From Power On	Reply as modules start to appear.
Display Contrast: Sets the contrast ratio of the LCD display.	Very Light	As the front panel 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.
	Light	
	Medium	
	Dark	
	Very Dark	

Selected Item	Options	Description
No. Services: It defines how many services (up to eight) the Encoder can generate in the output transport stream.	DVB only	Only available if the syntax is set to DVB. 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 4.5.9*) In ATSC only one motherboard service is possible.
Mbd. Service PIDs: Only available if Syntax is DVB and the number of services is greater than one.	Unique per Service	An elementary stream such as video can only be assigned to one service.
	Duplicate PIDs	An elementary stream can be shared by services, but this does mean that both services must have the same scrambling setting.
Reset On Download		The option is status only. The Encoder automatically reboots following a download, keeping the current configuration.
Reset Encoder This option is not normally used.		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.

4.5.8 Build Menu

The `Build Menu` is selected from the `System Menu`. The `Build Menu` shows the status of the options shown in *Figure 4.5*. They cannot be changed.

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

4.5.9 Additional Services (Mbd Services Menu)

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. See *Table 4.8* for option descriptions.

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.

Path: Summary Screen [More]> Setup> System> Mbd Services > n Service

Table 4.8: Additional Services (Mbd Services Menu) – Host Service n Options

Selected Item	Options	Description
Scramble: Controls whether the service is in the clear (no scrambling) or the type of scrambling applied to it.		
Name: Sets the service name for the service.		
Service ID: Sets the service ID for the service	0 to 65535	The service ID for the service is used to uniquely identify it in the PAT, PMT, SDT, EIT and NIT.
Logical Channel: Defines the logical channel number to be given to the service.	1 to 1023	This information is included in the NIT.
Service Type: The service type identifies the type of service carried.	Digital TV	The information is included in the SDT.
	Digital Radio	
	Teletext	
	Data Broadcast	
Enc Session Word: Sets the encrypted session word to be used to scramble the service		Available if the scramble option has been set to BISS-E scrambling.

Selected Item	Options	Description
Session Word: Sets the session word to be used to scramble the service		Available if the scramble option has been set to BISS Mode 1 scrambling.
PMT PID: Defines the Packet Identifier (PID) used for the Program Map Table (PMT) associated with the service.		
PCR PID: Display the PCR PID.		It cannot be changed.
Data A - RS232 (0121h) Data B – RS422 (0121h) Video (0134h)		There is a menu item for each elementary stream 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 4.6* for menu structure).

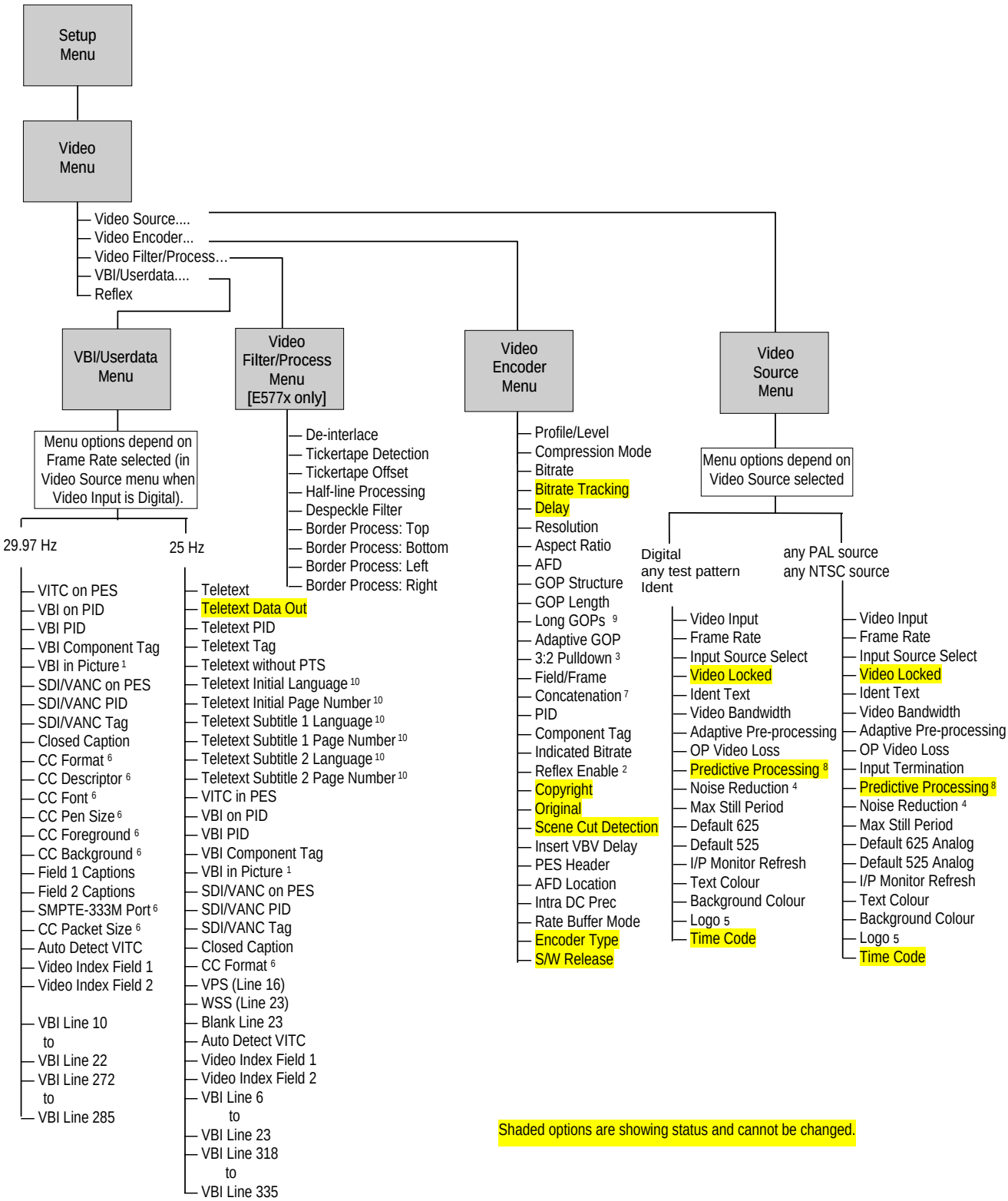
4.6.2 Video Source Menu

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

Path: Summary Screen [More]> Setup> Video> Video Source

Table 4.9: Video Source Menu

Selected Item	Options	Description
Video Input (None):	Off	Video input switched off.
Video Input (Analogue Composite)	NTSC-M No Pedestal	NTSC-M video input (with no Pedestal) on COMP VIDEO connector.
	NTSC-M with Pedestal	NTSC-M video input (with Pedestal) on COMP VIDEO connector.
	PAL-B/G/H/I	PAL-B/G/H/I video input on COMP VIDEO connector.
	PAL-D	PAL-D video input on COMP VIDEO connector.
	PAL-M	PAL-M video input on COMP VIDEO connector.
	PAL-N (Jamaica)	PAL- N video input on COMP VIDEO connector.
	PAL-N	PAL- N video input on COMP VIDEO connector.
Ident, Digital and Internal Test Pattern Video Sources	Serial Digital	Serial digital video input on SDI IN connector.
	Bars and 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 for test purposes.
Frame Rate: Enables the Frame Rate to be set.	29.97 Hz	Used in 525 lines (NTSC-M + PAL-M).
	25 Hz	Used in 625 lines (PAL).
	Only shown when the video input is Serial Digital, any Test Pattern or Off.	
Input Source Select: Allows the enabling or disabling of automatic frame rate detection.	Manual	The frame rate must be set via the Frame rate option.
	Auto Frame Rate	The frame rate is automatically detected.
	Auto Config Switch	The frame rate is automatically detected, and the Encoder loads the appropriate config defined by Default 525 Config and Default 625 Config.
Video Locked: This option indicates whether the video is locked.		It is for status only and cannot be changed.
Ident Text: Text that is displayed if the video output is lost.		



Shaded options are showing status and cannot be changed.

Closed Caption =	Line x	Line x & y	SMPTE 334	SMPTE 333
Field 1 Captions	✓	✓		
Field 2 Captions		✓		
SMPTE-333M Port				✓
CC Format	✓	✓	✓	ATSC only
CC Descriptor	✓	✓	✓	✓
CC Packet size				✓
CC Font	✓	✓		
CC Pen Size	✓	✓		
CC Foreground	✓	✓		
CC Background	✓	✓		

Shaded entries are for 29.97 Hz frame rate only.
Unshaded entries are for 25 Hz and 29.97 Hz frame rates.

1 VBI in Picture is only available when the Profile/Level is set to 422P@ML.
2 Reflex Enable only shown if M2/ESO2/VBR option enabled.
3 3:2 Pulldown is only available for 525 line 29.97 Hz inputs.
4 Noise Reduction only shown if M2/ESO2/NR option enabled.
5 Logo only shown if the logo has previously been downloaded into the Encoder.
6 See table to left for additional items when Closed Captions enabled.
7 Concatination is only available if M2/ESO2/ACON option enabled.
8 Predictive Processing only shown for MPASS capable Encoders.
9 Long GOPs only available if M2/ESO2/PU has been purchased.
10 Teletext options only available when Teletext = On: 7-22/320-335.

Figure 4.6: Menu Hierarchy – Setup/Video Menu

Selected Item	Options	Description	
Video Bandwidth: The Video Bandwidth Option controls the filtering of the video before it is compressed.	Sharp	Filter is at the maximum bandwidth possible for the resolution selected.	Reducing the bandwidth requires slightly less bits in the compressed bitstream. Refer to *ST.AN.BW.E10074* for more information.
	Medium	Slightly reduced bandwidth.	
	Medium Soft	Reduced a little further.	
	Soft	Reduced a little further still.	
	Auto	Automatically adjusts the bandwidth depending on the video bitrate 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: Select what is displayed on the television screen in the event of losing video input.	Freeze Frame	The last video frame received is encoded if the video input is lost.	
	Black	A black screen is encoded if the video input is lost.	
	Bars and 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 and Red + Ident	Bars and red test pattern is encoded if the video input is lost. Text message is superimposed.	
	Stored OSD	Only available if the Encoder has an OSD loaded.	
	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: Read-only indication of the current mode.	Normal	Encoder is in non multi-pass mode.	Only displayed for E5770 / E5775 Encoders or if M2/EOM2/MPM hardware option installed.
	Advanced	Encoder is in multi-pass mode.	
Input Termination: Switch the termination of the analogue video input On or Off.		Only shown for analogue video formats.	
Noise Reduction: Switch the noise reduction feature On (at different levels) or Off. Only available when software option M2/ESO2/NR is enabled.	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 turnaround 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.	
	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.		

<table>
<tr><th>Selected Item</th><th>Options</th><th>Description</th></tr>
<tr><td>Max Still Period</td><td></td><td>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.</td></tr>
<tr><td>Default 625 [Analog]:
Sets the default for the 625 Line standard.</td><td>PAL-B/G/H/I
PAL-D
PAL-M (Jaimaca)
PAL-M</td><td></td></tr>
<tr><td>Default 525 [Analog]:
Sets the default for the 55 Line standard.</td><td>NTSC with pedestal
PAL-M
NTSC no pedestal</td><td></td></tr>
<tr><td>I/P Monitor Refresh:
Sets the update rate of the input video monitor on the front panel, and the web browser monitor.</td><td></td><td></td></tr>
<tr><td>Text Colour:
Defines the text colour for any on-screen messages generated by the Encoder (e.g. by the Ident test pattern).</td><td>Available Options
White, Blue, Magenta, Yellow, Green, Pink
Black, Red, Orange, Grey, Cyan</td><td rowspan="2">CAUTION…
Make the background colour a contrast to the text otherwise the text will not be seen!</td></tr>
<tr><td>Background Colour:</td><td>Available Options
White, Blue, Magenta, Yellow, Green, Pink
Black, Red, Orange, Grey, Cyan</td></tr>
<tr><td>Logo:
(When Logo Downloaded into Unit).
Gives the choice of superimposing the broadcaster’s logo on the video (On) or not (Off).</td><td></td><td>Only available if the logo has previously been downloaded into the equipment (see Annex D, Creating and Downloading a Logo).</td></tr>
<tr><td>Time Code:
Indicates the time given by the Vertical Interval Time Code (VITC) or generated by the Encoder.</td><td></td><td>It is for status only.</td></tr>
</table>

4.6.3 Video Encoder Menu

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.

Path: Summary Screen [More]> Setup> Video> Video Encoder

Table 4.10: Video Encoder Menu Option Descriptions

Selected Item	Options	Description
Profile/Level:	422P@ML	4:2:2 Profile @ Main Level. Typically used in 4:2:2 contribution feed.[2]
This option enables the Profile/Level to be set.	MP@ML	Main Profile @ Main Level. Typically used in 4:2:0 direct-to-home.
Compression Mode:	Seamless 1	This gives a fixed delay which allows the bitrate to be changed, over the permitted range, without a break in transmission.
Selects various compression modes in which some encoding parameters are automatically controlled depending on the selected encoding delay.	Seamless 2	
	Seamless 3	
	Seamless 4	
	Seamless 5	
	Seamless 6	
		In the following modes the delay is a function of the bitrate selected. If the bitrate 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	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	The generated transport stream is not fully DVB compliant and may not work with all Decoders.

CAUTION...

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

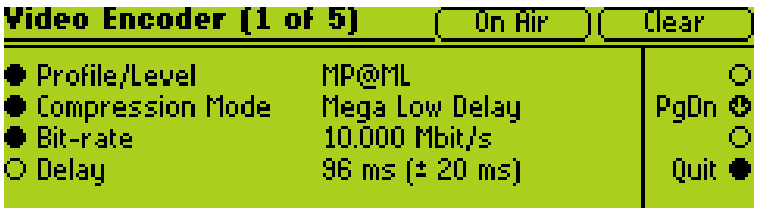
Profile (Full Resolution Only)	Seamless 1 (Mbit/s)	Seamless 2 (Mbit/s)	Seamless 3 (Mbit/s)	Seamless 4 (Mbit/s)	Seamless 5 (Mbit/s)	Seamless 6 (Mbit/s)
4:2:0	0.8 - 10	1.5 - 10	2 - 15	0.4 - 10	1 - 12	1.3 - 10
4:2:2[2]	1.5 - 13	3 - 27	5 - 33	0.7 - 10	2.1 – 2.5	2.5 - 20
Rate Buffer delay	2.5 s	1.2 s	1 s	3.3 s	1.3 s	1 s

[2] 4:2:2 is not available unless the M2/ESO2/422 software option is enabled.

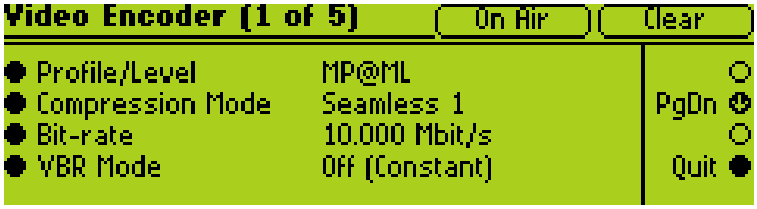
Selected Item	Options	Description	
	Seamless 1 This would be used for 4:2:0 DTH statistical multiplexing applications. The Encoder delay is approximately 2.5 seconds. **Seamless 2** mode emulates System 3000 6U and 6U+ Encoders delay. Actual minimum and maximum rates depend on video standard and resolution. **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 (if enabled) statistical multiplexing and a low B_{min}. Actual minimum and maximum depend on the video standard and resolution.		In Seamless Modes 4, 5 and 6 coding performance is compromised a little to achieve lower B_{min}s.
Bitrate: Set the Bitrate.		An error message is shown with the correct range of bitrates if the wrong rate is entered.	
	High bitrates in low resolutions cannot always generate sufficient bits to match the requested bitrate. 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 mode (if enabled) the upper video bitrate limit of the IRD is 25 Mbit/s.		
Bitrate Tracking:		If the Bitrate option is set to its maximum then Bitrate Tracking is automatically switched on. In this mode, any changes which cause the mux bitrate to increase or decrease will cause the video rate to always fill the available mux bitrate. Changes which cause the mux rate to change include varying audio bitrate, RS-232 data bitrate, changing symbol-rate (on Voyager units). Bitrate tracking is switched off by manually setting the video bitrate to any value lower than the maximum.	
	On an Encoder fitted with a Remux card, only changes to the **Host Bitrate** will cause the video rate to track. Increasing the final bitrate (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.		
VBR Mode 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 standalone Variable Bitrate (VBR) mode. When in this mode the bitrate 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 bitrate to achieve a particular picture quality set by the user. If this is set very high then the generated bitrate clips at the Bmax value. If it is set very low then the bitrate clips at Bmin. Somewhere in-between the bitrate varies, depending on the picture material being encoded. Simple pictures use a lower bitrate than complex pictures. When in this mode the main encoder output remains at the bitrate set within the Mux menu and any spare unused bitrate is filled with stuffing packets. These could optionally be removed and reinserted by some equipment between the Encoder and Decoder.	

Selected Item	Options	Description

A typical view of the Video Encoder menu would be:

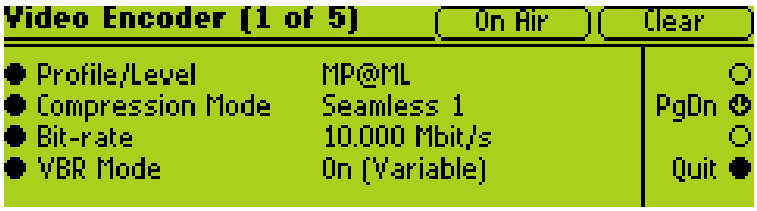


To run in VBR mode the Encoder must be placed into a Seamless Compression mode.



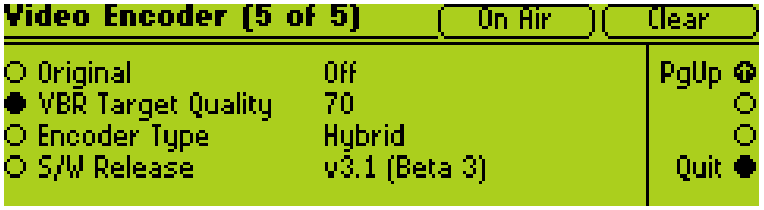
A new menu item **VBR Mode** then appears. When set to Off (Constant) the Encoder generates a fixed constant bitrate set by the **Bitrate** option.

When changed to On (Variable) the Encoder enters its standalone VBR Mode.



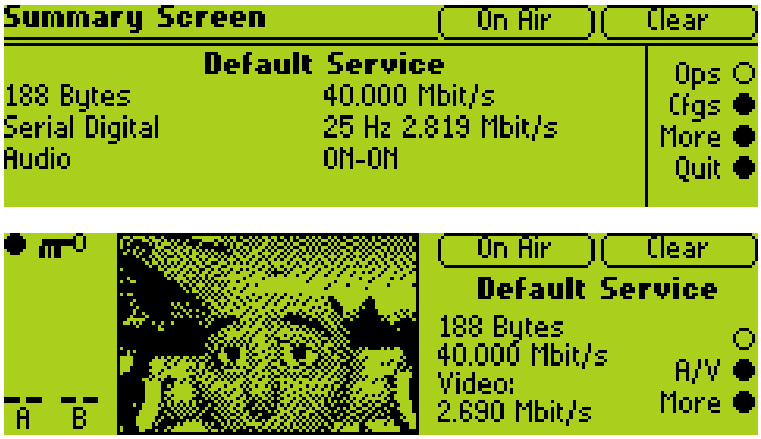
A new menu item appears Max (VBR) **Bitrate**. This is the maximum bitrate the Encoder will generate. The read-only menu item **Bitrate** remains, but now indicates the bitrate being generated by the Encoder.

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 bitrate being used. This will typically vary.

Selected Item	Options	Description



Delay: Shows the current video delay.		It is for status only and cannot be changed.
Resolution: Shows 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.

Options		Description
625 Line Modes	525 Line Modes	
Auto (720x576)	Auto (720x480)	[In Auto, pixel value in brackets varies with bitrate that is set.]
720 x576	720 x480	Relates to the number of pixels across the screen and the number of lines down the screen (pixels x lines).
704 x576	704x480	
640 x576	640x480	
544 x576	544x480	
528 x 576	528x480	
480 x576	480x480	
352x576	352x480	
352x288 (SIF)	352x240 (SIF)	

Aspect Ratio: This option does not affect the image processing.	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.
	16:9	Video image is encoded at 16:9 aspect ratio.
	2.21:1	Video image is encoded at 2.21:1 aspect ratio. Not currently used.

Selected Item	Options	Description
AFD Option: Active Format Descriptor (AFD) uses three bits of video index to define the video format.	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.
	This information is encoded into user data and can then be used by a Decoder for wide-screen switching. 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.	

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: This option enables the GOP Structure to be set.	IBBBP	(IBBBPBBBPBBBI) (SD Only).
	IBBP	for successive B frames (IBBPBBPBBPBBPI) – default.
	IBP	for operation with B frames (IBPBPBPBPBPI).
	IP	for non-B frame operation (IPPPPPPPPPPI) - default for very low delay mode.
	IBBB	(IBBBIBBBIBBBIBBB) - professional editing standard. (SD only)
	IBB	IBBIBBIBBIBBIBBI) - professional editing standard.
	IB	(IBIBIBIBIBIBIBIB) - a professional editing standard.
	I-Frame	(IIIIIIIIIIIIII) - for precise editing and compression.
	For some GOP changes operation can be seamless but this is not guaranteed.	
GOP Length: Sets the video GOP structure length. GOP lengths available depend on GOP structure selected and the frame rate.	Min: 1 Maximum GOP lengths: 12 for 25 Hz 15 for 29.97/30 Hz 24 for 50 Hz 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.
	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. 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.	

Selected Item	Options	Description
Long GOPs: Enable or disable the use of GOP structures that are longer than 500 ms in duration. Only available if M2/ESO2/PU has been purchased.		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 bitrates. 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.
	CAUTION... Long GOPs are not DVB compliant, and should be used with caution.	
Adaptive GOP:		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: Choose either field or frame based pictures.	Fields	Field based pictures.
	Frames	Frame based pictures.
	Auto	Automatically chooses the correct option on a frame by frame basis.
	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.	
3:2 Pull-down: Switch the 3:2 pull-down (film) mode On and Off. 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.
	This option is only available for 29.97 Hz, 30 Hz, 59.97 Hz and 60 Hz modes. VBI in Picture is not supported when 3:2 Pull-down is active. 3:2 Pull-down is not valid for Very Low Delay and Mega Low Delay coding modes.	
Concatenation: Only available when software option M2/ESO2/ACON is purchased.		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: Enter or update the video PIDs, as required.	32 to 8191	Enter a PID then press the **Enter** softkey to accept it. To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Component Tag: Defines the optional component tag assigned to this video stream.		
Indicated Bitrate: Controls the video bitrate that is signalled in the transport stream.	Max Value	The maximum possible bitrate for the profile and encoding mode is signalled. This is the way all previous generations of TANDBERG Television Encoders have operated.
	Actual Value'	The encoding mode is not a seamless mode, then the bitrate signalled is the actual video bitrate set on the Encoder.
Reflex Enable: Enable (On) or disable (Off) Reflex.		Only available if M2/ESO2/VBR purchased.

Selected Item	Options	Description
Indicated Bitrate:		This option controls the video bitrate that is signalled in the transport stream. If set to 'Max Value' the maximum possible bitrate for the profile and encoding mode is signalled. This is the way all previous generations of TANDBERG Television's Encoders have operated. If set to 'Actual Value', and the encoding mode is not a seamless mode, then the bitrate signalled is the actual video bitrate 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: Indicates whether the information in the bitstream is shown to be protected by copyright.		It is for status only and cannot be changed.
Original: Indicates whether the bitstream is an original or a copy of an original bitstream.		It is for status only and cannot be changed.
Scene Cut Detection:		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.
Insert VBV Delay:		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: Controls how often the Encoder inserts a PES header into the transport stream.	per GOP	The default option is', when the Encoder will insert a PES header at the start of every GOP.
	per Picture	The Encoder inserts 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: Indicates where the AFD information is transmitted.	Sequence Header	
	Picture Header	
Intra DC Precision:	Auto	Selects the optimum number of bits depending on the profile, coding mode and video bitrate.
	8 bits	
	9 bits	
	10 bits	
	11 bits	Available if 422P@ML option enabled.
Rate Buffer Mode:	Small	Refer to *Chapter 6* for information about using this option.
	Medium	
Encoder Type: Shows the type of Encoder.		It is for status only and cannot be changed.
S/W Release: Shows the software release of the Video Compression Module.		It is for status only and cannot be changed.

4.6.4 Video Filter/Process

The `Video Filter/Process` Menu is available for E577x Encoders only.

Path: Summary Screen [More]> Setup> Video> Video Filter/Process

Table 4.11: Video Filter/Process

Selected Item	Options	Description	
De-interlace: Using this feature can save between 5% and 15% of the required bitrate depending on picture content. This feature is of most benefit in Reflex systems.	On		E577x Encoders or those having option M2/ENC/MPM enabled only
	Off	For services with permanent horizontal scrolling, it is recommended to turn de-interlacing Off.	
	Adaptive	In normal use, Adaptive is recommended. In this mode, the Encoder de-interlaces content that has low motion. Therefore, content that is relatively easy to code will be coded with even fewer bits.	
Tickertape Detection: This feature has effect on the encoding only if **De-interlace** is set to **Adaptive**.	On	When set to **On** and **Horizontal Scrolling**, text is detected in the band indicated by **Tickertape Offset**, the frame will not be de-interlaced. This is to avoid judder in the scrolling text. It is recommended to turn **Tickertape Detection On** for services which have occasional horizontal scrolling text.	
	Off		
Tickertape Offset: This feature has effect on the encoding only if **Tickertape Detection** is set to **On**.	0 to 100	This indicates the percentage offset of the band from the bottom of the screen. It is not possible to set the width of the band, this is fixed.	
Half-line Processing: Applicable to Encoders running 625 line, 50 Hz applications only.		625 line video includes half-lines at the start and end of each field. These half-lines can cause coding artefacts and take a disproportionate number of bits to code. The Half-line Processing feature treats the half lines differently to reduce the bitrate demand.	
Despeckle Filter:	0 – 14 The filtering is more aggressive as the level increases.	Level 0 is Off. Levels 1 to 7 is used to remove low to medium levels of noise. Level 8 and upwards are suited for film grain noise.	
	Auto	The Auto option selects the optimum level given the current encoding parameters.	
	The Despeckle Filter complements the adaptive noise reduction on the motherboard so can be used in conjunction to remove different types of noise. It is ideally suited for removing bit errors (median filtering) and film grain noise.		
Border Process: Top/Bottom/Left/Right Applies processing to the extreme edges of the picture so that less bits are used to code these areas.	0	no processing	
	25		
	50		
	75	(100 would represent full processing resulting in solid block borders!)	

4.6.5 Vertical Blanking Interval (VBI)/Userdata Menu

Overview

The VBI/Userdata 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.

Path: Summary Screen [More]> Setup> Video> VBI/Userdata

VBI/Userdata Menu (25 Hz Frame Rate)

Table 4.12: VBI/Userdata Menu (25 Hz Frame Rate)

Selected Item	Options	Description
Teletext: Enables the extraction of Teletext System B (WST) data.	Off	Provides a quick way of configuring the Encoder to the most common Teletext configuration. Teletext extracted from lines 7-22 and 320-335. It is possible to extract Teletext from lines 6, 318 and 319 as well, but these lines must be individually configured.
	On: 7-22/320-335	
Teletext Data Out: Indicates whether the Encoder is currently outputting Teletext data.		It is for status only and cannot be changed.
Teletext PID: Defines the PID to be used for Teletext data.	Off	
	On	
Teletext Tag: Sets the component tag for the Teletext stream.	0 to 255.	
Teletext without PTS	Off	
	On	
Teletext Initial Language	ISO 639 language codes	Only displayed if Teletext = On: 7-22/320-335. The ISO 639 language codes used for audio is available as options (except for Main, Auxiliary, User-Defined Language 1 and User-Defined Language 2). The default is “eng”. Teletext Pages comprise of the “Magazine Number” and the “Teletext Page”. The input range available is 0x100 to 0x8FE as specified in ETS 300 706. The msd is the magazine number and the two lsds are the page number e.g. 0x100 is magazine 1, page 00. The default is “0x100”.
Teletext Initial Page Number	0x100 to 0x8FE	
Teletext Subtitle 1 Language	ISO 639 language codes	
Teletext Subtitle 1 Page Number	0x100 to 0x8FE	
Teletext Subtitle 2 Language	ISO 639 language codes	
Teletext Subtitle 2 Page Number	0x100 to 0x8FE	
VITC on PES Option: Extraction of VITC data from VBI lines.		Enabling this option enables the VBI on PID option. Extracted from Line 16 or 22 for 625-line systems (EBU definitions) or Line 14 for 525-line systems.
VBI on PID: Allows the transmission of VBI data on its own PID to be turned On or Off.		Enabling VITC on PES enables this option automatically.
VBI PID: Defines the PID to be used for VBI data.		
VBI Component Tag: Sets the component tag for the VBI stream.	0-255	

Selected Item	Options	Description
VBI In Picture Option: Enables the extended picture format available in the MPEG 4:2:2 specification to be selected. The **VBI in Picture** option is only accessible if the selected video profile/level is **422P@ML** (software option).	On	VBI is coded as active video.
	Off	
	Off (Bitrate too low)	Insufficient bitrate.
	When selected, the Encoder compresses and transmits the VBI data as part of the active picture. 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 mode requires up to 3 Mbit/s of bitrate, depending on the amount and complexity of the VBI present. It may be necessary to increase the video bitrate accordingly to maintain picture quality. 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.	
	CAUTION... When encoding VBI in this way **3:2 Pull-down** 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.	
SDI/VANC on PES:	Off	The default is off.
	On	Closed Caption data and any user data embedded in the SD-SDI according to SMPTE 334, is extracted and sent via PID, carried in the Transport Stream in accordance to the ARIB STD-B40 ver.1.0 format. The PID is signalled as 'PES private data'. (Stream type 6). The data from each 'VBI line' that has "VANC data-piping" selected is inserted onto a separate PES packet and encapsulated into the transport stream on the PID specified in the "VANC PID" menu.
SDI/VANC PID:	0x1FDO to 0x1FEF	The default is 0x1FD0
SDI/VANC Tag:	0 to 255	The default is 196. The tag ID is added to the PMT descriptor for the VANC data component when present. When 0 is selected the descriptor is removed from the PMT.
Closed Caption	On (Video 18 and 331)	This option controls the extraction and processing of closed caption data by the Encoder. Closed caption data can be obtained from: video line 18, video lines 18 and 331, or be received in accordance with SMPTE 334M on SD-SDI.
	On (Video 18)	
	On (SD-SDI/SMPTE 334M)	
	Off	
CC Format	ATSC	Only displayed when Closed Caption enabled.
	SCTE 20and21	
	SCTE 21	
	SCTE 20	
VPS (Line 16): Enables or disables the extraction of VPS (Video Programming System) data.	Extracted from line 16 of the video input.	
VITC on PES: Extraction of VITC data Enabling this option will disable VBI on PID.	Extracted from Line 16 or 22 for 625-line systems (EBU definitions) or Line 14 for 525-line systems.	

Selected Item	Options	Description
WSS (Line 23): 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
	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.	
Blank Line 23: 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: When enabled, the Encoder automatically detects the presence of Vertical Interval Time Code (VITC) data.		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.
Video Index Field 1	525 line: Off, Line 10 – 22 625 line: Off, Line 6 – 23	Allows the line carrying the Video Index in-Field 1 to be selected. The default setting is Off.
Video Index Field 2	525 line: Off, Line 272 – 285 625 line: Off, Line 318 – 335	Allows the line carrying the Video Index in-Field 2 to be selected. The default setting is Off.

Selected Item	Options	Description
VBI Line 'n' Option		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).

Option	Description
Frame Rate = 29.97 Hz	
Off	VBI data is not extracted from the line.
VANC data- piping	When the "VANC on PES" menu option is set to "On" the data from each 'VBI line' that has "VANC data-piping" selected is inserted onto a separate PES packet and encapsulated into the transport stream on the PID specified in the "VANC PID" menu.
Vertical Interval Time Code	VITC data extracted from the line.
Video Index	
Closed Caption Indicates that closed captioning data is extracted.	The setting cannot be selected on this screen, but is set by setting the Closed Caption option to On [SMPTE 333M], On [video 21 and 284] or On [video line 21]. Setting Line 21 back to Off or VITC resets the Closed Caption option back to Off.
Neilsen AMOL 1	Neilsen AMOL 1 data is extracted from the line.
Neilsen AMOL11	Neilsen AMOL 11 data is extracted from the line.
Frame Rate = 25 Hz	
Off	VBI data is not extracted from the line.
VANC data-piping	When the "VANC on PES" menu option is set to "On" the data from each 'VBI line' that has "VANC data-piping" selected is inserted onto a separate PES packet and encapsulated into the transport stream on the PID specified in the "VANC PID" menu.
Vertical Interval Time Code	VITC data extracted from the line.
Video Index	Aspect ratio will be affected.
Teletext System B (World System Teletext)	Teletext System B data extracted from the line. When Teletext = On 7-22 and 320-335, those lines carry Teletext data. It is possible to extract Teletext from lines 6, 318 and 319 as well, but these lines must be individually configured.
Inverted Teletext	Inverted Teletext is extracted from the line.
Wide Screen Signalling Indicates that WSS data is extracted.	The setting cannot be selected on this screen, but is set by setting the WSS (Line 23) option to On. Setting Line 23 back to Off, VITC or Teletext System B resets the WSS (Line 23) option back to Off.
Closed Caption	Closed Caption data is extracted from the line.
Video Programming System	The setting cannot be selected on this screen, but is set by setting the VPS (Line 16) option to On. It indicates that VPS data is extracted from the line. Setting Line 16 back to Off, VITC or Teletext System B resets the VPS (Line 16) option back to Off.

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. To autodetect VITC the lines within the VBI line option must be set to VITC (SD only).
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.

Selected Item	Options	Description
Time Code Source	Auto	
	Free Running	
	LTC via HD-SDI	
	VITC via HD-SDI	

	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 4.7: VBI Structure Implemented by TANDBERG for 525-line Systems

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...

1. Any type of valid VBI can be on any line, even if it is not usually associated with that line.
2. 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.
3. An MPEG frame is 576 lines when formatting 625-line format pictures.
4. Line 23 is the Wide Screen Signalling line. It carries information which defines the picture Aspect Ratio.
5. ETS 300 294 is the specification which describes WSS.
6. EN 300 472 is the specification associated with System B Teletext (World System Teletext).

Figure 4.8: VBI Structure Implemented by TANDBERG for 625-line Systems

VBI/Userdata Menu (29.97 Hz Frame Rate)

Table 4.13: VBI Menu (29.97 Hz Frame Rate)

Selected Item	Options	Description
VITC on PES:		Extraction of VITC data from Line 16 or 22 for 625-line systems (EBU definitions) or Line 14 for 525-line systems. Enabling this option enables VBI on PID.
VBI on PID:		Turns the transmission of VBI data on its own PID On or Off. Enabling VITC on PES automatically enables this option.
VBI PID:		Defines the PID to be used for VBI data.
VBI Component Tag:	0 to 255	Sets the component tag for the VBI stream.
VBI In Picture: Selects the extended picture format available in the MPEG 4:2:2 specification. The VBI in Picture option is only accessible if the selected video profile/level is 422P@ML (only available when software option M2/ESO2/422 is purchased).	On	VBI is coded as active video.
	Off	
	Off (Bitrate too low)	Insufficient bitrate.
	When selected, the Encoder compresses and transmits the VBI data as part of the active 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 mode requires up to 3 Mbit/s of bitrate, depending on the amount and complexity of the VBI present. It may be necessary to increase the video bitrate accordingly to maintain picture quality. 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.	
	CAUTION... When encoding VBI in this way 3:2 Pull-down 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.	
SDI/VANC on PES:	Off	The default is off.
	On	Closed Caption data and any user data embedded in the SD-SDI according to SMPTE334, is extracted and sent via PID, carried in the Transport Stream in accordance to the ARIB STD-B40 ver.1.0 format. The PID is signalled as 'PES private data'. (Stream type 6). The data from each 'VBI line' that has "VANC data-piping" selected is inserted onto a separate PES packet and encapsulated into the transport stream on the PID specified in the "VANC PID" menu.
SDI/VANC PID:	0x1FDO to 0x1FEF	The default is 0x1FD0
SDI/VANC Tag:	0 to 255	The default is 196. The tag ID is added to the PMT descriptor for the VANC data component when present. When 0 is selected the descriptor is removed from the PMT.
Closed Caption:	On (Video 21 and 284)	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 and SMPTE 334M on SD-SDI.
	On (Video Line 21)	
	On (SD-SDI/SMPTE 334M)	
	On (SMPTE 333M)	
	The Encoder automatically converts EIA608 to EIA708 format. The "CC..." settings are used in this conversion.	

Selected Item	Options	Description
SMPTE 333M Port: Controls which RS-232 interface is used for receiving the closed caption data.		This option is only displayed if the Closed Captions are set to SMPTE 333M input.
Field 1 Captions: 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. Only available if Closed Captions = On (Video 21) or On (Video 21 and 284).
Field 2 Captions: 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. Only available if Closed Captions = On (Video 21 and 284).
CC Format: Inserts the closed captions as user data in the video stream in the selected format.	ATSC SCTE 20 and 21 SCTE 21 SCTE 20 TANDBERG/NDS Television proprietary format	This controls the format used to insert the closed captions as user data in the video stream. CC Format is ATSC only when Closed Captions = On (SMPTE 333M).
CC Descriptor: Controls the CC Descriptor type that the Encoder generates.	Line 21 only Line 21 and Advanced Advanced only	This option is only available if the CC format is set to ATSC.
CC Font: Defines the font to be used for displaying the closed caption text.		Only available if Closed Captions = On (Video 21 and 284)
CC Pen: Defines the pen size to be used for displaying the closed caption text.		
CC Foreground: Defines the foreground colour to be used for displaying the closed captions.		
CC Background: Defines the background colour to be used for displaying the closed captions.		
Auto Detect VITC: Enables the Encoder to automatically detects the presence of Vertical Interval Time Code (VITC) data.		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.
Video Index Field 1	Off, Line 10 – Line 22	Allows the line carrying the Video Index in-Field 1 to be selected.
Video Index Field 2	Off, Line 272 – Line 285	Allows the line carrying the Video Index in-Field 2 to be selected.

Selected Item	Options	Description
CC Packet Size: Controls the size of Closed Caption packet the Encoder requests from the closed caption server via the SMPTE 333M interface.	SYN0 (0x05) SYN5 (0x14) SYN10 (0x23) SYN15 (0x32) SYN20 (0x41) SYN25 (0x50)	This option is only displayed if the Closed Captions are set to SMPTE 333M input.
Auto Detect VITC: Enables 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 an inserted into the stream.
VBI Line 'n'		Each VBI line can be individually configured as to the format of VBI data that should be extracted from that line. However, a maximum of eight VBI lines can be processed per field (this does not include Teletext lines).

Option	Description
Frame Rate = 29.97 Hz	
Off	VBI data is not extracted from the line.
Vertical Interval Time Code	VITC data extracted from the line.
Video Index	
Closed Caption	The setting cannot be selected on this screen, but is set by setting the Closed Caption option to On [SMPTE 333M], On [video 21 and 284] or On [video line 21]. It indicates that closed captioning data is extracted from the line. Setting Line 21 back to Off or VITC resets the Closed Caption option to Off.
Neilsen AMOL 1	Neilsen AMOL 1 data is extracted from the line.
Neilsen AMOL11	Neilsen AMOL 11 data is extracted from the line.
Frame Rate = 25 Hz	
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.
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 WSS (Line 23) option to On. It indicates that WSS data is extracted from the line. Setting Line 23 back to Off, VITC or Teletext System B resets the WSS (Line 23) option back to Off.
Closed Caption	Closed Caption data is extracted from the line.
Video Programming System	The setting cannot be selected on this screen, but is set by setting the VPS (Line 16) option to On. It indicates that VPS data is extracted from the line. Setting Line 16 back to Off, VITC or Teletext System B resets the VPS (Line 16) option back to Off.

Selected Item	Options	Description
To autodetect VITC the lines within the VBI line option must be set to VITC (SD only).	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. 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. In HD only Teletext and Vertical Timecode are available.	
Time Code in Userdata: Used to insert a time code into userdata as defined by SMPTE 328.	On/Off	For High Definition Encoders only. Only the time code section of SMPTE 328 is implemented, along with appropriate headers.

4.7 Audio Menu

4.7.1 Read This First!

4.7.2 Overview

The Encoder can process two stereo pairs as standard but it can process more with the addition of Audio Option Cards. The control menu for each stereo pair is essentially the same, but the options available are dependent on the coding standard selected. See *Figure 4.9* for the menu structure.

4.7.3 Audio A / B Menus

Figure 4.9 shows the Audio menu options generally in the order they appear on the front panel.

Path: Summary Screen [More]> Setup> Audio> AudioA/B

Table 4.14: MPEG- 2 Coding Standard Options

Selected Option	Description	Comments	
MPEG Layer 2	MPEG Layer 2 audio coding standard.	This menu defines the encoding parameters for the motherboard audio encoder when the TS output is enabled.	
Dolby Digital Pass-Thru	Pre-encoded (in Dolby Encoder) audio coding standard. See *Annex F, Audio Modes*, for information when using this mode.	When a Dolby Digital or Dolby Digital Plus input is applied to the audio input, the encoder will automatically detect the input standard (either Dolby Digital or Dolby Digital Plus) and output the stream in the correct format.	If the audio input has been set to Analogue, selecting the Pass-thru option will force the audio input to digital. This is because pre-encoded bitstreams will never be transmitted as analogue signals.
Dolby E Pass-Thru	Dolby E audio coding standard (pre-encoded in Dolby Encoder). See *Annex F, Audio Modes*, for information when using this mode.		
Dolby Digital	Dolby Digital audio coding standard.		
Linear PCM (Direct)	Linear PCM audio coding standard.	See *Annex F, Audio Modes*, for information when using this mode.	
Linear PCM (Via SRC)	Linear PCM audio coding standard.	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).	

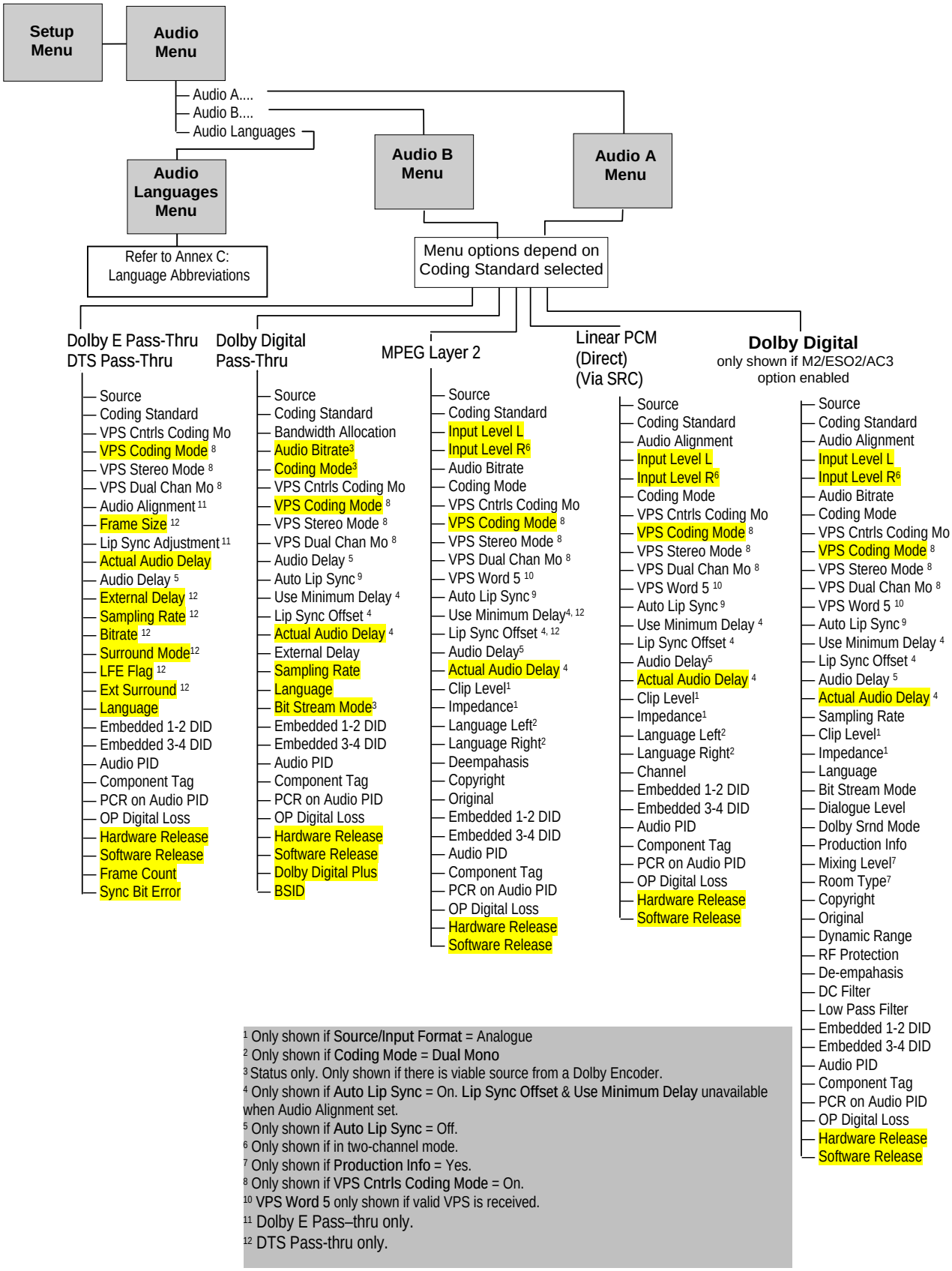


Figure 4.9: Menu Hierarchy – Setup/Audio Menu

Coding Standard Associated Options

Table 4.15 shows the options available for each Coding Standard in alphabetical order. This is to allow quick access to the information. Go to *Table 4.16* for a description of any particular option.

Table 4.15: Coding Standard Associated Options

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

Option	Coding Standard					Comments
	Dolby E Pass-Thru DTS Pass-Thru	Dolby Digiatl Pass-Thru	MPEG Layer 2	Linear PCM	Dolby Digital	
Low Pass Filter					✓	
Mixing Level					✓	Only shown if Production Info = Yes.
OP Digital Loss	✓	✓	✓	✓	✓	
Original			✓		✓	
PCR on Audio PID	✓	✓	✓	✓	✓	
Production Info					✓	
RF Protection					✓	
Room Type					✓	Only shown if Production Info = Yes.
Sampling Rate This option controls the audio sampling rate.					✓	
SMPTE 302M Stnd	✓			✓		Choose the **Audio Alignment** option to enable the SMPTE 302M 2002 standard. This disables the **SMPTE 302M Standard** option.
Software Release	✓	✓	✓	✓	✓	
Source	✓	✓	✓	✓	✓	
Sync Bit Error	✓					
Use Minimum Delay	✓	✓	✓	✓	✓	Only shown if Auto Lip Sync = On. If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.
VPS Cntrls Coding Mode			✓			
VPS Coding Mode			✓			Only shown if VPS Cntrls Coding Mode = On.
VPS Stereo Mode			✓			Only shown if VPS Cntrls Coding Mode = On.
VPS Dual Chan Mode			✓			Only shown if VPS Cntrls Coding Mode = On.
VPS Word 5			✓			Only shown if VPS Cntrls Coding Mode = On. VPS Word 5 only shown if valid VPS is received.

Table 4.16 lists all the Audio A/B options in alphabetical order to allow easier searching.

Table 4.16: Audio A/B Options

Selected Option	Options	Description
Actual Audio Delay:		Shows the actual audio delay. It is for status only and cannot be changed.
Audio Alignment When set, each PES contains an integral number of audio access units (AU's) and the PTS shall be the same as the nearest video frame (which is required by some set-top boxes).	Unaligned Aligned to PES Header	When checked, Auto Lip Sync is forced On, the delay can be 'nudged' using the Lip Sync Adjustment option. This is to support the SMPTE 302M-2002 specification for carriage of AES3 data in an MPEG transport stream. It provides one audio PES packet per video frame, such that the PES packet is aligned to that video frame and stamped with the same PTS. NOTE... Choose the **Audio Alignment** option to enable the SMPTE 302M 2002 standard. This disables the SMPTE 302M **Standard** option.
Audio Bitrate		This option sets the audio bitrate of this audio channel. For Pass-thru standards: This option shows the audio bitrate of this audio channel. It is for status only and cannot be changed

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

Audio Delay: It sets the delay that should be applied to the audio.	Min:	111	Audio Delay in milliseconds. This option is only available if the Auto Lip Sync option is set to Off.
	Max:	3540	

Selected Option	Options	Description
Audio PID: This option sets the PID to be used for the audio channel. In the event of a PID clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.		To be DVB compliant the audio PID should not be less than 32. However it is possible to set the PID to less than 32, but in the event of a PID clash the Encoder's internal checking algorithm will not resolve the conflict.
Auto Lip Sync[3]: 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. If the control equipment is a TT7000 System Manager, ensure that the Auto Lip Sync option is turned on. The TT7000 does not have a lip sync function therefore the Encoder has to provide this. To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.
Bit-stream Mode: This option sets the bit-stream mode that is ignaled in the bitstream. It is used to indicate the type of service the bitstream conveys.	Complete Main	
	Music and Effects	
	Visually impaired	
	Hearing impaired	
	Dialogue	
	Commentary	
	Emergency	
	Reserved	
	Voice Over/Karaoke	In Dolby Digital when the coding mode is 1/0 this option appears as "Voice Over" otherwise as "Karaoke".
BSID		
Channel: This option controls the value written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.	Min: 0	This value is written to the channel identification field in the (SMPTE 302M) AES3 data elementary stream header.
	Max: 15	
	This option is only available if the coding standard is Dolby E Pass-thru.	
Clip Level: This option is only displayed if the audio source is set to analogue. It enables the audio clip level to be set. That is the head room above 0 dBu prior to the audio being clipped.	12 dB	12 dB audio clipping level.
	15 dB	15 dB is only available with PCB issue 4 and later.
	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.
	The clip levels available depend on the hardware issue of the Encoder.	

[3] To ensure correct lip sync when working with linear or pre-encoded audio, use the option card M2/EOM2/AUDLIN2.

Selected Option	Options		Description
Coding Mode: This option sets the audio coding mode. If the current audio bitrate is outside the bitrate range supported by the new coding mode, the bitrate is automatically changed to the lowest value within the supported range.	MPEG Layer 2	Mono Left	Single channel mono audio, encoding the left channel.
		Mono Right	Single channel mono audio, encoding the right channel.
		Dual Mono	Dual channel mono audio. Both mono channels are transmitted in the same PID.
		Stereo	Dual channel stereo audio.
		Joint Stereo	Dual channel joint (intensity) stereo audio.
		Audio Description	Only available if the source is digital or SDI embedded.
	Dolby Digital	1/0 (Left)	Single channel mono audio, encoding the left channel.
		1/0 (Right)	Single channel mono audio, encoding the right channel.
		2/0(L,R)	Dual channel stereo audio coding.
	Linear PCM	Dual Mono	Dual channel mono audio. Both mono channels are transmitted in the same PID.
		Stereo	Dual channel stereo audio.
Coding Standard: This option defines the standard used for the audio encoding operation associated with this menu.			The available standards are shown in *Table 4.14*.
Component Tag:			This item defines the optional component tag to be assigned to this audio stream.
Copyright: This controls the Copyright flag in the bitstream.			If set to On the bitstream is shown to be protected by copyright.
DC Filter: 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.
De-emphasis: This option is turned on in order to de-emphasise pre-emphasised audio input into the Encoder.	MPEG Layer 2	To meet the MPEG Layer 2 audio encoding algorithm specification, the audio must not have pre-emphasis applied. If the input signal does have pre-emphasis applied, a de-emphasis filtering process must be applied prior to encoding.	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.
	Dolby Digital	To meet the Dolby Digital audio encoding algorithm specification, the audio must not have pre-emphasis applied. If the input signal does have pre-emphasis applied, a de-emphasis filtering process must be applied prior to encoding.	
Dialogue Level: This option sets the dialogue level that the Encoder will signal in the bitstream.	–1 dB to –31 dB	The dialogue level indicates how far the average dialogue level is below digital 100%. It is not used by the Dolby Digital decoder, but may be used by other parts of the sound reproduction system.	
Dolby Srnd Mode: This option determines whether the bitstream is ignaled as conveying a Dolby Surround encoded program or not.	Not indicated	It is not known if the bitstream is conveying a Dolby Surround encoded program.	
	Not Dolby Surround	The bitstream is not conveying a Dolby Surround encoded program.	
	Dolby Surround	The bitstream is conveying a Dolby Surround encoded program.	
	This option is only available if the coding mode is 2/0(L,R). This information is not used by the Dolby Digital Decoder, but may be used by other parts of the sound reproduction system.		

Selected Option	Options	Description	
Dynamic Range: This option determines which compression profile is applied to the encoding process.	None	Program reproduction with the original dynamic range.	
	Film Standard Film Light Music Standard Music Light Speech	The dynamic range of audio material can vary according to its origin. The dynamic range compression profile determines the characteristic curve of the dynamic range compression algorithm (each profile has its own boost, null-band and cut parameters).	
Embedded 1-2 DID: This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 1 and SDI Embedded 2.	Min: 0 Max: 1023 Other: >1023	Off Select DID Default DID	If this is set to 1024, then the default DID will be used. Refer to *Annex F, Audio Modes* for information about DIDs.
Embedded 3-4 DID: This option defines the DID to be de-embedded to obtain the audio source for SDI Embedded 3 and SDI Embedded 4.	Min: 0 Max: 1023 Other: >1023	Off Select DID Default DID	If this is set to 1024, then the default DID will be used. Refer to Annex F, Audio Modes for information about DIDs.
External Delay: This option is used to compensate for external delays in the overall system so that the pre-encoded audio bitstream can remain locked in time with the video bitstream.	The valid input range is a number of milliseconds between 0 and 450.		
Hardware Release: This option indicates the hardware version of this audio encoder channel.		It is for status only and cannot be changed.	
Impedance: It enables the input impedance of the analogue audio input to be set to either 600 Ω or 20 kΩ.		This option is only displayed if the audio source is set to analogue.	
Input L/R Input Level L Input Level R		This displays the input level of the left or right audio channel for the Service. It is for status only and cannot be changed.	
Language/Left/Right: This enables the language of the audio channel to be set.		If the coding mode is dual mono, then a different language can be set for the left and right channels.	
Lip Sync Adjustment: When Audio Alignment is enabled, the audio delay can be nudged as indicated. The default is 0.	-1 frame 0 +1 frame +2 frames	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. This option is only available when the Audio Alignment option is enabled.	
Lip Sync Offset: This option allows a fixed delay to be applied to the audio in addition to the auto lip sync delay.	Min: -50 Max: 50	Lip Sync Offset in milliseconds. This option is only available if the Auto Lip Sync option is set to On.	
Low Pass Filter: This option is used to enable or disable a low pass filter in the audio input.		The low pass filter has a cut-off near the specified bandwidth of the audio channel.	

Selected Option	Options	Description
Mixing Level: This parameter indicates the acoustic sound pressure level of the dialogue level during the final audio mixing session.	0 dB to 31 dB	Mixing levels between 0 dB to 31 dB. This option is only available if the Production Info option is set to On. This makes it possible for the program to be replayed at the same loudness, or at a known difference from the original. Refer to ATSC Doc. A52 for further details.
OP Digital Loss: This option controls behaviour digital audio is not locked.	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
Original: This controls the setting of the Original flag in the bitstream.		If set to On the bitstream will be signalled as an original, if set to Off the bitstream will be signalled as a copy of an original bitstream.
PCR On Audio PID: This option controls whether PCR should be ignaled on the audio PID.		This may be necessary if an audio only service is being generated. The default setting is Off.
Production Info:		This option indicates whether the Mixing Level and Room Type parameters exist within the bitstream.
RF Protection: This option enables or disables RF Overmodulation Protection.		It is used in situations where the audio signal of a decoded Dolby Digital bitstream is delivered via a link with very restricted dynamic range. One example is the case of a television broadcast, where sound is modulated onto an RF channel and delivered to a low-cost television Receiver. In this situation it is necessary to restrict the maximum peak output level to a known value with respect to dialogue level, in order to prevent overmodulation.
Room Type: This parameter indicates the type and calibration of the mixing room used for the final audio mixing session.	Not Indicated	
	Small, Flat Mon	Type and calibration of the mixing room used for the final audio mixing session.
	Large, X Curve Mon	
	This option is only available if the Production Info option is set to On. Refer to ATSC Doc. A52 for further details.	
Sampling Rate: This option defines the audio sampling rate for the encoding operation.	32 kHz	Sets the sampling frequency to 32 kHz.
	48 kHz	Sets the sampling frequency to 48 kHz
	NOTE... 44.1 kHz is not an available option as it cannot be generated from the 27 MHz video clock.	
SMPTE 302M Standard: SMPTE 302M defines the mapping of AES3 data into an MPEG-2 transport stream.	1998 Standard	Refers to the 1998 SMPTE 302M standard.
	2000 Standard	Refers to the 2000 SMPTE 302M standard.
	This option is only available if the coding standard is Dolby E Pass-thru. 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. Choose the Audio Alignment option to enable the SMPTE 302M 2002 standard. This disables the SMPTE 302M Standard option.	
Software Release: This option indicates the software version of this audio encoder channel.		It is for status only and cannot be changed.

Selected Option	Options	Description	
Source This option defines what audio source is used the encoding operation associated with this menu.	Off	No audio packets are sent in the transport stream and audio is removed from the SI.	
	Mute	Audio is produced but it is silence (all samples are zero).	
	Test Tone	Audio input is a 1 kHz test tone. The bitrate automatically changes to 96 kbit/s.	Analogue sources only
	Analogue	Analogue input on the AUDIO IN connector.	Analogue sources only
	Digital	Digital audio input on AUDIO IN connector.	
	SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF.	These are default DIDs
	SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x2FF.	These are default DIDs
	SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FD.	These are default DIDs
	SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x1FD.	These are default DIDs
Sync Bit Error			
Use Minimum Delay: This sets the lowest possible audio delay.		If this option is set to ON, the Auto LipSync and Audio Delay options are unavailable.	
VPS Cntrls Coding Mode When selected, this option allows the extraction of the Audio Coding Mode from Video Programming System (VPS).		The VBI line must be set in the Video\VBI menu for extraction of VPS.	
VPS Coding Mode This menu displays what the motherboard has been able to extract from the VPS. This is a read-only item.	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.	Only available if **VPS Controls Coding Mode** is set to **On**.
	Undefined		Only available if **VPS Controls Coding Mode** is set to **On**.
	Single Chan (Mono)		Only available if **VPS Controls Coding Mode** is set to **On**.
	Stereo		Only available if **VPS Controls Coding Mode** is set to **On**.
	Dual Chan		Only available if **VPS Controls Coding Mode** is set to **On**.
VPS Dual Chan Mode	Auto-Bit5	In auto modes, the corresponding bit in VPS Word5 controls whether the dual or single channel is coded.	Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit6		Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit7		Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit8		Only available if **VPS Controls Coding Mode** is set to **On**.
	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. Bit 1 is 1 and Bit 2 is 1).	Only available if **VPS Controls Coding Mode** is set to **On**.
	Single		Only available if **VPS Controls Coding Mode** is set to **On**.
VPS Stereo Mode	Auto-Bit5	In auto modes, the corresponding bit in VPS Word5 controls whether stereo or joint stereo is coded.	Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit6		Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit7		Only available if **VPS Controls Coding Mode** is set to **On**.
	Auto-Bit8		Only available if **VPS Controls Coding Mode** is set to **On**.
	Stereo	If either of these options is selected, Word5 is ignored and coding is forced when Bit1/2 is 1 0	Only available if **VPS Controls Coding Mode** is set to **On**.
	Joint Stereo		Only available if **VPS Controls Coding Mode** is set to **On**.

Selected Option	Options	Description
VPS Word 5		Only available if valid VPS is being received. If it has not been able to extract any information, it displays 0xFF.

Displays the hex value extracted from the VPS.

Incoming Signalling via Line 16 Video Programming System Word 5				Encoding and Signalling Modes to be Performed by the Audio Encoder SO/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)

4.7.4 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.

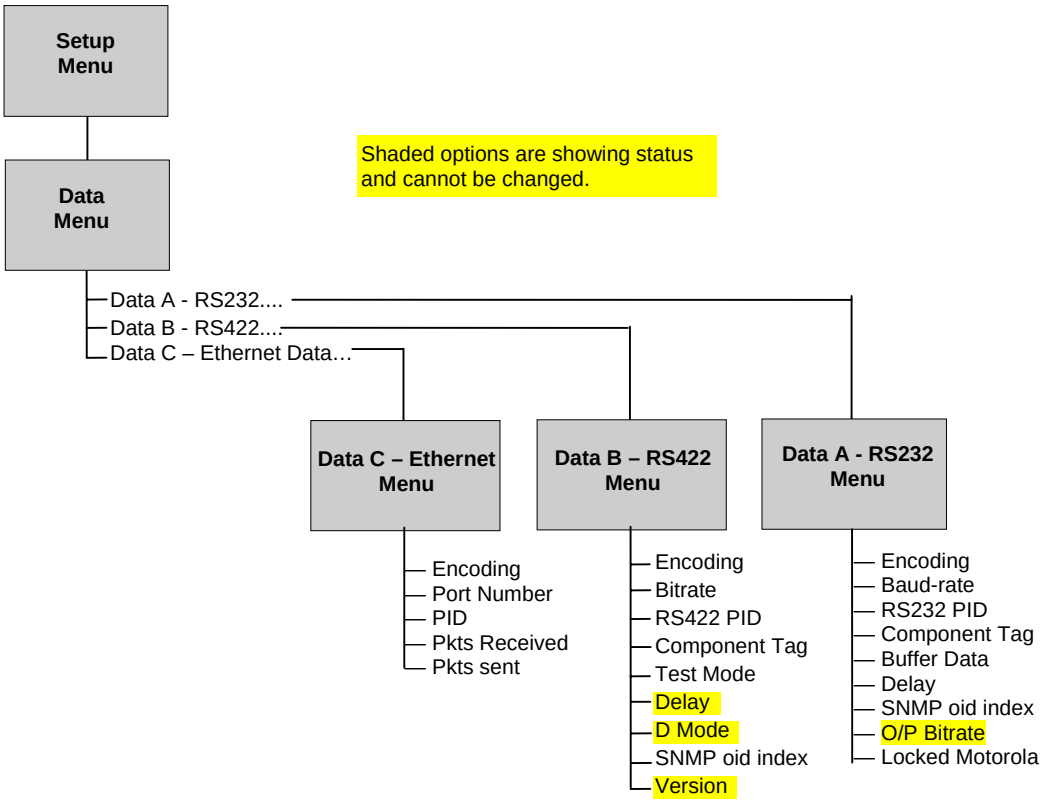
Path: Summary Screen [More]> Setup> Audio> Audio Languages

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. If M2/EOM2/DAT is fitted there are additional menus for RS-422 data and for RS-232 asynchronous data.

See *Figure 4.10* for the menu structure.



> NOTE...
> If Ethernet data is turned on it shall not be possible to turn RS232 data on, and vice-versa.

Figure 4.10: Menu Hierarchy – Setup/Data Menu

4.8.2 Data A - RS232 Menu

Table 4.17 shows the options for the Data A – RS232 Menu options.

Path: Summary Screen [More]> Setup> Data> Data A – RS232

> NOTE...
> If RS232 data is turned on it is not possible to turn Ethernet data on.

Table 4.17: Data A - RS232 Menu Options

Selected Item	Options	Description
Encoding: Switches the RS-232 asynchronous data channel On or Off.	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 RS-232 data is encapsulated directly into the full 184 payload bytes of the transport packets (i.e. no PES layer). The RS-232 data-stream is expected to contain complete DCIIText packets. These packets must be preceded by the sequence (0x7F, 0xFE, 0x7F, 0Xfe) followed by 2-bytes which contain the length of the DCIIText packet. Once this sequence is detected, the option Locked Motorola indicates Yes.
	On(DVB)	This is the format specified by DVB
	On(Tandberg)	This is a proprietary format
	If Ethernet data is turned on it is not possible to turn RS232 data on.	
Baud Rate: Sets the baud rate of the RS-232 asynchronous data channel.	1200	1200 Baud rate.
	2400	2400 Baud rate.
	4800	4800 Baud rate.
	9600	9600 Baud rate.
	19200	19200 Baud rate.
	38400	38400 Baud rate.
RS232 PID: Enter or update data PIDs.	PIDs 32 to 8191 are available for use.	To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Component Tag: Defines the optional component tag to be assigned to this data stream.		
Buffer Data:	Send immediately	This option is only available in TANDBERG mode. Whenever data is available at the RS232 port it is sent in the output transport stream. This can result in wasted bandwidth due to low packet occupancy. Also results in a higher packet rate which may cause some receivers to overflow.
	Wait 1 Second	Data is buffered until enough has arrived to fill a transport packet or 1 second elapses, whichever occurs first.
Delay: Sets the Delay to be set.		The option cannot be changed.
SNMP oid index	Min: 1	All option modules have the same SNMP oid (object identifier) with the exception of one byte which identifies which slot the module is in. A MEM /nCC 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/nCC. 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/nCC.
	Max: 7	
O/P Bitrate: Shows the output bitrate.		This option is for status only.

4.8.3 Data B - RS422 Menu

Table 4.18 shows the options for the Data`B – RS422 Menu options.

Path: Summary Screen [More]> Setup> Data> Data B – RS422

Table 4.18: Data B - RS422 Menu Options

Selected Item	Options	Description
Encoding: Switches the RS-422 synchronous data channel On or Off.		
Bitrate: Sets the bitrate of the RS-422 synchronous data channel.	Settings cycle from 56 to 1792 in steps of 56 then from 64 to 2048 in steps of 64, then back to 56	RS-422 synchronous data channel bitrate.
RS422 PID: Enteri or update data PIDs.	PIDs 32 to 8191 are available for use.	To be DVB compliant, PIDs below 32 are reserved. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.
Component Tag:		This item defines the optional component tag to be assigned to this data stream.
Test Mode: Switch the Test Mode On and Off.		
Delay:		The Delay option cannot be changed.
D Mode:		The D Mode option cannot be changed.
SNMP oid index:	Min: 1 Max: 7	All option modules have the same SNMP oid (object identifier) with the exception of one byte which identifies which slot the module is in. An MEM expects the data module to be in slot two or three in the previous version of the Encoder. Therefore, slots one and two in this Encoder have been allocated to correspond directly to slots two and three in the previous Encoder. In this Encoder the data module can be allocated to slot one, making it inaccessible to an MEM. This variable allows the on-board data module to be apparently moved around - to a slot in which it may be referenced by the MEM.
Version: Shows the version of the data.		It is for status only and cannot be changed.

4.8.4 Data C – Ethernet Menu

Table 4.19 shows the options for the Data`C – Ethernet Menu options.

Path: Summary Screen [More]> Setup> Data> Data C – Ethernet Data

> NOTE...
> If Ethernet data is turned on it is not possible to turn RS232 data on.

Table 4.19: Data C - Ethernet Menu Options

Selected Item	Options	Description
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:	On(BissKeys)	Similar to On(TSPkt Data), 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	
	Delivery of packets is not guaranteed. The maximum data rate is 100 kbit/s. It is only possible to turn this option on if RS232 data is turned off.	
Port Number: This is the IP Port number.	0 to 65535	The default is 1000.
PID:	0x0001 – 0x1FFE	The default is 0x100. 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 4.11* for the menu structure.

4.9.2 Output Format Option

The output format of the Encoder cannot be changed and is set to ASI.

Path: Summary Screen [More]> Setup> Output> Output Format

4.9.3 Delivery Descriptor Menu

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

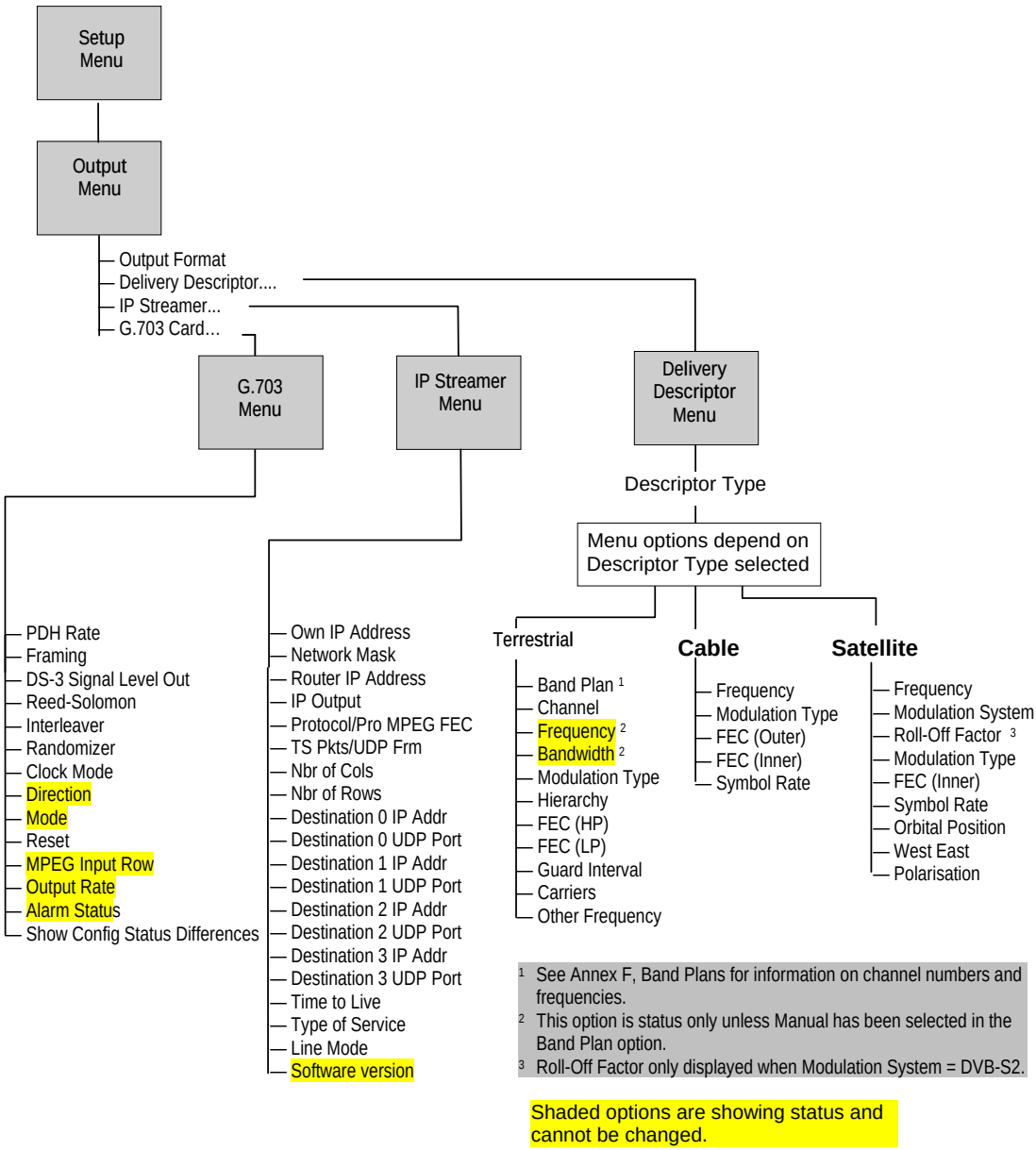
Path: Summary Screen [More]> Setup> Output> Delivery Descriptor

4.9.4 Descriptor Type Option

This option enables the descriptor type to be specified.

Table 4.20: 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 ProMPEG FEC for IP Streaming in E57xx Encoders.

Figure 4.11: Menu Hierarchy – Setup/Output Menu

4.9.5 Descriptor Type = Terrestrial

Table 4.21 shows the options for the Terrestrial Descriptor Type.

Table 4.21: Options for Terrestrial Descriptor Type

Selected Item	Options	Description
Band Plan		This option enables the Band Plan to be set).
Once a country has been selected then the required channel should be selected in the Channel option.		
	Options / Options	
	Australia / Ireland	
	Europe VHF / South Africa	
	Europe CATV / French Overseas PIA	
	Italy / France	
	Morocco / Japan	
	New Zealand / USA	
	China / CCIR[4]	
	OIRT[5] / Manual	
Channel	Depends upon the country selected.	Each channel number corresponds to a particular frequency (see *Annex E, Band Plans*). See *Annex E, Band Plans* for the frequencies associated with particular countries.
Frequency: Specify the carrier frequency of the transmitter.	Min: 0.0001 MHz Max: 42949.6729 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.
	This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control. This option is status only unless Manual has been selected in the Band Plan option.	
Bandwidth: Specify the channel spacing of the terrestrial transmitter.	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.
	This option is status only unless Manual has been selected in the Band Plan option.	
Modulation Type: Specify the type of modulation used.	QPSK	Terrestrial transmitter uses QPSK modulation.
	16QAM	Terrestrial transmitter uses 16QAM modulation.
	64QAM	Terrestrial transmitter uses 64QAM modulation.
Hierarchy: Specify the hierarchy of the terrestrial transmission.	Non-Hierarchical	Terrestrial transmission is not hierarchical.
	Alpha=1	Terrestrial transmission is hierarchical, and the α value = 1.
	Alpha=2	Terrestrial transmission is hierarchical, and the α value = 2.
	Alpha=4	Terrestrial transmission is hierarchical, and the α value = 4.

[4] CCIR is now know as International Telecommunications Union-Radiocommunications Study Groups.
[5] Organisation that co-ordinated TV standards and programme interchange among the Eastern–block countries of Europe.

Selected Item	Options	Description	
FEC (HP) and FEC (LP): Specify the inner FEC schemes used by the terrestrial transmitter. The screen for the FEC (LP) option is the same except that (LP) replaces (HP).	1/2	FEC rate HP/LP is 1/2.	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.
	2/3	FEC rate HP/LP is 2/3.	
	3/4	FEC rate HP/LP is 3/4.	
	5/6	FEC rate HP/LP is 5/6.	
	7/8	FEC rate HP/LP is 7/8.	
	If the **Hierarchy** option is set to **Non-Hierarchical**, then only the **FEC Rate** parameter is used and shown on the display.		
Guard Interval: Specify the guard interval of the terrestrial transmitter.	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: Specify the transmission mode (i.e. number of carriers in an OFDM frame) used by the terrestrial transmitter.	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: Set the flag which specifies whether other frequencies are in use or not.	None	No other frequency is in use.	
	in use	One or more other frequencies are in use.	

4.9.6 Descriptor Type = Cable

Table 4.22 shows the options for the Cable Descriptor Type

Table 4.22: Cable Descriptor Type Options

Selected Item	Options	Description
Frequency: Specify the carrier frequency of the transmitter.	Min: 0.0001 MHz Max: 42949.6729 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.
	This option is not displayed if the unit is set to generate PSIP externally or it is under MEM/nCC control. This option is status only unless Manual has been selected in the Band Plan option.	
Modulation Type: Specify the type of modulation used by the cable channel.	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): Specify the outer FEC rate used by the cable channel.	No outer FEC coding	Cable channel does not use outer FEC.
	RS(204/188)	
FEC (Inner): Specify the inner FEC rate used by the cable channel.	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:	Min: 0.4688 Msym/s	Symbol rate. Changing the symbol rate affects the automatic Tx bandwidth, video bitrate and video resolution calculations.
	Max: 30.000 Msym/s	
	Step Size: 0.0001 Msym/s	

4.9.7 Descriptor Type = Satellite

Table 4.23 shows the options for the Satellite Descriptor Type.

Table 4.23: Satellite Descriptor Type Options

Selected Item	Options	Description
Frequency: Specify the carrier frequency of the transmitter.	Min: 0.0001 MHz Max: 42949.6729 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.
	This option is not displayed if the unit is set to generate PSIP externally or it is under MEM control. This option is status only unless Manual has been selected in the Band Plan option.	
Modulation System: Selects the modulation system.	DVB-S	Compliant to the DVB-S specification.
	DVB-S2	Compliant to the DVB-S2 specification.

Selected Item	Options		Description
Roll-Off Factor:	0.20		Only displayed when Modulation System = DVB-S2.
	0.30		
	0.35		
Modulation Type: Specify the type of modulation used by the satellite transponder.	DVB-S	DVB-S2	
	BPSK	BPSK	Satellite transponder uses BPSK modulation.
	QPSK	QPSK	uses QPSK modulation.
	8PSK	8PSK	Satellite transponder uses 8PSK modulation.
	16QAM	16QAM	Satellite transponder uses 16QAM modulation.
		16APSK	
		32APSK	
FEC (Inner): Specify the inner FEC rate used by the satellite transponder.	DVB-S	DVB-S2	
	No conv. coding	No conv. coding	Satellite transponder does not use inner FEC rate.
		1/4	Satellite transponder uses inner FEC rate of 1/4.
		1/3	Satellite transponder uses inner FEC rate of 1/3.
		2/5	Satellite transponder uses inner FEC rate of 2/5.
	1/2	1/2	Satellite transponder uses inner FEC rate of 1/2.
		3/5	Satellite transponder uses inner FEC rate of 3/5.
	2/3	2/3	Satellite transponder uses inner FEC rate of 2/3.
	3/4	3/4	Satellite transponder uses inner FEC rate of 3/4.
		4/5	Satellite transponder uses inner FEC rate of 4/5.
	5/6	5/6	Satellite transponder uses inner FEC rate of 5/6.
	7/8	7/8	Satellite transponder uses inner FEC rate of 7/8.
	8/9	8/9	Satellite transponder uses inner FEC rate of 8/9.
		9/10	Satellite transponder uses inner FEC rate of 9/10.
Symbol Rate:	Min: 0.4688 Msym/s		Symbol rate. Changing the symbol rate affects the automatic Tx bandwidth, video bitrate and video resolution calculations.
	Max: 30.0000 Msym/s		
	Step Size: 0.0001 Msym/s		
Orbital Position: Specify the orbital position of the satellite.	Min: 0.0°		If the specified orbital position is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.
	Max: 360.0°		
	Step Size: 0.1°		
West East: Specify the satellite west/east flag to indicate whether the satellite position is in the western or eastern part of the orbit.	West		Satellite position is in western part of the orbit.
	East		Satellite position is in the eastern part of the orbit.
Polarisation: Specify the polarisation of the satellite transponder.	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 = IP Streamer (M2/EOM2/IP/PROFEC Option Module)

Table 4.24 shows the options for the IP Streamer Output Format.

Path: Summary Screen [More]> Setup> Output> IP Streamer

Table 4.24: IP Streamer Output Format Options

Selected Item	Options	Description
Own IP Address:		The IP address associated with the 100 Mbit/s Ethernet video output interface.
Network Mask:		The network mask setting corresponding to the Own IP address.
Router IP Address:		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:		Allows the User to switch off or on the IP streamed video output.
Protocol/ProMPEG FEC:	UDP	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.
	RTP/FEC0	
	RTP/FEC1	
	RTP/FEC2	
	RTP/FEC3	
	RTP/FEC4	
	RTP	
TS Pkts/UDP Frm:	1 - 7	Configures how many 188-byte MPEG-2 Transport Stream packets are mapped into each UDP frame. For bitrates 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:		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:		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:		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.
	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:		Up to four separate UDP Ports can be assigned. This configures the UDP destination port field in the outgoing UDP frames.
Time To Live:	A value greater than one is recommended	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.
Type of Service:		The byte value of the Type-of-Service (TOS) field in the IP header as specified in RFC-791. It is used for Class-of-service prioritisation. It depends on the Router honouring this field.
Line Mode:	Auto (default and preferred setting)	Allows the IP Streamer card to automatically negotiate the port speed and mode as the port automatically advertises its maximum capabilities.
	Fixed	If set to Fixed, the line speed is fixed to 100 Mbits/s Full Duplex mode.

4.9.9 Output Format = G.703 Output Menu

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 4.11* for the menu structure.

Path: Summary Screen [More]> Setup> Output> G703 Output

> NOTE...
> The G.703 card is only compatible with TANDBERG Television's MkII G.703 Input card.

Table 4.25: G.703 Output Format Options

Selected Item	Options		Description
PDH Rate:	E3 (34.368 Mbit/s)		Sets the overall G.703 Interface Module's line rate.
	DS3 (44.736 Mbit/s)		
Framing:	E3	DS3	Sets the G.703 Interface Module's E3 or DS-3 framing mode. The modes for E3 are and. The selectable modes are dependent upon what the PDH Rate is set to.
	None	None	
	G.832	M13	
		c-bit	
DS-3 Signal Level Out:			Only available for the DS-3 PDH Rate selection. 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 pre-shapes the output signal amplitude.
Reed-Solomon:			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:			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:			Only available if Reed-Solomon is set to On. The Reed-Solomon encoded pattern is Randomised according to the DVB-C standard.
Clock Mode: This option should be set to Slave and is the ONLY setting to be used in this application.	Master:		Generate an MPEG-2 transport rate that fits exactly into the Telecommunications rate.
	Slave:		Insert 'stuff' packets to fill up the Output Rate.
	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.		
Direction:			This is always displayed as Tx and indicates that the G.703 card portion of the G.703 Interface Module is set to Tx mode.
Mode			This is always be displayed as MKII and indicates that the G.703 card portion of the G.703 Interface Module is set to MKII mode.
Reset			This option is for TANDBERG Television's use only and it is a method to reset the G.703 card of the G.703 Interface Module.

4.10 Mux Menu

4.10.1 Overview

The Mux Menu is selected from the Setup Menu by pressing the **Mux** softkey.

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 4.12* for details when **Syntax = DVB**. See *Figure 4.13* for details when **Syntax = ATSC**.

Path: Summary Screen [More]> Setup> Mux

4.10.2 Mux Output, no Remux Card

To obtain various outputs when no Remux card is fitted, see *Table 4.26: Mux Menu Associated Options* and associated option descriptions in *Table 4.28: Remux Menu Options*

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:

- *Table 4.26: Mux Menu Associated Options* and associated option descriptions in *Table 4.28: Remux Menu Options*
- Remux Module menu – see *Table 4.28.*
- Host and Incoming Services – see *Table 4.29: 1.Service/2.Service Menu Options.*

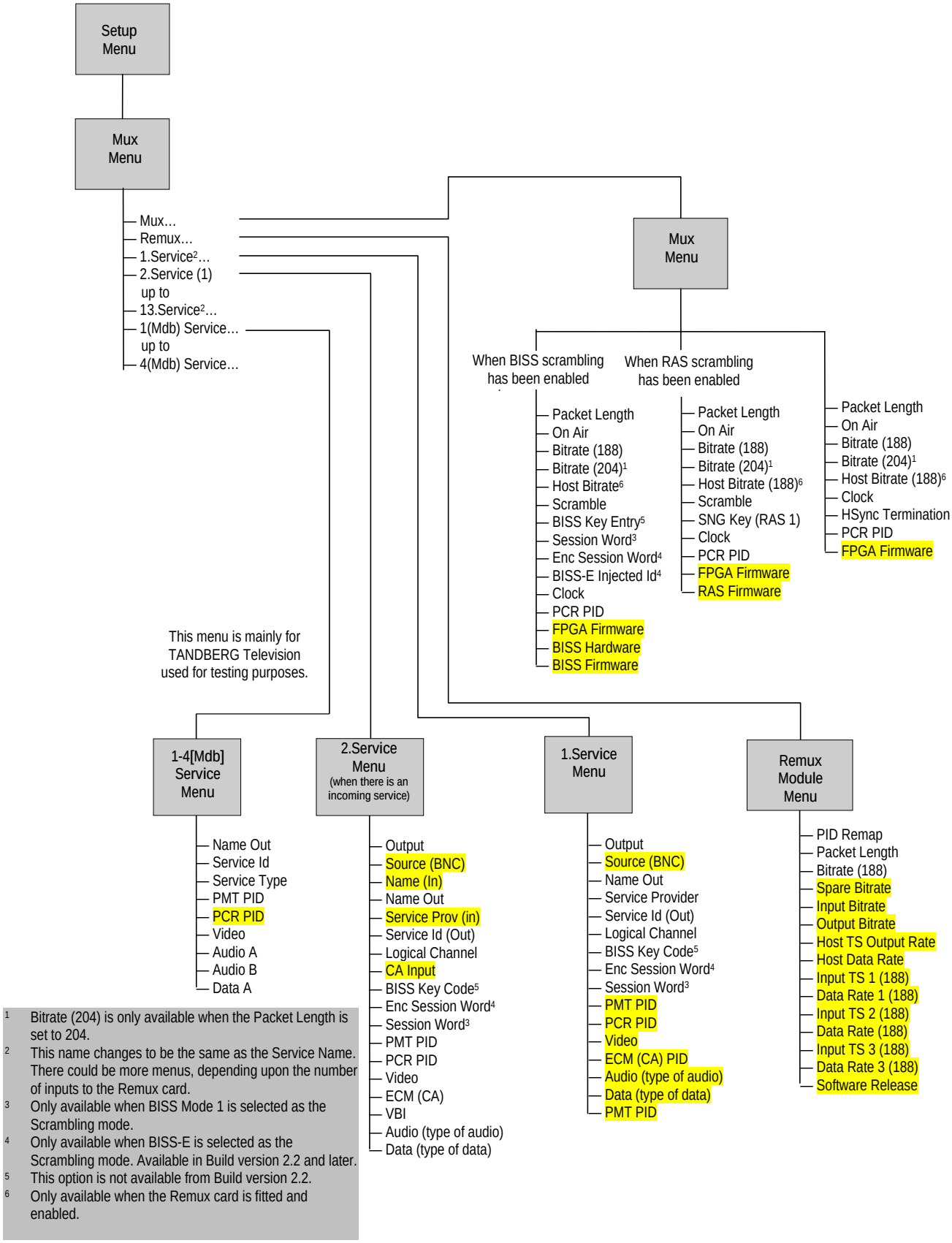


Figure 4.12: Menu Hierarchy – Setup/Mux Menu (Syntax = DVB)

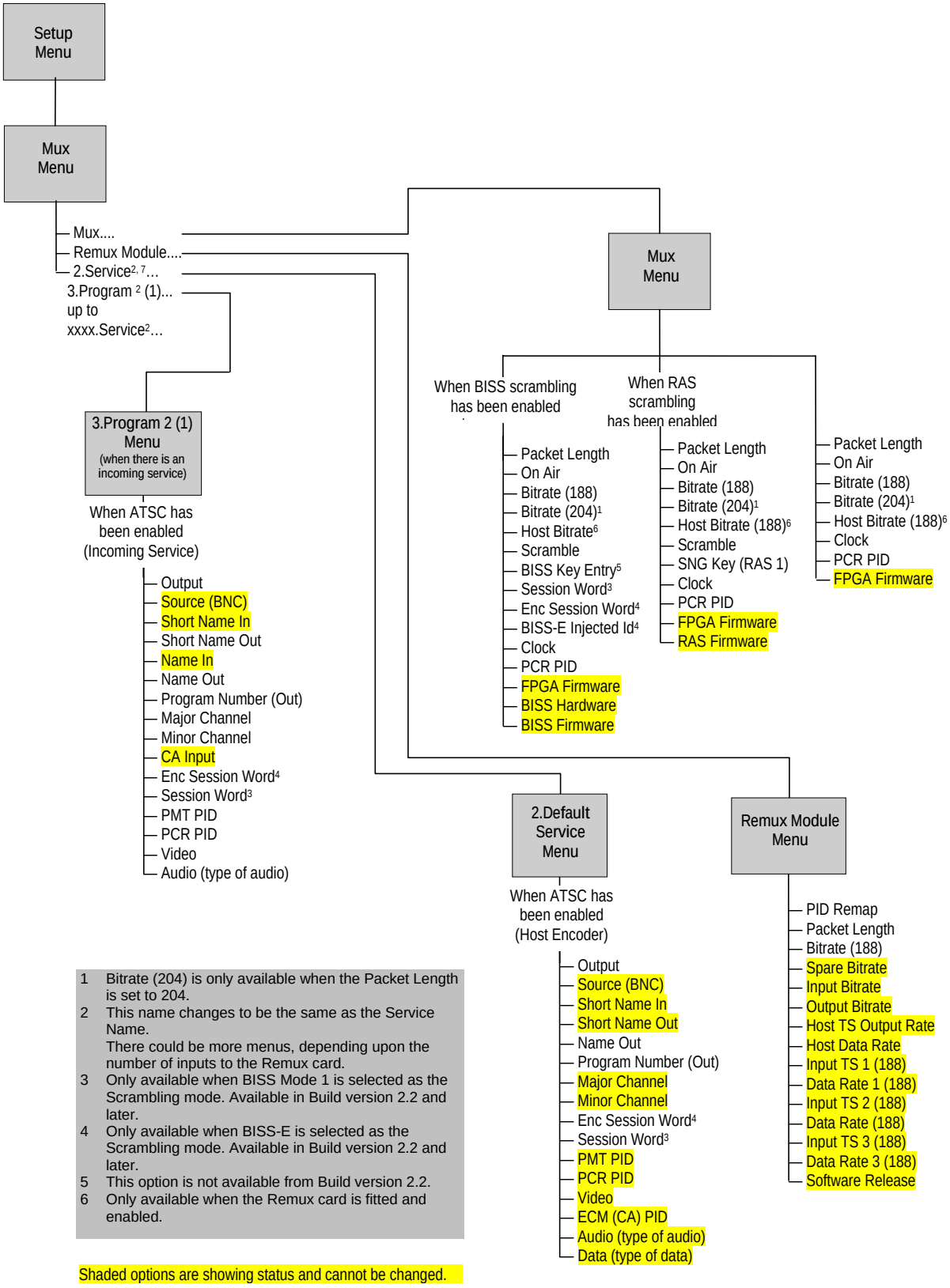


Figure 4.13: Menu Hierarchy – Setup/Mux Menu (Syntax = ATSC)

4.10.4 Mux (Scrambling) Menu

Table 4.26 shows the options available for each standard in alphabetical order as are the option descriptions shown in *Table 4.27.* This will help easy access to information.

Table 4.26: Mux Menu Associated Options

Option	Mux Menu			Comments
	BISS Scrambling Enabled	RAS Scrambling Enabled	No Scrambling (clear)	
BISS Entry Key	✓			This option is not available from Build version 2.2.
BISS Firmware	✓	✓	✓	
BISS Hardware	✓	✓	✓	
BISS-E Injected Id	✓			Only available when BISS-E is selected as the Scrambling mode.
Bitrate (188)	✓	✓	✓	
Bitrate (204)	✓	✓	✓	Bitrate (204) is only available when the Packet Length is set to 204.
Clock	✓	✓	✓	
Enc Session Word	✓			Only available when BISS-E is selected as the Scrambling mode.
FPGA Firmware	✓	✓	✓	
Host Bitrate	✓			Only available when the Remux card is fitted and enabled.
Host Bitrate (188)		✓	✓	
On-Air	✓	✓	✓	
Packet Length	✓	✓	✓	
PCR PID	✓	✓	✓	
RAS Firmware		✓		
Scramble	✓	✓		
Session Word	✓			Only available when BISS Mode 1 is selected as the Scrambling mode.
SNG Key (RAS 1)		✓		

Table 4.26 shows the options available for each standard in alphabetical order as are the option descriptions shown in *Table 4.27.* This will help easy access to information.

Table 4.27: Mux Menu Options

Selected Item	Options	Description
BISS Entry Key		
BISS Firmware: Shows the BISS Firmware version.		It is for status only and cannot be changed.
BISS Hardware: Shows the BISS Hardware version.		It is for status only and cannot be changed. BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Selected Item	Options	Description
BISS-E Injected Id: This option is an identifier for the unit.		This option is only used with BISS-E and comprises a 56-bit hexadecimal word. **CAUTION...** Take precautions to avoid general knowledge of the BISS-E Injected Id.
Bitrate (188): Bitrate (204): Multiplexer output bitrate 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 Step Size: 0.0001 Mbit/s	Both the Bitrate (188) and the Bitrate (204) can be in the range of 0 Mbit/s to 110 Mbit/s. Changing the bitrate affects the automatic video bitrate and video resolution calculations. If the specified bitrate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.
	If the Packet Length option is set to 188 bytes then only the Bitrate (188) option is displayed. If the Packet Length option is set to 204 bytes then both the Bitrate (188) and Bitrate (204) options are displayed.	
Clock: Set the Clock reference source.	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. A hardware modification is required to implement it.
	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.	
Enc Session Word: This option 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. **CAUTION...** Take precautions to avoid general knowledge of the Encrypted Session Word.
FPGA Firmware: This option indicates the version of the FPGA Firmware.		It is for status only and cannot be changed.
Host Bitrate: This option refers to the multiplex in the local (host) Encoder.	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 bitrate when in baseband output format and ASI output mode. Changing the bitrate affects the automatic video bitrate and video resolution calculations. The maximum bitrate is 65 Mbit/s irrespective of packet size. To obtain 69 Mbit/s modulated output rate, set the packet size to 188 and bitrate to 65 Mbit/s. The modulator automatically adds 16 Reed-Solomon bytes per packet. If the specified bitrate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.
	When the Remux option module M2/EOM2/REMUX is fitted, there is an additional item in the `Mux Menu` and a further `Remux Module Menu` and `1.Service Menu`. Addition to Mux Menu When Remux Fitted	
On-Air: Enables the output of the Encoder to be sent to the Multiplexer.	On	Multiplexer output is switched on.
	Off	Multiplexer output is switched off.

Selected Item	Options	Description
Packet Length: This option enables the Packet Length to be set.	188 bytes	Uses 188 byte packet format.
	204 bytes	Uses 204 byte packet format.
PCR PID: This option shows the Program Clock Reference Packet Identifier.	Min: 1 Max: 8190 (1FFEh) Step Size: 1	
RAS Firmware: This option indicates the version of the RAS Firmware.		It is for status only and cannot be changed.
Scrambling (BISS): This option enables security scrambling of the Encoder transmission to be switched on or off.	BISS Mode 1	Encoder output is scrambled. Scrambling key used is entered using the **Session Word** option.
	BISS-E	Encoder output is scrambled. Scrambling key used is entered using the **Enc Session Word** option.
	Off	Encoder output is not scrambled.
	If the scrambling is switched between BISS Mode 1 and BISS-E, the session word, or the encrypted session word must be re-entered.	
Scramble (RAS1): This option enables RAS1 security scrambling of the Encoder transmission to be switched on or off.	Off	Encoder output is not scrambled.
	RAS (Fixed 1)	Encoder output is scrambled using the fixed RAS key assigned by TANDBERG Television, and preprogrammed into the Encoder.
	RAS (Fixed 2)	Encoder output is scrambled using the fixed second RAS key assigned by TANDBERG Television, 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)	See SNG Key (RAS 1) in this table.
	RAS Fixed Keys and the EBU Key are only programmed into the Encoder if requested when the units are ordered.	
Session Word: A Session Word is the 48-bit code used to encrypt and decrypt the transport stream.	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.
	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. **CAUTION...** Take precautions to avoid general knowledge of the Session Word.	
SNG Key (RAS 1):		Encoder output is scrambled. Scrambling key used is entered using the **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. If less then seven digits are entered, they are prefixed with 0's (zero) to give a seven digit code.

4.10.5 Remux Module

If the Remux option module M2/EOM2/REMUX is fitted, there is an additional item in the `Mux Menu` (see *Figure 4.12*) and a further `Remux Module Menu` and `1.Service Menu`.

Table 4.28: Remux Menu Options

Selected Item	Options	Description
PID Remap: This option allows the action taken during PID Remapping to be tailored.	Update PIDs from I/Ps	In this mode, only changes at any of the Remux inputs (e.g. PID change, new component appears) are always passed through to the output and the outgoing PSI tables change accordingly.
	Lock PID Mapping	In this mode, changes at the Remux inputs will not be ecognized. The outgoing PSI tables will also not change. This can result in TS errors being flagged by an ecogniz, 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 ecogniz.
	PID Lock Power Up Delay Option	This option only appears in Lock PID Mapping mode, 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 Lock PID Mapping mode. It indicates whether the power-up delay has expired and lock-down has occurred.
	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 ecognized 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: Sets the Packet Length.	188 bytes	Uses 188 byte packet format.
	204 bytes	Uses 204 byte packet format.
Bitrate		
Bitrate (188): Bitrate (204): Multiplexer output bitrate 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 Step Size: 0.0001 Mbit/s	Both the Bitrate (188) and the Bitrate (204) can be in the range of 0 Mbit/s to 110 Mbit/s. Changing the bitrate affects the automatic video bitrate and video resolution calculations. If the specified bitrate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.
	If the Packet Length option is set to 188 bytes then only the Bitrate (188) option is displayed. If the Packet Length option is set to 204 bytes then both the Bitrate (188) and Bitrate (204) options are displayed.	
Spare Bitrate Input Bitrate Output Bitrate Host TS Output Rate Host Data Rate Input TS 1 (188) Data Rate 1 (188) Input TS 2 (188) Data Rate 2 (188)	These options are status only and cannot be changed. The maximum input bitrate allowed on the Remux Module ASI inputs is 50 Mbit/s. If the input bitrate exceeds 86 Mbit/s it will be incorrectly reported as a lower rate.	

Selected Item	Options	Description
Input TS 3 (188)		
Data Rate 3 (188)		
Software Release		

4.10.6 1.Service/2.Service Menu

When the Remux option module M2/EOM2/REMUX is fitted, there is an additional item (`Host Bitrate`) in the `Mux Menu` and a further `Remux Module Menu` and `1.Service Menu`.

Table 4.29: 1.Service/2.Service Menu Options

Selected Item	Options	Description
Output: This option enables the Output to be set.	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 **Session Word** entered in the `Mux Menu`.
	On (BISS Mode 1)	The service is included in the output, scrambled, using BISS Mode 1 and the **Session Word** entered in this menu.
	On (BISS-E)	The service is included in the output, scrambled, using BISS-E and the **Enc(rypted) Session Word** entered in this menu.
Source (BNC): This option indicates the source of the input. It is for status only.	0	Host Encoder.
	1, 2, 3	Remux inputs 1 to 3.
Short Name In: This option allows the Short Name In to be changed.		This option is only shown in ATSC mode.
Short Name Out: This option allows the Short Name Out to be changed.		This option is only shown in ATSC mode.
Name (In): This option indicates the input service name. It is status only and cannot be changed.		This option is only shown on an incoming Service menu (2-13.Service Menu).
Name Out: This option allows the service output name to be changed.		
Service Prov (In): This option indicates the input service provider's name. It is set for status only and cannot be changed.		This option is only shown on an incoming Service menu (2-13.Service Menu).
Service Provider: This option relates to the output service provider and allows the name to be changed.		
Service Id (Out): This option enables the output Service Identity to be specified.	Min: 1 Max: 65535 Step Size: 1	Service identity number. It is the number at the start of the remuxxed services.

Table 4.29: 1.Service/2.Service Menu Options (continued)

Selected Item	Options	Description
Program Number (Out): This option enables the output program number to be specified.	Min: 1 Max: 65535 Step Size: 1	Program Number.
	This option is only shown in ATSC mode.	
Major Channel: This option enables the major channel to be specified.		This option is only shown in ATSC mode.
Minor Channel: This option enables the minor channel to be specified.		This option is only shown in ATSC mode.
Logical Channel: This option enables a number to be given to the Logical Channel.		
CA Input: This option indicates the type of CA present on the input.		It is set for status only and cannot be changed. This option is only shown if there are incoming services.
Enc Session Word: This option 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.
	CAUTION... Take precautions to avoid general knowledge of the Encrypted Session Word.	
Session Word: A Session Word is the 48-bit code used to encrypt and decrypt the transport stream.	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.
	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.	
	CAUTION... Take precautions to avoid general knowledge of the Session Word.	
PMT PID: This option shows the Program Map Table Packet Identifier.	Min: 32 Max: 8190 (1FFEh) Step Size: 1	Program Map Table Packet Identifier (PMT PID).
	This option is status only for the Host Encoder but can be changed for incoming services.	
PCR PID: This option shows the Program Clock Reference Packet Identifier.	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Program Clock Reference Packet Identifier (PCR PID).
	This option is status only for the Host Encoder but can be changed for incoming services.	

Selected Item	Options	Description
Video: This option shows the Video PID.	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Video PID.
	This option is status only for the Host Encoder but can be changed for incoming services.	
ECM (CA) PID: This option shows the Entitlement Control Message (Conditional Access) Packet Identifier (PID).	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Entitlement Control Message Packet Identifier (ECM PID).
	This option is status only for the Host Encoder but can be changed for incoming services.	
Audio (Type of Audio): 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	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Audio PIDs.
	This option is status only for the Host Encoder but can be changed for incoming services. 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.	
Data (Type of Data): This option is used for entering or updating data PIDs.	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Data PIDs.
	This option is status only for the Host Encoder but can be changed for incoming services. 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.	
Teletext: This option is used for entering or updating Teletext PIDs.	Min: 1 Max: 8190 (1FFEh) Step Size: 1	Teletext PIDs.
	This option is status only for the Host Encoder but can be changed for incoming services.	

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 4.14* for menu structure).

Path: Summary Screen [More]> Setup> ATM

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 4.30: 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.

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 4.31: 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.

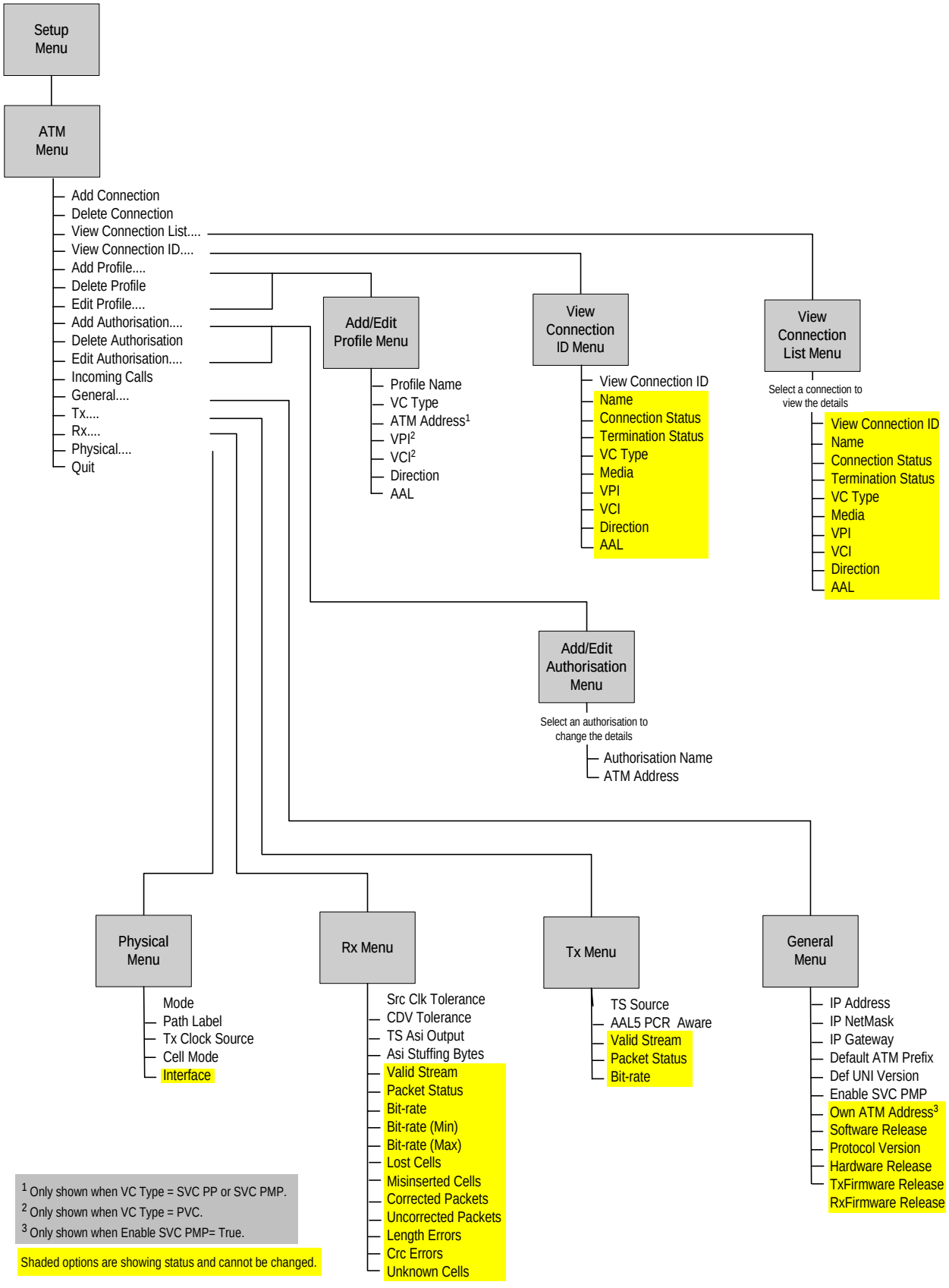


Figure 4.14: Menu Hierarchy – Setup/ATM Menu

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.

Table 4.32: View Connection List Screen

Selected Option	Description
View Connection ID	These options are status only and cannot be changed.
Name	
Connection Status	
Termination Status	
VC Type	
Media	
VPI	
VCI	
Direction	
AAL	

The following options (connection details) are status only and cannot be changed.

4.11.5 View Connection ID Menu

View Connection ID Option

Enter a number to view the details of that specific connection ID.

Table 4.33: View Connection ID Screen

Selected Option	Description
Name	These options are status only and cannot be changed.
Connection Status	
Termination Status	
VC Type	
Media	
VPI	
VCI	
Direction	
AAL	

4.11.6 Add/Edit Profile Menu

Access the `Profile Menu` from the `ATM Menu`. Then press the **Profile** softkey. Change the option to ‘Active’ and press the **Enter** softkey.

Table 4.34: 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	

This shows the Edit Profile screen which displaqs 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 4.35: Edit Profile Options

Selected Item	Options	Description
Profile Name		Use the keypad to amend the profile name (if necessary).
VC Type: This option enables the VC Type to be set.	SVC PP	Switched Virtual Circuit (SVC).Point-to-Point (PP). PP indicates transmission to a single Receiver.
	SVC PMP	Switched Virtual Circuit (SVC). Point to Multi-point (PMP). PMP indicates simultaneous transmissions to several Receivers
	PVC	Permanent Virtual Circuit (PVC) connection.
	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. 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.	
ATM Address: Allows an ATM address value to be input.	0 to 255	Enter the ATM address value. This option is only shown when VC Type = SVC PP or SVC PMP.
VPI: Allows a Virtual Path Identifier value to be input.	0 to 255	Enter the Virtual Path Identifier (VPI) value. This option is only shown when VC Type = PVC.
VCI: Allows a Virtual Channel Identifier value to be input.	50 to 65535 Values less than 49 are reserved.	Virtual Channel Identifier. This option is only shown when VC Type = PVC.
	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.	
Direction: Enables the Direction to be set.	TX	Transmit direction.
	RX	Receive direction.
	TXRX	Bi-directional.
AAL: Enables the selection of an ATM adaptation layer used with the MPEG transport stream.	AAL-1 FEC	ATM adaptation layer and Forward Error Correction, used with the MPEG transport stream.
	AAL-1	ATM adaptation layer without Forward Error Correction, used with the MPEG transport stream.
	AAL-5	ATM adaptation layer, used with the MPEG transport stream and ATM signalling.
	ATM Adaptation Layer – the standards layer that allows multiple applications to have data converted to and from the ATM cell.	

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 4-78.*

The Profile parameters available change according to VC Type (see *Figure 4.14* on *page 4-77*).

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 4.36: 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 4.37: 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 4-80.*

4.11.12 Incoming Calls Option

This enables the Incoming Calls to be changed.

Table 4.38: 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

Table 4.39: General Menu Options

Selected Item	Options	Description
IP Address: This is a network address used to identify the ATM interface when plugged into an Ethernet network via the 10BaseT socket on the card.	xxx.xxx.xxx.xxx	Use the keypad to amend the IP Address.
IP NetMask	xxx.xxx.xxx.xxx	Use the keypad to amend the IP NetMask.
IP Gateway: 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: This option identifies the ATM address prefix defined by the connected ATM network operator.	26 digit hexadecimal number	This only needs to be specified if the ATM network does not support Integrated Layer Management Interface (ILMI) which normally sets this prefix automatically
Def UNI Version: 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.	UNI 3.0 UNI 3.1 UNI 4.0	Protocol versions 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.	
Enable SVC PMP: This enables the Enable SVC PMP to be changed.	TRUE	When set to TRUE a new status parameter, Own ATM Address, appears in the General menu.
	FALSE	
Own ATM Address		These options are status only and cannot be changed.
Software Release		
Protocol Version		
Hardware Release		
TxFirmware Release		
RxFirmware Release		

4.11.14 Tx Menu

Table 4.40: Tx Menu Options

Selected Item	Options	Description
TS Source:	Encoder	Default setting.
This option enables a choice of which MPEG transport stream source is to be transmitted.	ASI	External ASI BNC input.
AAL-5 PCR Aware:	On	AAL-5 PCR Aware Option enabled.
This is an alternative AAL-5 transmission mode.	Off	AAL-5 PCR Aware Option disabled – default setting.
Valid Stream		These options are status only and cannot be changed.
Packet Status		
Bitrate		

4.11.15 Rx Menu

Table 4.41: Rx Menu Options

Selected Item	Options	Description
Srce Clk Tolerance:	Normal ± 30.0ppm	
This setting affects the reception clock recovery tolerance to the source transmitter clock accuracy, normally set to Normal.	PAL-I ± 0.226ppm	PAL-I source
	ATSC ± 2.8ppm	ATSC source
	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.	
CDV Tolerance:	Min: 0 µsec	The maximum ATM network Cell Delay Variation of the MPEG transport stream that can be tolerated (in micro (µ) seconds).
This setting affects the reception clock recovery tolerance to cell delay variation introduced by the ATM network.	Max: 4000 µsec	
	Step Size: 1 µsec	
	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.	
Cell Delay Variation – a component of cell transfer delay, induced by buffering and cell scheduling.	CAUTION... 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.	
TS ASI Output:	Active	The transport stream ASI output is enabled.
This enables the TS Asi Output to be changed.	Not Active	The transport stream ASI output is disabled.
ASI Stuffing Bytes:	0	Byte mode
This enables the ASI Stuffing Bytes to be changed.	1-7	Bytes for Burst mode

Selected Item	Options	Description
Valid Stream		These options are status only and cannot be changed.
Packet Status		
Bitrate		
Bitrate (Min)		
Bitrate (Max)		
Lost Cells		
Misinserted Cells		
Corrected Packets		
Uncorrected Packets		
Length Errors		
Crc Errors		
Unknown Cells		

4.11.16 Physical Menu

Table 4.42: Physical Menu Options

Selected Item	Options	Description
Mode: Match the setting to that of the connected network, normally set to SDH.	SDH [Monomode]: (M2/EOM2/ATMS155SM)	Synchronous Digital Hierarchy - the ITU-TSS International standard for transmitting information over optical fibre.
	SONET [Multi-mode]: (M2/EOM2/ATMS155MM)	Synchronous Optical Network - an ANSI standard for transmitting information over optical fibre.
	G.823 ADM; G.751 PLCP [E3]: (M2/EOM2/ATMS34)	The physical layer is E3 using duplex BNC (coaxial) interface.
	C-bit Parity; ADM M23; ADM C-bit Parity; PLCP M23; PLCP [DS3]: (M2/EOM2ATMS45)	DS-3 is the third level in the PDH multiplex hierarchy found in North America.
	SDH; SONET [STM-1 Electrical Module]: (M2/EOM2ATMS155E)	Synchronous multiplexing hierarchy, BNC (coaxial) interface. Rates of up to 155 Mbit/s.
Path Label: 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.	Min: 0	The path label which identifies ATM cells. The input must be set to the default value, 19.
	Max: 255	
	Step Size: 1	
	This MUST be set to the default, which is 19. Do not change or the frames might not be recognised as carrying ATM cells.	
Tx Clock Source: The physical layer clock reference source used to transmit the data on the interface.	Recovered Rx clock	Use when connected to a switch.
	Local Clock	Use when connected directly to another ATM card.
	It is normally set to 'Recovered Rx clock' when connected to a switch but when connected directly to another ATM card, one of the cards should be set to 'Local Oscillator'.	
Cell Mode: Specifies how null cells are flagged on the interface	Idle	
	Unassigned	Normally set to 'Unassigned' (default setting).
Interface		These options are status only and cannot be changed.

4.12 Digital Programme Insertion (DPI) Menu

4.12.1 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 DVS525 protocol.

4.12.2 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.

4.12.3 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.

4.12.4 DPI Initiated by DVS525

The number of options available through this method are shown in *Figure 4.15.* In this mode, the Encoder responds to messages received via Ethernet adhering to the DVS525 protocol.

4.12.5 Menu Structure

Figure 4.15 shows the options available from the menu.

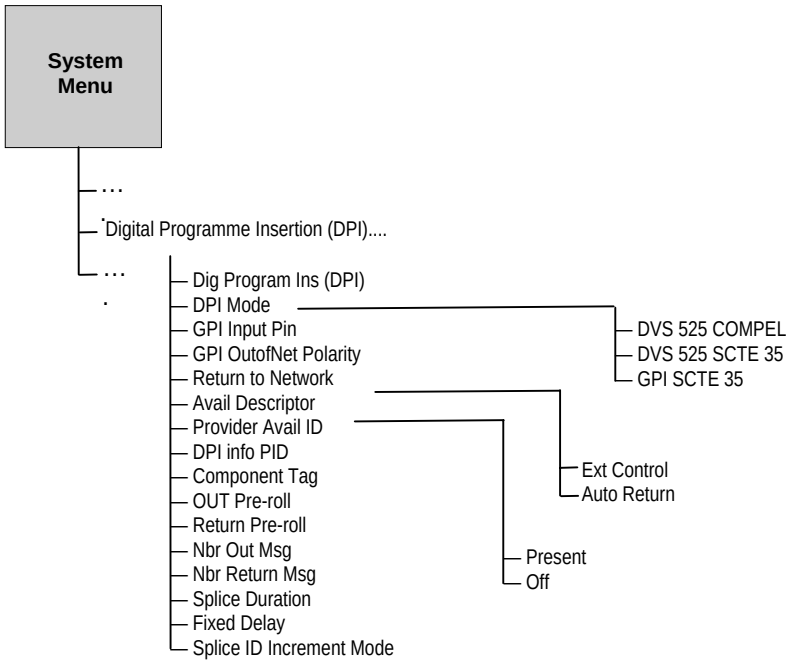


Figure 4.15: Menu Hierarchy – Digital Programme Insertion DPI Menu (GPI Initiated)

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 4.43: DPI Options (DPI Mode= GPI SCTE 35)

Menu Item	GPI	DVS 525	Description
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 DVS525 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.

4.13 Errors Menu

4.13.1 Overview

From the E5720 2U Encoder the `Errors Menu` can be selected from the `Advanced Menu` by selecting the **Errors** option. From the E5710 1U Encoder the `Errors Menu` can be selected from the `Main Menu` by selecting the **Errors** option.

New errors are reported to the front panel display approximately every 30 seconds.

4.13.2 Active Errors Option

This gives a list of any current errors.

4.13.3 Ignored Errors

Errors flagged as 'Ignored Errors' are displayed in the Ignored list and aren't passed onto to any other equipment.

4.13.4 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

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

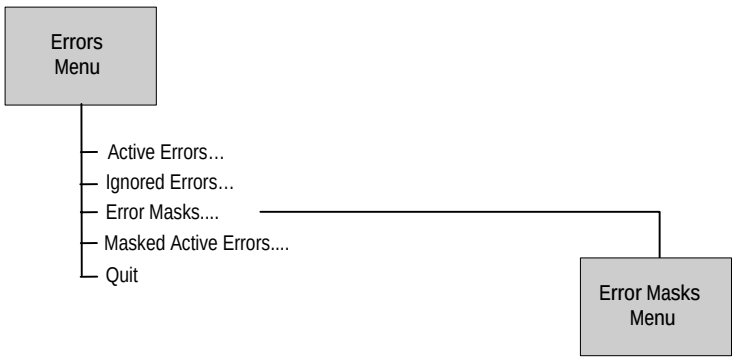


Figure 4.16: Menu Hierarchy – Error Masks Menu

4.13.5 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.

4.14 Diagnostics Menu

See *Chapter 6, Preventive Maintenance and Fault-finding* for information about the `Diagnostics Menu`.

4.15 Configs Menu

4.15.1 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.

4.15.2 Overview

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

The Encoder normally holds the following configurations:

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

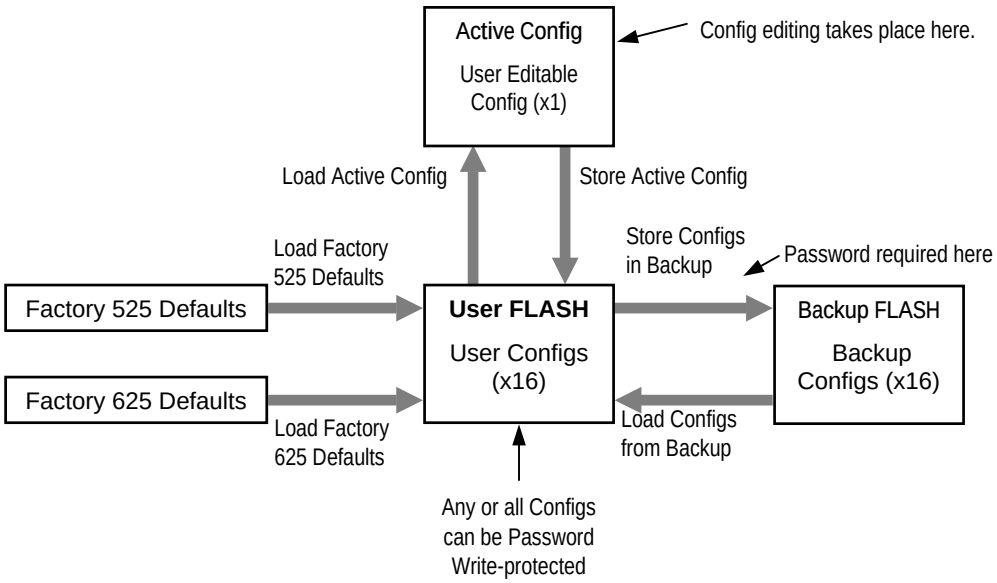


Figure 4.17: Configuration, Graphical Explanation.

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 Default Configurations

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

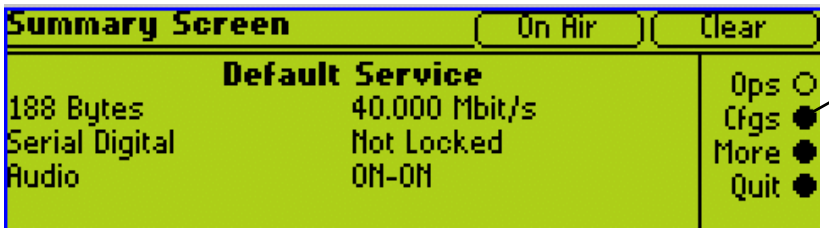
Configuration, Write-Protection

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.

4.15.3 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 4.15.4*) 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.



This menu provides options for loading and storing predefined configurations and updating and restoring backup configurations.

4.15.4 Load Active Config Option

Use the softkeys to select the required configuration to be loaded.

4.15.5 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.

4.15.6 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.

4.15.7 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.

4.15.8 Factory 525 Defaults Option

This option enables the 16 user configurations to be overwritten by the factory default settings for 525 line/29.97 Hz video operation.

> NOTE...
> The Factory 525 Defaults option is activated immediately.

4.15.9 Factory 625 Defaults Option

The Factory 625 Defaults option is very similar to the Factory 525 Defaults option, except that it overwrites the 16 user configurations with the factory default settings for 625 line/25 Hz video operation.

> NOTE...
> The Factory 625 Defaults option is activated immediately.

Chapter 5

Web Browser Interface

Contents

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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.

NOTES...

1. Active Scripting must be enabled in Microsoft Internet Explorer to enable the menu functionality.
2. Netscape (Mozilla FireFox) 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*)**.**

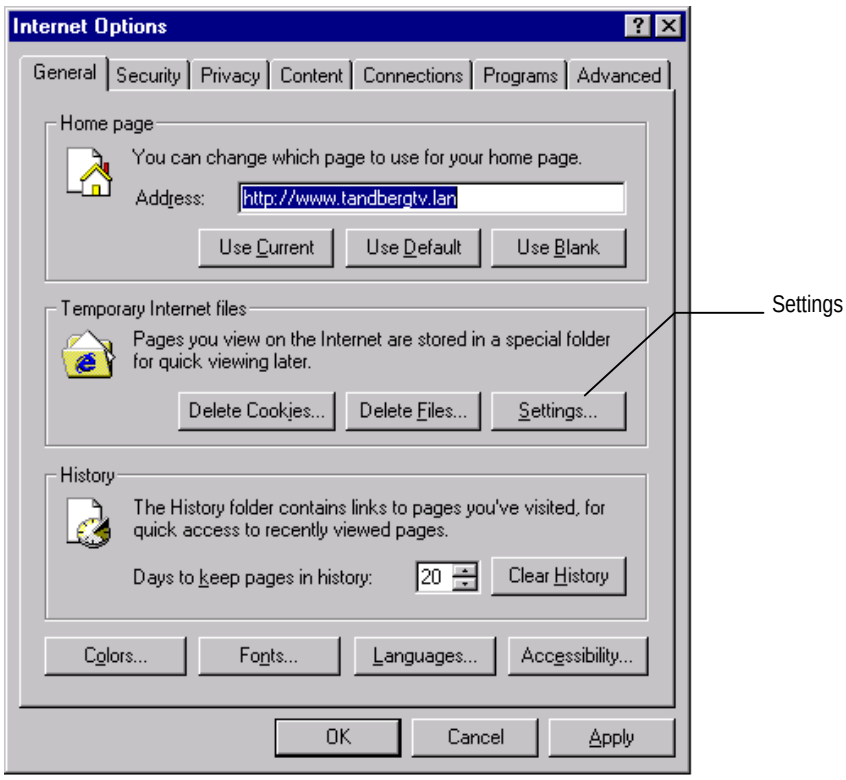

Figure 5.1: Internet Options Dialog Box

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

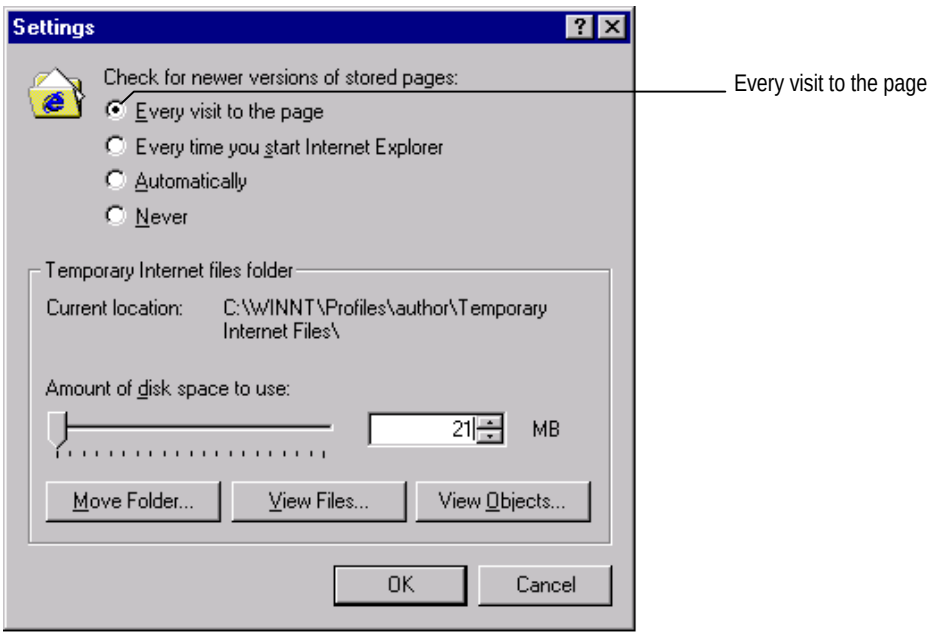

Figure 5.2: Settings Dialog Box

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*).

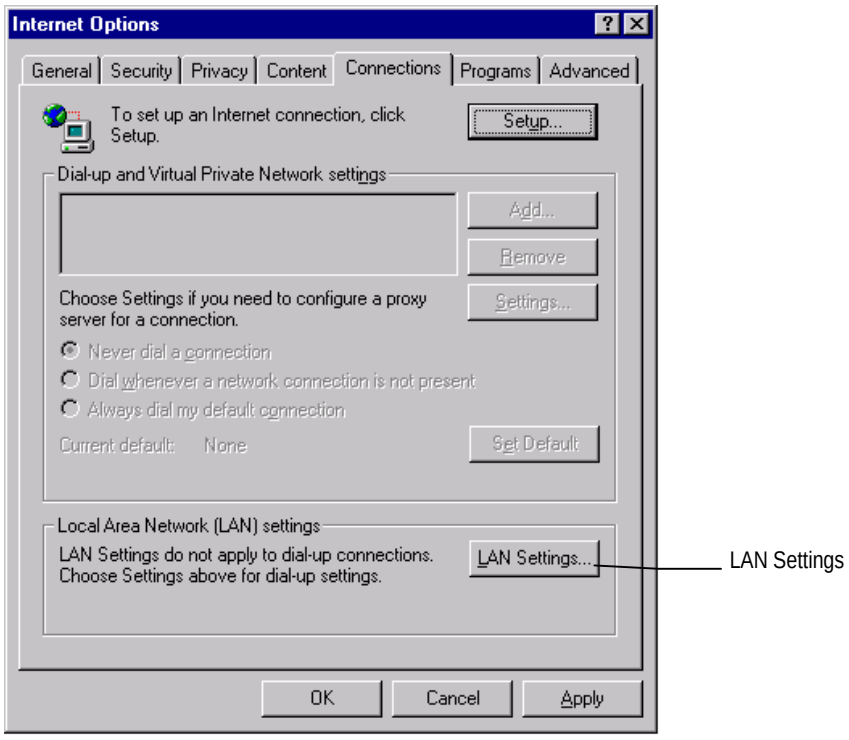

Figure 5.3: Connections Tab

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

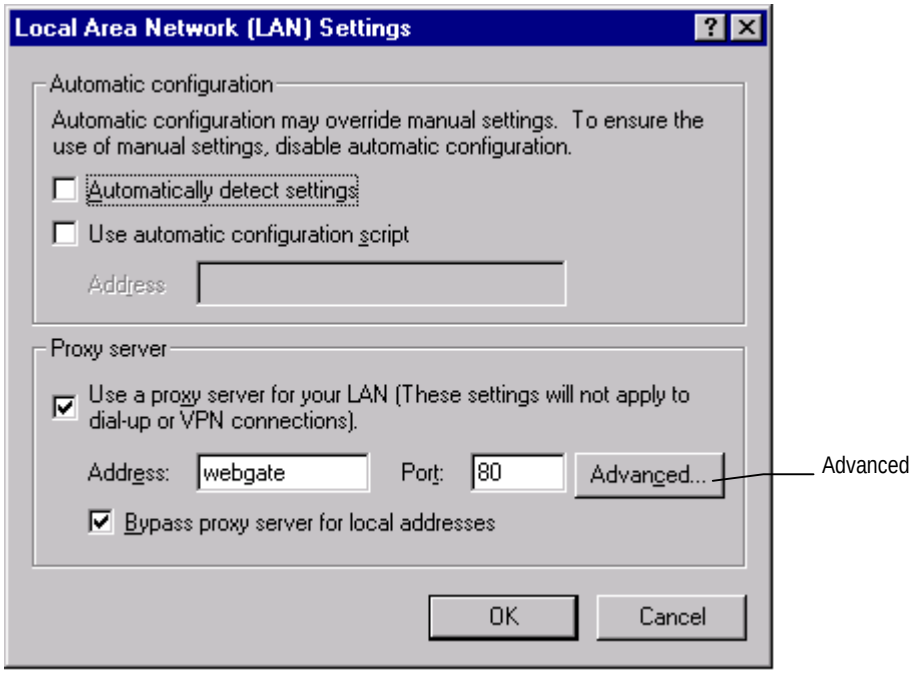

Figure 5.4: Local Area Network (LAN) Settings Dialog Box

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

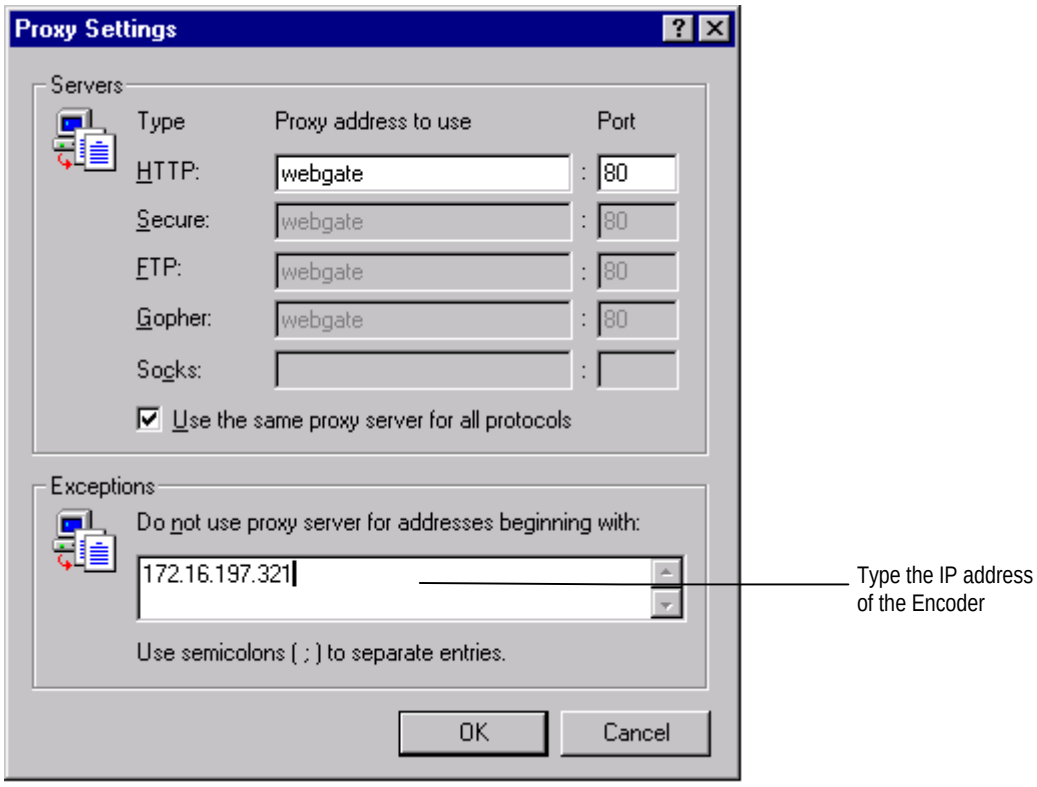

Figure 5.5: Proxy Settings Dialog Box

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 Username/Password

Internet Explorer will then request a username and password to give access to the Menu system. The defaults are:

- username is “Engineer”
- password is “password”

These can be modified within the Menu system.

No web pages are cached so the password is not retained from a previous session.

5.4 Web Browser Interface Options

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

Tabbed dialogs give access to various information and allow configuration of the Encoder.

- **Status**

  Detailed current status of Encoder including current active alarms.

- **Device Info**

  Display and set various information. Allows alarm masks to be set and display of current, masked and latched alarms

- **Support**

  Displays various information about the Encoder useful when reporting a fault.

  - **Version Info**

    Gives full information on the build status of the Encoder

  - **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.

  - **Customer Support**

    This page links to the TANDBERG Television internet site.

  - 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.

- NV Event Log - shows the actions which have been performed since the Encoder was last switched on
- External Controller – gives the IP addresses of external equipment which can control the Encoder.

- **Engineering**
  - **Symbol Rate Calculator**

    The Modulation Help allows you to see the difference that various parameters have upon the symbol rate and bandwidth.
  - **OFDM Bitrate Calculator**

    The Bitrate Calculator allows you to enter various parameters and the optimal bitrate (Mbit/s) is automatically calculated for 204 bytes and 188 bytes.
  - **Encoder List**

    Shows a list of the Encoders on the network together with various parameters.
- **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.
- **Stored Configs**
  - **Load Config**

    Gives a list of preconfigured settings.
  - **Save Config**

    Saves the current setting to an existing prenamed configuration.
- **Save / Load**
  - **Save configuaration to file**

    This saves a file containing an XML description of the current Encoder settings. Forward this file to TANDBERG Television Technical Support in the event of a problem.
  - **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 D, Creating and Downloading a Logo* for information on how to use the programs.

- **SNMP MIB**

  This option is password protected. It allows the Simple Network Management Protocol (SNMP) Management Information Base (MIB[1]) files to be downloaded from the Encoder to the PC. The password is available from TANDBERG Television Customer Services under a non-disclosure agreement (NDA).

5.5 Fault Reporting

In the support menu, click **Version Info**. When this I displayed, from **Edit** menu on Explorer, click **Select All** and then **Copy**. Open notepad and paste this in. Save the notepad file. Repeat this for **Event Log** and **NV Event Log**.

Also, send an XML configuration file of the Encoder configuration. See *Save / Load* under *Section 5.3* for details.

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

Chapter 6

Preventive Maintenance and Fault-finding

Contents

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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 standalone 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 Error Messages – When to Use Them

6.4.1 Error Messages on the Front Panel

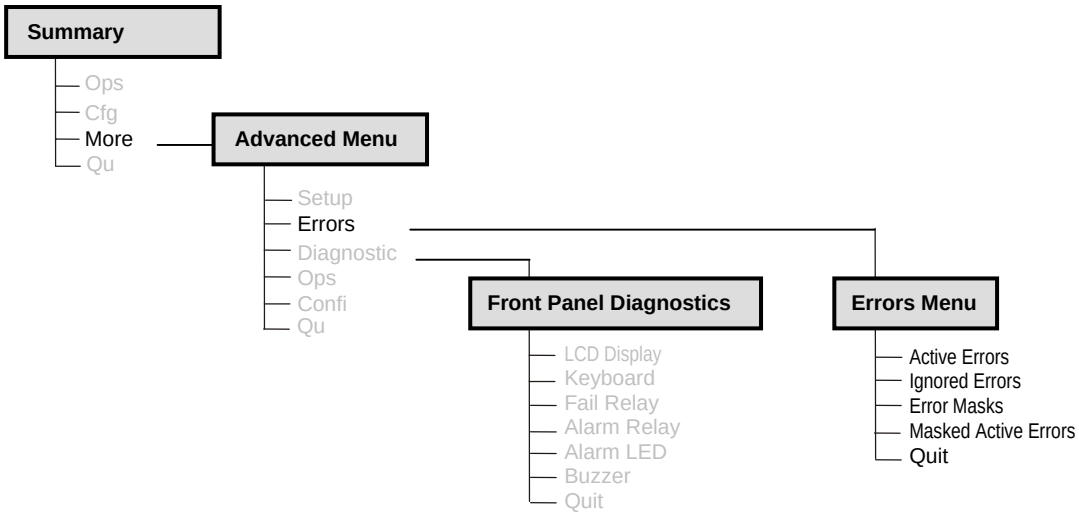

Figure 6.1: Finding the Errors Menu on the Front Panel

Investigate any run-time errors by pressing the **Active Errors** softkey in the `Errors Menu` (see *Figure 6.1*). Current errors are displayed.

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

Refer to *Chapter 4, Operating the Equipment Locally, Section 4.12, Error Menus* for further details of error messages.

CAUTION...

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

NOTE...

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

6.4.2 Error Messages on the Web Browser

Current errors are displayed on the Status tabbed page. The state for each condition can be assigned via the Alarms page (see Section *6.6.3*).

There are three states for the error message: Minor, Critical or Off.

- **Minor** (Alarm) shows the error message and triggers the alarm relay
- **Critical** (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

6.5 Front Panel Diagnostics Menu

Introduction

The `Diagnostics Menu` is selected from the `Advanced Menu` by pressing the **Diagnostics** softkey. This menu has a selection of diagnostic tests which allow the operator to test the individual component parts of the equipment.

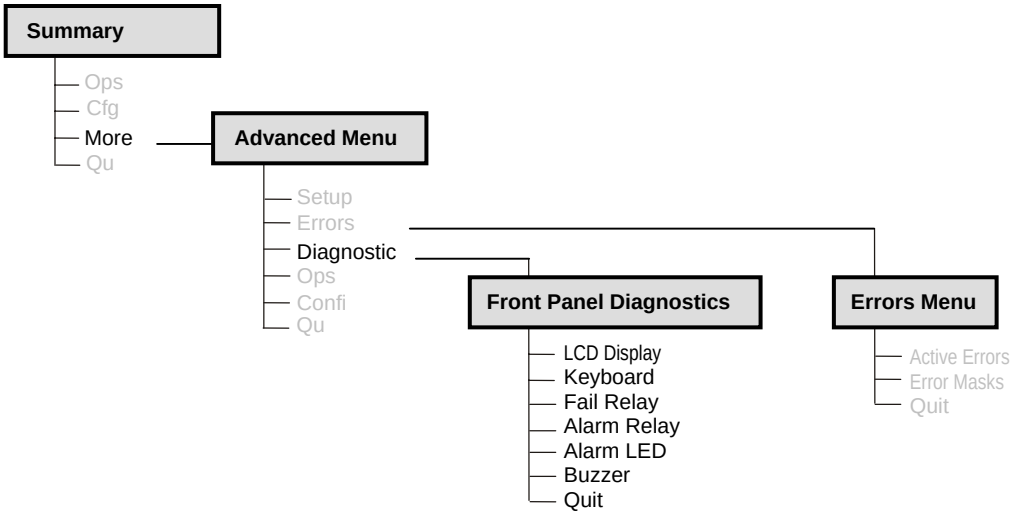

Figure 6.2: Finding the Diagnostics Menu

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.

6.6 Web Browser Support

6.6.1 Support Tabbed Page

Figure 6.3 shows the items available on the Support tabbed page available through the Web Browser. Use this page to interrogate the Event Logs and to check the Hardware and Software configuration of the Encoder

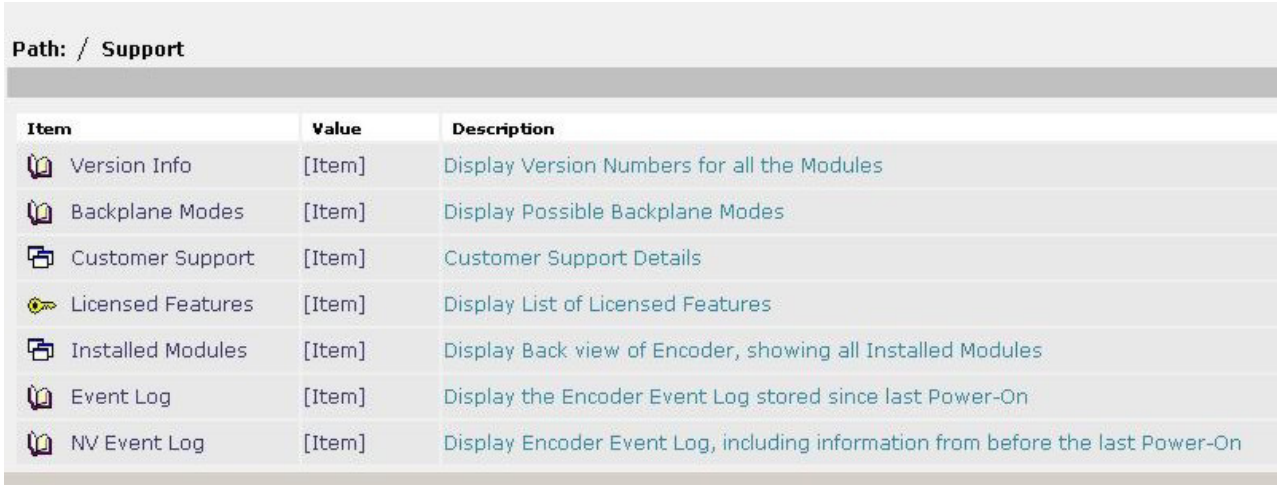

Figure 6.3: Support Tabbed Page

6.6.2 Device Information Tabbed Page

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

Use this page to access the current Alarms and Errors.

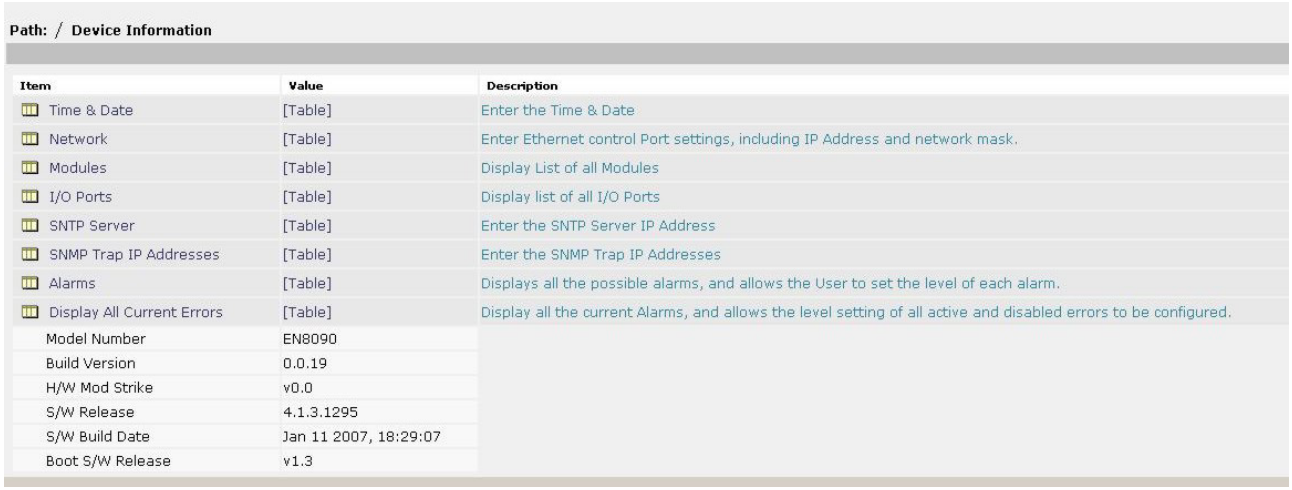

Figure 6.4: Device Information Tabbed Page

6.6.3 Alarms Page

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

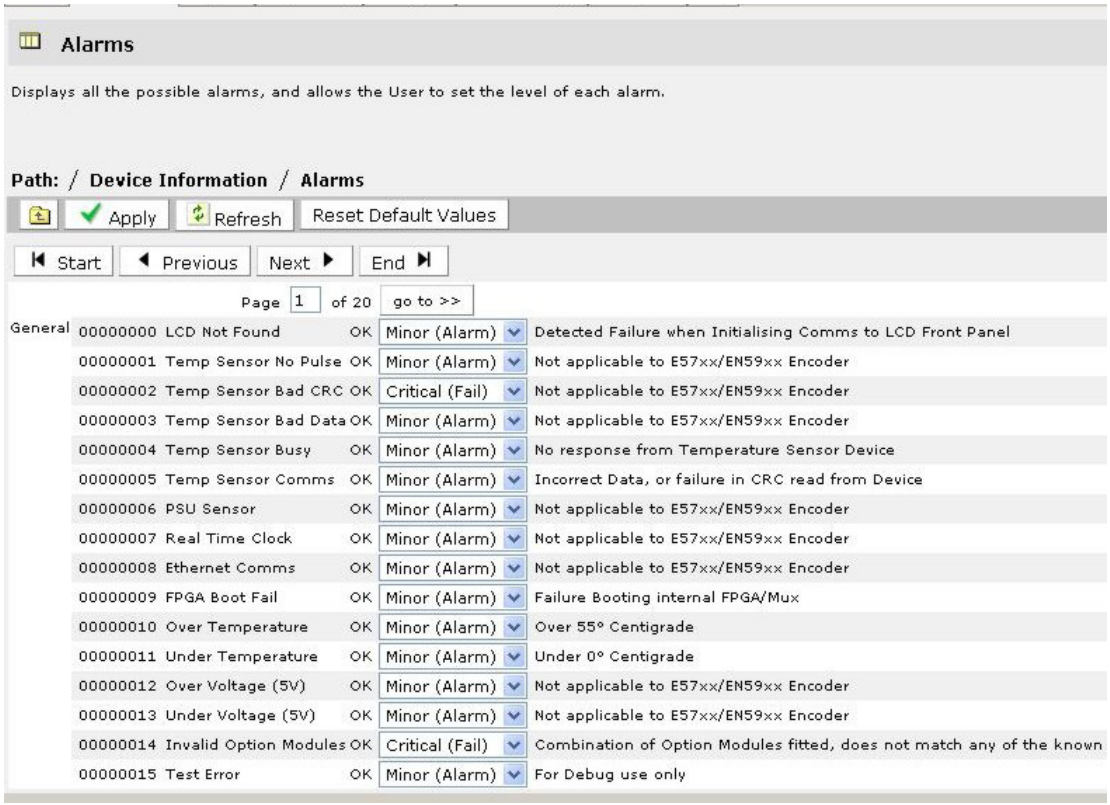

Figure 6.5Typical Alarm Page

Items can be masked or level assigned from this page. The same function is available through the front panel controls and display (see *Section 6.4.1*).

Table 6.1: Alarm/Fail Masking

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

6.7 Fault-finding

6.7.1 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 provide 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.

6.7.2 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 6.7.3, A.C. 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.

6.7.3 A.C. User Accessible Fuse Replacement

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

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

To replace the a.c. power fuse:

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

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

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

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

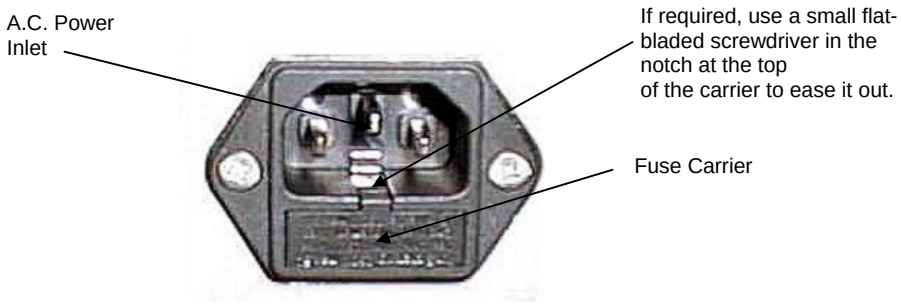

Figure 6.6: Position of A.C. Fuse Carrier

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

6.7.4 D.C. User Accessible Fuse Replacement

WARNING...

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

NOTE...

Refer to *Annex B, Section B.5.2, D.C. Supply Input (-48 V Version)* for information about the d.c. fuse.

To replace the d.c. power fuse:

1. Ensure that d.c. power is turned off or the power cable is disconnected from the power inlet.
2. Unscrew the fuse carrier and remove the old fuse (see *Figure 6.7*).

CAUTION...

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

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

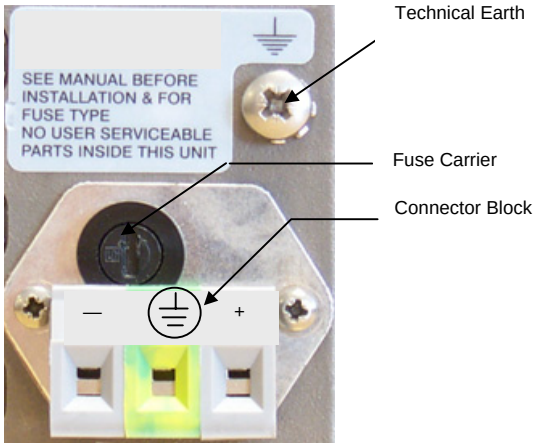

Figure 6.7: Position of Fuse Carrier for -48 Vdc Input

6.7.5 Video Fault-finding

Fault Symptoms

Table 6.2: Video Fault-finding

Problem	What to do
Video input lock error	Check video input.
Video - wrong line standard	Check which video format is selected.
VCM stopped	Reboot.
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, bitrate 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 bitrate. Changing the bitrate changes the buffer size, requiring a reset of the coding process.

For reflex operation video bitrate changes must be seamless as the bitrate varies continuously. All the seamless modes are seamless only for video bitrate changes. However, for some GOP changes operation can be seamless, but this aspect is not guaranteed.

Noise Reduction

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

6.7.6 Audio Fault-finding

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

6.7.7 Mux Fault-finding

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

1. The bitrate - 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.

6.8 Rate Buffer Setting (SD Only)

The Encoder, when running in 4:2:2[1] mode, has two software selectable rate buffer modes; small and medium.

When transmitting 4:2:2[1] 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 6.3: Rate Buffer Settings

	E5710/E5720 Setting	Alteia Setting
PRO IRD	SMALL	-
Alteia only	MEDIUM	MEDIUM
Alteia and PRO IRD	SMALL	SMALL

6.9 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.

6.10 Power Supply Problems/Green LED on Front Panel Unlit

6.10.1 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.

[1] 4:2:2 is only available when software option M2/ESO2/422 is purchased.

6.10.2 Power LED Unlit

If the Encoder Power LED is unlit, fault-find the problem as detailed in *Table 6.4*.

Table 6.4: Power LED Unlit Fault-finding

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

6.10.3 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 6.5*.

> 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 6.5: Fans Not Working/Overheating

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	**Check Fan Rotation**. Inspect the fans located at the sides of the enclosure. Are the fans rotating? Check Base Board temperature and fan (see the `Build Menu` in *Figure 4.4*).	Check that the Encoder has been installed with sufficient space allowed for air flow (see *Chapter 2, Installing the Equipment*). If the ambient air is too hot, additional cooling may be required.	Possible break in the d.c. supply from the PSU module to the suspect fan(s). Call a Service Engineer.

6.11 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.

µm	Micrometre (former name - micron): a unit of length equal to one millionth (10^{-6}) of a metre.
3:2 pull-down	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
422P@ML	422 Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 50 Mbit/s over various mediums. Used for Contribution and Distribution applications.
5B6B	5 Binary Bits Encoded to 6 Binary Bits: Block code.
AAC	Advanced Audio Compression algorithm that has been ratified for both MPEG-2 (ISO/IEC 11818-7) andMPEG-4 (ISO/IEC 14496-3)
AACplus	This is the trademark name for the version of MPEG-4 AAC which includes Spectral Band Replication (SBR) to achieve extremely low bitrate encoding.
AC-3	Audio Coding algorithm number 3 (See Dolby Digital).
ACC	Authorisation Control Computer.
ADPCM	Adaptive Differential Pulse Code Modulation: An advanced PCM technique that reduces the bitrate by coding the difference values between successive samples rather than the absolute value of each sample.
ADT	Audio, Data And Teletext.
ADTS	Audio Data Transport Stream is the method of encapsulation MPEG-2 AAC bitstream into transport stream.
AFC	Automatic Frequency Control.
AFS	Automation File Server.
AGC	Automatic Gain Control.
AMOL I and II	Automatic Measure of Line-ups I and II: Used by automated equipment to measure programme-viewing ratings.
ARIB	Association of Radio Industries and Businesses is a Japanese organisation for the promotion of the efficient use of the radio spectrum and defines the broadcast standards for Japan.
ASF	Advanced Stream Format is the file format used by Microsoft for real-time streaming of multimedia data. It has been publicly released in Summer 2002.
ASI	Asynchronous Serial Interface.
ASIC	Application-Specific Integrated Circuit: A customised chip designed to perform a specific function.
Async	Asynchronous.

ATM	Asynchronous Transfer Mode: A connection orientated, cell based, data transport technology designed for Broadband ISDN (B-ISDN). It provides a circuit-switched bandwidth-on-demand carrier system, with the flexibility of packet switching. It offers low end-to-end delays and (negotiable on call set-up) Quality of Service guarantees. Asynchronous refers to the sporadic nature of the data being transmitted. Cells are transmitted only when data is to be sent; therefore the time interval between cells varies according to the availability of data.
ATSC	Advanced Television Standards Committee: An organisation founded in 1983 to research and develop a digital TV standard for the U.S.A. In late 1996, the FCC adopted the ATSC standard, the digital counterpart of the NTSC standard.
B3ZS	Bipolar with Three Zero Substitution: A method of eliminating long zero strings in a transmission. It is used to ensure a sufficient number of transitions to maintain system synchronisation when the user data stream contains an insufficient number of 1s to do so. B3ZS is the North American equivalent of the European HDB3.
Backward Compatibility	Refers to hardware or software that is compatible with earlier versions.
BAT	Bouquet Association Table: Part of the service information data. The BAT provides information about bouquets. It gives the name of the bouquet and a list of associated services.
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bitrate when the symbols only have two states (1 and 0). Measured in Baud.
BDU	Bitstream Data Unit is a section of Vc-1 bitstream that is self-contained.
BER	Bit Error Rate: A measure of transmission quality. The rate at which errors occur in the transmission of data bits over a link. It is generally shown as a negative exponent, (e.g. 10^{-7} means that 1 in 10,000,000 bits are in error).
BISS	Basic Interoperable Scrambling System: Non-proprietary encryption from EBU (Tech3290).
Bitrate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.
Block; Pixel Block	An 8-row by 8-column matrix of luminance sample values, or 64 DCT coefficients (source, quantised, or dequantised).
Bouquet	A collection of services (TV, radio, and data, or any combination of the three) grouped and sold together, and identified in the SI as a group. A single service may be in several bouquets.
B-Picture; B-Frame	Bi-directionally Predictive Coded Picture/Frame: A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backward prediction). B frames are not used in any prediction.
BPSK	Binary Phase Shift Keying: A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.
BW	Bandwidth: The transmission capacity of an electronic line such as (among others) a communications network, computer bus, or broadcast link. It is expressed in bits per second, bytes per second or in Hertz (cycles per second). When expressed in Hertz, the frequency may be a greater number than the actual bits per second, because the bandwidth is the difference between the lowest and highest frequencies transmitted. High bandwidth allows fast transmission or high-volume transmission.
Byte-mode	Each byte is delivered separately in the ASI Transport Stream, with stuffing data added between the Bytes to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
CA	Conditional Access: The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
CABAC	Context Adaptive Binary Arithmetic Coding is a form of entropy coding used in H.264 that has greater coding efficiency than CAVLC but is more computationally expensive.
CAT	Conditional Access Table: Part of the MPEG-2 Program Specific Information (PSI) data. Mandatory for MPEG-2 compliance if CA is in use.
CAVLC	Context Adaptive Variable Length Coding is a form of entropy coding used in H.264 that has lower coding efficiency than CABAC but is less computationally expensive.
C-Band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 4 GHz to 6 GHz. Used by communications satellites. Preferred in tropical climates because it is not susceptible to fading.
CBR	Constant Bitrate where the bitrate of the bitstream out of the encoder remains constant over an extended period of time within the buffer limits of the decoder.
CCIR	*See:* ITU-R.
CCITT	*See:* ITU-T.
Channel	A narrow range of frequencies, part of a frequency band, for the transmission of radio and television signals without interference from other channels. In the case of OFDM, a large number of carriers spaced apart at precise frequencies are allocated to a channel.

Channel Coding	A way of encoding data in a communications channel that adds patterns of redundancy into the transmission path in order to improve the error rate. Such methods are widely used in wireless communications.
Chrominance	The colour part of a TV picture signal, relating to the hue and saturation but not to the luminance (brightness) of the signal. In a composite-coded colour system, the colour information (chrominance, often referred to as chroma) is modulated onto a high frequency carrier and added to the monochrome-format video signal carrying the luminance (Y). In a component-coded colour system, the two colour-difference signals (R-Y)(B-Y) usually referred to as C_RC_B (digital) or P_RP_B (analogue), are used to convey colour information. When C_RC_B (P_RP_B) is added to the luminance (Y), the complete picture information is conveyed as YC_RC_B (YP_RP_B).
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
CODE	Create Once Distribute Everywhere.
Codec	The combination of an Encoder and a complementary Decoder located respectively at the input and output of a transmission path.
COFDM	Coded OFDM: COFDM adds forward error correction to the OFDM transmission consisting of Reed-Solomon (RS) coding followed by convolutional coding to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.
Compression	Reduction in the number of bits used to represent the same information. For the purposes of a broadcast system, it is the process of reducing digital picture information by discarding redundant portions of information that are not required when reconstituting the picture to produce viewing clarity. Compression allows a higher bite-rate to be transmitted through a given bandwidth.
Compression System	Responsible for compressing and multiplexing the video / audio / data bitstreams, together with the authorisation stream. The multiplexed data stream is then ready for transmission.
C_RC_B	Digital Colour difference signals. These signals, in combination with the luminance signal (Y), define the colour and brightness of each picture element (pixel) on a TV line. *See:* Chrominance
CRC	Cyclic Redundancy Check: A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to ensure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.
CVCT	**Cable Virtual Channel Table** (ATSC).
dB	Decibels: A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 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.
De-blocking Filter	An in-loop deblocking filter is designed to smooth out artefacts introduced by the compression process in the reconstructed image in both the encoder and decoder. Then the motion estimation and compensation should produce better quality for the same bitrate.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
Decoding Time stamp	A field that may be present in a PES packet header that indicates the time that an access unit is to be decoded in the system target Decoder.
DID	Data Identifier for embedded audio within the HD-SDI signal.
Differential Coding	Method of coding using the difference between the value of a sample and a predicted value.
DIL	Dual In Line: The most common type of package for small and medium scale integrated circuits. The pins hang vertically from the two long sides of the rectangular package, spaced at intervals of 0.1 inch.
DIN	Deutsches Institut für Normung: German Standards Institute.
Dolby Digital	Formerly AC-3. An audio coding system based on transform coding techniques and psychoacoustic principles.
Downlink	The part of the satellite communications circuit that extends from the satellite to an Earth station.

Downconvert	The process by which the frequency of a broadcast transport stream is shifted to a lower frequency range.
DPCM	Differential Pulse Code Modulation: An audio digitisation technique that codes the difference between samples rather than coding an absolute measurement at each sample point.
DRM	Digital Rights Management where the rights to view or copy the material is defined and enforced. This is similar to Controlled Access (CA) but in general, no smartcards are used
DSNG	Digital Satellite News-Gathering.
DSP	Digital Signal Processor.
DTE	Data circuit Terminating Equipment: A communications device that originates (is the source) or is the end receiving unit (destination) of signals on a network. It is typically a terminal or computer.
DTH	Direct-To-Home. The term used to describe uninterrupted transmission from the satellite directly to the subscriber, that is, no intermediary cable or terrestrial network utilised.
DTS	Digital Theater Systems: A motion picture digital sound system.
DVB	Digital Video Broadcasting: A European project that has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) medium, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
DVB SI	Digital Video Broadcasting Service Information.
DVB-PI	DVB-Physical Interfaces
Earth	Technical Earth: Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth. Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.
EBDU	Encapsulated Bitstream Data Unit is a section of VC-1 bitstream that is self-contained and has been encapsulated with a start code.
EBU	European Broadcast Union.
ECM	Entitlement Control Message.
EDI	Ethernet Data Input
EIA	Electronics Industries Association (USA).
EIDU	Encapsulated IDU that is an IDU with a start code and, in some cases, an end code to define the IDU within a continuous bitstream.
EIT	Event Information Table: Equipment: A component of the DVB-Service Information (SI) stream generated within an Encoder, containing information about events or programmes such as event name, start time, duration, etc. System: EIT (Present/Following) contains the name of the current and next event. It may include an optional descriptor (synopsis) giving brief details of content. EIT (Schedule) is used to produce a full EPG. The EIT is the only DVB-SI table, which can be encrypted.
Elementary Stream	A generic term for a coded bitstream, be it video, audio or other.
EMC	Electromagnetic Compatibility.
EMM	Entitlement Management Message.
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.
EPG	Electronic Programme Guide: On-screen programme listing using thumbnail pictures and/or text.
Ethernet	The most widely used local area network (LAN) defined by the IEEE as the 802.3 standard. Transmission speeds vary according to the configuration. Ethernet uses copper or fibre-optic cables.
ETS	European Telecommunications Standard.
ETSI	European Telecommunications Standards Institute.
FCC	Federal Communications Commission.
FDM	Frequency Division Multiplex: A common communication channel for a number of signals, each with its own allotted frequency.
FEC	Forward Error Correction: A method of catching errors in a transmission. The data is processed through an algorithm that adds extra bits and sends these with the transmitted data. The extra bits are then used at the receiving end to check the accuracy of the transmission and correct any errors.
FFT	Fast Fourier Transformation: A fast algorithm for performing a discrete Fourier transform.

FIFO	First In, First Out: A data structure or hardware buffer from which items are taken out in the same order they were put in. Also known as a shelf from the analogy with pushing items onto one end of a shelf so that they fall off the other. A FIFO is useful for buffering a stream of data between a sender and receiver that are not synchronised - i.e. they not sending and receiving at exactly the same rate.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	File Transfer Protocol: A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
G.703	The ITU-T standard that defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP	Group of Pictures: MPEG video compression works more effectively by processing a number of video frames as a block. The TANDBERG Television Encoder normally uses a 12 frame GOP; every twelfth frame is an I frame.
GUI	Graphical User Interface: The use of pictures rather than just words to represent the input and output of a program. A program with a GUI runs under a windowing system and has a screen interface capable of displaying graphics in the form of icons, drop-down menus and a movable pointer. The on-screen information is usually controlled / manipulated by a mouse or keyboard.
H.264	ITU/ETSI name for MPEG-4 Part-10 (ISO/IEC 14496-10).
HD-SDI	High-Definition Serial Digital Interface which is used for the input of HDTV signals
HDTV	High Definition Television.
HE-AAC	High-Efficiency AAC is the broadcast profile for MPEG-4 and is specified in ISO/IEC 14496.3.
HPA	High Power Amplifier: Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
HSYNC	Horizontal (line) SYNCs.
Hub	A device in a multi-point network at which branch nodes interconnect.
ICAM	Integrated Conditional Access Module: Embedded in the IRD and responsible for descrambling, plus packet filtering and reception. It also contains the physical interface to the subscriber's viewing card.
ICE	Intelligent Compression Engine: the module on which the advanced coding of video and audio is performed.
IDU	Independent data unit that is a portion of elementary stream that can be decoded independently of any other portion.
IEC	International Electrotechnical Committee.
IF	Intermediate Frequency: Usually refers to the 70 MHz or 140 MHz output of the Modulator in cable, satellite and terrestrial transmission applications.
Interframe Coding	Compression coding involving consecutive frames. When consecutive frames are compared, temporal redundancy is used to remove common elements (information) and arrive at difference information. MPEG-2 uses B and P frames, but since they are individually incomplete and relate to other adjacent frames, they cannot be edited independently.
Intraframe Coding	Compression coding involving a single frame. Redundant information is removed on a per frame basis. All other frames are ignored. Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I frames; these are independent frames and can be edited.
IP	Internet Protocol: The IP part of TCP/IP. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or sub-network. IP accepts packets from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a datagram to the layer 2 data link protocol. It may also break the packet into fragments to support the Maximum Transmission / Transfer Unit (MTU) of the network.
I-picture; I-frame	Intracoded Picture/Frame: A picture / frame, which is coded using purely intracoding with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IPPV	Impulse Pay Per View: One-time events, purchased at home (on impulse) using a prearranged SMS credit line.
IRD	Integrated Receiver Decoder: The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
IRE	Institute of Radio Engineers: No longer in existence but the name lives on as a unit of video amplitude measurement. This unit is 1% of the range between blanking a peak white for a standard amplitude signal.

ISDN	Integrated Services Digital Network: The basic ISDN service is BRI (Basic Rate Interface), which is made up of two 64 kbit/s B channels and one 16 kbit/s D channel (2B+D). If both channels are combined into one, called bonding, the total data rate becomes 128 kbit/s and is four and a half times the bandwidth of a V.34 modem (28.8 kbit/s). The ISDN high-speed service is PRI (Primary Rate Interface). It provides 23 B channels and one 64 kbit/s D channel (23B+D), which is equivalent to the 24 channels of a T1 line. When several channels are bonded together, high data rates can be achieved. For example, it is common to bond six channels for quality videoconferencing at 384 kbit/s. In Europe, PRI includes 30 B channels and one D channel, equivalent to an E1 line.
ISO	International Standards Organisation.
ISOG	Inter-union Satellite Operations Group.
ITS	Insertion Test Signal: A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	Invitation To Tender.
ITU-R	International Telecommunications Union - Radiocommunications Study Groups (was CCIR).
ITU-T	International Telecommunications Union - Telecommunications Standardisation Sector (was CCITT).
JPEG	Joint Photographic Experts Group: ISO/ITU standard for compressing still images. It has a high compression capability. Using discrete cosine transform, it provides user specified compression ratios up to around 100:1 (there is a trade-off between image quality and file size).
JVT	The Joint Video Team (JVT) is a partnership between ISO/IEC and ITU to develop the new video compression standard MPEG-4 Part 10 from the original ITU-T H.26L project.
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
Ku-band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 12 GHz to 14 GHz. Used by communications satellites. Preferred for DTH applications because this range of frequency is less susceptible to interference.
LAN	Local Area Network: A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
LATM	Low-overhead Audio Transport Multiplex is part of the method to encapsulate MPEG-4 HE-AAC into transport stream. It is used in conjunction with LOAS.
L-band	The frequency band from 950 MHz to 2150 MHz, which is the normal input-frequency-range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.
LED	Light Emitting Diode.
LNB	Low Noise Block Down-Converter: The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
LO	Local Oscillator.
LOAS	Low-overhead Audio Stream is part of the method to encapsulate MPEG-4 HE-AAC into transport stream. It is used in conjunction with LATM.
LSB	Least significant bit.
Luminance	The television signal representing brightness, or the amount of light at any point in a picture. The Y in YC_RC_B.
LVDS	Low Voltage Differential Signal: LVDS is a generic multi-purpose Interface standard for high speed / low power data transmission. It was standardised in ANSI/TIA/EIA-644-1995 Standard (aka RS-644).
Macroblock	A 16x16-pixel area of the TV picture. Most processing within the MPEG domain takes place with macro blocks. These are converted to four 8x8 blocks using either frame DCT or field DCT. Four 8 x 8 blocks of luminance data and two (4:2:0 chrominance format), four (4:2:2) or eight (4:4:4) corresponding 8 x 8 blocks of chrominance data coming from a 16 x 16 section of the luminance component of the picture. Macroblock can be used to refer to the sample data and to the coded representation of the sample values and other data elements.
Mbit/s	Million bits per second.
MCC	Multiplex Control Computer: A component of a System 3000 compression system. The MCC sets up the configuration for the System 3000 Multiplexers under its control. The MCC controls both the main and backup Multiplexer for each transport stream.
MCPC	Multiple Channels Per Carrier.
MEM	Multiplex Element Manager: A GUI-based control system, part of the range of TANDBERG Television compression system control element products. The evolution 5000 MEM holds a model of the system hardware. Using this model, it controls the individual system elements to configure the output multiplexes from the incoming elementary streams. The MEM monitors the equipment status and controls any redundancy switching.

MMDS	Multichannel Microwave Distribution System: A terrestrial microwave direct-to-home broadcast transmission system.
Motion Compensation	The use of motion vectors to improve the efficiency of the prediction of sample values. The prediction uses motion vectors to provide offsets into the past and/or future reference frames or fields containing previously decoded sample values that are used to form the prediction error signal.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML	Main Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MP@HL	Main Profile at High Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 80 Mbit/s over various mediums.
MPEG	Moving Pictures Experts Group: The name of the ISO/IEC working group, which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bitrate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bitrates and picture resolutions.
MPEG-4	New industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bitrate in preparation for broadcasting. Specified in ISO/IEC 14496. Part 2 of this standard defines the original MPEG-4 video compression whereas Part 10 is the new algorithm also known as H.264.
MPEG-4 PT 10	Advanced Video Coding (AVC) standard designed to provide increased coding efficiency over MPEG-2. Specified in ISO/IEC 14496-10 and as ITU-T Recommendation H.264. The standard is split into profiles which define which tools can be used and levels which define the allowed bitrates and resolutions **.**
MSB	Most significant bit.
Msymbol/s	(Msym/s) Mega (million) Symbols per second (10^6 Symbols per second).
Multiplex	A number of discrete data streams (typically 8 to 12), from encoders, that are compressed together in a single DVB compliant transport stream for delivery to a Modulator.
MUSICAM	Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing: An audio bitrate reduction system relying on sub-band coding and psychoacoustic masking.
Mux	Multiplexer: Transmission Multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation. The Multiplexer also contains the cipher card, which scrambles the services according to the control words supplied by the BCC.
Network	In the context of broadcasting: a collection of MPEG-2 transport stream multiplexes transmitted on a single delivery system, for example, all digital channels on a specific cable system.
NICAM	Near Instantaneously Companded Audio Multiplex: Official name is NICAM 728. Used for digital stereo sound broadcasting in the UK employing compression techniques to deliver very near CD quality audio. 728 refers to the bitrate in kbit/s.
NIT	Network Information Table: Part of the service information data. The NIT provides information about the physical organisation of each transport stream multiplex, and the characteristics of the network itself (such as the actual frequencies and modulation being used).
nm	Nanometre: a unit of length equal to one thousand millionth (10^{-9}) of a metre.
NTSC	National Television Systems Committee: The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.
NVOD	Near Video On Demand: Method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
NVRAM	Non-volatile Random Access Memory: Memory devices (permitting random read / write access) that do not lose their information when power is removed. Stores the default configuration parameters set by the user.
OFDM	Orthogonal FDM: A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.
OID	Object Identifier is the part of the SNMP message that defines which module should receive the command.

OPPV	Order ahead Pay Per View: An advance purchase of encrypted one-time events with an expiry date.
OSD	On-screen display: Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.
PAL	Phase Alternating Line: A colour TV broadcasting system where the phase of the R-Y colour-difference signal is inverted on every alternate line to average out errors providing consistent colour reproduction.
PAT	Program Association Table: Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. The PAT points (maps) to the PMT.
PCM	Pulse Code Modulation: A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR	Program Clock Reference: A time stamp in the transport stream from which the Decoder timing is derived.
PDC	Programme Delivery Control (VBI): A Teletext service allowing simple programming (i.e. VideoPlus) of VCR recording times. If the desired program is rescheduled, PDC updates the programming information in the VCR.
Pel	Picture Element: Also known as a pixel. The smallest resolvable rectangular area of an image either on a screen or stored in memory. On screen, pixels are made up of one or more dots of colour. Monochrome and grey-scale systems use one dot per pixel. For grey-scale, the pixel is energised with different intensities, creating a range from dark to light (a scale of 0-255 for an eight-bit pixel). Colour systems use a red, green and blue dot per pixel, each of which is energised to different intensities, creating a range of colours perceived as the mixture of these dots. If all three dots are dark, the result is black. If all three dots are bright, the result is white.
PES	Packetised Elementary Stream: A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 Kbytes. A time stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	Packet Identifier: The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
PIN	Personal Identification Number: A password used to control access to programming and to set purchase limits. Each subscriber household can activate several PINs and may use them to set individual parental rating or spending limits for each family member.
Pixel	PIX (picture) Element: The digital representation of the smallest area of a television picture capable of being delineated by the bitstream. See Pel for more information.
pk-pk	peak to peak: Measurement of a signal or waveform from its most negative point to its most positive point.
PLL	Phase-Locked Loop. A phase-locked loop is a control system which controls the rotation of an object by comparing its rotational position (phase) with another rotating object as in the case of a sine wave or other repeating signal. This type of control system can synchronise not only the speed, but also the angular position of two waveforms that are not derived from the same source.
PMT	Program Map Table: Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. Each service has a PMT, which lists the component parts (elementary streams of video, audio, etc.) for the various services being transmitted.
P-picture/P-frame	A picture / frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
ppm	Parts per million and is the number of times the event occurs for every million.
PPV	Pay Per View: A system of payment for viewing services based on a usage / event basis rather than on on-going subscription. Subscribers must purchase viewing rights for each PPV event that they wish to view. PPV events may be purchased as IPPV or OPPV.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
P_RP_B	Analogue Colour difference signals. Refer to C_RC_B for an explanation.
PROM	Programmable Read-Only Memory: A device, which may be written once with data for permanent storage, and then read whenever required. Special types of PROM permit the erasure of all data by Ultraviolet light (EPROM) or by application of an electronic signal (EEPROM).
PS	Program Stream: A combination of one or more PESs with a common timebase.

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

SI	Service Information: Digital information describing the delivery system, content and scheduling (timing) of broadcast data streams. DVB-SI data provides information to enable the IRD to automatically demultiplex and decode the various streams of programmes within the multiplex. Specified in ISO/IEC 13818[1]. (DVB)
Single Packet Burst Mode	A burst of ASI bytes (either 188 or 204, depending on packet length) is contiguously grouped into an MPEG-2 Transport Stream packet. Stuffing data is added between the packets to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
Smart Card	A plastic card with a built-in microprocessor and memory used for identification, financial transactions or other authorising data transfer. When inserted into a reader, data is transferred to and from the host machine or a central computer. It is more secure than a magnetic stripe card and it can be disabled if the wrong password is entered too many times. As a financial transaction card, it can be loaded with digital money and used in the same way as cash until the balance reaches zero. The file protocol is specific to its intended application.
SMATV	Satellite Mast Antenna Television: A distribution system, which provides sound and television signals to the households of a building or group of buildings, typically used to refer to an apartment block.
SMPTE	Society of Motion Picture and Television Engineers.
SMS	Subscriber Management System: A system which handles the maintenance, billing, control and general supervision of subscribers to conditional access technology viewing services provided through cable and satellite broadcasting. An SMS can be an automatic (e.g. Syntellect) system where subscribers order entitlements by entering information via a telephone. Alternatively, an SMS can be a manual system, which requires subscribers to speak with an operator who then manually enters their entitlement requests. Some systems support multiple SMSs.
SNG	Satellite News-Gathering.
SNMP	Simple Network Management Protocol.
Spatial Redundancy	Information repetition due to areas of similar luminance and/or chrominance characteristics within a single frame. Removed using DCT and Quantisation (Intra-Frame Coding).
SPI	Synchronous Parallel Interface.
Statistical Redundancy	Data tables are used to assign fewer bits to the most commonly occurring events, thereby reducing the overall bitrate. Removed using Run Length Coding and Variable Length Coding.
TAXI	Transparent Asynchronous Tx / Rx Interface: A proprietary high-speed data interface.
TCP / IP	Transmission Control Protocol/Internet Protocol: A set of communications protocols that may be used to connect different types of computers over networks.
TDM	Time Division Multiplex: One common, communications channel carrying a number of signals, each with its own allotted time slot.
TDT	Time and Date Table: Part of the DVB Service Information. The TDT gives information relating to the present time and date.
Temporal Redundancy	Information repetition due to areas of little or no movement between successive frames. Removed using motion estimation and compensation (Inter-Frame Coding).
Time stamp	A term that indicates the time of a specific action such as the arrival of a byte or the presentation of a presentation unit.
TOT	**Time Offset Table:** This optional SI table supports the use of local offsets as well as the UTC time/date combination. The purpose of the table is to list by country the current offset from UTC and the next expected change to that offset (to track when daylight saving occurs). The offset resolution is to within 1 minute over a range of ±12 hours from UTC.
Transport Stream	A set of packetised elementary data streams and SI streams, which may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Transport Stream Packet Header	A data structure used to convey information about the transport stream payload.
TS	Transport Stream.
TSDT	Transport Stream Descriptor Table: A component of the MPEG-2 PSI data. This table describes which type of Transport stream it is in (i.e. DVB, ATSC etc.). It may also contain other descriptors.
TSP	Transport Stream Processor.
TVCT	**Terrestrial Virtual Channel Table** (ATSC).
U	44.45 mm (rack height standard).

UART	Universal Asynchronous Receiver Transmitter: A device providing a serial interface for transmitting and receiving data.
UHF	Ultra High Frequency: A portion of the electromagnetic spectrum covering 300 MHz to 3000 MHz (3 GHz).
Upconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher frequency range.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS	Uninterruptable Power Supply: A method of supplying backup power when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide battery power for a few minutes; enough to power down the computer in an orderly manner. This is particularly important where write back cache is used. Write back cache is where modified data intended for the disk, is temporarily stored in RAM and can be lost in the event of a power failure. Sophisticated systems are tied to electrical generators that can provide power for days. UPS systems typically provide surge suppression and may provide voltage regulation.
UTC	Universal Time Co-ordinate: An internationally agreed basis for timekeeping introduced in 1972 and based on international atomic time (corresponds to Greenwich Mean Time or GMT).
VBR	Variable Bitrate where the quality of the compression is kept constant independently of the source material so that the bitrate of the bitstream normally varies with time.
VCT	Virtual Channel Table (ATSC).
VHF	Very High Frequency: A portion of the electromagnetic spectrum covering 30 MHz to 300 MHz.
VITC	Vertical Interval Time Code.
VITS	Vertical Interval Test Signal: *See:* ITS.
VPS	Video Programming System: A German precursor to PDC that exists on line 16 of the VBI
WM9S	Windows Media 9 Series is the complete collection of algorithms and protocols that have been released by Microsoft.
WMA	Windows Media Audio which is the set of audio compression algorithms used in Windows Media 9 Series to achieve optimal quality at different bitrates.
WMV	Windows Media Video which is the set of video compression algorithms used in Windows Media 9 Series.
WSS	Wide Screen Switching Signalling: Data used in wide-screen analogue services, which enables a receiver to select the appropriate picture display mode.
WST	World System Teletext: System B Teletext. Used in 625 line / 50 Hz television systems (ITU-R 653).
XILINX	A type of programmable Integrated Circuit.
Y (Luminance)	Defines the brightness of a particular point on a TV line. The only signal required for black and white pictures.

BLANK

Annex B

Technical Specification

Contents

List of Tables

B.1 Inputs

B.1.1 Video

SDI

Table B.1: Serial Digital Video Specification

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

H SYNC

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

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

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 an Alteia^{plus} Decoder.

Table B.4: Encoder Settings for PAL/NTSC Video Performance Figures

Item	Specification
Noise reduction	Off
Video bitrate	8 Mbit/s
Resolution	720 x 576
GOP	IBBP
Profile	422P@ML
Packet length	188
Mux Bitrate	40 Mbit/s

PAL Video Performance Figures

Table B.5: PAL System Video Performance Figures

Pattern	Item	Specification
	Input return loss	35 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	35 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	M	B	G	H	I	D
Region	USA/Japan		----- Europe / Asia ----			UK	
Standard	NTSC	---------- PAL ----------					
Lines / frame	525	525	625	625	625	625	625
Fields / second	60	60	50	50	50	50	50
Interlace	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Frames / second	30 (29.97)	30 (29.97)	25	25	25	25	25
Lines / second	15 750	15 750	15 625	15 625	15 625	15 625	15 625
Aspect ratio	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3	4/3
Video band (MHz)	4.2	4.2	5.0	5.0	5.0	5.5	6

Video Coding Resolutions

Table B.8: Video Coding Resolutions

625 Line Modes	525 Line Modes
720 pixels x 576 lines	720 pixels x 480 lines
704 pixels x 576 lines	704 pixels x 480 lines
640 pixels x 576 lines	640 pixels x 480 lines
544 pixels x 576 lines	544 pixels x 480 lines
528x576	528x480
480 pixels x 576 lines	480 pixels x 480 lines
352 pixels x 576 lines	352 pixels x 480 lines
352 pixels x 288 lines	352 pixels x 240 lines

B.1.2 Audio

Analogue and Digital Audio

Table B.9: Analogue and Digital Audio Specification

Item	Specification
Safety status	SELV
Connector designation	AUDIO IN
Connector type	15-way, D-type male connector
Input standard (analogue)	Balanced analogue
Clip level	12 dB, 15 dB 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
Input standard (digital)	AES/EBU digital
Termination	110 Ω
Sampling rate	32/48 kHz (selectable)
Input rate	32, 44.1, 48 kHz
Output (digital) ref	AES/EBU digital
Impedance	75 Ω
Sampling rate	48 kHz
Coding Standards	
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 Pass-through (ATSC A/52, DVB TR 102 154) (see *Note 1*, after this Table)
Coding standard	Linear PCM/Dolby E Pass-through (SMPTE 302M) (see *Note 1*, after this Table)
Coding standard	DTS pass-through (see *Note 1*, after this 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 Ω termination.

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

Item	Specification
Set-up of Alteia Receiver	
Audio Format	MPEG
Output	Analogue
Clip Level	18 dB

Item		Specification
Set-up of Audio Encoder		
Input		Analogue
Clip Level		18 dB
Sampling Frequency		48 kHz
Coding Standard		MUSICAM, MPEG 1 (Layer 2)
Coding Mode		Stereo
Bitrate		384 k bit/s
Set-up of Lindos Audio Oscillator		
Sequence		TPBDLKZ
Test		Tolerance for Left and Right Legs for Channel (A) and Channel (B)
Test Level	T	
1 kHz @ 0 dB		± 0.2 dB
Sweep 20 Hz - 20 kHz ***@ -20 dB***	P	
20 Hz – 63 Hz		+0.0 to - 0.5 dB
100 Hz – 10 kHz		+0.2 to - 0.3 dB
12.5 Hz – 18 kHz		+0.2 to - 0.5 dB
20 kHz		0 to -1.5 dB
Crosstalk @ 0 dBs	B	
100 Hz		72 dB
1 kHz		74 dB
6.3 kHz		67.5 dB
10 kHz		63 dB
Distortion + noise @ +8 dB	D	
100 Hz		68 dB
1 kHz		70 dB
Noise RMS	L	
A-weighted		70 dB
Unweighted		70 dB
User Levels @ 1 kHz (0 to 50 dB)	K	
+10 dB		±0.2 dB
-10 dB		±0.2 dB
-20 dB		±0.2 dB
-30 dB		±0.2 dB
-40 dB		±0.3 dB
Phase @ 0 dBs	Z	
40 Hz		±2°
100 Hz		±2°
315 Hz		±2°
1 kHz		±2°
6.3 kHz		±2°
10 kHz		±2°
15 kHz		±2°

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

MPEG-1 Audio Encoding Bitrates

Table B.12: MPEG-1 Audio Encoding Bitrates

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

Dolby Digital Audio Encoding Bitrates

Table B.13: Dolby Digital Audio Encoding Bitrates

Bitrate (kbit/s)	Single Channel Mono (1/0)	Dual Channel Stereo (2/0)
56	✓	-
64	✓	-
80	✓	-
96	✓	✓
112	✓	✓

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

Dolby Formats Explained

Table B.14: Dolby Formats

Format	Category		Description
	Surround Sound Encoding	High Definition	
Dolby Digital	✓		Originally called AC-3, this system delivers five audio channels plus a Low Frequency Effects (LFE) signal to a sub-woofer.
Dolby Digital Plus		✓	Based on the Dolby Digital, this format is a bridge between SD and HD by using higher efficiency encoding. It provides up to 7.1 channels and supports multiple programs in a single encoded bitstream.
Dolby E	✓		This extends the Dolby Digital format by adding a centrally positioned rear speaker.
Dolby Surround	✓		The first multichannel format. It provides four audio channels to five speakers (the same channel feeds both rear speakers).

B.1.3 RS-232 Data

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

Table B.15: RS-232 Asynchronous Data Input Specification

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

B.1.4 RS-422 Data

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

Table B.16: RS-422 Data Specification

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

B.2 Test Tones

Table B.17: Test Tones Specification

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

B.3 ASI Out 1, ASI Out 2, ASI Out 3 Outputs

Table B.18: ASI Out Specification

Item	Specification
Safety status	SELV
Connector type	BNC 75 Ω
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.19: 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.20: Alarm Specification

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

B.4.4 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.21: Remote Control Specification

Item	Specification
Safety status	SELV
Connector designation	REMOTE CONTROL
Connector type	9-way D-type male

B.5 Power Supply

B.5.1 A.C. Mains Input

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

Table B.22: A.C. Power Supply Specification

Item		Specification
Power distribution system		Type TN ONLY (EN 60950 para 1.2.12.1): Power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. This equipment must NOT be used with single-phase three-wire and PE, TT or IT Type Power distribution systems.
Connection to supply		Pluggable Equipment Type A (EN 60950 para 1.2.5): Equipment 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	1U	2 A (100-120 Vac range) 1 A (220-240 Vac range)
	2U	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	1U	85 W maximum (NO options fitted) 150 W maximum (WITH options fitted)
	2U	100 W maximum (NO options fitted) 250 W maximum (WITH options fitted)
Stand-by power	1U 2U	6 W typically 15 W typically

B.5.2 D.C. Supply Input (-48 Vdc Version)

NOTES...

1. Only models M2/ENC/E5710/48V and M2/ENC/E5720/48V use a d.c. power supply.
2. Ensure correct polarity is maintained.
3. The unit must have a protective earth.

Table B.23: D.C. Power Supply Specification

Item		Specification
Rated voltage:		For connection to –48 Vdc supplies only. (PSU input tolerance –40 to –60 Vdc). Correct polarity must always be observed.
Rated current:	1U 2U	4 A 5 A
Input connector:		Terminal block
Fuse:		Fuse in –48 Vdc connector at rear of unit.
Fuse type:		Bussmann S505 Littelfuse 215 5x20mm time delay (T) 1500A breaking capacity (HBC) IEC/EN 60127-2 Sheet 5
Fuse current rating:		6.3 A 250 V T HBC
Power consumption	1U 2U	85 W maximum (with no options fitted) 100 W maximum (with no options fitted)

B.6 Physical Details

Table B.24: Physical Details

Item	Specification
Height	1U, 44.5 mm chassis 2U, 88.9 mm chassis
Width	1U, 442.5 mm excluding fixing brackets 2U, 442.5 mm excluding fixing brackets
Overall width	1U, 482.6 mm including fixing brackets 2U, 482.6 mm including fixing brackets
Depth	1U, 545 mm excluding rear connector clearance 2U, 545 mm excluding rear connector clearance
Approximate weight	1U, 7.5 kg (16.5 lbs) 2U, 11.5 kg (25.3 lbs)

B.7 Environmental Conditions

Table B.25: Environmental Specification

Item	Specification
Operational	
Temperature	-10°C to +50°C (14°F to 122°F) ambient with free air-flow
Over temperature alarm generated at	>= 55°C
Under temperature alarm generated at	< 0°C
Temperature checked	Once every 30 seconds
All fans switched off at	< 10°C (when set to auto)
Half the fans switched off at	< 20°C (when set to auto)
All fans on at	>= 20°C (when set to auto)
Relative humidity	0% to 90% (non-condensing)
1U Cooling requirements	Cool air enters on the left and exits from the right hand side
2U Cooling requirements	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 *Chapter 2, Installing the Equipment, Figure 2.2*
Handling/movement	Designed for stationary or fixed use when in operation
Storage/Transportation	
Temperature	0°C to +70°C (32°F to 158°F)
Relative humidity	0% to 90% (non-condensing)

B.8 Compliance[1]

B.8.1 Safety

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

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

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

UL 60950-1	USA	Information Technology Equipment - Safety.

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

B.8.2 EMC[2]

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

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

B.8.3 CE Marking

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

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

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

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

> NOTE...
> The CE mark was first affixed to this product in 2001.

B.8.4 C-Tick Mark

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

> NOTE...
> The C-Tick mark was first affixed to this product in 2001.

[2] The EMC tests were performed with the Technical Earth attached, and configured using recommended cables (see *Table B.26*).
[3] Applies only to models of the Encoder using ac power sources.

B.8.5 Packaging Statement

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

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

B.8.6 Packaging Markings

The symbols printed on the outer carton are described below:

Handle with care

This way up

Fragile

Protect from moisture

See *Section B.8.3*.

See *Section B.8.4*.

Defines country of origin.

The packaging is reusable per GB 18455-2001

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

Recyclable per GB 18455-2001

.

B.8.7 Materials Declarations

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

For the European Union

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

For China

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

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

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

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

B.8.8 Equipment Disposal

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.

For the European Union

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

B.8.9 Recycling

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

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

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

B.9 Cable Types

The signal cable types (or similar) in *Table B.26* are those recommended by TANDBERG Television in order to maintain product EMC compliance.

Table B.26: 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)
SDI In (Video Input)	BNC	Canford Audio BBC 1/3 PSF
H SYNC	BNC	Canford Audio BBC 1/3 PSF
Composite Video (Input)	BNC	Canford Audio BBC 1/3 PSF
Audio (Input)	15-way D-type Male	Canford Audio DFT 110 Ω
Audio Out (XLR Expander Card)	XLR	Canford Audio DFT cable

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Annex C

Language Abbreviations

Languages are shown in alphabetical order.

LANGUAGE	ABBREVIATION
Afrikaans	afr
Albanian	alb
Arabic	ara
Basa	bas
Basque	baq
Bihari	bih
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
Malay	msa
Malayalam	mal
Marathi	mar
Miscellaneous	mis
Multiple languages	mul
Ndebele (North)	nde
Norwegian	nor
Oriya	ori
Persian	per
Punjabi	pan
Polish	pol
Portuguese	por
Romanian	rum
Russian	rus
Serbo-Croat	scr
Slovak	slk
Spanish	spa
Somali	som
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
Main	one
Auxiliary	two
User-defined 1	ud1 (Default string)
User-defined 2	ud2 (Default string)
User-defined Language 1	ud1 (Default string)
User-defined Language 2	ud2 (Default string)

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.

Annex D

Creating and Downloading a Logo

Contents

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D.1 Introduction

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

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

D.2 Summary of Features

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

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

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

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

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

D.3 OSD Programs Built Into the Encoder

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

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

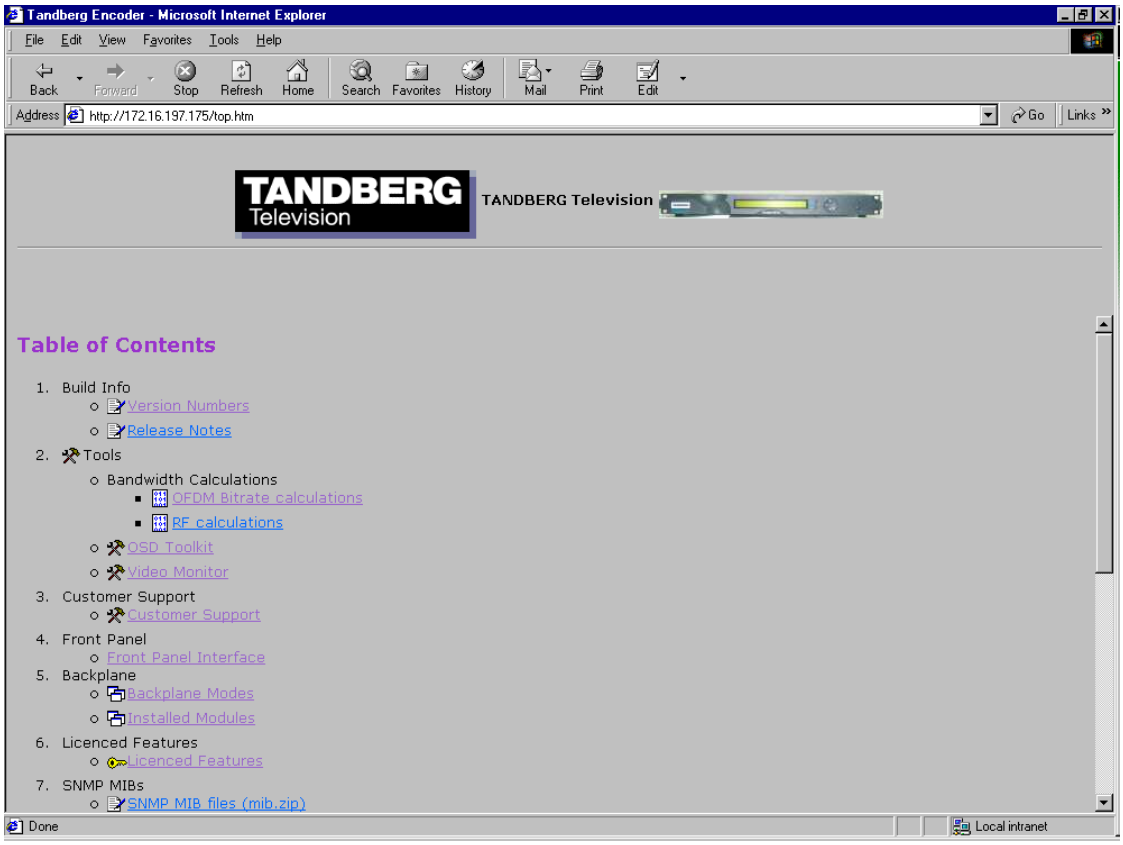

Figure D.1: Web Browser Interface

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

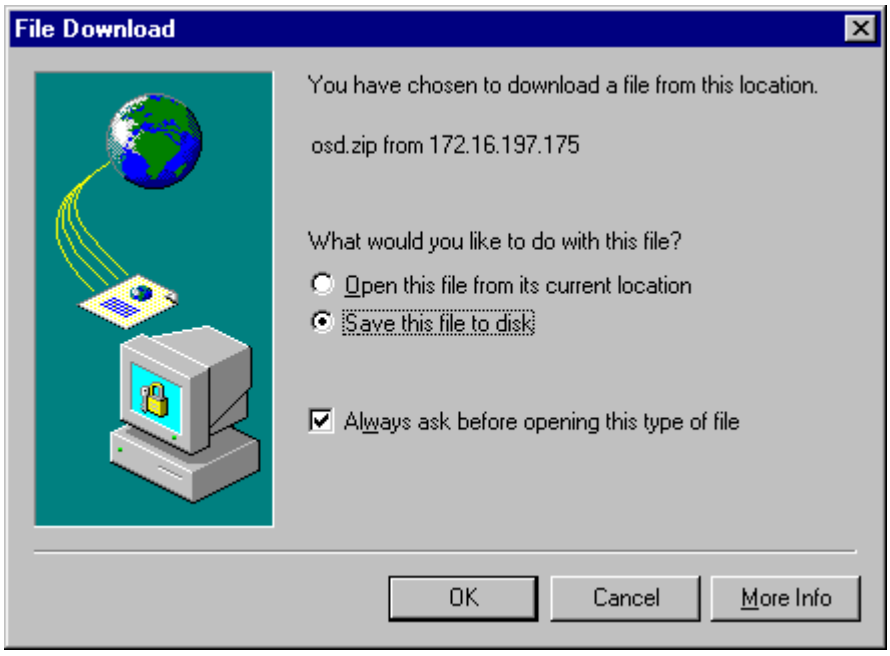

Figure D.2: File Download Dialog Box

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*.

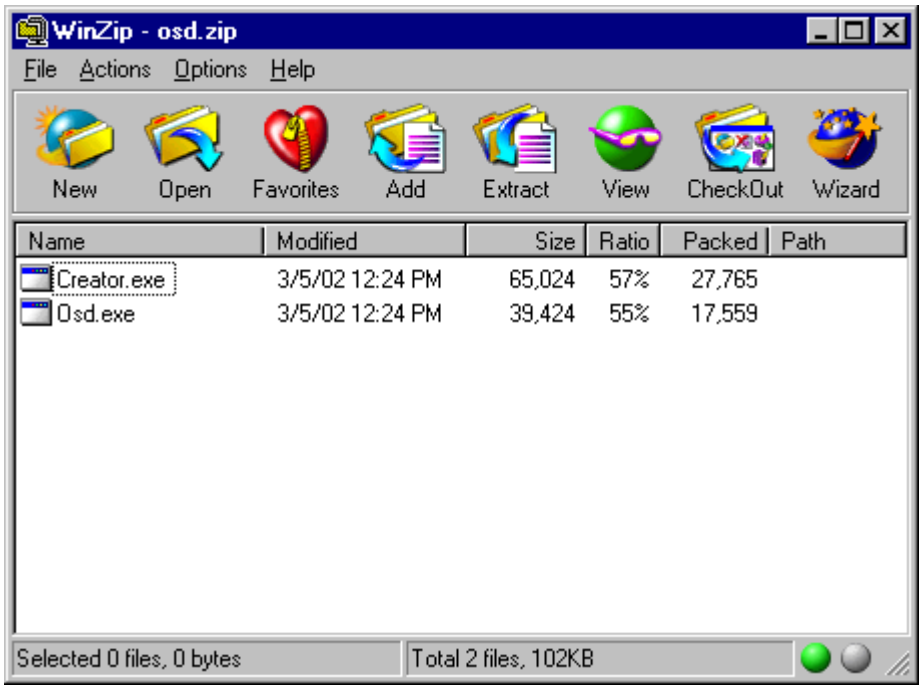

Figure D.3: Files for OSD Creator and Loader

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*.

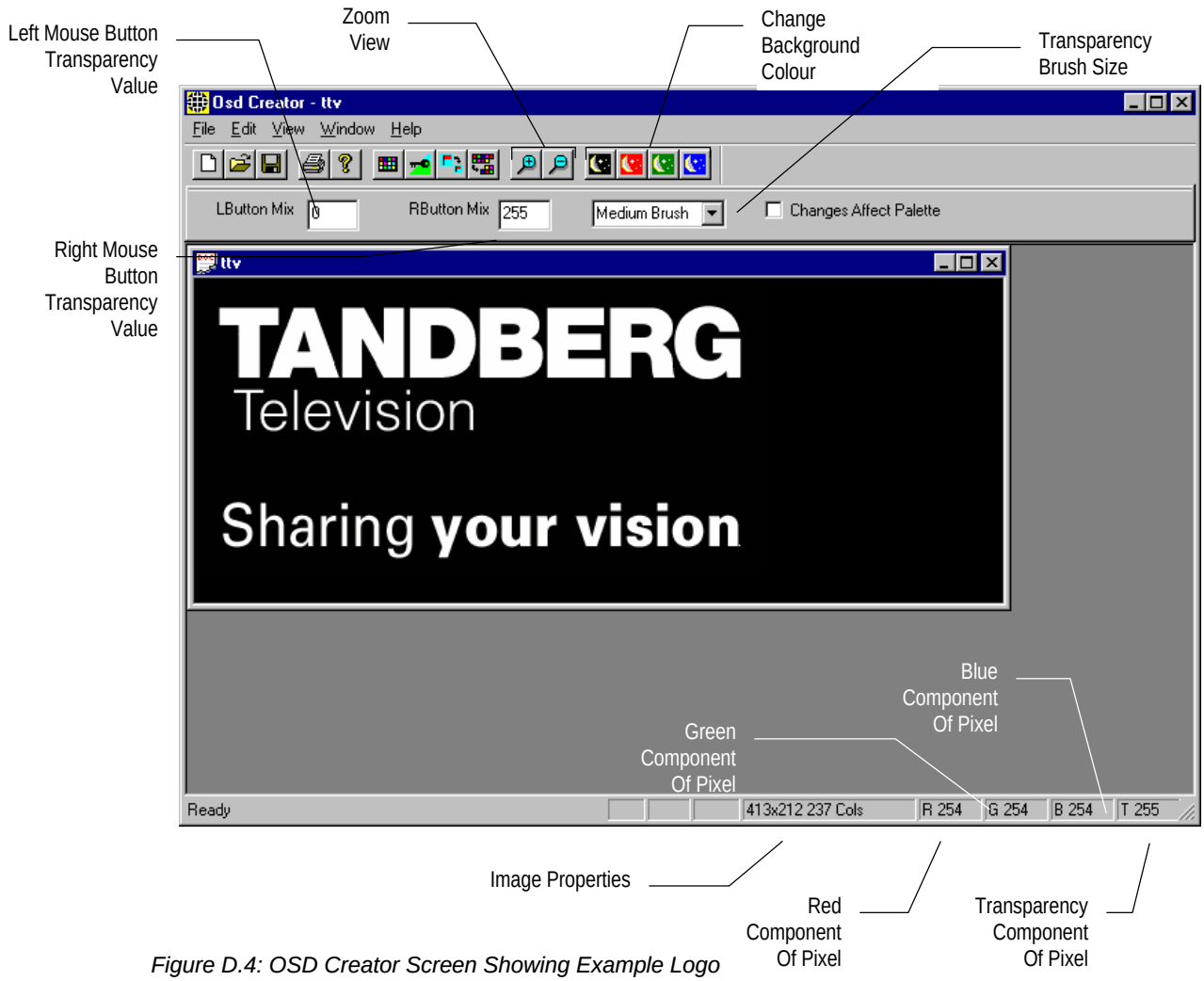

Figure D.4: OSD Creator Screen Showing Example Logo

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*.

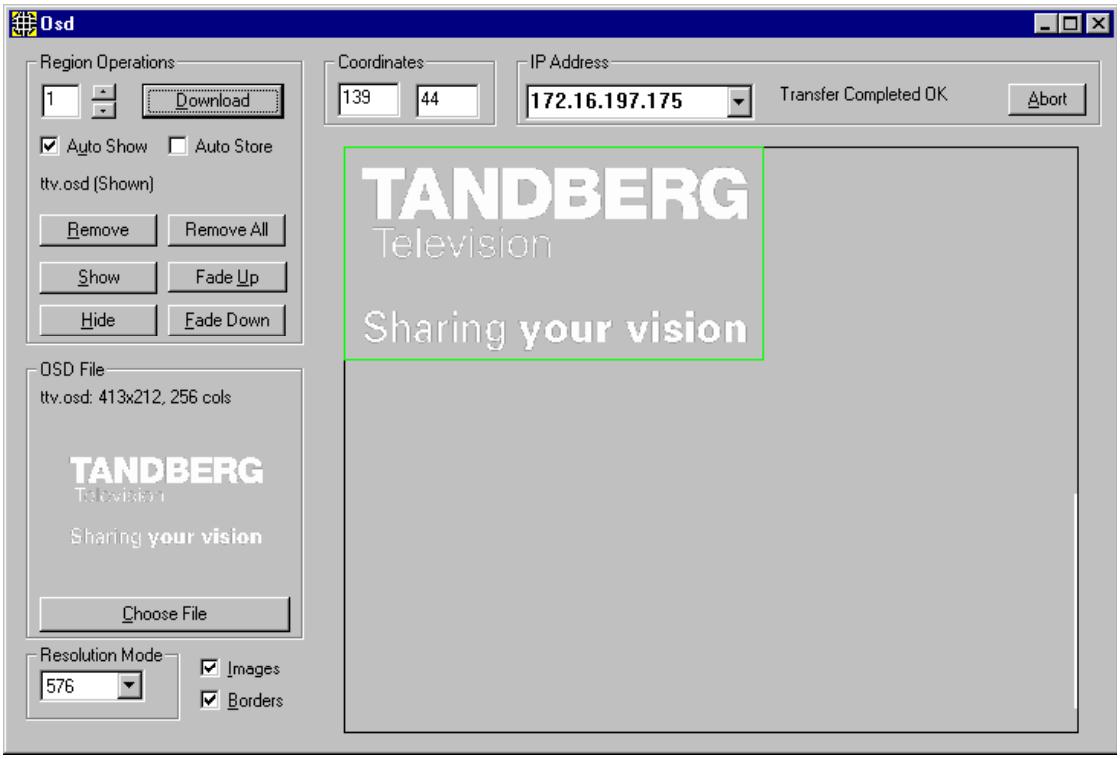

Figure D.5: OSD Loader Screen Showing Example Logo

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	Not Supported
576p	Not Supported
720p	Not Supported
1080i	Not Supported

D.7.2 Download an .osd File

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

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

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

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

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

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

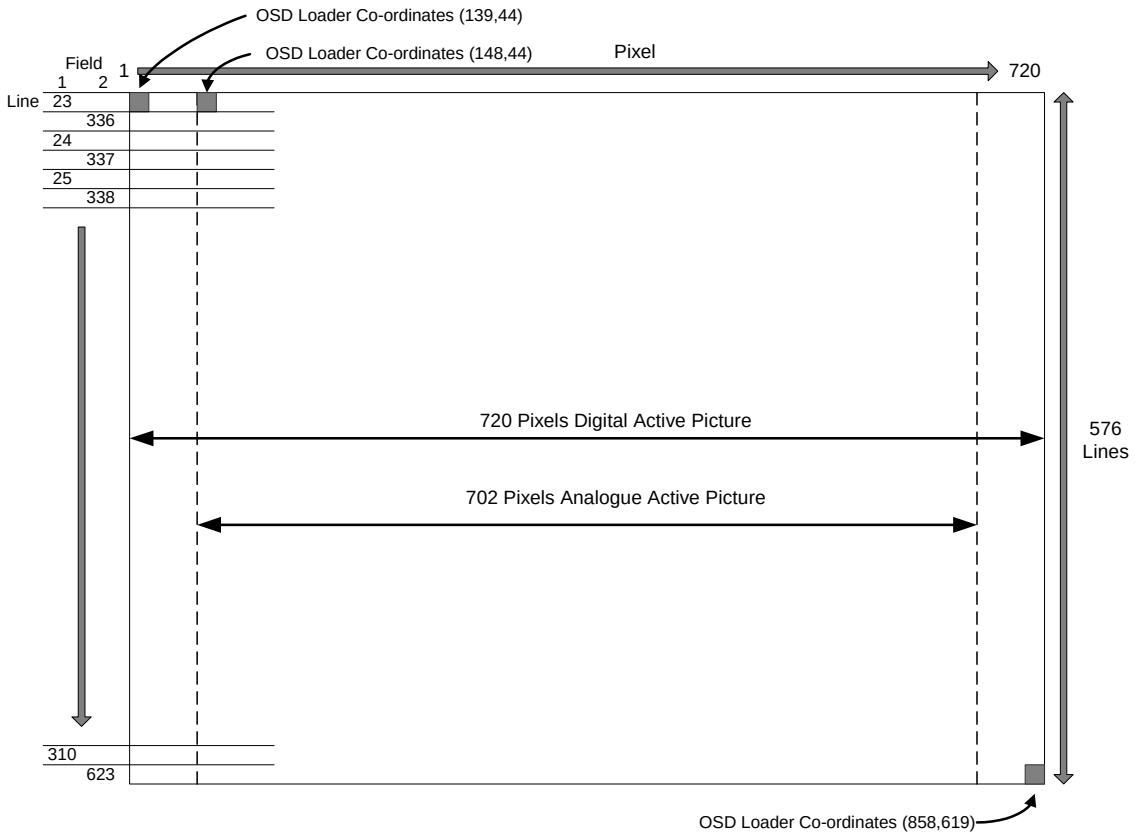

Figure D.6: 625 Line, OSD Co-ordinates in Active Picture

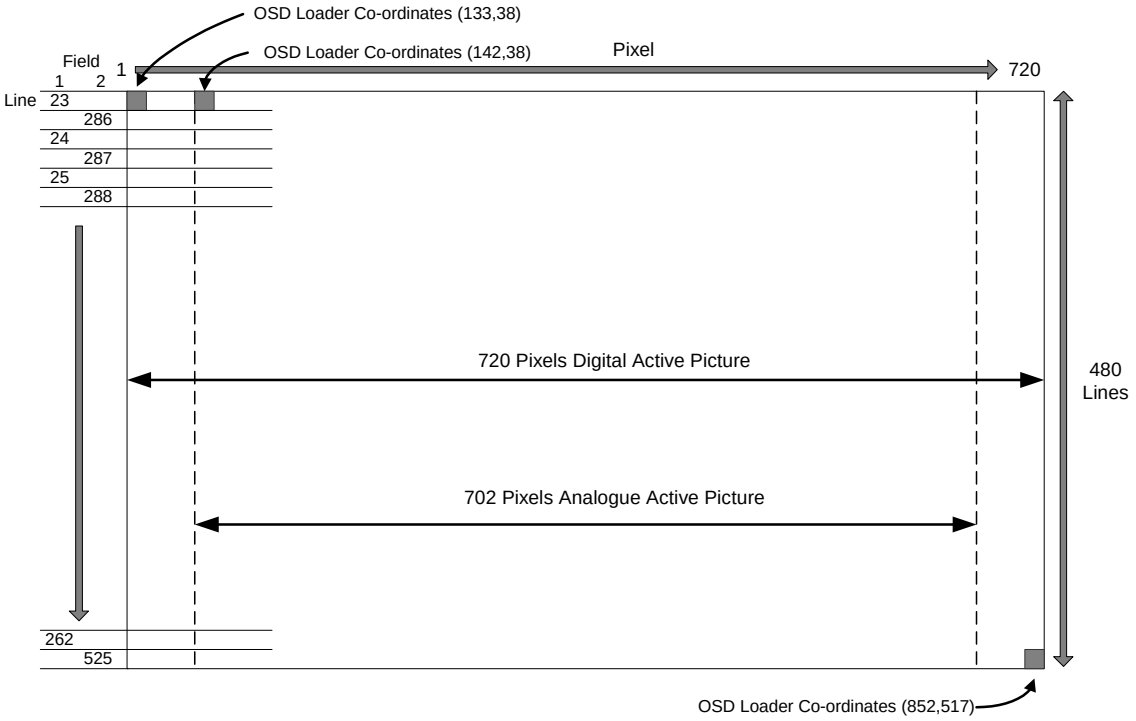

Figure D.7: 525 Line, OSD Co-ordinates in Active Picture

D.7.3 Show and Hide Regions

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

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

D.7.4 Multiple Regions

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

D.7.5 Region Interference

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

D.8 Fault-finding

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

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

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Annex E

Band Plans

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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	88.00	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_1	219.500
E	186.000	H_2	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	650.00	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[1]

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

[1] 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	17	497.000	33	593.000	49	689.000
J 2	99.000	18	503.000	34	599.000	50	695.000
J 3	105.000	19	509.000	35	605.000	51	701.000
J 4	173.000	20	515.000	36	611.000	52	707.000
J 5	179.000	21	521.000	37	617.000	53	713.000
J 6	185.000	22	527.000	38	623.000	54	719.000
J 7	191.000	23	533.000	39	629.000	55	725.000
J 8	195.000	24	539.000	40	635.000	56	731.000
J 9	201.000	25	545.000	41	641.000	57	737.000
J 10	207.000	26	551.000	42	647.000	58	743.000
J 11	213.000	27	557.000	43	653.000	59	749.000
J 12	219.000	28	563.000	44	659.000	60	755.000
13	473.000	29	569.000	45	665.000	61	761.000
14	479.000	30	575.000	46	671.000	62	767.000
15	485.000	31	581.000	47	677.000	63	773.000
16	491.000	32	587.000	48	683.000	-	-

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[2]

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	-	-

[2] CCIR is now know as International Telecommunications Union-Radiocommunications Study Groups.

Annex F

Audio Modes

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F.1 A Brief Introduction to Coding Standards

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

F.1.1 MPEG

The Moving Pictures Experts Group (MPEG) was formed in 1988 to generate compression techniques for audio and video. In the first version, ISO/IEC 11172-3 MPEG-1 audio, has a selection of two separate algorithms. MPEG-1 Layer I and II were implementations of the MUSICAM algorithm and MPEG-1 Layer III (mp3) was an implementation of the ASPEC algorithm. The algorithms have since been improved and extended with other versions of MPEG.

MPEG-1 Layer I/II

This algorithm is similar to MUSICAM and only really differs in the structure of the frame headers. Layer I is a restricted version of the full algorithm to allow a reduced decoder to be developed. Hence, over time as the processing power of decoders have increased by orders of magnitude, Layer I is no longer used for broadcast.

The algorithm creates 3 frames of 384 samples. Each small frame is divided into subbands and these subbands can be coded for each frame or for all 3. There is limited ability to allocate bits to different bands and there is no entropy coding of the encoded samples so a relatively high bitrate is required to obtain a reasonable quality.

This is selectable from the Audio A and B menu.

MPEG-2 AAC-LC (Advanced Audio Coding)

Further audio research after the completion of MPEG-1 and MPEG-2 standard allowed the development of a significantly improved coding standard that was not compatible to the previous standards. The target was to achieve good audio quality at 320 kbit/s for a 5.1 channel system. It has a different frame size that more closes represents the frequency response of the error, more stereo encoding tools and advanced entropy coding of the encoded samples.

There are 3 profiles or versions available:

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

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

F.1.2 Dolby Digital

Dolby Digital is an algorithm from Dolby that forms part of both the ATSC and DVB standard for digital broadcasting. It is marketed under the name of Dolby Digital.

The encoder includes a psychoacoustic model to improve the quality. The signal is divided into 32 multiple subbands, which correspond to the critical bands of the human ear. The number of bits is fixed for each subband but there are additional bits that can be allocated to any subband where encoding quality has suffered. Dolby recommends stereo signals may be coded at
192 kbit/s, and 5.1 at 448 kbit/s, but other rates can be used if required.

The encoders have the ability to encode stereo and equivalent modes, and will also pass-through pre-compresses Dolby Digital (both stereo and multichannel). This can be selected in menus Audio A and B, which includes the choice of pre-encoded or uncompressed inputs.

Advanced Menus 4A-4D include the option for pass-thru mode with optional glitch suppression mode. When in this mode, the coding module monitors the encoded bitstream and if the framing structure is incorrect, a valid silence frame or the last good frame is inserted in its place. If this state occurs for more than a second, the encoder signals that the Dolby Digital bitstream is corrupted.

F.2 Audio Coding Modes

F.2.1 Mono

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

F.2.2 Stereo

This mode treats the incoming audio signal as a left and right channel that the viewer will listen to simultaneously. Practically, these stereo signals can be uncorrelated where they are coded separately or related where they combined into a sum and difference channel and each is coded separately. Another stereo coding tool called Intensity Stereo uses the fact that the human ear locates high frequency sounds by amplitude rather than phase. So this tool removes phase differences between the channels at high frequency.

F.2.3 Dual Mono

This was introduced to allow two mono channels to be carried in the same bandwidth as stereo signal. The main use for this mode is for multilingual transmission where decoder selects which language to decode on left or right.

F.2.4 Multichannel Sound/5.1

A stereo signal produces a very focused audio field so unless the viewer is sitting in the correct position, the audio reproduction suffers. More audio channels are required to generate a larger audio field in which the viewer can listen. The current standard for the multichannel configuration is 5.1 where:

- 1st audio pair: Left front and right front, coded as a stereo pair and can be used when there is only stereo speakers.
- 2nd audio pair: Centre channel for speech and low-frequency enhancement (LFE) channel to be feed to a bass speaker for good low frequency reproduction, these are coded as mono channels with restricted frequency on the LFE channel.
- AES 2: Left surround, Right Surround.

F.3 Audio Coding Modules

The EN5900 High Definition Encoder has two physically separate audio coding modules:

- Advanced audio encoding: this module is controlled through menus called Advanced Audio 4A – 4D. The functionality is currently restricted to up to 4 services of Dolby Digital or Dolby Digital pass-thru but more functions will be included in the future.
- Standard audio encoding: this module includes stereo MPEG-1 Layer II and Dolby Digital encoding functionality and is controlled using the menus called Audio A and B.

F.3.1 Digital Audio

There are two connections available. 'Audio In 2' connects to the Advanced Audio modules, while 'Audio In' is associated with the standard module. Audio in 2 can be used for surround inputs.

When a digital audio source is used, consideration must be given to the choice of clock source used by the Encoder. To ensure correct operation the Encoder and the audio may need to be *genlocked* to the studio source. *Table F.1* and *F.2* show the coding methods that may be used with the digital audio inputs.

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

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

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

Connection	Module	Coder	Bitrate
Audio In 2	Advanced	Dolby Digital and Dolby Digital Plus pass-thru	384 kbit/s for 5.1.
Audio In	Standard	Dolby Digital and Dolby Digital Plus pass-thru	128 kbit/s for stereo

F.3.2 Digital Audio on AUDIO IN 2

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

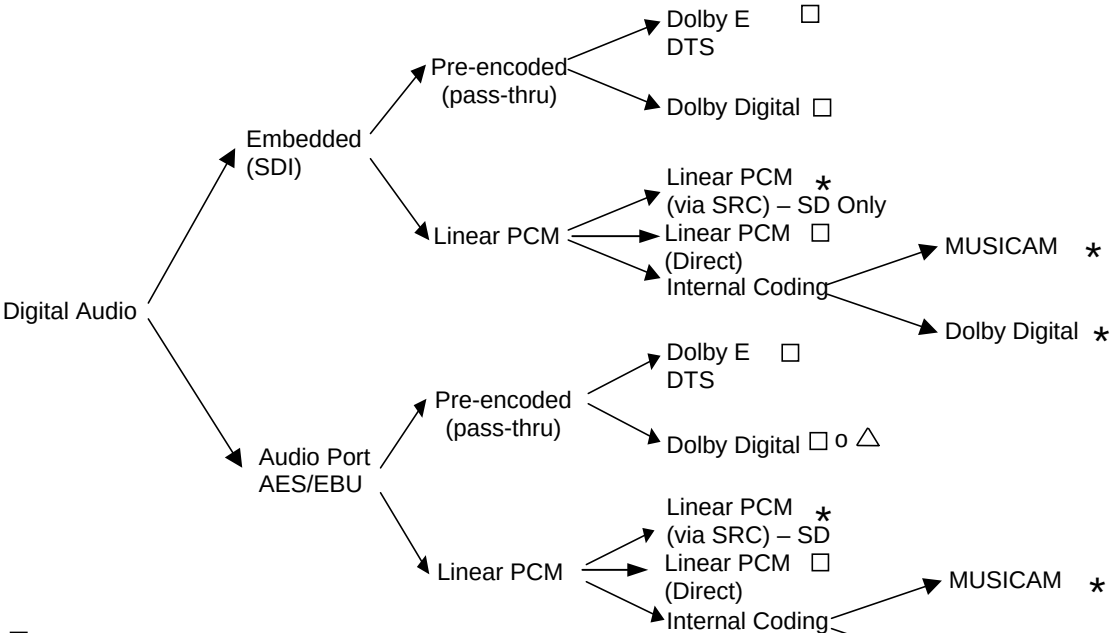
When the digital audio source is used with the **AUDIO IN 2** connector, consideration must be given to the choice of clock source used by the Encoder. To ensure correct operation, both the Encoder and the audio source may need to be genlocked to the studio source by selecting the video clock as external.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

F.3.3 Digital Audio on AUDIO IN

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

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

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.1* 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).



☐ **EITHER** (preferred method for stability)
The entire system must be genlocked to studio reference black and burst. That is, set Encoder clock source **AND** the upstream audio coding equipment to HSYNC.
OR
Set the E57xx Encoder clock set to “Video”. The upstream audio equipment **MUST** also be locked to video.

△ Lock Dolby Digital Encoder to AES/EBU reference from Encoder. Independent of Encoder clock source.

* Independent of Encoder clock source.

Figure F.1: Digital Audio Modes

F.4 Detail of Encoder Operation

F.4.1 HD SDI Embedded Audio

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

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

The standard DIDs that are used for the extraction are:

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

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

F.4.2 HD SDI Input Selection

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

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

Coding standard	Coding Modes
AAC	1 x 5.1, 1 x stereo or 4 x stereo
Dolby Digital pass-thru	4 x 5.1 or 4 x stereo or equivalent 4 x mono

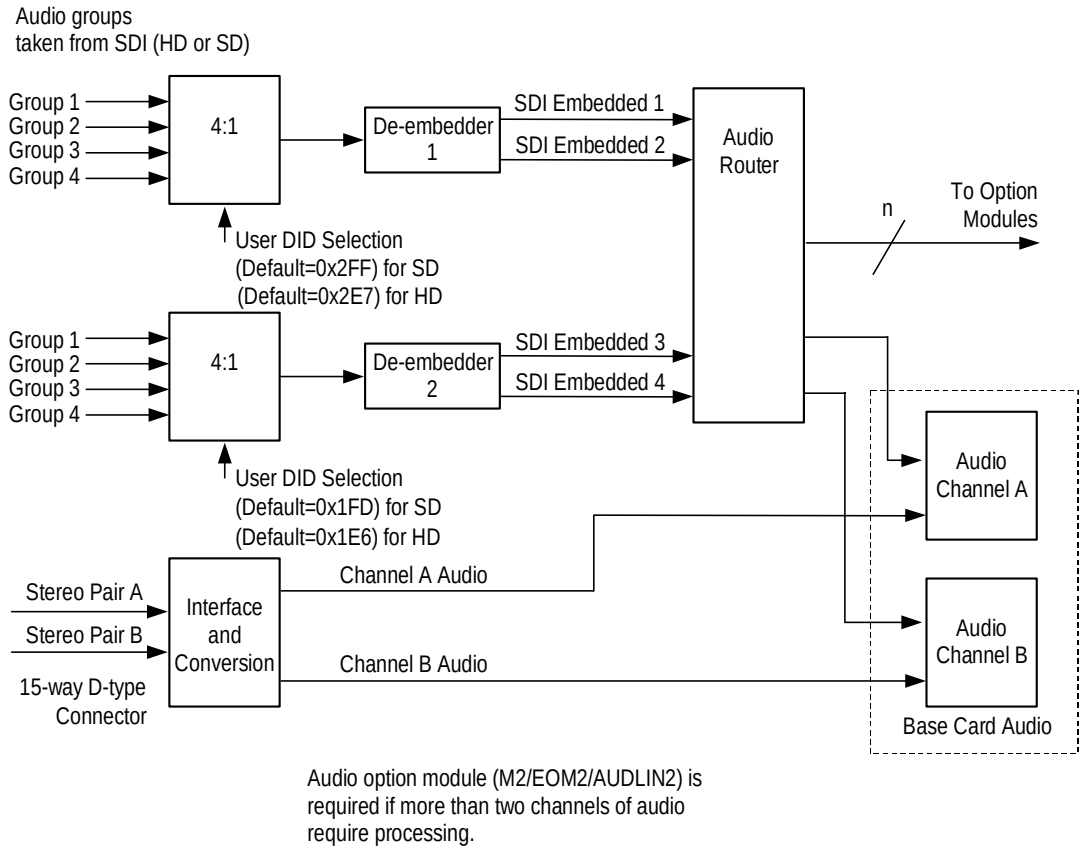


Figure F.2: Embedded Audio and Stereo Pairs

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

Table F.4: HD SDI Default DID's

Embedded Audio	Default DID
1-2	0x2E7 (Group 1)
3-4	0x1E6 (Group 2).
5-6	0x1E5 (Group 3)
6-8	0x2E4 (Group 4)

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

F.5 Analogue Audio

On the encoder there are two sets of analogue audio stereo analog-to-digital converters available that are fed directly into the standard encoding module. The converters have been fixed to operate at a sampling rate of 48 kHz but the encoding level can be set from the audio input menu. These converters are high quality and are calibrated in terms of incoming voltage to number as part of the production process.

Figure F.3 shows the coding methods that may be used with the analogue audio input.

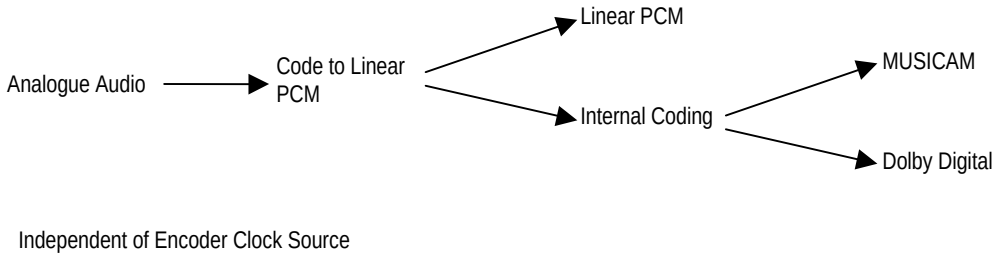


Figure F.3: Analogue Audio Modes

F.5.1 Input Impedance

The analog input can have an input impedance of either:

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

F.5.2 Clip Levels

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

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

12dBu = 3.08 Vrms = 4.36 Vpeak

18dBu = 6.16 Vrms = 8.71V peak

24dBu = 12.28 Vrms = 17.37 Vpeak

NOTES...

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

F.6 Summary

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

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

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

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Annex G

Accuracy of Frequency Sources

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

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

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

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

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

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

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

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Annex H

Use of Remux Card in ATSC

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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.

There is also a mode ‘Off (Ext. PSIP)’. In this configuration, the Encoder does not generate any SI tables. All tables must be fed in via an external PSIP generator.

CAUTION...

It is the operator's responsibility to ensure the Encoder is set to generate elementary streams according to the SI tables that are fed in.

PIDs 0,1 and 0x1FFB are automatically mapped through in this mode. Other PIDs can be passed by specifying the min and max PID range as above.

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.

Annex I

EDH Capability for E57xx Encoders

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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 • Software aware that EDH is not supported		EDH works, but unreliably • EDH support only partially implemented in software	EDH works, but unreliably • EDH support only partially implemented in software
Software versions 3.0.1 and above	EDH does not work, no errors reported • Software aware that EDH is not supported • Various EDH status flags available in the menus (all inactive) • UES (Unknown Error Status) flags active		EDH works partially, converts edh errors to eda, does not report all errors • Gennum chip modifies EDH data in incoming SDI stream • 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. • 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.	EDH works as per specifications

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Annex J

Setting of the Remux Card for Data/PSIP and DVB-Subtitles Input

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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-characte r 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. Identifiy 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 set up 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 *Section 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 PID map shown in *Table J.4*.

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.

Annex K

ProMPEG FEC Support for IP Streaming in E57xx Encoders

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K.1 Introduction

With the V3.8.1 software release of the E57xx encoder, IP streaming corresponding to the ProMPEG FEC protocol is possible.

This Annex provides information on setting up ProMPEG FEC only.

> NOTES...
>
> 1. The current IP streamer option card is NOT capable of being upgraded to support ProMPEG 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 ProMPEG FEC

K.2.1 Introduction

The ProMPEG 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 ProMPEG FEC scheme has been implement to the **ProMPEG 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.

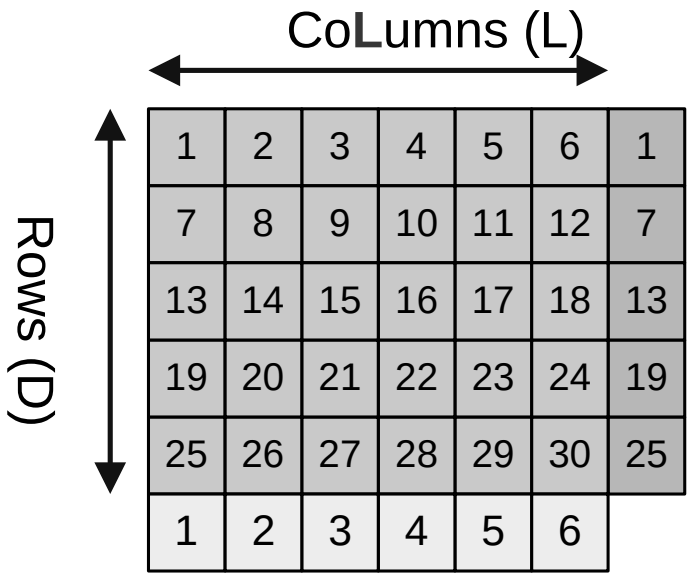

Figure K.1: Columns and Rows

K.2.2 Configuring ProMPEG FEC

Protocol/ProMPEG FEC Option

When ProMPEG 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 ProMPEG 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:

$$\text{Overhead} = \frac{L + (D * L)}{(D * L)} = \frac{1}{D} + 1$$

Worst case is 4 rows = (1/4) + 1 = 25%

Best case is 20 rows = (1/20) + 1 = 5%

Row and Column Overheads:

$$\text{Overhead} = \frac{D + L + (D * L)}{(D * L)}$$

Worst case is 4x4 = (4+4+16) / 16 = 50%

Best case is 10x10 = (10+10+100) / 100 = 5%

K.2.4 Recommendations for use of ProMPEG FEC

Overview

There are no official recommendations within the ProMPEG 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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