TANDBERG
Television

ST.US.E10074.4

USER GUIDE

evolution5000

E5710, E5720, E5770 and E5775 Encoder Software Version 3.9.0 (and later)

E5710/E5770 Encoder

E5720/E5775 Encoder

ENGLISH (UK)

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1 Who Should Use This User Guide?

This User Guide is written for operators/users of the E5710 (1U), E5770 (1U), E5720 (2U) and E5775 (2U) Encoders to assist in installation and operation. Detailed information can be found in the *Reference Guide* companion document which is issued on CD.

CAUTION

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

1.1 What Equipment is Covered by This User Guide?

Table 1.1: Equipment Model Descriptions

Model Number	Marketing Code	Description
E5710	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	M2/ENC/E5710/48V	An M2/ENC/E5710 Encoder with –48 Vdc input.
E5720	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	M2/ENC/E5720/48V	An M2/ENC/E5720 Encoder with –48 Vdc input.
E5770	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	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] 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.

1.2 Hardware and Software Options

See *Table 1.2* and *Table 1.3* for a list of hardware and software options available with the Encoder. Detailed information is in the *Reference Guide*.

Table 1.2: Hardware Options

Marketing Code	Description
	Daughter Card Options
M2/EDCOM2/BISS	BISS[3] scrambling option - Mode 0, 1 and BISS-E
	Hardware Options
M2/EOM2/AUDLIN2	Additional Audio + Linear PCM
M2/EOM2/REMUX	Remux Option Module
M2/EOM2/ASI-OPT	ASI Optical Outputs
M2/EOM2/SSI-US	SMPTE 310 (SSI) Outputs
M2/EOM2/ATMS155MM	STM-1 OC3 Multimode Physical Interface Module (SDH STM-1/SONET STS-3c Multimode Optical)
M2/EOM2/ATMS34	PDH/E3 Module
M2/EOM2/ATMS45	PDH/DS3 Module
M2/EOM2/IP	IP Output Card
M2/EOM2/IP/PROFEC	IP Card Pro-MPEG FEC
M2/EOM2/G703	G.703 Output Card
M2/EOM2/MPM	Multi-pass Encoder Card
M2/EOM2/GPI	General Purpose Interface (GPI) Option Card

[3] BISS is implemented according to Tech 3290 March 2000 and BISS-E is implemented according to Tech 3292 April 2001.

Table 1.3: Software Options

Marketing Code	Description
M2/ESO2/NR	Noise Reduction - three levels of professional-grade adaptive noise reduction.
M2/ESO2/PU	Performance Upgrade/Bit-rate <1.5 Mbit/s - enables advanced TANDBERG Television coding algorithms that increase the efficiency by at least 0.75 Mbit/s per channel. It also reduces the lower bit-rate limit to 256 kbit/s.
M2/ESO2/VBR	Reflex and VBR - automatic variable bit-rate at a fixed quality setting for optimum bandwidth usage in stand-alone or Reflex statistical multiplexing modes.
M2/ESO2/422	MPEG-2 422P@ML - for professional editing quality pictures, 1.5 Mbit/s to 50 Mbit/s.
M2/ESO2/RAS	RAS (Remote Authorisation System) - allows material to be protected from illegal viewing using TANDBERG Television's proprietary scrambling system.
M2/ESO2/ACON	Auto Concatenation - aligns the Encoder to the previous Encoder's GOP structure to significantly reduce coding artefacts caused by successive coding and decoding.
M2/ESO2/AC3	Dolby Digital (AC-3) - enables Dolby AC-3 stereo encoding.
M2/ESO2/MHP	MHP Timing Events
M2/ESO2/DTS	DTS Audio
M2/ESO2/525VBIDATA	NABTS and GEMSTAR 2.0 VBI extraction
M2/ESO2/DPI	Splice Points Licence key
M2/ESO2/EthernetData	188-byte transport packets as UDP datagrams on the Ethernet port.

2 Installing the Equipment

2.1 Introduction

CD For best performance and reliability follow the instructions for site requirements and installation in the *Reference Guide* and only use installation accessories recommended by the manufacturers.

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.

2.2 Operating Voltage

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.

NOTE

Refer to the *Reference Guide* for details of the colour codes used on the mains leads.

CD See *Table 2.2* for fuse information and also the *Reference Guide* for a full power supply specification.

AC Models

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

-48 Vdc Models

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

2.3 Power Cable and Earthing

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

WARNINGS

1. The Technical Earth is not a Protective earth for electric shock protection.
2. 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.
3. Before connecting the unit to the supply, check the supply requirements in Annex B of the Reference Guide.

2.4 Power Supply Stand-by Switch

This switch puts the Encoder into stand-by mode. It powers down the supply rails of the display and internal circuits within the unit. The switch type avoids accidental powering-down of the Encoder. For normal use, using a screwdriver, ensure that the **I** is always at the top (see *Figure 2.1*).

NOTES

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

WARNING

This is NOT a mains switch and will not isolate the Encoder from the power supply. Disconnect the power cord to isolate the unit.

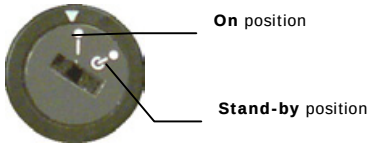

Figure 2.1: Stand-by Switch

2.5 Connecting Up the Basic Encoder

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Always use the specified cables supplied for signal integrity and compliance with EMC requirements (see *the Reference Guide*).

Only those connectors used are labelled in *Figure 2.3* and described in *Table 2.1*.

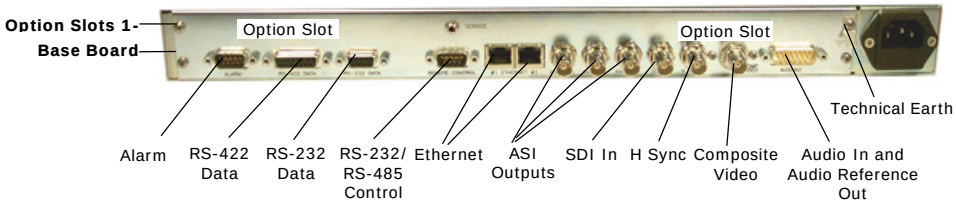


Figure 2.2: E5710/E5770 (1U) Rear Panel Component Parts and Connectors

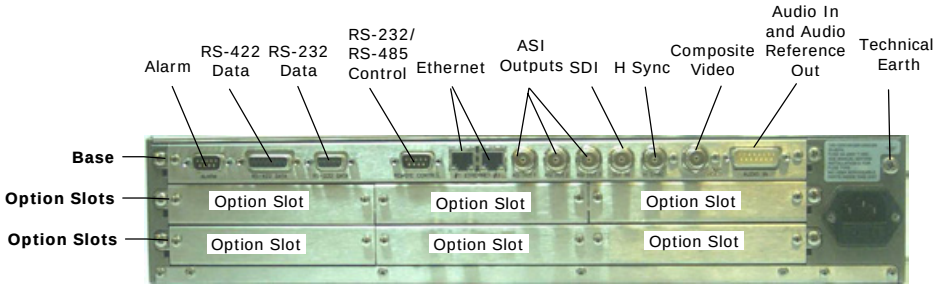


Figure 2.3: E5720/E5775 (2U) Rear Panel Component Parts and Connectors

Table 2.1: Types of Connector

Type of Connector	Description
SDI IN	A 75 Ω BNC connector provides a serial digital video input to the unit. This input is terminated in 75 Ω.
COMP VIDEO	A 75 Ω BNC connector provides a high quality analogue video input to the unit.
H SYNC	**Optional** - 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.

Type of Connector	Description
Audio In	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 which 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. This is for when the unit is connected to an external Dolby Digital Encoder. There are four XLR female connectors, with the fifth cable being a BNC which provides an AES/EBU 75 Ω digital reference output.
ASI OUT 1, 2 and 3	A 75 Ω BNC connector provides the output from the Encoder. 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).
Ethernet #1 and #2	An 8-way, RJ-45 connector provides a 10BaseT Ethernet interface for communications with the TDC/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.
Remote Control	A 9-way, D-type male connector provides an RS-232/RS-485 port for remote control of the Encoder. This connector is wired as a DTE.
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.
RS-232	RS-232 data is available on the Base Board. A 9-way, D-type female connector provides an RS-232 asynchronous, serial communications data input interface.
RS-422	A 15-way, D-type female connector provides an RS-422 synchronous, serial communications data input interface.
Technical Earth	Connect the Encoder's Technical earth to a suitable point.

NOTE

Refer to the *Reference Guide* for all power supply, fuse, safety, EMC information and operating conditions.

2.6 Connecting the Encoder to the 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 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.

Connect the Encoder to the power supply as follows:

- **Power Supply**

  Ensure the power supply is isolated and switched off.

- **Encoder**

  Ensure the correct fuse type and rating has been fitted to both the equipment and the power cable.

- **Supply Cord**

  Connect the lead to the Encoder input connector and then to the power supply. Switch on the power supply.

Table 2.2: Fuse Type and Rating

Power Supply	Fuse Type and Rating
100-120 Vac / 220-240 Vac	IEC/EN 60127-2 Sheet 5 Bussmann S505/Littelfuse 215 5 A 250 V T HBC
-48 Vdc	IEC/EN 60127-2 Sheet 5 Bussmann S505/Littelfuse 215 6.3 A 250 V T HBC

NOTE

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

3 Operating the Equipment From the Front Panel

3.1 Introduction

The front panel display and keypad may be used to configure, control and monitor the Encoder when an external control system is not used.

3.2 Establishing Local Control (E5710/E5770)

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

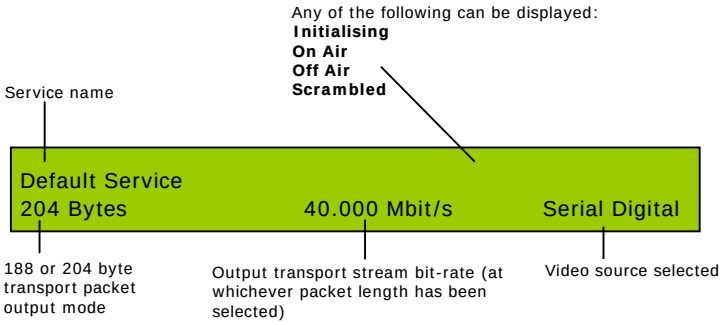


Figure 3.1: E5710/E5770 Summary Screen

3.3 Navigating the Menus (E5710/E5770)

3.3.1 E5710/E5770 Navigation Keys and Buttons

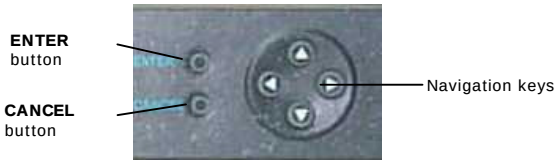


Figure 3.2: E5710/E5770 Navigation Keys and Buttons

NOTE

The navigation keys are referred to as LEFT, RIGHT, UP and DOWN, indicating the direction of the arrows.

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

To navigate the menus:

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

To return to the summary screen from anywhere in the menus press the LEFT arrow key as many times as necessary.

3.3.2 Changing a Setting (E5710/E5770)

Once an item has been selected for editing the setting can be changed. Use the UP and DOWN arrow keys to toggle through the different values.

To insert a character press and hold the **ENTER** key.

To delete a character press and hold the **CANCEL** key.

Press **ENTER** to accept a new setting.

Press **CANCEL** to leave the setting unchanged.

NOTE

To allow key parameters to be changed quickly the A/V Menu behaves slightly differently. Press ENTER to toggle through the different values of a parameter. The last value selected is the one that is accepted for use.

3.4 Establishing Local Control (E5720/E5775)

3.4.1 Input Monitor / Keyboard Lock (E5720/E5775)

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.

Figure 3.3: E5720/E5775 Input Monitor

The softkeys can be locked out to prevent inadvertent operation (see the key icon in *Figure 3.3*). 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.

3.4.2 Summary Screen

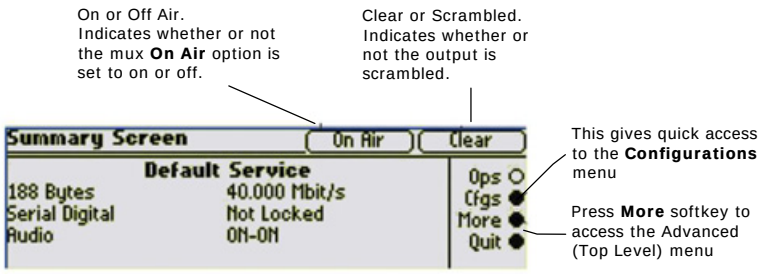


Figure 3.4: E5720/E5775 Summary Screen

3.5 Navigating the Menus (E5720/E5775)

3.5.1 Moving Through the Menu Screens

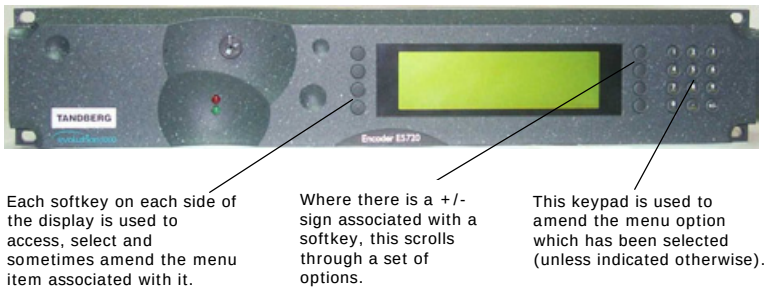


Figure 3.5: E5720/E5775 Keypad and Display Functions

3.5.2 How to Use the Keypad

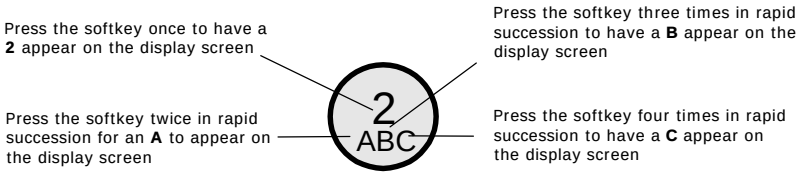


Figure 3.6: Accessing Inscriptions on the Keypad

3.5.3 How to Use the Functions Associated with Softkeys

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

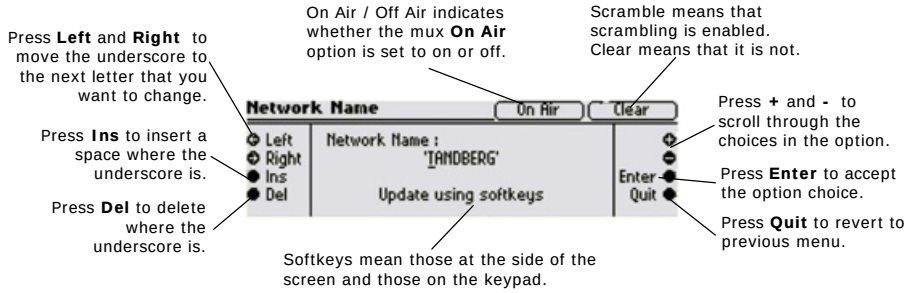
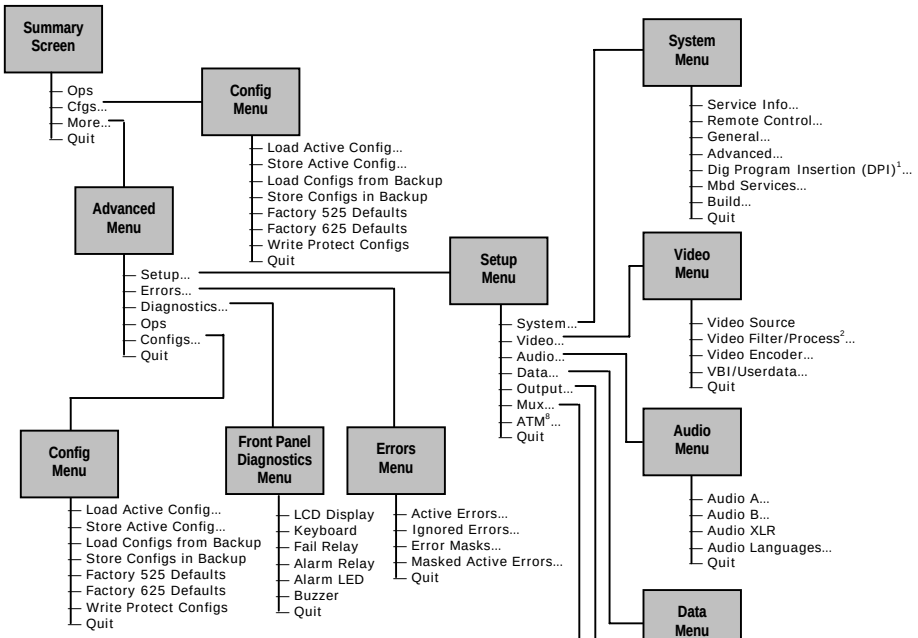


Figure 3.7: Functions Associated With Softkeys

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 Typical Operation and Setting of Parameters



1. Dig Program Insertion (DPI) menu is only available when M2/ESO2/DPI licence key is purchased.
2. Some options in this menu structure are only available if the Encoder is an E5770 or E5775, or when the M2/EOM2/MPM option card is purchased.
3. Data C – Ethernet Data menu is only available when M2/ESO2/EthernetData licence key is purchased.
4. The output menu shows an IP Streamer option as an example of a typical menu.
5. G.703 Card menu is only available when M2/EOM2/G703 option card is purchased.
6. Remux Module menu is only available when M2/EOM2/REMUX option card is purchased.
7. 'Service' changes to be the same as the Service Name. There could be more menus, depending upon the number of inputs to the Remux card (if fitted).
8. ATM menu is only available when any M2/EOM2/ATMSxxxx card is purchased.

Figure 4.1: Menu Structure

Refer the following steps for a typical set-up. See *Figure 4.1* for the menu tree structure and *Section 4.1* onwards on how to navigate the menus. For more detailed information or parameters not mentioned refer to the *Reference Guide*.

- Select the syntax.
- **Optional** - load a default configuration and amend if necessary or restore the factory defaults. Refer to *Section 5* for examples of typical configurations.
- Set the remote control options.
- Set the mux options.
- Set the video options.
- Set the audio options.
- Set the data options.
- Set the output options.

4.1 Select Syntax

Navigate to the `Service Info Menu` and select the **Syntax** option. Choose DVB or ATSC, as required. The service information for the service can then be set in the `Service Info Menu`.

4.2 Load Default Configuration / Restore Factory Defaults

From the Summary screen navigate to the `Configs Menu`. Select **Load Active Config** and choose one of the configurations. Amend the parameters as necessary.

4.3 Set the Remote Control Options

If the Encoder is to be controlled via its Ethernet interface the unit's IP address and associated parameters must be set in the `Remote Control Menu`.

Alternatively, if the Encoder is to be controlled via RS-232/RS-485, the serial protocol, baud-rate and unit address must be set in the `Remote Control Menu`.

Navigate to the Remote Control Menu. Select the following options:

- **IP Address Option** – enter or change the IP address of the unit.
- **Serial Protocol Option** – select RS-485 or RS-232.
- Change other options as required.

4.4 Set the Mux Options

Navigate to the Mux Menu. Select the following options:

- **Packet Length Option** – select either 188 (typical) or 204 bytes.
- **On Air** – set to On to send the output of the Encoder to the Multiplexer.
- **Bit-rate (188) / Bit-rate (204) Options** – select the required bit-rate.

NOTE

If the Packet Length option is set to 188 bytes then only the Bit-rate (188) option is displayed. If the Packet Length option is set to 204 bytes then both the Bit-rate (188) and Bit-rate (204) options are displayed.

4.5 Set the Video Options

Navigate to the Video Menu and select the Video Source Menu to configure the video input to the Encoder. Select the following options:

- **Video Input** – select the video input required. If the selected input is SDI, the frame rate must also be set, although this can be detected automatically (see the *Reference Guide* for details).

Exit the Video Source Menu and then select the Video Encoder Menu to configure the following options.

- **Profile\Level Option** – select MP@ML or 422P@ML.

NOTE

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

- **Compression Mode** – select the required compression mode. Standard is the default mode. The various seamless modes allow the bit-rate to be changed, over a defined range, without a break in transmission. The low delay modes use various techniques to reduce the encoding delay, but picture quality may reduce (see the *Reference Guide* for more details).

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> **NOTE**
>
> Changing compression mode can change the GOP structure and length.

- **Bit-rate** – select the required video bit-rate. This defaults to the maximum possible bit-rate given the current mux bit-rate set, and the bit-rates set for the other elements such as audio and data.

> **NOTE**
>
> High bit-rates in low resolutions cannot always generate sufficient bits to match the requested bit-rate. However, a valid picture will still be produced.

- **Intra DC Precision (V3.7 on) –** select the required value: Auto, 8 bits, 9 bits, 10 bits. 11 bits is also available in 422P@ML. **Auto** selects the optimum number of bits depending on the profile, coding mode and video bit-rate.

4.6 Set the VBI Options

Navigate to the `Video Menu` and select the `VBI Menu`. The options available depend on whether the video source is 625 lines, 25 Hz or 525 lines, 29.97 Hz.

> **NOTES**
>
> 1. Requires up to 3 Mbit/s of video bit-rate to carry this additional information.
> 2. 3:2 pulldown cannot be used when using this option.

VBI Options (625 lines, 25 Hz) - the Encoder can extract a maximum of eight VBI lines per field. However this limit does not apply to Teletext. The possible VBI lines are 6 – 23 and 318 – 335.

The possible VBI types are; Vertical Interval Time Code (VITC), Video Index, Teletext System B, Inverted Teletext, Wide Screen Signalling, and Video Programming System (VPS).

- **Teletext** - to enable the processing of Teletext select the following options:
  - **Teletext All Lines** – set to **On** to enable Teletext System B extraction from all VBI lines.
  - **Teletext PID** – assign the PID to be used to carry the extracted Teletext data.
  - **VBI Line** – select individual VBI lines to either turn Teletext extraction off for that line, or to change the VBI type.
- **Other VBI types** - to enable the processing of VBI other than Teletext select the following options:
  - **VBI on PID** – set to **On** to enable the extracted VBI data to be carried on a separate PID.
  - **VBI PID** - assign the PID to be used to carry the VBI data.
  - **VPS (Line 16)** – set to **On** if VPS is to be extracted from line 16.
  - **WSS (line 23)** – set to the appropriate WSS type, if WSS is to be extracted from line 23. The WSS types are ETSI 300 294, or WSS-AFD.
  - **Auto Detect VITC** – set to **On** if the Encoder is required to automatically detect the presence of VITC and extract it.
  - **VBI Lines** – if necessary, select individual VBI lines to set the VBI type that the Encoder should extract from that line.

VBI Options (525 lines, 29.97 Hz) - the Encoder can extract a maximum of eight VBI lines per field. The possible VBI types are; Vertical Interval Time Code (VITC), Video Index, Closed Caption, Neilson AMOL 1, and Neilson AMOL 11.

To enable the processing of VBI select the following options:

- **VBI on PID** – set to **On** to enable the extracted VBI data to be carried on a separate PID.
- **VBI PID** - assign the PID to be used to carry the VBI data.
- **Auto Detect VITC** – set to **On** if the Encoder is required to automatically detect the presence of VITC and extract it.
- **VBI Lines** – select individual VBI lines to set the VBI type that the Encoder should extract from that line.

- **Closed Captions** – set to the required source of closed caption data. The options are; video line 21, video line 21 and line 284, SMPTE 333M, SCTE20, SCTE21 or SCTE20 & 21.
- **CC Format** – select the required closed caption format, the default is ATSC, and this is the required setting for EIA-708B compliant closed captions.
- **SMPTE 333M Port** – if the closed caption source has been set to SMPTE 333M, then the Encoder's RS-232 port through which the data is to be input must be selected.

For more details regarding setting up the Encoder's closed caption options see the *Reference Guide*.

4.7 Set the Audio Options

The standard Encoder can process two stereo pairs, but up to eight can be processed with the addition of audio option cards. All the audio inputs are configured in a similar manner. Navigate to the Audio Menu. select the options as required. For example:

- **Source Option** - select the audio source. This can be an analogue or a digital input, or can be de-embedded from the SDI input. If the audio source is embedded in the SDI then the audio DID must be set. Entering 1024 for the DID causes the default DID for the selected group to be used.
- **Coding Standard Option** - Select the coding standard, e.g. MPEG Layer 2, Dolby Digital (AC-3), Linear PCM (Direct) [SMPTE 302M], Linear PCM (Via SRC) [sample rate converter] etc.
- **Audio Alignment Option** – [for Linear PCM and Dolby E only] setting this option guarantees compatibility with SMPTE 302M and should normally be used.
- **Bit-rate Option** - select the required audio bit-rate.
- **Coding Mode** – select the required coding mode, e.g. Mono Left, Mono Right, Dual Mono, Stereo
- **Extraction of Audio Coding Mode from VPS** – when set to ON the VPS word sets the Coding Mode.
- **Use Minimum Delay** - This sets the lowest possible audio delay. If this option is set to ON, the Auto Lip Sync and Audio Delay options are unavailable.

4.8 Set the Data Options

Navigate to the `Data Menu`. If serial data (RS-232, RS-422 or Ethernet data) is to be encoded then configure the input source and bit-rates.

NOTE

It shall only be possible for the encoder to accept either RS-232 data or Ethernet data.

4.9 Set the Output Options

The `Output Menu` allows the output of the Encoder to be selected. This is set to ASI unless an option card providing an alternative output is fitted. If the output is set to ASI, a `Delivery Descriptor Menu` is available, which allows all the parameters in the delivery descriptor to be set.

4.10 Configuring Option Cards

CD For information regarding configuring any option cards that may be fitted to the Encoder. Please refer to the *Reference Guide*.

4.11 Configuring the Encoder for Minimum Video Delay

There is a trade-off between encoding delay and picture quality for a given bit-rate. The parameters that can be adjusted to reduce the encoding delay are as follows:

- **Clock Source** - the Clock option is found in the Mux Menu. Setting the clock source to either HSYNC or Video, means that the frame resynchroniser in the video input of the Encoder is not used, which removes between 0 and 40 ms of delay.
- **Compression Mode** - the **Compression Mode** option is found in the `Video Encoder Menu`. There are three compression modes that reduce coding delay: **Low Delay**, **Very Low Delay** and **Mega Low Delay**.

  Low Delay mode reduces the size of the video rate buffer, which results in a smaller encoding delay. This can compromise video quality in some circumstances.

Very Low Delay mode also reduces the size of the video rate buffer, but it also forces the GOP structure to IP, which removes the frame reordering delay, and uses field pictures.

Mega Low Delay mode is not fully DVB compliant. It has a smaller video rate buffer than Very Low Delay mode, it also uses a GOP structure of IP but it automatically decides whether to code a picture as fields or a frame.

- **Video Bit-rate** - the video bit-rate can be set in the Video Encoder Menu. The simple rule is that the higher the bit-rate, the lower the encoding delay.

4.12 Configuring the Encoder for Minimum Bit-rate

The following parameters can be configured to minimise the video bit-rate required for a given picture quality:

- **Compression Mode** - the **Compression Mode** option is found in the Video Encoder Menu. For minimum bit-rate this should be set to standard.
- **Video Bandwidth** - the **Video Bandwidth** option is found in the Video Source Menu. To minimise the video bit-rate this should be set to medium, or better still soft. However, this does effect the sharpness of the pictures.
- **Noise Reduction** - if the noise reduction option has been purchased, then there will be a **Noise Reduction** option in the Video Source Menu. The higher the level of noise reduction set, the lower the video bit-rate, but the sharpness of the pictures will be reduced.
- **Video Resolution** - the **Resolution** option is found in the Video Encoder Menu. Selecting a lower resolution will reduce the video bit-rate, but will reduce the amount of detail in the picture.
- **GOP Structure** - the **GOP Structure** option is found in the Video Encoder Menu. In general if the video bit-rate is > 1.5 Mbit/s then it is recommended to use IBBP. However, if the bit-rate is < 1.5 Mbit/s it may be better to use IP.
- **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.

- **Long GOP** - if the performance upgrade option has been purchased, in the Video Encoder Menu there will be a **Long GOP** which, if set to On, allows GOPs of greater than 0.5 seconds duration to be selected. Setting a longer GOP may allow the video bit-rate to be reduced, but at the cost of a longer time to acquire the service. Also, if a very long GOP is used, the build-up of noise up to the next I frame may become noticeable.

4.13 Multi-pass Encoding (E5770 and E5775)

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. Additional options are available under the Video menu.

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.

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.

5 Typical Configurations

5.1 Stand-alone ATSC Encoder

To put the Encoder into a typical configuration for a stand-alone ATSC Encoder perform the following:

- Navigate to the `Config Menu`.
- Factory 525 Defaults - this changes all the available configurations to the factory default ones for 525 line video.
- Load Active Config – select the 'Standard (ATSC)' configuration which has the video bit-rate that is required.

  A summary of the standard ATSC configuration is:

  - Syntax = ATSC
  - Mux bit-rate = 19.392658 Mbit/s
  - Video Source = NTSC with pedestal
  - Video Encoding Profile = MP@ML (4:2:0)
  - Compression Mode = Standard
  - Audio Channel A = Analogue Source, Dolby (AC-3) encoding at 384 kbit/s
  - Audio Channel B = Off
  - Closed Captions = EIA-708B sourced from line 21 of the video.
- Navigate to the `Service Info Menu` and configure the SI parameters such as channel name, and network name as required.

It may also be necessary to modify some of the other default settings to suit the particular installation, see the *Reference Guide* for details.

5.2 Contribution Feed (Low Delay)

To put the Encoder into a typical configuration for a contribution link that requires low delay, such as required for performing two-way interviews, carry out the following:

- Navigate to the `Config Menu`.
- Select either **Factory 525 Defaults** or **Factory 625 Defaults** – depending on the line standard of the video feed. This changes all the available configurations to the factory default ones for the selected line standard.
- **Load Active Config** – select the 'Very Low Delay' configuration which has the video bit-rate that is required. In 525 line, we recommend selecting a DVB configuration for a contribution feed.

  A summary of the very low delay configurations is:

  - Mux bit-rate = 40 Mbit/s
  - Video Source = SDI (25 Hz or 29.97 Hz depending on line standard)
  - Video Encoding Profile = MP@ML (4:2:0)
  - Compression Mode = Very Low Delay
  - Audio Channel A = Analogue Source, MPEG Layer 2 encoding at 384 kbit/s
  - Audio Channel B = Analogue Source, MPEG Layer 2 encoding at 384 kbit/s

To achieve minimum delay it is desirable to set the mux bit-rate to the maximum possible for the link, and set the video bit-rate to the maximum. Also, the delay could be reduced further by changing the compression mode to 'Mega Low Delay'.

It may also be necessary to modify some of the other default settings to suit the particular installation, see the *Reference Guide* for details.

5.3 Contribution Feed (4:2:2)

Software option module M2/ESO2/422 is required for this installation. To put the Encoder into a typical configuration for a contribution link that requires 4:2:2 video carry out the following:

- Navigate to the Config Menu.
- Select either **Factory 525 Defaults** or **Factory 625 Defaults** – depending on the line standard of the video feed. This changes all the available configurations to the factory default ones for the selected line standard.
- **Load Active Config** – Select the '4:2:2' configuration which has the video bit-rate that is required. In 525 line we would still recommend selecting a DVB configuration for a contribution feed.

  A summary of the very low delay configurations is:

  - Mux bit-rate = 40 Mbit/s
  - Video Source = SDI (25 Hz or 29.97 Hz depending on line standard)
  - Video Encoding Profile = 422P@ML (4:2:2)
  - Compression Mode = Standard
  - Video Bit-rate = 25 Mbit/s
  - Audio Channel A = Analogue Source, MPEG Layer 2 encoding at 384 kbit/s
  - Audio Channel B = Analogue Source, MPEG Layer 2 encoding at 384 kbit/s

It will probably be desirable to modify the video bit-rate to that required, and the mux bit-rate to the minimum required to carry the video and audio channels defined.

It may also be necessary to modify some of the other default settings to suit the particular installation (see the *Reference Guide* for details).

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