V6757 Squeezer
V6759 Expander

SDI Audio Mux and Demux with Fibre Optic Interface

INSTALLATION and OPERATION

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CONTENTS

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1. DESCRIPTION

1.1 GENERAL

The V6757 and V6759 are a pair of modules in the Vistek V1600 product range for transporting analogue video with embedded audio over an SDI link. The SDI link may be conventional coax cable or single mode fibre. While the analogue video is normally composite PAL, SECAM or NTSC (of any type), there is a mode for carrying any suitable analogue signal, even without conventional sync pulses. This means that even irregular signals, such as video with Sound-in-Syncs can also be carried. The V6757 has an input cable equaliser which can compensate for the effects of up to 300m of co-axial cable.

The SDI output from the V6757 is a completely standard digital signal which can be handled by any transparent SDI processing equipment, such as distribution amplifiers, routers, frame syncs etc. The only restriction is that the processing equipment should not change the active parts of the signal; this includes the vertical blanking part of the signal. Provided the analogue video is the same standard as the SDI video then the picture is easily recognisable on a picture monitor or waveform monitor, even though it has not been decoded. In practice in the V6757 the whole of the analogue signal, including syncs and burst, is sampled, squeezed up and inserted into the active portion of the SDI signal. In the V6759 the operation is reversed and the squeezed data is expanded and converted back to analogue. Hence the V6757 is a Squeezer and the V6759 is an Expander.

Normally the V6757 module will be fitted with the laser transmitter, and the V6759 with the photodiode receivers, but this does not necessarily have to be the case.

The optical interfaces are all single-mode fibre using lasers of various wavelengths. These allow the use of the modules over fairly long range links of both video and audio, without the need for separate fibre interfaces.

The V6757 can embed up to 8 channels of audio (2 groups). The audio inputs can be either analogue audio, or digital AES. If the AES digital option is used then the audio is usually sample rate converted. This ensures that it is synchronous with the SDI video, which is a requirement for many de-embedders from other manufacturers. The Sample Rate Converters (SRCs) can be disabled, if it is not wanted to modify the data. This is essential for certain non-audio data carried in AES such as Dolby compressed data.

Conversely the V6759 can de-embed up to 8 channels of audio (2 groups). The audio outputs can be either analogue or digital AES. The AES outputs are not sample rate converted.

Both modules can also operate as audio embedders and de-embedders in the pure SDI domain. Thus the V6757 can also use a conventional SDI signal on its input and embed up to 2 groups of audio. Similarly the V6759 always supplies an SDI output. If there is no input then there is an internal free-running Black generator into which audio can be embedded.

An audio processing option is available, AP, which allows the user to adjust many of the audio parameters. These range from the input and output gains to forcing Mono, Left/Right Swap, and routing and mixing the outputs from various input sources.

The audio I/O is determined by the type of audio sub-module fitted. Types available are for Digital I/P and O/P and Analogue I/P and O/P. The multiplexers are fitted with I/P sub-modules and the demultiplexers with O/P ones.

The system also includes three GPIs. These are sampled by the V6757, transported through the SDI, and reconstituted by the V6759. There is no Nyquist limit filtering, but the sample rate is about 768kHz, so it is possible, for example, to carry high speed RS232 signals.

The GPIs can also be used to select a range of internal operations, such as SDI I/P 2, MUTE, MONO etc.

The modules are fully compatible with the DART remote control network for which there is a selection of hardware and software control systems.

1.2 AUDIO SUB-MODULES

This table shows the various audio sub-modules in the series. When the module is powered up the front panel will show its type as in the Display column.

Product	Desc.	Display	Audio sub	Comments
V6757 / A	Squeezer	V6757	130-3760	Analogue I/P
V6757 / D			130-3710	Digital I/P
V6759 / A	Expander	V6759	130-3750	Analogue O/P
V6759 / D			130-3720	Digital O/P

The options above are:

/A Analogue audio Input or Output (8 audios)
/D Digital audio Input or Output (4 AES)

There are also fibre options added to the part number to represent the optical characteristics. They are not displayed directly on the top level menu. These will be either **/R** or **/Txxxx** where xxxx represents the laser wavelength.

1.3 VIDEO SUB-MODULES

This table shows the two video sub-modules used.

Product	Desc.	Video sub
V6757	Squeezer	130-4190
V6759	Expander	130-4200

2. SAFETY WARNING

LASER SAFETY

The V6757/59 when fitted with TX and RX sub-modules are Class 1 Laser Products under the **F**ood and **D**rug **A**dministration (FDA) / **C**enter for **D**evices and **R**adiological **H**ealth (CDRH) regulation. They cannot, under normal operating conditions (i.e., intended use), emit a hazardous level of optical radiation. No warning label or control measures are required by the FDA/CDRH. The IEC (International Electrotechnical Commission) standard (Publication 60825-1) requires a warning label and specifies that classification be made under fault conditions. Therefore, systems that are Class 1 under FDA/CDRH rules may not necessarily be Class 1 under the IEC.

The Laser wavelengths being used on V6751 Series may range from 1310nm to 1610nm. The average optical output power does not exceed 0dBm (1mW) under normal operating conditions. The optical output, when unused, is automatically covered with a shutter which prevents direct exposure to the laser beam.

Even though the power of these lasers is low, the beam should be treated with caution and common sense because it is intense and concentrated. Laser radiation can cause irreversible and permanent damage of eyesight. Please read the following guidelines carefully:

① Make sure that a fibre is connected to the board's fibre outputs before power is applied. If a fibre cable (e.g. patchcord) is already connected to an output, make sure that the cable's other end is connected, too, before powering up the board.

② **Do not** look in the end of a fibre to see if light is coming out. The laser wavelengths being used (most commonly 1310nm and 1550nm) are totally invisible to the human eye and will cause permanent damage. Always use optical instrumentation, such as an optical power meter, to verify light output.

Attention

Basic rules for proper handling of fibre optic connectors:

Do's

Always clean the connector before mating
Mate the connector immediately
Cover unused connectors with dust protection caps.

Don'ts

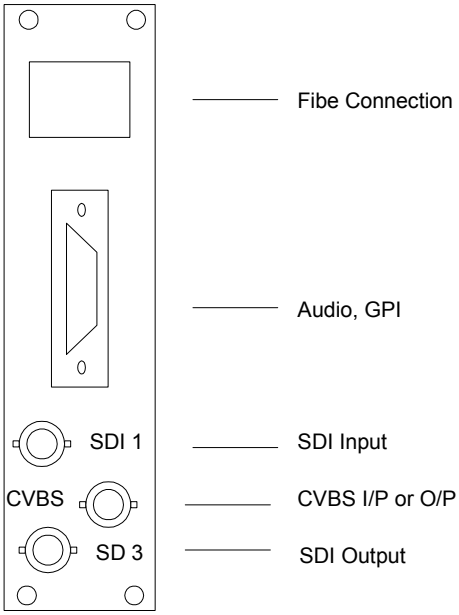
Never touch the end face of the fibre connectors!
Do not let the connector lie around and collect dust before mating!

For cleaning, only lens-grade, lint-free tissue (e.g. Kimwipes), saturated with 99.8+% pure, anhydrous Isopropyl Alcohol, shall be used (Vistek P/N 950-1000).

3. INSTALLATION

3.1 REAR PANELS

V16VR3V 3U REAR



Note: It is also possible to use the rear panel designed for the V6351 and V6751 series of audio embedders and de-embedders (V16VR3R), but then there is not a dedicated BNC for the CVBS. In that case the CVBS connection must be made through the HDD audio/GPI connector. See section 3.3.3.

3.2 POWER REQUIREMENTS

These modules are powered from the rack into which they are running and the total consumption depends on which, if any, sub-modules are fitted:

Total Fit	POWER
V6757 + Digital Input	7.8W
V6757 + Analogue Input	9W
V6759 + Digital Output	8.5W
V6759 + Analogue Output	10.5W

3.3 SIGNAL CONNECTIONS

3.3.1 Video

On all the rear panel types the upper three BNCs are for SDI video as follows:

Connector	Type	Function
SDI 1	BNC	SDI Video I/P
CVBS	BNC	Analogue composite (CVBS). In or Out.
SDI 3	BNC	SDI O/P 1

Note: The links, LK2 and LK3, must be set to SOUTH. See section 3.8.2.

3.3.2 Optical

There is a single optical connector on the rear panel:

Connector	Type	Function
Fibre	SC/PC	Optical O/P on TX modules Optical I/P on RX modules

3.3.3 Audio

All audio connections are through the High Density D-type connector (HDD) on the rear panel. For both modules the audio is always connected to or from the same pins. This table shows all the connections on the HDD connector. For the main audio there are eight blocks of 3 pins – Block 1 to Block 8. These are referred to as Blocks to avoid confusion with groups, channels etc. Each block is either a single analogue balanced differential signal or an AES pair (which, of course, carries two audio signals). The AES pairs may be either differential or single-ended (75R). When working with digital I/O it is likely that either Blocks 1, 3, 5 and 7 or Blocks 2, 4, 6 and 8 would be used depending on the choice of differential or single-ended AES connections.

Internally there are four AES channels used as A, B, C and D. Within each AES there are two audios, often used as Left and Right but indicated here as 1 and 2.

When using the Digital 75R connections the RET pin should also be connected to a suitable GND.

Signal Group	HD44 Pin	Label	Analogue	Digital Balanced	Digital 75R
Block 1	14	Ch A 1 P	Ch A 1 Pos	Ch A Pos	
	44	Ch A 1 N	Ch A 1 Neg	Ch A Neg	
	15	Ch A 1 GND	Ch A 1 Gnd	Ch A Gnd	
Block 2	13	Ch A 2 P	Ch A 2 Pos		Ch A
	43	Ch A 2 N	Ch A 2 Neg		Ch A Ret
	28	Ch A 2 GND	Ch A 2 Gnd		
Block 3	12	Ch B 1 P	Ch B 1 Pos	Ch B Pos	
	42	Ch B 1 N	Ch B 1 Neg	Ch B Neg	
	26	Ch B 1 GND	Ch B 1 Gnd	Ch B Gnd	
Block 4	11	Ch B 2 P	Ch B 2 Pos		Ch B
	41	Ch B 2 N	Ch B 2 Neg		Ch B Ret
	40	Ch B 2 GND	Ch B 2 Gnd		
Block 5	9	Ch C 1 P	Ch C 1 Pos	Ch C Pos	
	39	Ch C 1 N	Ch C 1 Neg	Ch C Neg	
	10	Ch C 1 GND	Ch C 1 Gnd	Ch C Gnd	
Block 6	8	Ch C 2 P	Ch C 2 Pos		Ch C
	38	Ch C 2 N	Ch C 2 Neg		Ch C Ret
	24	Ch C 2 GND	Ch C 2 Gnd		
Block 7	7	Ch D 1 P	Ch D 1 Pos	Ch D Pos	
	37	Ch D 1 N	Ch D 1 Neg	Ch D Neg	
	21	Ch D 1 GND	Ch D 1 Gnd	Ch D Gnd	
Block 8	6	Ch D 2 P	Ch D 2 Pos		Ch D
	36	Ch D 2 N	Ch D 2 Neg		Ch D Ret
	5	Ch D 2 GND	Ch D 2 Gnd		
CVBS A	23	CVBSA*			
	22				
	35	GND			
CVBS B	18	CVBSB*			
	17				
	35	GND			
Misc	20	GPI 1			
	25	GPI 2			
	30	GPI 3			
	27	Reserved			
	29	GND			

* – These connections are only used with rear panel intended for the non-squeezer/expander units.
V6757 – CVBS A = I/P CVBS B = not used
V6759 – CVBS A = O/P CVBS B = O/P

3.3.4 GPI Connections

There are three GPI connections to the V6757/V6759. They are through dedicated pins on the HDD connector on the rear panel:

GPI 1	Pin 20
GPI 2	Pin 25
GPI 3	Pin 30

The GPIs can be used for two purposes:

1. As simple logic control to select operating parameters.
2. As a sampled TTL signal, carried from the Squeezer to the stretcher.

When being used as control they should be made active by grounding the relevant pin.

The status of the GPI pins can be monitored on:

STATUS GPI Sta 1↓ 2↓ 3↓

The arrows indicate the status of the GPI input by pointing up if the GPI is active (in practice this means that they point down for +5V and up for 0V).

The GPIs can be used to select a range of features which are described in Section 5.10.1.

When the GPIs are being used as dynamic signals to be sampled then they should be considered as LVTTL signals. The actual circuitry on the I/O is discussed later in section 5.10.2.

3.4 ELECTRICAL SIGNAL SPECIFICATIONS

SIGNAL	TYPE	COMMENTS
SDI Inputs and Outputs	BNC	SDI Video to SMPTE 259M Max cable length >200m
Audio, Analogue, I/P	HDD 44-way	Balanced, High Impedance, >20kΩ
Audio, Analogue, O/P	HDD 44-way	Balanced, Low impedance, <50Ω
Audio, Digital	HDD 44-way	Balanced - AES3-1992 or Unbalanced - AES3-3id1995
GPI	HDD 44-way	5V pull-up via 4K7 Connect to GND to activate. see section 5.10.2 for details

3.5 OPTICAL SIGNAL SPECIFICATIONS

3.5.1 Optical Transmitter

Parameter	Optical Output (Fibre Transmitter)
Connector Type	SC/PC with Shutter, single-mode
Insertion Loss	< 0.3dB (< 0.15dB typ.)
Back Reflection	better than -45dB
Laser Diode Type	**F**abry **P**erot (FP) or **D**istributed **F**eed**B**ack (DFB)
Standard Laser Wavelengths	1310nm (FP), 1550nm[1*] (DFB)
CWDM Laser Wavelengths	1410nm, 1430nm, 1450nm, 1470nm, 1490nm 1510nm, 1530nm, 1550nm, 1570nm, 1590nm 1610nm (all DFB)
Optical Output Power	2 user selectable options: Medium: -7dBm (typ) High: -3dBm (typ) **Note:** Output Power may vary by ± 1dBm
Extinction Ratio	> 7dB (typ)
Transmission Length	up to 70 km @ 1550nm (CORNING SMF-28 single-mode fibre)

3.5.2 Optical Receiver

CAUTION

Please note the following if it is intended to use an optical RX in connection with a 3rd party fibre transmitter:

The maximum optical input power must not exceed 5mW (average) or 10mW (peak) at wavelengths 1110nm ≥ λ ≤1650nm. Exceeding these limits may result in a permanent damage of the optical receiver unit.

Parameter	Optical Input (Fibre Receiver)
Connector Type	SC/PC with Shutter, single-mode
Insertion Loss	< 0.3dB (< 0.15dB typ)
Back Reflection	better than -45dB
Photodiode Type	InGaAs PIN-Photodiode
Detection Range	1100nm – 1650nm
Saturation Power	> -3dBm (0.5mW), typ
Sensitivity	-3dBm to -28dBm (typ)
Bit Error Rate (BER) (SDI Check Field @270Mbps)	$<10^{-12}$
Fibre Type	Single-mode (9/125µm)

[*] Note that the standard 1550nm(DFB) is not suitable for use in CWDM systems.

3.6 VIDEO INSERTION DELAY

This table shows the insertion delay of the various modules and their configuration:

Product	Delay
V6757 SDI to SDI	2.18µs
V6759 SDI to SDI	1.54µs
V6757 CVBS to SDI *	19.1µs
V6759 SDI to CVBS *	4.6µs
V6757/9 CVBS to CVBS	23.7µs

* Since the CVBS signal is squeezed in time in the V6757 before being embedded in the SDI data it is not meaningful to define an actual insertion delay of the video from the CVBS to SDI for the V6757. Similarly there is no constant delay from the SDI data to CVBS for the V6759. The figures above relate to the time from the leading edge of syncs to the SAV of the digital waveform. This may be useful for timing the signal into a digital infrastructure.

3.7 ADJUSTMENT RANGES

3.7.1 Video Adjustments – V6757

The only user video adjustment here is for the CVBS Cable Equaliser.

EQ :	ON/OFF
EQ gain range:	0 to ~300m

3.7.2 Video Adjustments – V6759

There are no video adjustments.

3.7.3 Audio Gain Ranges

Audio gain adjustments can only be made with the Audio Processing option (AP).

Input gain range :	-16dB to +15.875dB in 0.125dB steps
Output gain range :	-16dB to +15.875dB in 0.125dB steps

These gain adjustments are independent of and in addition to any setting for the digital levels, known within this document as Maximum Audio Level (MAL).

3.7.4 Audio Input Settings

Audio input settings can only be made with the Audio Processing option (AP).

These operations always operate on each audio pair. The component channels of each pair are referred to as L (for Left) and R (for Right), but they do not need to be related. They could just as easily be referred to as Channels 1 and 2.

The following eight functions are available:

Function	L O/P	R O/P
normal	L	R
L to Both	L	L
R to Both	R	R
LR Swap	R	L
Mono	(L+R)/2	(L+R)/2
L Only	L	mute
R Only	mute	R
Off	mute	mute

3.7.5 Audio Routings

Audio routings can only be made with the Audio Processing option (AP).

These operations allow each output pair to be made up from a combination of the input pairs. This operation happens after the preceding Input Settings.

For 4 channel variants:

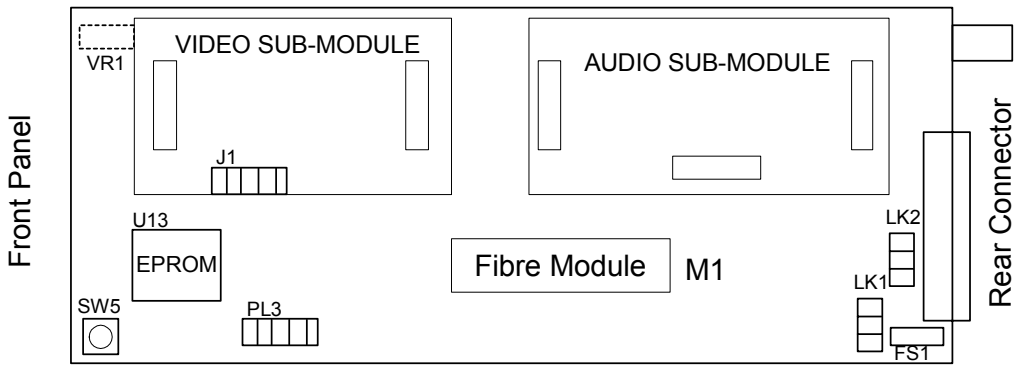
A O/P	B O/P	C O/P	D O/P
A	B	C	D
B	A	A	A
C	C	B	B
D	D	D	C
A+B	B+A	C+A	D+A
A+C	B+C	C+B	D+B
A+D	B+D	C+D	D+C
A+B+C	B+A+C	C+A+B	D+A+B
A+B+D	B+A+D	C+A+D	D+A+C
A+B+C+D	B+A+C+D	C+A+B+D	D+A+B+C
A+C+D	B+C+D	C+B+D	D+B+C
B+C	A+C	A+B	A+B
B+D	A+D	A+D	A+C
B+C+D	A+C+D	A+B+D	A+B+C
C+D	C+D	B+D	B+C
OFF	OFF	OFF	OFF

3.8 HARDWARE

3.8.1 The PCB

The figure below shows diagrammatically the printed circuit board along with certain other components of interest. In particular it shows the position and orientation of the links and switches which set up the operation modes and the location of the audio sub-module, if fitted.

The EPROM location is shown, as it is the component that would need to be changed as a result of any software upgrade in the field. This is a PLCC type and the proper tool should be used to remove a device and care must be taken to ensure that a replacement is inserted the right way round and pushed fully 'home'.



3.8.2 Links and Switches

The purposes of the links and switches is shown in the following table. Details of their operation are described in later sections.

ITEM	Title	Comments
VR 1	Equaliser Control	Cable Equaliser control in the V6757 only. Accessible through the front panel. **Must** be enabled through the Engineering menu.
FS 1	Fuse	In series with the +15V input to the module.
SW 5	RESET	Used to reset the internal microcontroller.
PL 3	JTAG Connector	For development and test use only. (May not be fitted)
J1	JTAG Connector	For development and test use only on the Video sub-module. (May not be fitted)
LK 1, 2	Define BNC 2	16VR3V Rears – Always South
		16VR3R Rears – South – SDI 2 = Output North – SDI 2 = Input

3.8.3 Fuse

There is only one fuse on these modules which is in series with the main DC input:

FS 1	Fuse 2 Amp Wire ended	In series with the +15V input to the module.

3.8.4 Audio Sub-module

This provides the audio I/O. These modules can be changed in the field, and the system will automatically detect which type is fitted. Unless audio I/O is not required there should always be a sub-module fitted here.

3.8.5 Video Sub-module

The video sub-module handles the CVBS processing. On the V6757 it has the cable equaliser, the video ADC and the squeezing function. On the V6757 it has the expanding function and the video DAC. The video sub-module also processes the dynamic function of the GPIs.

3.8.6 Optical Sub-Modules

A range of fibre optic sub-modules is available for the V6757/59 modules, from which only one can be fitted to each module. The selection of the module should be done at the time of ordering since it needs to be fitted at the factory. Normally the V6757 will be fitted with an optical transmitter and the V6759 will be fitted with an optical receiver, but this is not necessarily the case.

Whether the module has a transmitter or receiver will affect normal operation. For example it should not be possible to select Fibre as an input if a receiver is not fitted. For this reason there is page on the **CONFIG** menu to set the sub-module type:

```
CONFIG   OpticOpt   Fibre Tx
                    Fibre Rx
```

Since changing this parameter should not be necessary in service and could have a bad effect on using the unit it can only changed with a Password. This is described later in section 5.11.

It the fibre sub-module is a transmitter then the system should know the type and wavelength. This does not directly affect the operation of the unit, but could have an effect on other downstream equipment, such as CWDM combiners (Coarse Wavelength Division Multiplexing). Thus it is possible to read the laser wavelength both on the front panel under **STATUS** and over the DART remote control system. The wavelength can only be set if **OpticOpt** is set to **Fibre Tx**, and is not password protected (because it does not affect actual operation). It should be set in:

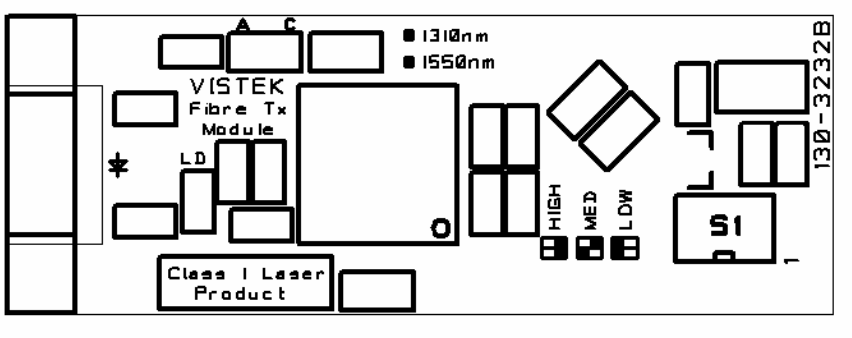
```
CONFIG   LaserTyp   Txxxx       DB type laser with wavelength xxxxnm
                    TyyyyDFB    DFB type laser with wavelength yyyynm
```

3.8.7 Fibre TX Sub-module

This is fitted into the M1 on the main board. It is a small PCB soldered in to place and has a fibre pigtail which is routed to the Fibre I/O connector. Since the fibre sub-module is soldered in place it is not easily changed in the field.

There are two types of fibre sub-module – Laser transmitter (TX) and photodiode receiver (RX). Normally the V6757 has a TX and the V6759 has an RX, but this is not necessarily the case.

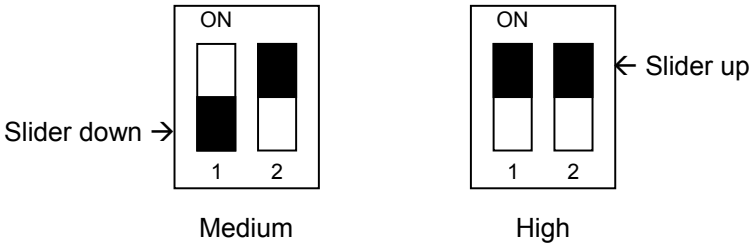
The TX module, shown below, has a very small DIL switch, S1, which is used to set the output power.



It is important that the output power of the Laser transmitter is set so as to be suitable for the receiver. Receivers have a maximum input power level, often specified as the 'Saturation Power', which should not be exceeded for reliable transmission. For short haul it is possible to use an optical attenuator to avoid saturation in the receiver.

Switch S1 on the sub-module is used to set the output power. The following table shows the settings and the figure shows how to set switch.

Switch Setting	Output Power[1](dBm)	Output Power[1] (mW)	Typical Application[2]
Medium	-7	0.2	Medium haul, < 15 km
High	-3	0.5	Long haul, > 15 km



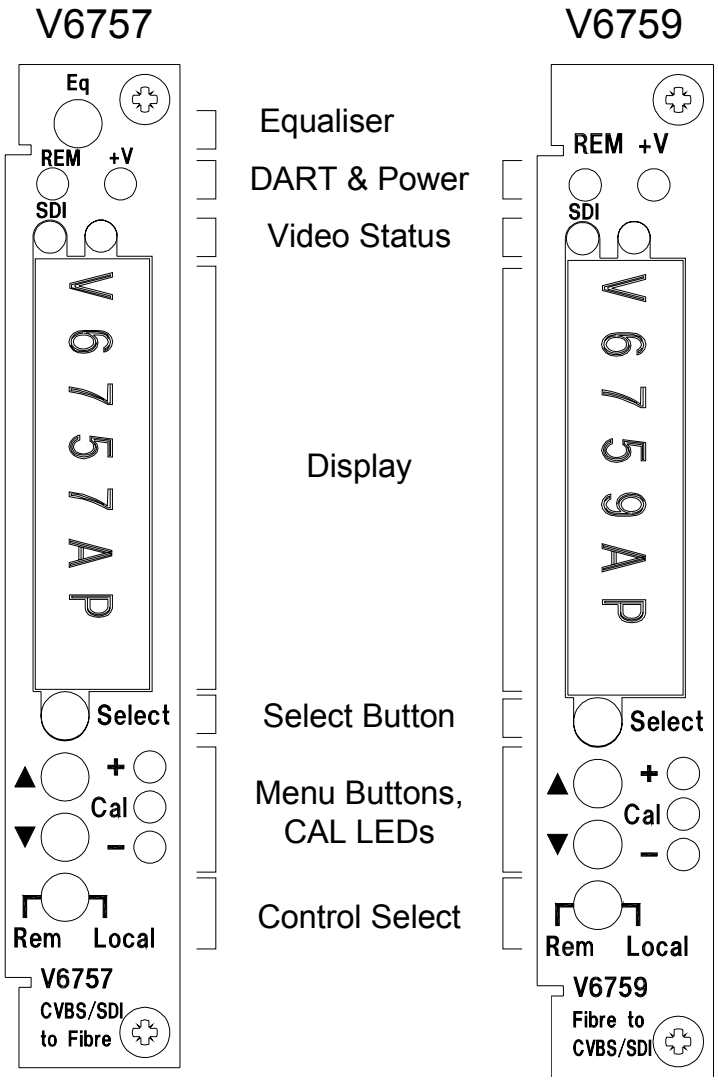
3.8.8 Fibre RX Sub-module

This is fitted into the M1 on the main board. It is a small PCB soldered in to place and has a fibre pigtail which is routed to the Fibre I/O connector. Since the fibre sub-module is soldered in place it is not easily changed in the field.

There are two types of fibre sub-module – Laser transmitter (TX) and photodiode receiver (RX). Normally the V6757 has a TX and the V6759 has an RX, but this is not necessarily the case.

[1] These values are typical. The actual value may vary by ± 1 dBm but will remain constant over temperature and life.
[2] Assumes a point-to-point connection @ 1310nm without any WDM, CWDM, etc. devices in the transmission line.

3.9 FRONT PANEL



The front panel on the V6757 and V6759 are a considerable advance on what is usually available on single module interface equipment. It provides the user with total control and monitoring of the unit without the need to consult manuals and read unlabelled indications. While this kind of control is generally available with a remote control system, as it is over DART, it is unusual to have this level of access locally.

At first use the menu system may seem cumbersome but with only a small amount of practice it will become very easy to use.

3.9.1 Direct Indications

The four LEDs at the top of the panel provide these direct indications of the unit:

REM — Short blinks to indicate access by the DART controller, if fitted. It does **not** directly indicate that the unit is in remote control mode. If the rack frame does not have a Rack Controller fitted then this LED will not blink.

+V — Indicates that the main regulated power is present on the board. This is derived from the +15V distributed through the rack. These modules have many power rails, but only the main +3.3V is indicated here. It will, of course, be OFF if the fuse, FS1, were to have been blown.

SDI — A pair of LEDs to indicate video input signals. The left one shows I/P 1 present. The right one will indicate the presence of I/P 2. I/P 2 may be an SDI, if enabled through LKs 1 and 2 and selected, or a Fibre input if available and selected.

3.9.2 Display and Switches

The main display is an eight character LED matrix display. It has been set so that when fitted into a 3U rack (V1606) it can be read from the left, and when fitted to a 1U rack (V1601) it is horizontal and the 'proper' way up. (At present there is not a suitable rear module for these modules to be fitted into a 1U frame.)

The three buttons are labelled **Select**, ▲ and ▼. The **Select** button is used to move down and up the menus. A short press will move down one level, while pressing and holding for about half a second will move up one level. If you continue to hold it will progressively move up a level every half second until it reaches the top level (**SLEEP**), or you let go, in which case it will stay where it is. When at any level the ▲ and ▼ buttons will move through the list of options, or if in an actual variable (such as Video Gain) they will change the values.

The menu system is described in more detail later in section 5.1.2.

If the unit is in Local control then the display and switches are used to set up and show the operation the module. If in remote mode then they are still active for showing the status but cannot be used to actually change anything.

Beside the ▲ and ▼ buttons are three LEDs marked **+**,**CAL** and **–**. In general the **CAL** LED is used to show that a variable is set to its normalised value and if not then the others show which direction to which it has been changed or that it is no longer on its CAL value.

3.9.3 Remote/Local Control

The lowest switch selects between Local control and Remote control over DART:

Local	Control is from the front panel itself.
Rem	Control is from the DART system. This requires the use of an external controller running a suitable programme, which communicates with multiple racks using the Dartnet protocol.

4. BLOCK DIAGRAMS

4.1 GENERAL

The block diagrams in this section will help with the understanding of how the various parts are connected in terms of video and audio.

The FIFO section is for re-timing the inputs, so that they operate with a clean regenerated clock.

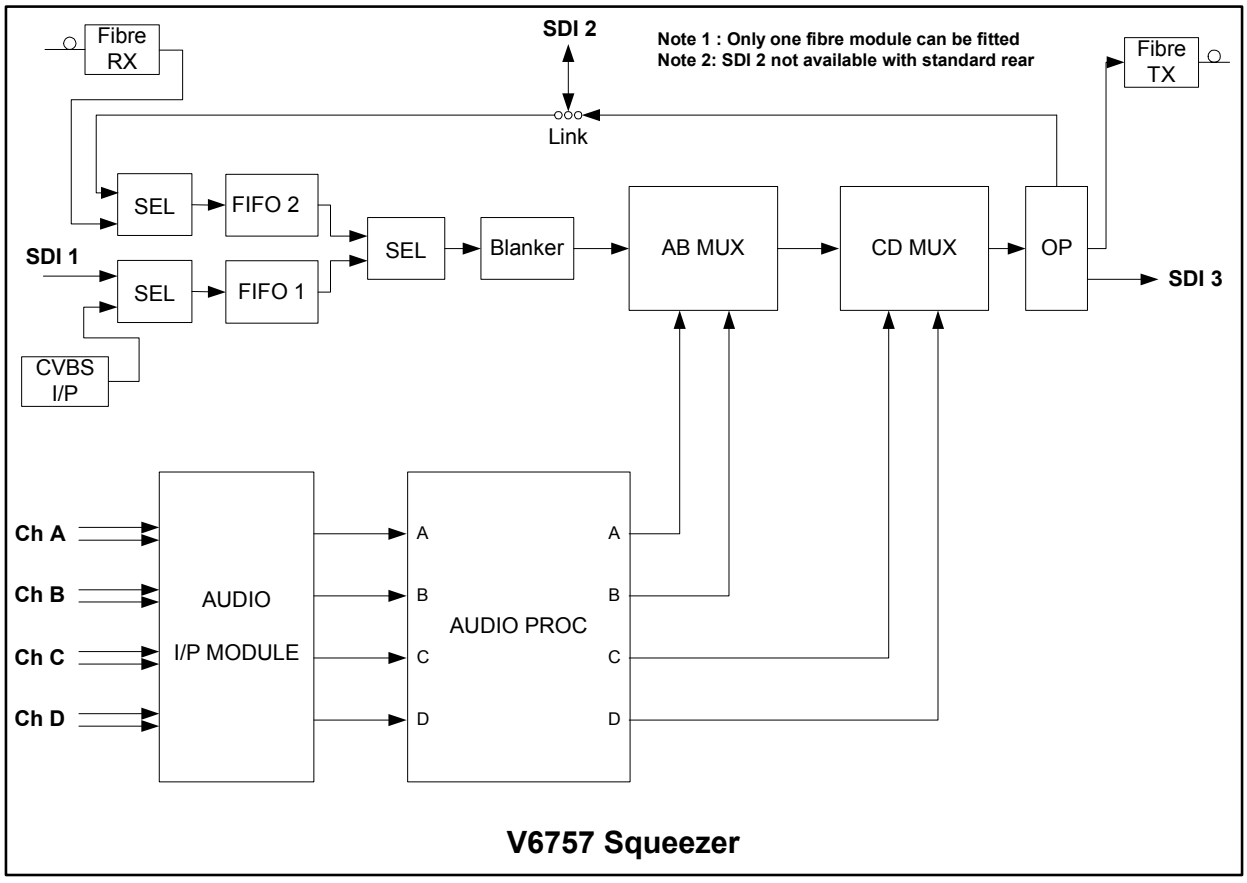
The audio Processing section is shown on all these block diagrams but it will only be available with the AP option. If the AP option is not available then the A, B, C, D outputs will be connected directly from the A, B, C, D inputs respectively. Even with out the AP option the Mux and Demux facility is still available.

The SEL block is a selector for choosing the video input to be from either SDI 1 or SDI 2. SDI 2 is only available if the Links LK 1 and 2 are set to North. Since these modules are designed to have CVBS I/O the usual rear module (16VR3V) uses the second BNC for CVBS. This means that the SDI 2 option is not available. If the older type of rear module is used (16VR3R – intended for the V6x5x Series) then SDI 2 will also be available on these modules.

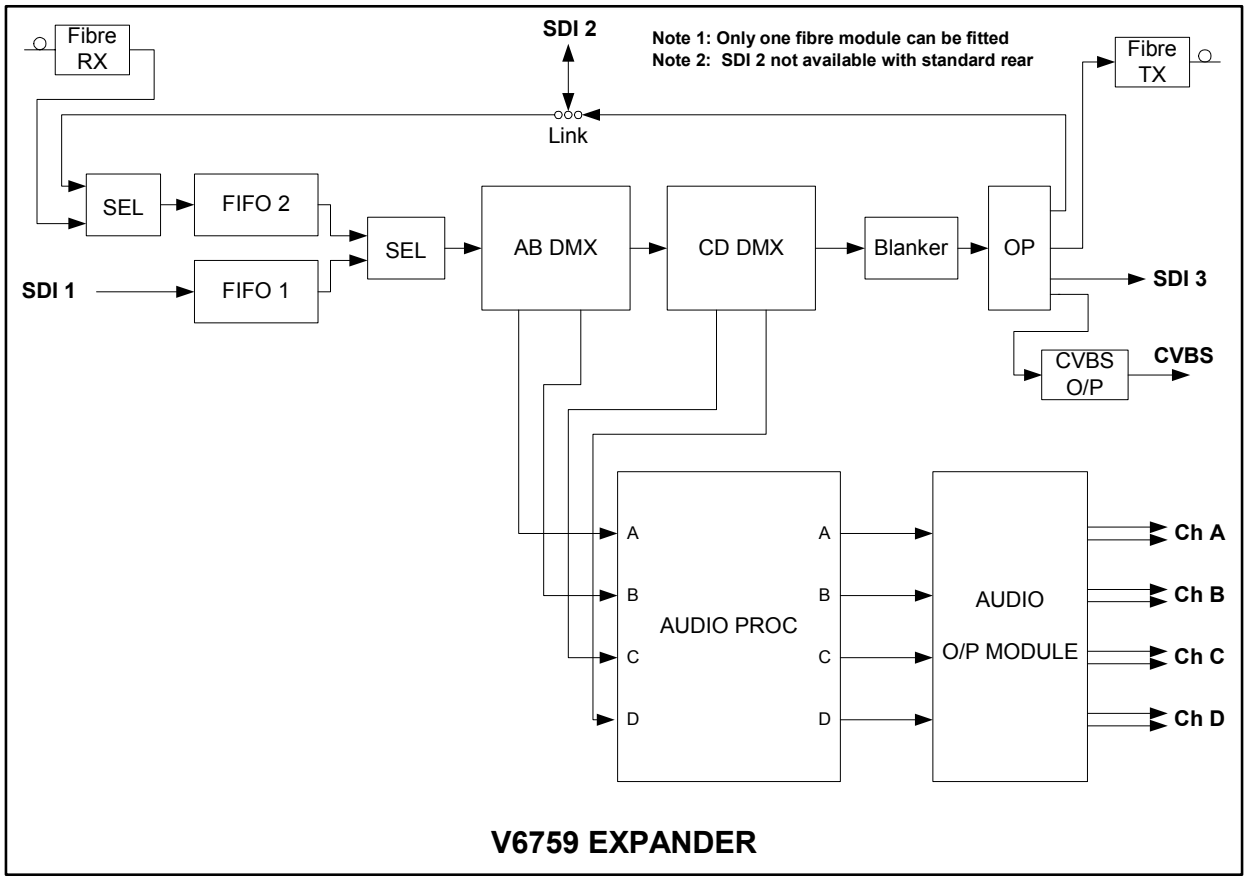
The OP block ensures a legal output, and puts EDH error checking codes on the output.

The Blanker block, which can be disabled, removes all ancillary data from the SDI video. Note that this also includes any non-audio type embedded data.

4.2 V6757AP CVBS SQUEEZER



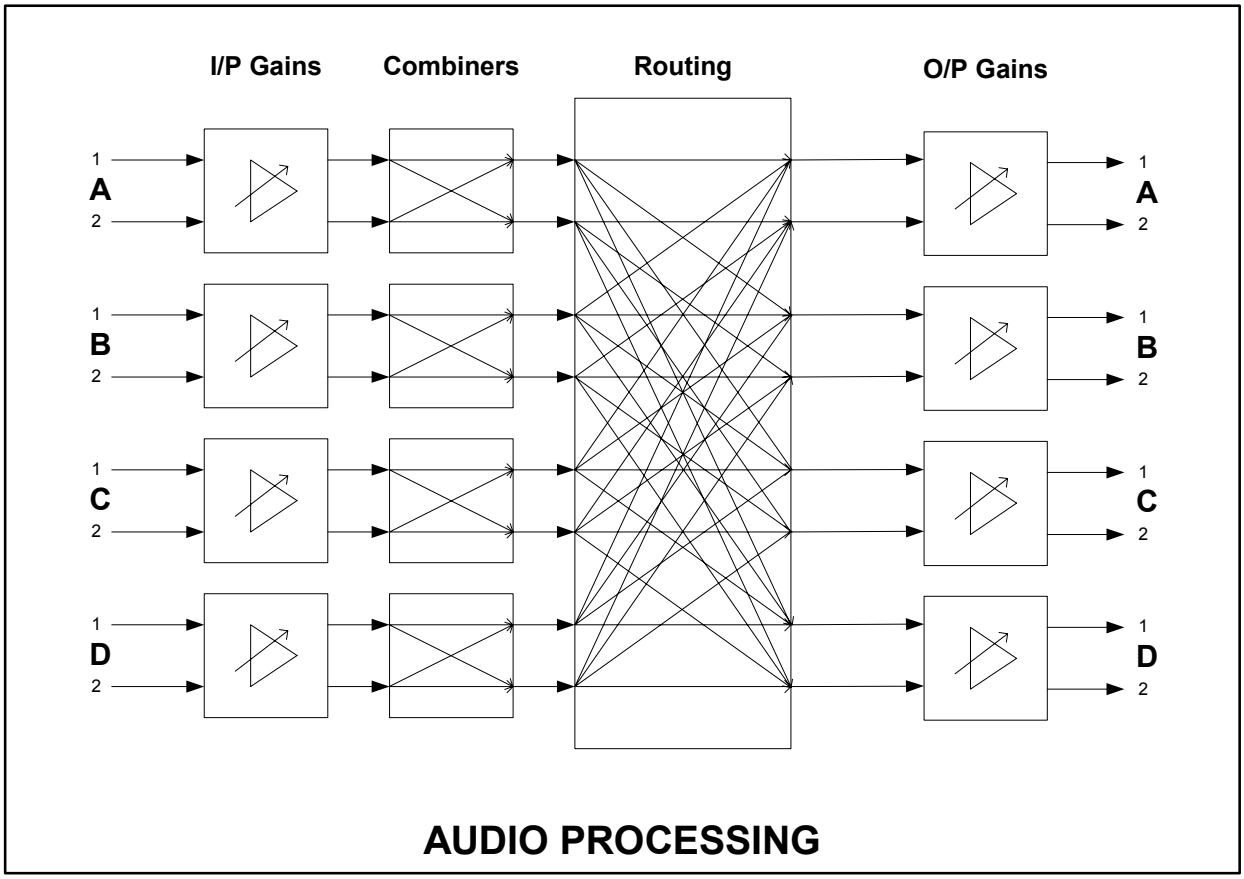
4.3 V6759AP CVBS EXPANDER



V6759 EXPANDER

4.4 AUDIO PROCESSING

This block diagram shows the general flow of the audio processing when enabled. It shows all four channels, A, B, C and D which are available. In general the audios should be used from A to B. Thus if only two AES signals are being processed (a single embedded group) then A and B should be used. This makes all the routing selections easier.



5. SYSTEM OPERATION

5.1 FRONT PANEL

5.1.1 Start up

Local control and monitoring of the V6757/59 modules is done through the front panel with its eight character LED display and three control buttons **Select**, ▲ and ▼. There are three LEDs which also contribute to the status indication; these are labelled **+**, **Cal** and **–**.

After power up the display will start at the top level and show the unit type and any options that are included. These options are not the same as the plug-on modules for the audio I/O. The display will be one of these:

V6757AP	Indicating a V6757 Quad Mux, with the Audio Processing option

5.1.2 Menu Control

The **Select** and ▲ and ▼ buttons are used to manoeuvre around the menu system. The menu structure has five levels and the **Select** button is used to go up and down the structure. The ▲ and ▼ buttons are used to move between selections or to adjust a parameter depending on which sort of menu is displayed. The five levels are as follows:

Sleep	Display is blank (except for Banner warnings).
Top Level	As above, e.g. **V6757**
Main Menu	The Main menu items, such as **MAIN,AUDIO**, **ENG'ING** etc. These items are all in Upper Case.
Sub Menu	Menu items under each main heading, such as **Video** or **A IPGain** under the **MAIN** and **AUDIO** main menu. These items are all in Sentence Case (generally lower case but with upper case first letters).
Parameter	The lowest level under the Sub Menu, and used to actually adjust a parameter. The display will depend on the actual parameter and may be a value such as **+0.00dB** for a gain or **ON** or **OFF** for a switch variable. There is usually a title to describe the variable and a small icon in the left hand character position, but 8 characters cannot provide for a detailed description.

Many of the sub menus depend on which audio I/O sub modules are fitted. For example the Calibration functions of the analogue audio ADCs and DACs under **CALIB** do not appear unless a suitable sub-module is fitted.

To move down a level just press the **Select** button briefly; then press either the **Select** button again to go down another level or the ▲ and ▼ buttons to move around the options within a level.

To move up a level press and hold the **Select** button for about half a second which will move up one level. If you continue to hold the **Select** button then it will move up a level every half a second until it reaches the Sleep level (one above the Top Level).

A complete list of all the menus is given in Section 8.

5.1.3 Menu Examples

This section has examples of how to manoeuvre through the menu system. The first one starts with the unit in its 'sleep' mode where the display is blank, and then proceeds to set the CD channel to multiplex onto Group 2 (assuming a V6751Q).

Action	Display	Comments
Select	**V6757**	Top Level
Select	**MAIN**	First Main Menu, and the one we want
Select	**Video**	First sub-Menu, and the one we want
▼	**AB MuxGp**	
▼	**CD MuxGp**	
Select	**CD Gp -**	The default setting – no muxing.
▲	**CD Gp 1**	
▲	**CD Gp 2**	Set it as we want it.

Now we shall select the ancillary blanking to be OFF. The following steps should be taken from the current position (Select+Hold means that you should press and hold the select button for about half a second):

Action	Display	Comments
Select+Hold	**CD MuxGp**	UP to the Sub Menu level
Select+Hold	**MAIN**	UP again to the Main Menu
▼	**AUDIO**	Assuming the AP option is enabled
▼	**DELAY**	Assuming the AP option is enabled
▼	**STATUS**	
▼	**ENG'ING**	Along to the Engineering Main Menu
Select	**Ref Src**	
▼	**Format**	
▼	**Anc Data**	To the Sub Menu we want
Select	**Anc Blnk**	This is the default setting.
▲	**Anc Pass**	As we want it

5.1.4 Sleep

If the front panel is not used for a certain amount of time then the display will automatically go into a sleep mode when it will be blank. Pressing any of the buttons will cause it to 'wake up' back into the top level. The time delay before the unit slips into sleep mode can be set up using the **ENG'ING** : **Sleep** menu.

5.1.5 Brightness

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

5.1.6 Banner

There are some conditions which need to be directly indicated to the operator and although the display system is highly versatile for a lot of complex operations it is not really convenient for immediate indications. In the past LEDs on the front panel have been used for this purpose.

To help with this a banner message will pass across the screen from right to left to show any critical statuses when the display is in sleep mode. This saves the need to manoeuvre down the menus to find out, for example, that a Test Pattern has been selected. Remember it is not necessary to wait for the time-out period for the unit to go into sleep mode, it can be forced there by going up a level from the so-called Top Level. The following conditions will be displayed on the Banner:

No Audio Module Fitted...	No audio module is fitted, but one is required.
AB Mux Error	The AB Mux is using a Group that already exists. This is a serious problem. Either use a different group or make sure that ancillary blanking is ON.
CD Mux Error	The CD Mux is using a Group that already exists. This is a serious problem. Either use a different group or make sure that ancillary blanking is ON.

The banner can be switched off in the **CONFIG** : **Banner** menu.

5.1.7 High Level Signal Status

There are two LEDs on the top of the front panel to indicate that the SDI inputs are present, and consequently these also indicate that they are absent. However there is no direct indication as to the format of these signals, i.e. 625/50 or 525/60. Since many installations may use multiple formats and therefore need a quick indication there are parallel menus with the Top Level.

If you press the ▲ and ▼ buttons from the Top Level then you will see the SDI and audio status directly. In each case this will show the signal presence and if it is there then what format it is. Again this is considerably faster than manoeuvring down the menu structure. For example:

SDI 625✔

There are in fact three different stati available at this level. They are:

IP 625 ✔	or	**IP FAIL**	
AES AxBx	or	**AES A✔B✔**	
AES CxDx	or	**AES C✔D✔**	Depends on actual configuration and audio sub-module.

These indications are still at the Top Level along with the indication of type of module, so a single press of the Select button will immediately move down the menu tree to a Main Level.

5.1.8 Variable Calibration

Most variables have a calibrated or normalised value. In some cases this is obvious, such as a gain setting should be normalised to 0dB, but in others it is less so. In the listing of all the variables in Section 9 the normalised value, if applicable, is shown.

Any variable can be individually set to its normalised value by pressing the ▲ and ▼ buttons at the same time.

Within each the Main Menu at the end of the list of Sub Menus is a pseudo Sub Menu called **Norm**. Selecting into this will let you normalise all the parameters within the Main Menu item to their normalised value.

The three LEDs beside the ▲ and ▼ buttons are used to show whether the variable is calibrated or not. After calibration the **CAL** LED will be ON.

5.2 REMOTE CONTROL

In addition to being controlled with the menu system on the front panel the V6757/59 modules can also be controlled over the DART remote control system. For this it should be fitted into a rack which also contains a Rack Controller. The Rack Controller provides an interface between all the units in the rack and the external DARTNET network. Various controlling devices are available for accessing units on the DARTNET; these include the V1602/V1605 1U and 2U hardware panels, the ViewFind PC program and the more sophisticated ViewNet Client Server interface. It is also possible to have third party software written to interact with DARTNET. The details and specification of the DART interface are described elsewhere.

There are separate settings for the unit when operating in Local and Remote control modes. This means that if the unit is changed between Local and Remote mode then the settings may change. The advantage of this is that if the unit has been set up locally and the operator inadvertently changes to Remote mode (which probably has different, or even default, settings) the local settings are not lost. There could be a disadvantage in that once the unit has been set up remotely it cannot not be switched to Local without causing a disturbance.

When in Remote Control the front panel menu system is still active but is only used to monitor the status of the unit. It cannot be used to change anything. There are in fact some exceptions to this since some parameters cannot be controlled remotely. For these, which are listed below, it is always possible to use the front panel to change them.

ENG'ING	**O/P EDH**	Disable/enable EDH on the output
ENG'ING	**Sleep**	Set the display Sleep timeout
ENG'ING	**TP Type**	Select type of Test Pattern
ENG'ING	**LEDLevel**	Set the Display brightness
CONFIG	**Banner**	Turn the top level display Banner On or Off
CONFIG	**GPI 1**	Set the application for GPI 1
CONFIG	**GPI 2**	Set the application for GPI 2
CONFIG	**GPI 3**	Set the application for GPI 3

5.3 VIDEO PROCESSING

5.3.1 Squeezer: CVBS Input

The composite CVBS input should be connected to the BNC labelled CVBS. With the standard rear this is connected directly to the squeezer sub-module, but if a rear panel intended for the V6x5x series of Multiplexers and Demultiplexers is being used then the connection is to one of the HDD pins; see section 3.3.3. On the standard rear, since the second BNC is used for CVBS, SDI 2 is not available. This is why the two links, LKs 1 and 2, should be fitted South; see section 3.8.2.

While the V6757 is primarily a CVBS Squeezer it can still be used for passing SDI video directly through, so it may be necessary to select the CVBS input. This is done on the main menu:

MAIN	**Video**	**CVBS**	
		SDI 1	
		Fibre	Only if Fibre RX fitted (unlikely on V6757)

The CVBS input may be DC or AC coupled. DC coupling is the normal operation and it means that the input is a standard type of composite video signal for which a sync separator can extract the relevant signal details and operate a clamp. This means that the CVBS signal will 'sit' at pre-determined levels within the SDI waveform and is the preferred way of operating. When DC coupled the SDI standard must be the same as the CVBS standard – 525/60 or 625/50. See section 5.3.5 below for more details about standards.

The coupling type is selected on the Engineering menu:

ENG'ING	**CVBSMode**	**DC Auto**
		AC 625
		AC 525

When AC coupled there is no clamp and the video signal will sit somewhere mid-way in the SDI waveform, and will move up and down depending on the AC content. When AC coupled there is no restriction on the signal type. It is intended for specialist video signals, such as Sound-in-Syncs, where it is not easy to extract the timing information. It is necessary for the operator to set the SDI standard – 525/60 or 625/50, since it need have no dependence on the input standard. Using this principle it is possible to send an analogue 625/50 CVBS over a 525/60 SDI link, or vice versa.

When operating in AC mode the SDI signal may not be easily viewable on a picture or waveform monitor, particularly if the CVBS and SDI standards are not the same.

When DC coupled the operating standard can be detected (525/60 or 625/50) and the system will automatically produce an SDI signal of the same standard. This means that the SDI signal is eminently viewable.

5.3.2 Squeezer: CVBS Equaliser

The V6757 Squeezer has a cable equaliser on its CVBS input. This can compensate for high frequency loss through a co-axial cable up to about 300m. The adjustment is made through a small hole in the upper part of the front panel. Rotating clockwise increases the gain, so compensating for longer cables.

Ideally the cable equaliser should be adjusted using a suitable test signal, such as a frequency sweep or burst. If this is not possible then a Colour Bar signal could be used to set the sub-carrier at the right level.

Before using the equaliser it must first be turned ON. This is done through the Engineering menu.

```
ENG'ING    CVBS EQ      EQ OFF
                        EQ  ON
```

5.3.3 Squeezer: SDI Input

If required a pure SDI signal may be connected to the SDI I/P BNC. This can then be selected from the front panel menu or over DART. It can also be selected by suitable programming of the GPIs.

If the SDI input is selected then no squeezing takes place. The signal is passed through to the output, with audio embedded as required with no further processing.

If the input fails then the unit will continue to operate with its own internal oscillator. While this has little benefit for the demultiplexing, it does mean that multiplexing will continue to operate and embed audio. If or when the SDI input returns then the unit will return to using the video. Note that these transitions to operation with and without an SDI input are not clean and glitch free.

5.3.4 Squeezer: Input Fail

What the squeezer does with an input fail depends on which input is selected and the mode:

Selected I/P Mode	I/P Fail effect
CVBS I/P, DC Mode	Free run oscillator, Digital Black
CVBS I/P, AC Mode	I/P Fail can't be detected. Free-run, random picture.
SDI I/P	Free run oscillator, Digital Black

In all cases the audio embedding will continue, but there may be a disturbance as the video signal fails and is re-established.

5.3.5 Squeezer: Standard, Reference and Locking

There is no external video reference to this module. It normally derives all its timing information from the selected video input and mode. For CVBS I/P in DC mode the CVBS signal provides the reference and the clock and SDI video is directly related. If in AC mode then the internal oscillator free-runs and the operating standard must be set through the Engineering menu as discussed in section 5.3.1.

If the SDI input is selected then the reference is derived directly from the SDI input.

In both the CVBS DC Mode and SDI inputs, the standard is also detected from the input signal. Normally the unit operates from this standard but it can be overridden in the Engineering menu:

```
ENG'ING    Format     Fmt Auto
                      Fmt S625
                      Fmt S525
```

It is also possible to set the reference source away from the video input. In particular it can be set to the primary AES input, in which case the video will automatically switch to digital black. This can be useful for sending embedded audio over an SDI link without the need for an actual SDI input. The AES A input is always used as the reference. The reference source is selected in the Engineering menu:

```
ENG'ING    Ref Src        Auto
                           AES
                      Free-run
```

For the vast majority of situations this should be left in **Auto**.

When the reference is set to **AES** the output will automatically be set to Black.

5.3.6 Expander: Reference and Locking

The Expander is much simpler than the Squeezer in terms of reference since there is only an SDI input. In practice this is always used as the reference for both the standards and the locking source. Although it is possible to change the reference source just like in the Squeezer on the Engineering menu this will virtually never be used since there is little point in de-embedding audio without a SDI input. The menus are given here for completeness:

```
ENG'ING    Ref Src        Auto
                           AES
                      Free-run
```

Similarly there is little point in taking the V6759 out of AUTO standard detection, but it can be done. Perhaps there is downstream equipment that cannot tolerate wrong standard signals. For completeness the menu is given here:

```
ENG'ING    Format     Fmt Auto
                      Fmt S625
                      Fmt S525
```

5.3.7 Test Patterns

Both units are able to generate a small number of Test Patterns. These are useful mainly for test and alignment. The choice of Test Pattern can only be done locally through the front panel, but the selection of it to be On or Off can also be done through DART.

In both cases the test pattern is generated on the video sub-module. It is important to note that on the V6757 this means that it is generated in place of the CVBS input, so it is only selected along with CVBS. If you select the SDI as input you will not get the test pattern on the output. Similarly on the V6759 it is generated at the CVBS output stage. This means that it will not appear on the SDI output.

There are two menus on the Engineering page for selecting the test patterns. The first one selects how they are displayed:

ENG'ING	**TP Sel**	**TP OFF**	
		TP ON	
		TP Split	Useful for ADC calibration

The second page selects which Test Pattern to display:

ENG'ING	**TP Type**	**TP 1**	Staircase
		TP 2	Limit Ramp
		TP 3	Shallow Ramp
		TP 4	Frequency Sweep
		TP 5	White
		TP 6	Black
		TP 7	Black
		TP 8	Black
		TP 9	Black
		TP 10	Black
		TP 11	Black
		TP 12	Black
		TP 13	Black
		TP 14	Black
		TP 15	Black

Note that **TP Sel** can be controlled either locally or over DART, but **TP Type** can only be controlled locally on the front panel although the unit does not have to be in Local Mode.

5.3.8 CVBS Squeezing - Timing

The purpose of the CVBS Squeezer is to fit a full width analogue video line into an SDI active video line. In principle this entails sampling the video at 13.5MHz to a resolution of at least 12 bits and then fitting this into the D1 active lines that carries 1440 samples at 27MHz. The extra bandwidth of D1 is used to carry the extra amplitude resolution of the analogue waveform.

In the case of 625/50 there are 864 samples at 13.5MHz in a full line, which are squeezed into 1296 D1 words; this is within the 1440 available in the active line. It may be noticed that the ratio is 3:2, or more conveniently 6:4. This means that we use 6 D1 samples (at 10 bits) to carry every 4 samples of analogue (at least 12 bits – we actually allow 14 bits).

The following table demonstrates how the bits are transferred:

Analogue:	A[13.0]	B[13..0]	C[13..0]	D[13..0]

Digital:	A[3..0] B[3..0]	A[13..4]	B[13..4]	C[13..4]	C[3..0] D[3..0]	D[13..4]
Sample type:	**C**	**Y**	**C**	**Y**	**C**	**Y**

It is deliberate that all the Y type samples contain MSB data. This means that the picture is recognisable on a picture monitor or waveform monitor, particularly if they are set to monochrome. The MSB data is limited to ensure that no illegal codes are produced.

Care is taken in the actual allocation of bits to ensure that no so-called illegal codes are generated.

Since every input line is sampled and squeezed onto the active portion of each line it is **essential** that none of the lines are blanked. This means that none of the processing equipment in the SDI chain between the Squeezer and the Expander can apply any vertical blanking.

It is also essential that the signal is not processed in any form which changes any timing relationship, such as DVE, Standards Conversion etc.

Any Keying operation may have some unexpected results.

5.3.9 CVBS Squeezing - Levels

The Squeezing system has been designed to incorporate an analogue signal as conveniently as possible with the SDI frame but so as to be viewable in monochrome form. This has meant allowing sufficient headroom for a full 100% colour bar signal, which is much higher than the classic 700mV of maximum white in a YCbCr system. Similarly we have had to allow for a full synchronising pulse which is considerably below black level. Fortunately, by allowing for 14 bits for each sample, we can accommodate a lot of headroom. In fact the system can handle a full analogue PAL signal at +6dB of its normal level, as would happen with an unterminated signal, without any clipping. The following table shows how the analogue levels are carried in the D1 stream. Both the full values, and the 10 MSBs are given. It is the 10 MSBs which are measurable on a D1 waveform monitor.

One of the advantages of having a wide amplitude tolerance is so that the system can handle AC connected signals, and still cope with a step change in signal content without temporary clipping.

Signal	mV	14 Bits Dec	10 Bits Dec	10 Bits Hex
Peak Yellow s/c, +6dB	1868	4013	1003	3EB
White, +6dB	1400	3264	816	330
Peak Yellow s/c	934	2518	629	275
White Level	700	2144	536	218
Black Level	**0**	**1024**	**256**	**100**
Sync Tip	-300	544	136	88
Sync Tip, +6dB	-600	64	16	10

5.3.10 SDI Viewing

It is an integral feature of the squeezing algorithm that the video picture is recognisable and viewable on both waveform monitors and picture monitors even in the SDI domain. This is because the luminance channel carries only the more significant bits. The chrominance channels carry the remainder, and will not look recognisable.

For best results the picture monitor should be set monochrome.

For most applications the Squeezer will be operating in a DC mode so that the SDI signal is locked to the CVBS input. In this case the picture will be stationary within the SDI scanning frame. However if the Squeezer is operating in an AC mode then there is no fixed relationship between the CVBS and SDI. In this case the analogue video may well appear to moving within the SDI, or even be completely unlocked, especially if it is of a different standard. But don't worry – it comes good again after expansion.

With a conventional CVBS input, and operating in DC mode, the monochrome channel on a SDI waveform will appear to be carrying the analogue signal, including syncs and burst, squeezed into the active line and sat up quite high.

5.3.11 Expander: CVBS Output

There is a single CVBS output from the Expander on the standard rear panel. If an original type of rear panel, intended for the V6x5x series, is used then two outputs are available on the HDD connector. See section 3.3.3.

5.3.12 Analogue GPIs

The Squeezer Expander system allows for the transmission of three analogue GPIs along with the analogue video. The same inputs are used as for the digital GPIs described in section 5.10.1. If any the analogue GPIs are to be used then the corresponding digital one should be disabled on both the Squeezer and Expander.

Each GPI input is 1 bit sampled at 36 times the line rate, approximately 560kHz, thus can carry time varying signals up to about 256kHz. It is important to note that there is virtually no pre- or post-sampling filtering so any time varying signal will suffer from aliassing. In many cases this will not matter, for example the system has been shown to carry high speed RS232 signals.

The sampled GPI signals are time compressed and inserted at the end of each active video line. They appear on the screen as a brightish white marker immediately before the EAV TRS.

On the V6759 Expander they are automatically extracted and appear on the GPI outputs as TTL signals.

5.3.13 Ancillary Blanking

The ancillary data area can be blanked on the selected SDI signal. The blanking takes place in a different place in the signal chain depending on the type of module.

It is not possible to selectively blank different types of ancillary data – either all is passed or all is blanked. Therefore there is no point in blanking the data at the front end of a Demultiplexer, since this would remove the data to be demultiplexed. The blanking is applied as follows:

V6757 Squeezer	Input
V6759 Expander	Output

The Block Diagrams in Section 4 show this process in more detail.

5.3.14 Vertical Interval

The vertical interval of the SDI signal is always passed. There is no separate processing of the vertical interval any differently to the active picture.

Since the squeezed data exists on every line, not just the active ones, it is essential that the vertical interval is not blanked or processed in any equipment between the Squeezer and the Expander.

5.3.15 TRS Signals

The digital TRS signals (Timing Reference Signal) are regenerated by the modules. This means that any minor errors on the input will be corrected.

The output TRS signal is always 10 bit compatible.

5.3.16 EDH

The EDH data is usually regenerated on the output. This is particularly important on the multiplexers since the data will have changed. It is possible, on the Engineering menu to disable the EDH generation.

Note that if using an SDI input and the ancillary data is not being blanked (either before or after the embedding operation) then any existing EDH data will pass through to the video output processing section. This means that if the EDH generation is turned off then the existing EDH data will probably be incompatible with the video data. This may cause an error to be indicated on following equipment.

5.3.17 Illegal Codes

The V6757 Squeezer with a CVBS input will not generate any illegal codes when operating. However during operating transitions, such as changing standards or reference source some disturbances may occur, but this will not include any illegal codes apart from mis-placed TRSs.

Similarly when operating with an SDI input the TRS and EDH data are generated, but no processing is done to detect or remove illegal codes within the input video.

On the V6759 the TRS and EDH data are generated, but no processing is done to detect or remove illegal codes within the input video.

5.4 FIBRE OPTICAL I/O

5.4.1 General

Generally, but not necessarily, the squeezing module (V6757) will be fitted with fibre optic transmitters and the expanding module (V6759) with receivers. Using the Main Level STATUS menu it is easy to see which is fitted. If this menu appears then a receiver is fitted:

```
STATUS   Fibre Rx
```

Alternatively if this appears then a transmitter is fitted:

```
STATUS   Fibre Tx
```

5.4.2 Fibre Transmitter (TX)

The Fibre Optic I/O is provided by the sub-module mounted in M1. Only one module can be fitted and it will be either a transmitter or a receiver. The transmitters are all Laser based and there is a choice of type and wavelengths. There are two types of laser for this type of application – **F**abry **P**erot (FP) or **D**istributed **F**eed**B**ack (DFB). The FP lasers are available in two nominal wavelengths – 1310nm and 1550nm, while the DFB lasers are available in a much wider range.

The advantage of having different wavelengths is that several optical signals can be combined together for transmission over a single fibre. This combining, known as **C**oarse **W**avelength **D**ivision **M**ultiplexing (CWDM) is done in dedicated blocks designed for specific wavelengths. At the receiving end complimentary blocks split the light onto several individual fibres according to their wavelength which go to the receivers. Thus the receivers can be wideband and do not need to be wavelength specific.

The standard lasers used on these modules are 1310nm (FP) and 1550nm (DFB). These are ideal for single operation or with a 2 way CWDM combiner since the wavelength separation is relatively wide. However the standard 1550nm (DFB) is not suitable for the finer spacing of bigger combiners, such as 9 ways. Therefore there is a separate selection. The full range of available lasers is:

Wavelength	Type	Comments
1310 nm	FP	Standard
1550 nm	DFB	Standard
1410 nm	DFB	for CWDM
1430 nm	DFB	for CWDM
1450 nm	DFB	for CWDM
1470 nm	DFB	for CWDM
1490 nm	DFB	for CWDM
1510 nm	DFB	for CWDM
1530 nm	DFB	for CWDM
1550 nm	DFB	for CWDM
1570 nm	DFB	for CWDM
1590 nm	DFB	for CWDM
1610 nm	DFB	for CWDM

There can be a problem with optical power into receivers (see below). If the TX power needs to be changed see section 3.8.7.

5.4.3 Fibre Receiver (RX)

There is only one type of Fibre Receiver, based on a wideband photodiode. If CWDM is being used then an external splitter is required to extract the single wavelength for the receiver.

There can be a problem with excessive optical power as an input to any optical receiver. All receivers should specify their Saturation Power (see section 3.5.2 for these receivers) and it is important not to exceed this for reliable data transmission. For a given transmitter power, followed by any combiner losses (such as in CWDM combiners and splitters) and fibre cable losses there will be a maximum receiver power. If this exceeds the saturation power then you need to either use an optical attenuator or reduce the transmitter power. On the TX modules in this range this can be done as described in section 3.8.7.

5.5 AUDIO GROUPS

Audio is embedded into a digital video signal by occupying the horizontal blanking interval. Within the analogue world this is where the sync pulse and burst would appear. These are not required for digital signals because an embedded Timing Reference Signal (TRS) is used at the start and end of the active video. The TRS is a short burst of data which defines the pixels, lines and fields.

The horizontal interval is slightly different for the 525/60 and 625/50 formats. 525/60 has 268 samples at 27MHz, while 625/50 has 280.

This horizontal blanking is available on every line in the signal, not just the active part, and can be used for lots of data, not just audio.

Most broadcast audio is sampled at 48kHz to a resolution of at least 20 bits. Other sample rates are sometimes used, but are usually converted to 48kHz before embedding. This is what the V6757 does. The audio is also usually grouped into pairs. These may be separate language services, or stereo pairs, but are usually routed and processed together.

The most common way of carrying digital audio is as an AES signal. This contains a pair of audio signals each with a word width up to 24 bits and associated channel status data. It is this signal which is embedded into the video signal.

Audio is embedded into any one of four groups, known as Group 1 to Group 4. Each group carries two AES signal (i.e. four audio signals). All groups can be embedded but there can be only one embedding of each group. Thus if a signal already contains a Group 1 then you cannot embed another Group 1 without removing the first one.

With the audio data rate at 48kHz and the video line rate at 15.625kHz (for 625/50 format) there needs to be, on average, 3.072 samples added to each line. This means that most lines have 3 samples while some need 4. (In fact the specification requires some lines to not have any data at all, so there are more '4 sample lines' than may be expected.) Each AES signal occupies 6 video samples (because the video samples are 10 bits wide while the audio with its data is about 27) so a '4 sample line' with two AES signals will need 48 samples. Four groups then require at least 192 samples.

This is a simplification, by not including some overheads, and does NOT allow for extended audio up to 24 bits. When all this is included then it can be shown that four full resolution groups can be fitted into a 625/50 signal, but may be truncated when fitted into a 525/60 signal. As a general rule four groups of full resolution data should not be used on 525/60 signals. If the signals being transmitted are only 20bits wide then there is no problem with four groups in 525/60 systems.

All the groups, and any other ancillary data, must be concatenated. There should not be any gaps so it is easy for subsequent equipment at add more data. It is not generally possible to remove any particular block of data, only to wipe the whole area clean.

Despite a detailed standard there are several variants as to how embedded audio is related to the video in terms of sampling frequency. Much equipment requires the two sampling frequencies for video and audio to be synchronous to one another. While they are clearly different values, 27MHz and 48kHz, to be synchronous they should have a common generating frequency such that there are an exact number of audio samples for each video frame(s):

625/50	1920 samples per frame
525/60	8008 samples per 5 frames

When an analogue audio signal is being used it is a simple matter to ensure that the ADC sampling frequency is locked to the video, but this is harder with a digital input. On the V6757 the Digital input module has high quality re-sampling filters which ensure that the embedded audio is synchronous.

5.6 AUDIO MULTIPLEXING

The audio can be embedded into any one of the four available groups. It is not possible to embed onto an already existing group unless the video signal has its ancillary data blanked. This can be done in the module.

To blank the incoming ancillary data go to:

ENG'ING	**Anc Data**	**Anc Blnk**	Ancillary blanked – default condition
		Anc Pass	Ancillary passed

There is nothing to actually stop you embedding onto an existing group, but there is a banner on the top level to indicate the error. It is possible to see what is on the incoming video on the status menu as below:

STATUS	**I/P Grps**	**None**	Indicate no audio
		1 2 3 4	Indicate the channels that are present. A small 'E' will indicate if they are extended to 24 bits.

The V6757 can embed onto all four groups

MAIN	**AB MUXGp**	**AB Gp -**	No Group – Default
		AB Gp 1	Group 1
		AB Gp 2	Group 2
		AB Gp 3	Group 3
		AB Gp 4	Group 4
MAIN	**CD MUXGp**	**CD Gp -**	No Group – Default
		CD Gp 1	Group 1
		CD Gp 2	Group 2
		CD Gp 3	Group 3
		CD Gp 4	Group 4

5.7 AUDIO DEMULTIPLEXING

On the V6759 audio can be extracted from any two of the four groups. They can both be set to the same group. There is no problem with multiple groups on demultiplexing, but it is possible to remove all the ancillary data from the output video. This is done after the de-embedding so does not affect the audio. If a group has been multiplexed more than once onto the video, then the demultiplexer will not recognise this, but produce bad output audio.

To blank ancillary data on the video output go to:

ENG'ING	**Anc Data**	**Anc Blnk**	Ancillary blanked – default condition
		Anc Pass	Ancillary passed

It is possible to see which if any of the groups on the input are occupied:

STATUS	**I/P Grps**	**None**	Indicate no audio
		1 2 3 4	Indicate the channels that are present. A small 'E' will indicate if they are extended to 24 bits.

The V6759 can de-embed from all four groups

MAIN	**AB DMXGp**	**AB Gp 1**	Group 1
		AB Gp 2	Group 2
		AB Gp 3	Group 3
		AB Gp 4	Group 4
MAIN	**CD DMXGp**	**CD Gp 1**	Group 1
		CD Gp 2	Group 2
		CD Gp 3	Group 3
		CD Gp 4	Group 4

5.8 AUDIO PROCESSING

The Block diagram in section 4.4 will help explain the flow of audio processing.

5.8.1 Input Processing

The input processing is only available with the Audio Processing option (AP). It allows for setting the gains of each input channel and set-ups within each pair.

For gains go to:

AUDIO	**A IPGain**
	B IPGain
	C IPGain
	D IPGain

All gains are adjustable from –16.00dB to +15.875dB in 0.125dB steps. The default setting is 0dB.

Each channel pair can be set up in various ways. It is not possible at this stage to move signals from one pair to another but a full facility is allowed within each pair. Go to:

AUDIO	**A Setup**	**Normal**	
		L Both	Channel 1 to both Channels 1 and 2
		R Both	Channel 2 to both Channels 1 and 2
		LR Swap	
		Mono	
		L Only	Channel 2 to mute
		R Only	Channel 1 to mute
		Off	Both channels to mute

The other four channels, B, C and D, are similar.

5.8.2 Routing

The routing section is only available with the Audio Processing option (AP).

The routing section allows for different selection and combinations to be applied to each output pair. Again it works with the A, B, C and D pairs (the dual units only have access to the A and B channels). There are sixteen different combinations for each which allows for all permutations and combinations. On the front panel the order of the selections may be different for each channel, so that the default is always first, but all combinations are available.

AUDIO	**A O/P**	**A**
		B
		C
		D
		A+B
		A+C
		A+D
		A+B+C
		A+B+D
		A+B+C+D
		A+C+D
		B+C
		B+D
		B+C+D
		C+D
		OFF

Channels B, C and D are similar.

The dual unit, V6753, only has A and B outputs so the selection is a bit less versatile:

AUDIO	**A O/P**	**A**
		B
		A+B
		OFF

5.8.3 Output Processing

The output processing is only available with the Audio Processing option (AP).

It allows for setting the gains of each output channel.

For gains go to:

```
AUDIO     A OPGain
          B OPGain
          C OPGain
          D OPGain
```

All gains are adjustable from –16.00dB to +15.875dB in 0.125dB steps. The default setting is 0dB.

5.8.4 Channel Status

Channel Status data (CS) is an integral part of the digital audio AES specification. It allows certain parameters of the AES signal to be included to assist with downstream processing. In general there are two ways to handle the CS; either pass through untouched, as would happen with a DA for example or regenerate, which must be done if the signal has been significantly processed.

In the multiplexing sections of the V6757 we either create the digital audio direct from analogue in an ADC or we re-sample a digital input. In both cases it is necessary to re-create the CS bits.

Because in the past there has been difficulty in guaranteeing the quality of the CS data in the broadcast environment, and that the V6757 can easily mix and combine audio from different source it has been decided to always re-generate the CS bits. The regenerated CS bits include the module type number as the Origin Data.

5.8.5 Maximum Audio Level (MAL)

The Maximum Audio Level (MAL) is a way of setting how digital audio is represented in the digital domain. The MAL is that level of audio, relative to 0dB in the analogue domain, which is at the limit of the digital gamut. Any more would result in clipping. It has to be applied correctly at the analogue and digital interfaces – ADCs and DACs.

While the V6757/59 can have ADCs and DACs there is only one MAL setting. If a purely digital interface is fitted then it has no meaning and cannot be set. With an analogue module it can be set by going to:

AUDIO MAL +18dB Default is +18dB. Adjustable from +12 to +24dB in 1dB steps

The MAL is sometimes referred to as a negative number. This often refers to a particular signal level relative to maximum, for example tone. MAL, as used here, is a better description.

Changing the MAL has opposite effects on the ADC and DAC. Increasing the MAL on the ADC increases the headroom and therefore reduces the apparent signal level. This is counter-intuitive. On the DAC increasing the MAL implies that the digital signal has more headroom, and therefore it will increase the output level. This is intuitive. Setting the MAL should be done system-wide within an installation and not used as a gain control.

5.9 OPTICAL PROCESSING

As discussed earlier only one optical sub-module can be fitted. It is either a transmitter or a receiver and should always be fitted at the factory.

If it is a transmitter then it will always process a copy of the electrical SDI outputs. There are no user controls. The only status feedback is the Laser condition. The module contains some optical feedback that monitors the condition of the laser, and should this fail then it can be read on the **STATUS** menu. It can also be read over the remote control system.

STATUS Fibre TX

If a receiver is fitted then the output can be monitored on the **STATUS** menu, which will indicate if an optical signal is being received.

STATUS Fibre RX

The SDI signal from the optical receiver shares a resource with the SDI 2 input. Thus it is not possible to operate in Video Split mode with SDI 2. The split will always use SDI 1 and SDI 2 or SDI 1 and Fibre.

It is essential that the unit is aware that a Fibre receiver is fitted, so that it is possible to select Fibre as the input on the front panel. This is set on the **CONFIG** menu using a Password, as described in section 5.11.

5.10 SYSTEM

5.10.1 Digital GPIs

The V6757/59 modules have three GPI inputs so that external hardware can simply select certain parameters. The GPI inputs all have a 47k pull-up resistor to +5V, and the external hardware should take the pin to Ground to activate the GPI. The GPI input is on the rear panel HDD connector. See section 3.3.4 for the actual pinout details.

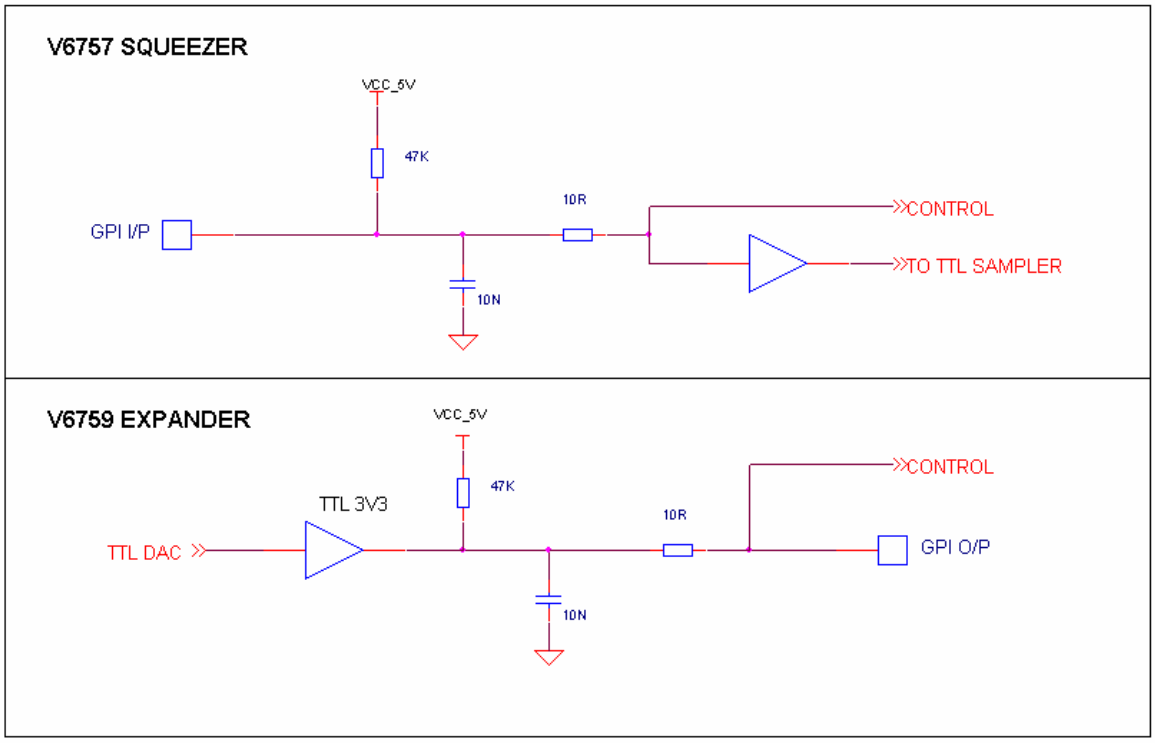
The options for the three GPIs are as follows:

CONFIG	**GPI**	**OFF**	GPI disabled
		SDI 2	Select SDI 2, if available by link setting.
		A Mono	
		B Mono	
		AB Mono	
		C Mono	
		D Mono	
		CD Mono	
		A LR Rev	
		B LR Rev	
		C LR Rev	
		D LR Rev	
		AB Swap	
		CD Swap	

These GPI operation do not necessarily have a one to one relationship with front panel or DART commands. They are intended to provide useful hardware control functions.

5.10.2 Analogue GPIs

Apart from the digital GPIs for controls the V6757/59 combination also has three analogue GPIs. These share the same pinouts as the digital GPIs so there is some interaction. The circuits below show how the GPIs are connected for both modules.



On the V6757 Squeezer the GPI input pin feeds both the standard digital GPIs and the sampler on the sub-module. If they are being used for an real time varying signal over the link, then the digital GPIs should be disabled on the **`CONFIG: GPI`** menu. All three GPIs can be used independently. There is no reason why one can't be used for analogue while the other two are for digital.

On the V6759 Expander the analogue signal comes as an output from the sub-module, but this is still an input to the digital GPI processing on the main board (labelled CONTROL in the drawing above). To avoid strange results the digital GPIs should in general be turned off.

5.10.3 VCO Centre Frequency

Normally, the video output is locked to the video input, if present. If there is no signal connected then the output will free run at the nominal centre frequency of the on board crystal. This centre frequency can be adjusted under the **`CALIB`** : **`CntrFreq`** menu, but this should not normally be necessary in the field. It will be necessary first to put the unit into its calibration mode by selecting:

`CALIB` : **`Cal Mode Cal On`**

5.10.4 Version Numbers

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

`STATUS`	**`Soft Ver`**	**`0.00.00`**	The operating code
`STATUS`	**`FPGA Ver`**	**`0.00.00`**	The FPGA data
`STATUS`	**`PCB Ver`**	**`0.00.00`**	The hardware version of the PCB
`STATUS`	**`Vid FPGA`**	**`0.00.00`**	The FPGA data on the video sub-module
`STATUS`	**`Vid PCB`**	**`00`**	The hardware version of the video sub-modulePCB

5.10.5 Display Sleep

Since, for the vast majority of their life, these modules will operate behind the front panel of a rack frame the display on the local front panel will not be visible so it will go to sleep after a certain time. This timeout delay can be changed on the **ENG'ING** : **Sleep** menu to be anything between 0 and 30 minutes; 0 minutes means that it will stay on indefinitely. The sleep timeout always counts from the last front panel button push. The default time is 5 minutes.

The panel can also be forced into its sleep mode by moving up a level from the Top Level menu which displays the module type, **V6751** etc.

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

5.10.6 Display Brightness

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

ENG'ING LEDLevel ▮▮▮▮

5.11 FIBRE CONFIGURATION

Most of the configuration functions, such as the use of the GPIs or the banner, have been described elsewhere. However one may, exceptionally, need to be done in the field.

It is important that the system is aware whether the optical module is a Transmitter or a Receiver. This is set under Configuration. Go to:

CONFIG Password 0

Now follow this sequence:

Action	Display	Comments
▼and ▲	**30000**	Press & hold together.
▼or ▲	**29876**	This is the actual Password
Select+Hold	**Password**	UP to the Sub Menu level
▼	**Variant**	
▼	**AudioOpt**	
▼	**DelayOpt**	
▼	**OpticOpt**	This is the parameter we are going to.
Select	**FibreRx**	
▼or ▲	**FibreTx**	Set to FibreTx or Fibre Rx, as required.
Select+Hold	**OpticOpt**	
Select+Hold	**CONFIG**	

Without practice this procedure may appear complicated, but it should not need to be done very often, if ever. Once you have set the Password you can only go into one parameter. So if you drop down into DelayOpt, say, by mistake, then you will have to set the Password again.

If you have set the module to be a Transmitter, then you should also set up the wavelength. This is done in **LaserTyp** which is the next menu below **FibreTx**. This menu will not be present if the sub-module is a receiver. Setting the wavelength is not password protected because it is used for information only and does not affect the unit's operation.

6. CALIBRATION

This section describes how to calibrate the unit as it is done in the factory. The modules do not contain any potentiometers, but like most equipment with analogue parts still needs to be calibrated. Normally this calibration is done in the factory and should not need to be repeated in the field but this section describes the procedure and is included for completeness.

High quality, calibrated test equipment should be used for this calibration. Note that it is not possible to return to the pre-calibration settings other than by making a note of the values and re-entering them.

6.1 SET-UP

There is a separate Main Level Menu for Calibration and this should be used throughout. The first sub-level menu is Cal Mode which can be used to turn calibration ON:

CALIB	**Cal Mode**	**Cal Off**
		Cal On

The calibration mode must be turned ON before any parameter can be adjusted. The calibration mode will be turned OFF in one of four ways:

1. Manually on the **CALIB** : **Cal Mode** menu.
1. By going up to the Top Level Menu
2. By re-powering the unit.
3. By letting the display timeout and go to sleep mode.

When the calibration mode is ON then the unit will automatically set up the required conditions in the unit as you enter each sub-menu. For example if you go into the CntrFreq sub-menu the unit will automatically go into free run.

To do any calibration the module must be in LOCAL mode.

6.2 FREE-RUN FREQUENCY

The modules have a voltage controlled crystal oscillator which is usually locked to the external video reference or to the input video. However if there is no input or reference then it will free-run and this free running frequency should be set. The oscillator is not accurate enough to be used as a frequency reference but nevertheless should be set close to the ideal so that any succeeding SDI equipment will be able to lock to its output, and so that when in free run it will only drift slowly away from its starting reference.

To calibrate the frequency set the unit into Free Run by turning Cal Mode ON and selecting the CntrFreq sub-menu.

CALIB	**Cal Mode**	**Cal On**

Now monitor the clock frequency on TP 14, or compare the output picture movement on a monitor with an accurate external reference and adjust the frequency on.

CALIB	**CntrFreq**	Range is –127 to +128

The setting is stored on the unit in non-volatile memory, and should not need regular adjustment.

Note that when you select **CntrFreq** the unit automatically generates Black and disconnects the input signal.

6.3 AUDIO ADC X(Y)

This is used to calibrate the audio ADC sub-module, if fitted. If there is no audio module, or a digital audio module is used then this menu does not appear. X is A to D, and Y is L or R.

This menu is read only until Cal Mode is turned ON (see above).

There are usually 8 menus: Left and Right for channels A, B, C and D.

The ADC should be calibrated using a very accurate, broadcast quality analogue tone generator and then viewing the embedded digital audio in the digital domain. When measuring the digital tone level it is important to understand the meaning of the Maximum Audio Level (MAL) which defines how the analogue level fits into the digital space.

6.4 AUDIO DAC X(Y)

This is used to calibrate the audio DAC sub-module, if fitted. If there is no audio module, or a digital audio module is used then this menu does not appear. X is A to D, and Y is L or R.

This menu is read only until Cal Mode is turned ON (see above).

There are usually 8 menus: Left and Right for channels A, B, C and D.

The DAC should be calibrated using a digitally generated embedded tone. This could be through an embedder with a digital input or directly from an embedded test signal generator.

Care should be taken to ensure that the input of the signal analyser is set to high impedance for accurate readings. When measuring the tone level it is important to understand the meaning of the Maximum Audio Level (MAL) which defines how the digital space is transferred to analogue levels.

6.5 V6757: VIDEO ADC

This is used to calibrate the ADC on the Squeezer sub-module.

This menu is read only until Cal Mode is turned ON (see above).

It is important that an accurate standard level video source is available from a suitable test signal generator. It should carry a predominantly monochrome signal with black and peak white.

In Engineering set the Test Patterns to Split and select Staircase, TP 1. Observe the Y channel of the SDI output on a SDI waveform monitor. The top half of the picture will be the external signal, while the bottom half will be the test signal. With the waveform monitor in Line mode, the two signals will appear to be overlaid.

First adjust the **VADC DC** so the black levels of the external and test signal are co-incident.

Then adjust the **VADCGain** so the white levels of the external and test signal are co-incident.

6.6 V6759: VIDEO DAC

This is used to calibrate the DAC on the Expander sub-module.

This menu is read only until Cal Mode is turned ON (see above).

Since the test signal can be generated internally in the digital domain it is not necessary to have an accurate generator, but it is important to have a high quality analogue video waveform analyser which can measure video amplitudes to an accuracy of ±1mV.

In Engineering set the Test Patterns to On and select Staircase, TP 1. Observe the CVBS output on a waveform monitor.

Adjust the menus as follows:

	Signal	625/50	525/60
VDAC DC	Black:	0V	40IRE
VDACGain	White:	700mV	100IRE

7. TROUBLE SHOOTING GUIDE (FAQS)

This section is to be a help in solving some common difficulties with the V6757/59 Modules. If there is no control from the front panel first check that the switch is set to Local.

7.1 VIDEO

Symptom	Possible explanation
No Video Output, with SDI 1 selected	Check left SDI LED on front panel. If OFF then check that there is actually an I/P signal. If ON then check that SDI 1 is being selected. It is possible that the **RefSrc** has been set to **AES** or **FreeRun** which would also cause the O/P to be Black. Check for Black Test Pattern.
No Video Output, with Fibre selected	As above, but use the Right hand LED
No Video Output, with CVBS selected	Check that the correct Rear Module is being used (16VR3V),and a CVBS signal is connected.
O/P Black with all inputs.	Check **RefSrc** on the **ENG'ING** menu. If it is set to AES or FreeRun then the O/P will be set to black. Check for Black Test Pattern.
V6759 output has high chroma, and/or overshoots on luminance	Equaliser on V6757 is turned ON and set too high.
Can't select Fibre	Check that a Fibre receiver is fitted, and indicated under **STATUS**. It is possible that the unit has not been set up with a Fibre RX. In which case see section 5.11.
Downstream equipment can't lock to output when module is in free-run.	Check that the free-run frequency has been set. Go to : **CALIB Cal Mode** and set it to **Cal ON**. Then select **CntrFreq** and adjust. The normal setting should be between –50 and +50.

7.2 FIBRE

Symptom	Possible explanation
TX doesn't work in CWDM	Is the TX the right wavelength? Check in **STATUS** : **FibreTyp**. This is set in the **CONFIG** : **LaserTyp** menu. Is it set right? Has it been changed?
Can't select Fibre	Check that a Fibre receiver is fitted, and indicated under **STATUS**.

7.3 AUDIO

Symptom	Possible explanation
No audio output from V6759	Is the selected video input present? Check that the correct audio module is fitted, i.e. analogue or digital Check that the selected group(s) are actually present on the input. Either the top level indicator, or **STATUS: I/P Grps** will show this. Check that the audio hasn't been disabled in the Audio Processing.
Corrupted audio on V6757 O/P	Is there a group conflict? Are you trying to append to audio from a Tektronix TSG422 which does not perform to the specification? You must Blank out any audio from this generator.
No audio on V6757 output	Check that the correct input module is fitted , i.e. analogue or digital. Check that there is an AES signal present on **STATUS: AES AB** or **AES CD**. Check that you are monitoring the actual group(s) being used. Check that the audio hasn't been disabled in the Audio Processing.
Can't Anc Blank on a V6757	Check that the AB Group is set to multiplex. If the AB mux is disabled it is not possible to blank out any anc data on original video.

7.4 OTHERS

Symptom	Possible explanation
Display never goes to sleep	Check whether the Sleep delay has been set to 0 Mins which means stay awake.
A GPI does not work	Check for GPI priority. GPI 1 overrules GPI 2 which overrules GPI 3. Each one can be checked on **STATUS** : **GPI STA**.
Front panel can change but there is no control	The unit is probably in Remote mode. The panel is still live for monitoring.

8. FRONT PANEL MENUS

This is a reference section which shows all the menus available on V6757 and V6759.

Some menu items may only appear with certain configurations.

8.1 V6757 – CVBS SQUEEZER

V6757

MAIN	AUDIO	STATUS	ENG'ING	CALIB	CONFIG
Video	MAL[1]	Variant	Ref Src	Cal Mode	GPI 1
AB MUXGp	Norm	Options	Format	ADC A(L)	GPI 2
CD MUXGp		SDI I/P	CVBS EQ	ADC A(R)	GPI 3
Norm		SDI 2	TP Sel	ADC B(L)	Banner
		CVBS	TP Type	ADC B(R)	Password
		I/P Grps	CVBS Mode	ADC C(L)	Variant
		AB OPAud	Anc Data	ADC C(R)	AudioOpt
		CD OPAud	AB Bits	ADC D(L)	OpticOpt
		AES AB	CD Bits	ADC D(R)	LaserTyp
		AES CD	AB Mode	VADCGain	TestMode
		Fibre Tx[2]	CD Mode	VADC DC	
		Fibre Rx	A On/Off	CntrFreq	
		GPI STA	B On/Off	Norm	
		LaserTyp[3]	C On/Off		
		V Module	D On/Off		
		Vid FPGA	A Format		
		Vid PCB	B Format		
		A Module	C Format		
		Soft Ver	D Format		
		FPGA Ver	O/P EDH		
		PCB Ver	Sleep		
			LEDLevel		
			Norm		

[1] Analogue I/O only
[2] Only one of Tx or Rx will appear
[3] Only if an optical Transmitter is fitted

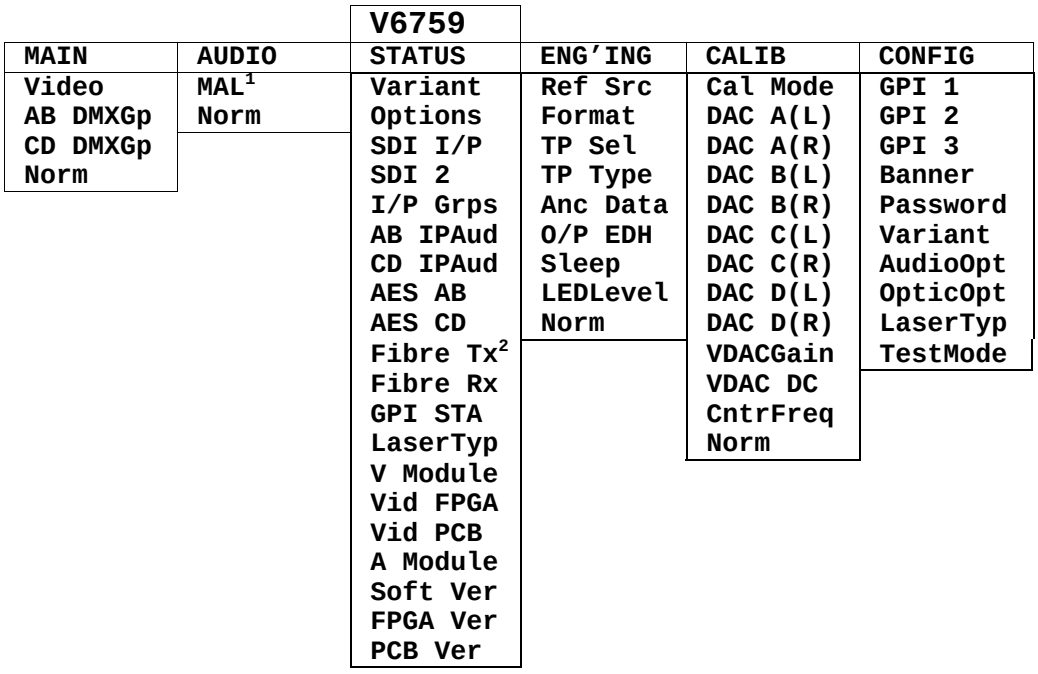
8.2 V6757AP – CVBS SQUEEZER WITH AP

V6757AP

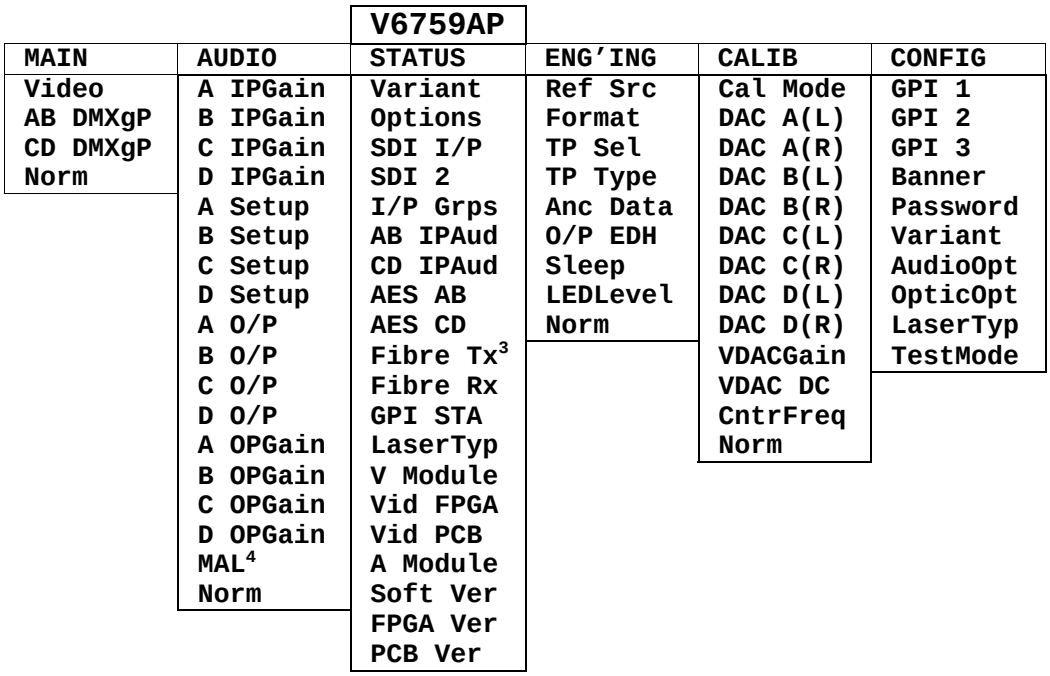
MAIN	AUDIO	STATUS	ENG'ING	CALIB	CONFIG
Video	A IPGain	Variant	Ref Src	Cal Mode	GPI 1
AB MUXGp	B IPGain	Options	Format	ADC A(L)	GPI 2
CD MUXgGp	C IPGain	SDI I/P	CVBS EQ	ADC A(R)	GPI 3
Norm	D IPGain	SDI 2	TP Sel	ADC B(L)	Banner
	A Setup	CVBS	TP Type	ADC B(R)	Password
	B Setup	I/P Grps	CVBS Mode	ADC C(L)	Variant
	C Setup	AB OPAud	Anc Data	ADC C(R)	AudioOpt
	D Setup	CD OPAud	AB Bits	ADC D(L)	OpticOpt
	A O/P	AES AB	CD Bits	ADC D(R)	LaserTyp
	B O/P	AES CD	AB Mode	VADCGain	TestMode
	C O/P	Fibre Tx[1]	CD Mode	VADC DC	
	D O/P	Fibre Rx	A On/Off	CntrFreq	
	A OPGain	GPI STA	B On/Off	Norm	
	B OPGain	LaserTyp[2]	C On/Off		
	C OPGain	V Module	D On/Off		
	D OPGain	Vid FPGA	A Format		
	MAL[3]	Vid PCB	B Format		
	Norm	A Module	C Format		
		Soft Ver	D Format		
		FPGA Ver	O/P EDH		
		PCB Ver	Sleep		
			LEDLevel		
			Norm		

[1] Only one of Tx or Rx will appear
[2] Only if an optical Transmitter is fitted
[3] Analogue I/O only

8.3 V6759 – CVBS EXPANDER



8.4 V6759AP – CVBS EXPANDER WITH AP



[1] Analogue I/O only
[2] Only one of Tx or Rx will appear
[3] Only one of Tx or Rx will appear
[4] Analogue I/O only

9. CONTROLS

These tables show a complete list of all the parameters that can be controlled locally for the various configurations. Unless otherwise shown they can also be controlled over the DART remote control system. Not all menus are available at any one time, since they depend on the module and which type of audio sub-module may be fitted, and sometimes on the operating conditions.

The tables also show the full range of the controls and their ranges and normalised value, if appropriate. The normalised value or setting is shown by the '**n**'.

9.1 VIDEO AND GROUPS - MAIN

MAIN	**Video**	**SDI 1**	n	
		SDI 2		If enabled on links
		Fibre		If Fibre RX module fitted
	AB DMXGp	**AB Gp 1**		
		AB Gp 2		
		AB Gp 3		
		AB Gp 4		
	CD DMXGp	**CD Gp 1**		
		CD Gp 2		
		CD Gp 3		
		CD Gp 4		
	AB MUXGp	**AB Gp -**		
		AB Gp 1		
		AB Gp 2		
		AB Gp 3		
		AB Gp 4		
	CD MUXGp	**CD Gp -**		
		CD Gp 1		
		CD Gp 2		
		CD Gp 3		
		CD Gp 4		

9.2 AUDIO PROCESSING – AUDIO

AUDIO	**A IPGain**	**+15.88dB**		
		⇓		
		+0.00dB	n	Resolution = 0.125dB
		⇓		
		-16.00dB		
	B IPGain		n	As A I/P Gain
	C IPGain		n	As A I/P Gain
	D IPGain		n	As A I/P Gain
	A Setup	**Normal**	n	
		A L Both		
		A R Both		
		ALR Swap		
		A Mono		
		A L Only		
		A R Only		
		A Off		
	B Setup			As A Setup
	C Setup			As A Setup
	D Setup			As A Setup
	A O/P	**A A**	n	
		A B		
		A C		
		A D		
		A A+B		
		A A+C		
		A A+D		
		A A+B+C		
		A A+B+D		
		AA+B+C+D		
		A A+C+D		

		A B+C		
		A B+D		
		A B+C+D		
		A C+D		
		A OFF		
	B O/P	B B	n	
		B A		
		B C		
		B D		
		B B+A		
		B B+C		
		B B+D		
		B B+A+C		
		B B+A+D		
		BB+A+C+D		
		B B+C+D		
		B A+C		
		B A+D		
		B A+C+D		
		B C+D		
		B OFF		
	C O/P	C C	n	
		C D		
		C B		
		C A		
		C C+A		
		C C+B		
		C C+D		
		C C+A+B		
		C C+A+D		
		CC+A+B+D		
		C C+B+D		
		C A+B		
		C A+D		
		C A+B+D		
		C B+D		
		C OFF		
	D O/P	D D	n	
		D C		
		D B		
		D A		
		D D+A		
		D D+B		
		D D+C		
		D D+A+B		
		D D+A+C		
		DD+A+B+C		
		D D+B+C		
		D A+B		
		D A+C		
		D A+B+C		
		D B+C		
		D OFF		
	A OPGain	+15.88dB		
		⇓		
		+0.00dB	n	Resolution = 0.125dB
		⇓		
		-16.00dB		
	B OPGain		n	As A O/P Gain
	C OPGain		n	As A O/P Gain
	D OPGain		n	As A O/P Gain
	MAL	+12dB		
		⇓		
		+18dB	n	
		⇓		
		+24dB		

9.3 OPERATING CONDITIONS – STATUS

STATUS	**Variant**	**V6751**		May have AP appended
		V6751Q		
		V6753		
		V6753Q		
		V6755		
	Options	**None**		
		Audio		
	SDI I/P	**IP 625 ✓**		
		IP 525 ✓		
		IP FAIL		
	CVBS	**IP 625 ✓**		V6757 Only
		IP 525 ✓		
	SDI I/P2	**N/A**		
		Avail		
	I/P Grps	**None**		No groups occupied.
	AB OPAud	**AB MUX OK**		AB Mux Group is available
		AB CONFL		AB Group Conflict
	CD OPAud	**AB MUX OK**		CD Mux Group is available
		AB CONFL		CD Group Conflict
	AES AB	**AES AxBx**		Indicates whether AES A and B are present or not. Applies to either Mux or Demux.
	AES CD	**AES CxDx**		Indicates whether AES C and D are present or not. Applies to either Mux or Demux.
	Fibre Tx	**OK**		operating normally
		Fail		Laser fail
	Fibre Rx	**NoSignal**		No optical input detected.
		Detected		Optical input OK
	GPI STA	**1↓ 2↓ 3↓**		↓ ⇒ Inactive. ↑ ⇒ Active.
	LaserTyp	**T1310**		TX Module with Standard 1310nm
		T1550		TX Module with Standard 1550nm
		T1410DFB		TX Module with CWDM grade 1410nm
		T1430DFB		TX Module with CWDM grade 1430nm
		T1450DFB		TX Module with CWDM grade 1450nm
		T1470DFB		TX Module with CWDM grade 1470nm
		T1490DFB		TX Module with CWDM grade 1490nm
		T1510DFB		TX Module with CWDM grade 1510nm
		T1530DFB		TX Module with CWDM grade 1530nm
		T1550DFB		TX Module with CWDM grade 1550nm
		T1570DFB		TX Module with CWDM grade 1570nm
		T1590DFB		TX Module with CWDM grade 1590nm
		T1610DFB		TX Module with CWDM grade 1610nm
	V Module	**None**		Not used on this series of module.
	Vid FPGA	**01.00**		
	Vid PCB	**00**		Video Module PCB revision
	A Module	**00:OP DD**		All Digital I/P module
		02:IP AA		All Analogue I/P module
		08:OP DD		All Digital O/P module
		10:OP AA		All Analogue O/P module
	Soft Ver	**01.00.00**		The operating code
	FPGA Ver	**01.01**		The Video FPGA data
	PCB Ver	**01**		The Main board PCB version.

9.4 ENGINEERING – ENG'ING

ENG'ING	Ref Src	Auto	n	
		AES		
		Free-run		
	Format	Fmt Auto	n	
		Fmt S625		
		Fmt S525		
	CVBS EQ	EQ OFF	n	
		EQ ON		
	TP Sel	TP OFF	n	
		TP ON		
		TP Split		
	TP Type	TP 1	n	
		|		
		TP 15		
	CVBSMode	DC Auto	n	
		AC 625		
		AC 525		
	Anc Data	Anc Blnk	n	
		Anc Pass		
	AB Bits	AB 20bit	n	
		AB 24bit		
	CD Bits	AB 20bit	n	
		AB 24bit		
	AB Mode	AB Synch	n	
		AB Async		
	CD Mode	CD Synch	n	
		CD Async		
	A On/Off	A On	n	
		A Off		
	B On/Off	B On	n	
		B Off		
	C On/Off	C On	n	
		C Off		
	D On/Off	D On	n	
		D Off		
	A Format	A Norm	n	
		A nonAES		
	B Format	B Norm	n	
		B nonAES		
	C Format	C Norm	n	
		C nonAES		
	D Format	D Norm	n	
		D nonAES		
	O/P EDH	EDH On	n	
		EDH Off		
	Sleep	5 min	n	Variable 0 to 30 minutes.
	LEDLevel	▓ ▓ ▓		

9.5 CALIBRATION – CALIB

CALIB	**Cal Mode**	**Cal Off**	n	
		Cal On		Must be set ON to enable correct conditions during calibration
	DAC A(L)	**-128**		
		+0	n	
		+127		
	DAC A(R)	**-128**		
		+0	n	
		+127		
	DAC B(L)	**-128**		
		+0	n	
		+127		
	DAC B(R)	**-128**		
		+0	n	
		+127		
	ADC A(L)	**-128**		
		+0	n	
		+127		
	ADC A(R)	**-128**		
		+0	n	
		+127		
	ADC B(L)	**-128**		
		+0	n	
		+127		
	ADC B(R)	**-128**		
		+0	n	
		+127		
	VADCGain	**-128**		
		+0	n	V6757 Only
		+127		
	VADC DC	**-128**		
		+0	n	V6757 Only
		+127		
	VDACGain	**-128**		
		+0	n	V6759 Only
		+127		
	VDAC DC	**-128**		
		+0	n	V6759 Only
		+127		
	CntrFreq	**Frq=-128**		Free-run Frequency
		Frq= +0		
		Frq=+127		

9.6 CONFIGURATION – CONFIG

CONFIG	**GPI 1**	**OFF**	n	
		SDI 2		
		A Mono		
		B Mono		
		AB Mono		
		C Mono		
		D Mono		
		CD Mono		
		A LR Rev		
		B LR Rev		
		C LR Rev		
		D LR Rev		
		AB Swap		
		CD Swap		
	GPI 2			As GPI 1
	GPI 3			As GPI 1
	Banner	**On**	n	
		Off		
	Password			
	Variant	**V6751QAP**		For example
	AudioOpt	**On**		
		Off		
	OpticOpt	**Fibre Rx**		Set Optical I/O – Password protected
		Fiber Tx		
	LaserTyp	**T1310**		TX module – 1310nm Standard
		T1550		TX module – 1550nm Standard (not for CWDM)
		T1410DFB		TX module – 1410nm DFB (OK for CWDM)
		T1430DFB		TX module – 1430nm DFB (OK for CWDM)
		T1450DFB		TX module – 1450nm DFB (OK for CWDM)
		T1470DFB		TX module – 1470nm DFB (OK for CWDM)
		T1490DFB		TX module – 1490nm DFB (OK for CWDM)
		T1510DFB		TX module – 1510nm DFB (OK for CWDM)
		T1530DFB		TX module – 1530nm DFB (OK for CWDM)
		T1550DFB		TX module – 1550nm DFB (OK for CWDM)
		T1570DFB		TX module – 1570nm DFB (OK for CWDM)
		T1590DFB		TX module – 1590nm DFB (OK for CWDM)
		T1610DFB		TX module – 1610nm DFB (OK for CWDM)
	TestMode	**Off**	n	
		On		Password required

9.7 TEST MODE – TEST

This section is not required for users, but is shown here for completeness.

It can only be accessed after turning Test Mode ON on the **Config** menu.

TEST	**Sync/Asy**	**Synch**	n	
		Asynch		
	AUD ERRA	**0000**	n	
		1F01		
	DMX STA	**00000000**	n	Demux Status
	Test			
	GENN AB			
	GENN CD			
	WReg0			
	WReg1			
	WReg2			
	WReg3			
	WReg4			
	WReg5			
	WReg6			
	WReg7			
	WReg8			
	WReg9			
	WReg10			
	WReg11			
	WReg12			
	WReg13			
	WReg14			
	WReg15			
	WReg16			
	WReg17			
	WReg18			
	WReg19			
	WReg20			
	RReg0			
	RReg1			
	RReg2			
	RReg3			
	RReg4			
	RReg5			
	RReg6			
	RReg20			
	A 8427			
	B 8427			
	C 8427			
	D 8427			

10. SOFTWARE VERSIONS

This table gives a brief summary of the various versions of software that have been issued with the corrections and improvements for each. This has been included in this manual so that users with earlier versions can understand when some facilities, or menu options may not appear.

VERSION	DATE	REMARKS
1.0	08-06-05	Initial Issue