VISTEK V1667, V1667/SY & V1667/SY-VHS 12-BIT PAL/NTSC TO SDI ADAPTIVE COMB FILTER DECODER USER GUIDE

www.pro-bel.com

Contents

1. GENERAL DESCRIPTION 4
2. INSTALLATION 5
2.1 Rear Panel Layout and Signal Connections 5
2.2 Frame Synchroniser Module (Optional) 6
2.3 Frame Synchroniser Delay 6
2.4 Insertion Delay 6
3. FRONT PANEL LAYOUT 7
3.1 Page/Parameter Map 8
4. FRONT PANEL DESCRIPTION (NORMAL OPERATION) 9
4.1 +V Indicator 9
4.2 REM Indicator 9
4.3 Video Standard Indicators / Selection of Video Standard 9
4.4 Parameter Indicators and Adjustment 9
4.5 Remote / Local Switch 10
5. TIMING PAGE (FRAME SYNCHRONISER) 11
5.1 Timing Page Entry 11
5.2 Timing Parameter Selection and Adjustment 11
5.3 Timing Page Exit 12
6. ENGINEERING PAGE 13
6.1 Engineering Page Entry 13
6.2 Engineering Parameter Selection and Adjustment 13
6.3 Engineering Page Exit 14
7. TECHNICAL SPECIFICATION 15
8. APPENDIX 16
8.1 On Board Adjustable Components 16
8.2 On Board Switches 16
8.3 VHS Input Option 17
8.3.1 Selection of VHS Decode Mode 17
8.3.2 Parameter Selection and Adjustment 18

8.4 An Introduction to Vislock Processing 18
8.4.1 What is VisLock? 18
8.4.2 How does it work? 18
8.4.3 Does the added data degrade my picture? 19
8.4.4 Will digital equipment in the path pass the VisLock signal? 19
8.4.5 How is VisLock Implemented? 19

1. GENERAL DESCRIPTION

The V1667 is a 12 bit broadcast quality multi-standard adaptive comb filter decoder, and forms part of the Vistek V1600 modular range of interface products. The 3U x 250mm card may be fitted into either the V1601 (1U) or V1603 (3U) 19" rack mountable enclosures, from which it derives its power. All signal inputs and outputs are made via a passive rear module.

In its basic form, without a Frame Synchroniser fitted (**V1667** product), the unit converts an analogue colour encoded composite video input to a 270Mbit component Serial Digital Video (SDV) output standard.

One of two Frame Synchroniser modules may be optionally fitted to the decoder. The standard Frame Synchroniser module (fitted on the **V1667/SY** product) permits the output of the unit to be timed up to an external reference, with a user programmable offset of up to ± 127 lines relative to the reference. The alternative module (fitted on the **V1667/SY-VHS** product) has the same functionality of the standard synchroniser module, but also offers the facility to decode non-timebase corrected signals, specifically the output of a VHS tape recorder.

VisLock processing may be optionally factory fitted to the card. VisLock processing is a patented method of converting an NTSC composite analogue signal to serial digital form (within the V1667), then subsequently re-converting back to NTSC (within a Vistek V1668 encoder) with negligible loss of picture quality.

The V1667 has a high impedance looping input, into which the analogue colour encoded input is presented. The card will detect, and consequently automatically decode, any of the standards listed below:-

PAL B, G, I, M, N
NTSC M, NTSC JAPAN
NTSC 443

The decoder may also be forced into any one of the specified standards, although it is generally recommended that the user leave the card set in automatic (**AUTO**) mode.

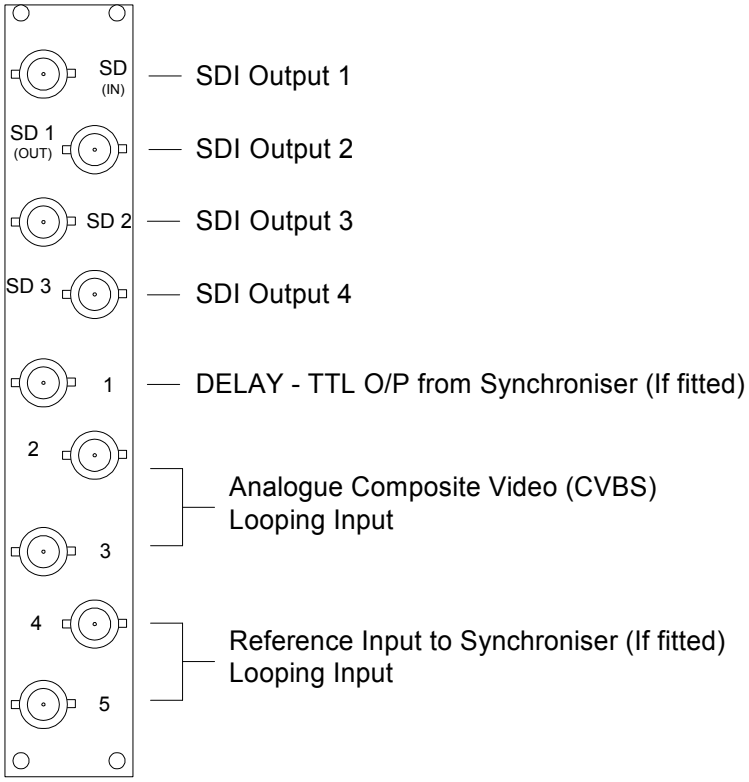
The V1667 has four 270Mbit component Serial Digital Video (SDV) outputs.

Front panel controls enable the user to set up/adjust various operating parameters, and if a Frame Synchroniser option is fitted they may be used to time the unit into an installation.

All parameter settings, for each standard, are stored in non-volatile memory. Thus a unit may be powered down without the settings being lost.

2. INSTALLATION

2.1 Rear Panel Layout and Signal Connections



BNC Connector	Input / Output Description	Comments
SD (IN)	SDI Output 1	Cable drive length:- up to 200 metres.
SD 1 (OUT)	SDI Output 2	Cable drive length:- up to 200 metres.
SD 2	SDI Output 3	Cable drive length:- up to 200 metres.
SD 3	SDI Output 4	Cable drive length:- up to 200 metres.
BNC 1	Delay O/P (TTL)	Only valid when a synchroniser sub-module is fitted.
BNC 2	CVBS Looping Input	High impedance looping input.
BNC 3		
BNC 4	Reference Looping Input	High impedance looping reference input.
BNC 5		Only valid when a synchroniser sub-module is fitted.

2.2 Frame Synchroniser Module (Optional)

A Frame Synchroniser module may be optionally fitted to the V1667. It is located into sockets P1, P2, P3 and P4. Its presence is automatically detected by the on board micro-processor and is consequently integrated into the signal processing path.

With a Frame Synchroniser fitted, the user may adjust the V1667 output timing relative to the reference input by up to a maximum offset of ± 127 lines. This operation is described in Section **5.2 Timing Parameter Selection and Adjustment**.

If a Frame Synchroniser module is fitted, but there is no reference input, then the decoder will enter a minimum delay mode. In this mode the synchroniser is bypassed, and the delay through the unit is fixed at 7µs.

See Section **8.3 VHS Input Option** for a description of the VHS frame synchroniser option.

2.3 Frame Synchroniser Delay

When the Frame Synchroniser option is fitted there is a TTL output signal to indicate the amount of extra delay inserted above the minimum as specified for the unit. The signal has a constant period of two frames and a variable mark space ratio which depends on the amount of delay inserted. The HIGH portion of the signal indicates the delay.

A typical waveform is as shown below:

Note: *If the input and reference signals are asynchronous then the width of the delay pulse will vary, and will be dependent on the relative timing of the two signals.*

2.4 Insertion Delay

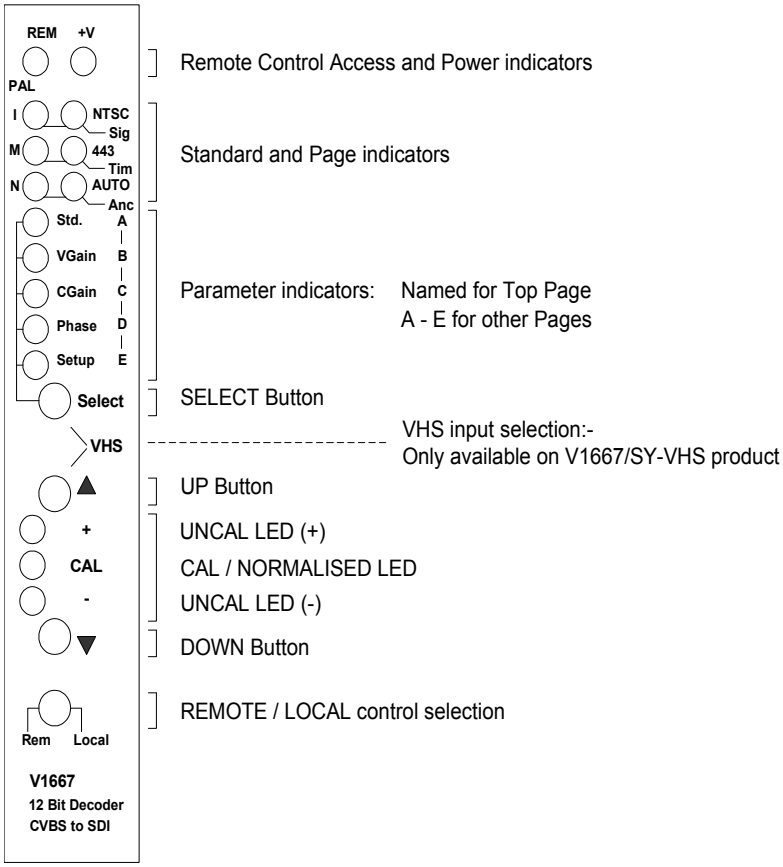
The insertion delay through the V1667 is dependent on whether a Frame Synchroniser option is fitted. Without a Frame Synchroniser it is deterministic and fixed. With the Frame Synchroniser fitted there is a delay range, and the absolute delay will be dependent on the relative timing between the input video signal and the reference input.

In each case the delay is measured between the composite video input and the input to the SDI serialiser.

Condition	Unit Delay
V1667 + No Frame Synchroniser Module	7µs
V1667 + Frame Synchroniser Module	7µs (Minimum) 1 Frame + 7µs (Maximum)

3. FRONT PANEL LAYOUT

See Section **8.3 VHS Input Option** for a description of the VHS decoding option.



The V1667 has a versatile front panel, shown above. Commonly used controls are directly available, whilst the less used ones are protected from inadvertent use. The panel uses the concept of **Pages** and **Parameters**. Within each **Page** there are a possible 5 adjustable **Parameters**.

There is provision for 5 pages in total, although only 3 are currently used. These are:

Top page (normal operation) — This is the normal operating page. The unit will always enter this page at power up.
See 4. FRONT PANEL DESCRIPTION (NORMAL OPERATION)

Timing Page — This page is used to adjust the Frame Synchroniser timing parameters and input failure modes, and is accessible only when a Frame Synchroniser module is fitted to the card.
See 5. TIMING PAGE (FRAME SYNCHRONISER)

Engineering Page — This page is used to make changes to the decoder processing that it is considered the user will only need to access infrequently (VITS pass/blank, etc..)
See 6. ENGINEERING PAGE

3.1 Page/Parameter Map

This table shows all the adjustable **Parameters** in each **Page**. It may be convenient to keep a copy close to the equipment.

	Top Page	Page 1 (SIG)	Page 2 (TIM)	Page 3 (ANC)	ENG.
A	Standard		V Timing		NTSC type
B	Video Gain		H Timing		Vertical interval
C	Chroma Gain		Sync. I/P fail mode		VisLock[1]
D	Phase		Minimum delay		Delay line PAL
E	Setup/Black		Timing Reset		Chroma B/W

[1] This control is available only if the VisLock option has been factory fitted to the card. See Section **8.4 An Introduction to Vislock Processing** for a description of the VisLock processing option.

4. FRONT PANEL DESCRIPTION (NORMAL OPERATION)

See Section **8.3 VHS Input Option** for a description of the VHS decoding option.

4.1 +V Indicator

This is a green LED that is illuminated when the module is powered.

4.2 REM Indicator

This yellow LED is illuminated when the module is accessed by the DART remote control system.

4.3 Video Standard Indicators / Selection of Video Standard

This is a bank of six yellow LEDs which indicate the operating standard and the status of the input signal. Please note that selection of the video standard via the front panel may only be achieved if the Local / Remote switch is set to **Loc**. When it is set to **Rem** there is a front panel lockout condition.

Selection of the operating standard is made by first pressing the Select button until the green Standard parameter LED is illuminated, then secondly by pressing the Up or Down buttons (▲ or ▼ respectively) to select the desired standard of operation.

The software allows the user to force any one standard, depicted by the relevant LED being illuminated, or to enter an automatic detect and decode mode, whereby the AUTO LED will be illuminated together with the relevant detected standard LED.

If there is no input signal present, or if the input signal is of poor quality, then the decoder will indicate this by flashing the selected standard LED when in force mode. When in automatic mode the AUTO LED will flash and none of the standard LEDs will be illuminated.

4.4 Parameter Indicators and Adjustment

There are five parameters that may be adjusted by the decoder in the Top Page. These are the video standard, video gain, chrominance gain, demodulation phase and setup/black level. The row of five green parameter LEDs indicate which parameter has been selected, and the status of the non-selected parameters.

Please note that selection and adjustment of any video parameter via the front panel may only be achieved if the Local / Remote switch is set to **Loc**. When this switch is set to **Rem** there is a front panel lockout condition.

Selection of the parameter to be adjusted is made by repeatedly pressing the **Select** button until the relevant green parameter LED is illuminated. The software cycles through each parameter in turn plus a sixth ‘dummy’ position, within which no parameter is selected (no LED illuminated). This helps to prevent accidental mis-alignment of a parameter.

After selecting the desired parameter, adjustment is made by using the Up and Down buttons (▲ or ▼ respectively). If the selected parameter is adjusted away from the calibrated position the green Cal LED will be extinguished, and one of the red LEDs (+ or -) will be illuminated, dependent on whether the chosen parameter has increased or decreased (Note: any non-selected parameter that has been adjusted away from its calibrated position will flash at low duty cycle). To reset the selected parameter to its calibration position depress the Up and Down buttons (▲ or ▼) simultaneously.

Adjustment of the video standard (**Standard**) is described in the section entitled **4.3 Video Standard Indicators / Selection of Video Standard**.

Video gain (**VGain**) may be increased by pressing the Up button (▲) or reduced by pressing the Down button (▼) . Video gain amplifies or attenuates all three of the component signals (Y, Cb, Cr) after the demodulation process and each by the same ratio.

Video gain	Max	200%		
	Cal.	100%	Resolution	0.2 % steps
	Min	0%		

Chrominance gain (**CGain**) may be increased by pressing the Up button (▲) or reduced by pressing the Down button (▼). Chroma gain amplifies or attenuates both of the colour difference signals (Cb, Cr) after the demodulation process and by the same ratio.

Chroma gain	Max	200%		
	Cal.	100%	Resolution	0.2 % steps
	Min	0%		

Demodulation phase (**Phase**) may be adjusted either side of the calibration position by using the Up and Down buttons (▲ and ▼).

Phase adj.	Max	+45°		
	Cal.	0°	Resolution	0.3° steps (approx.)
	Min	-45°		

The luminance output black level (**Setup**) of the signal may be adjusted either side of the calibration position (0mV black level in all standards) by using the Up and Down buttons (▲ and ▼).

Setup	Max	+100mV		
	Cal.	0mV	Resolution	0.75mV steps (approx.)
	Min	-100mV		

Please note: this adjustment is made **after** a nominal 54mV pedestal has been removed from 525 line standard inputs (excluding NTSC Japan).

4.5 Remote / Local Switch

The V1667 may be controlled locally via the front panel, hence this switch will be set to Local. Alternatively, the card may be controlled via the DART remote control system, in which case the switch will be set to Rem. When in the Rem position the front panel is locked out ie. it is not possible to modify the video standard or to make signal parameter adjustments.

5. TIMING PAGE (FRAME SYNCHRONISER)

See Section **8.3 VHS Input Option** for a description of the VHS decoding option.

5.1 Timing Page Entry

Press the Select button and hold in, followed by the Down (▼) button. Entry to the Timing Page will occur immediately, and will be indicated by the **Tim** pair of LEDs (PAL M and 443) flashing simultaneously.

Note: The Timing Page may only be accessed if there is a Frame Synchroniser Module fitted to the card.

5.2 Timing Parameter Selection and Adjustment

There are 4 adjustable parameters defined in the Timing Page. These are defined in the table below:

	Parameter
A	V Timing Offset
B	H Timing Offset
C	Sync Fail Mode
D	Minimum delay
E	Timing Reset

Selection of the parameter to be adjusted is made by repeatedly pressing the **Select** button until the relevant green parameter LED is illuminated. Then use the Up (▲) and Down (▼) buttons to adjust the chosen parameter as defined below.

To reset the chosen parameter to its calibration position depress the Up (▲) and Down (▼) buttons simultaneously.

The output of the decoder is vertically co-timed to the reference input when **V Timing Offset** is in the Cal. position (Green Cal. LED illuminated). If required the output may be advanced or delayed with respect to the reference by a maximum of 127 lines.

V Timing Offset	Max	+127 lines		
	Cal.	0 lines	Resolution	1 line
	Min	- 127 lines		

The output of the decoder is horizontally co-timed to the reference input when **H Timing Offset** is in the Cal. position (Green Cal. LED illuminated). If required the output may be advanced or delayed with respect to the reference by a maximum of ± 1/2 line.

H Timing Offset	Max	+ 1/2 line		
	Cal.	0 line	Resolution	37 ns
	Min	- 1/2 line		

The Frame Synchroniser offers three modes of operation when the input signal fails/disappears (**Sync Fail Mode**). These are:

Sync Fail Mode	(▲)	Freeze picture.
	Cal.	Freeze picture for 3 seconds, then cut to black
	(▼)	Cut to black.

The synchroniser sub-module may be bypassed by entering the **Minimum Delay** mode.

Minimum Delay Mode	Cal. LED	ON	Force Minimum Delay.
		OFF	Normal synchroniser functionality.

All of the timing parameters may be reset to their respective normalised positions by following the procedure described below:

1 Select the **Timing Reset** parameter.

2 Depress the Up (▲) and Down (▼) buttons simultaneously.

Successful timing reset will be indicated by the **Timing Reset** LED **(D)** being extinguished and the **V Timing Offset** LED **(A)** illuminating.

5.3 Timing Page Exit

Press the Select button, followed by the Down (▼) button. The decoder will exit the Timing Page immediately, and resume normal front panel operation.

If the unit is left in the Timing Page for more than five minutes, during which no button has been pressed, then the decoder will timeout from this mode and revert to normal front panel operation.

6. ENGINEERING PAGE

See section **8.3 VHS Input Option** for a description of the VHS decoding option.

6.1 Engineering Page Entry

Press the Select button and hold in, followed by the Down (▼) button. Keep both buttons depressed for 5 seconds until all six yellow standard LEDs become illuminated simultaneously. This indicates that the decoder has entered the Engineering Page.

6.2 Engineering Parameter Selection and Adjustment

Scroll around the five parameters using the Select button. The engineering parameter functions may be switched ON and OFF by using the Up and Down (▲ and ▼) buttons respectively. Engineering parameters are defined as:-

Parameter (Panel Legend)	Cal. LED	Engineering Page Parameter Function	Comments
A	ON OFF	NTSC NTSC Japan	Default (1)
B	ON OFF	Pass vertical interval data Blank vertical interval data	Default 625 Default 525
C	ON OFF	VisLock processing enabled VisLock processing disabled	 Default (2)
D	ON OFF	Adaptive delay line PAL Simple PAL	Default all PAL standards Default all other standards
E	ON OFF	Chrominance band pass filter.	(3)
All 5 LEDs	Depress the + and - buttons for 5 seconds for **Factory Initialisation** of all parameters in all standards (except timing parameters, which may be normalised within the timing page). After successful Factory Initialisation the decoder will automatically resume normal front panel operation.		

(1) NTSC or NTSC Japan selection is only available when in the NTSC standard setting.

(2) See Section **8.4 An Introduction to Vislock Processing** for a description of the VisLock processing option. This control is available only if the VisLock option has been factory fitted to the card.

(3) Use the Up and Down (▲ and ▼) buttons to adjust the bandwidth of the chrominance band pass filter. Adjustment range is between 1 (narrowest) and 6 (widest), and is indicated by the **+**, **Cal**. and **–** LEDs.

LED	Filter 1	Filter 2	Filter 3	Filter 4	Filter 5	Filter 6
+	OFF	OFF	OFF	ON	ON	ON
Cal.	OFF	ON	ON	OFF	OFF	ON
-	ON	OFF	ON	OFF	ON	OFF

6.3 Engineering Page Exit

Press the Select button, followed by the Down (▼) button. The decoder will exit the Engineering Page immediately, and resume normal front panel operation. If the unit is left in the engineering page for more than five minutes, during which no button has been pressed, then the decoder will timeout from this page and revert to normal front panel operation.

7. TECHNICAL SPECIFICATION

Analogue Input (Looping)

Format	PAL B, G, I, M, N, NTSC M, NTSC Japan, NTSC 443
Level	1V p-p composite (terminated)
Connector	BNC
Impedance	75Ω (external)
Return loss	> 35dB to 5.5MHz

Reference Input (Frame Synchroniser fitted)

Format	PAL B, G, I, M, N, NTSC M, NTSC Japan, NTSC 443
Level	Standard level Black and Burst (or 1V p-p composite)
Connector	BNC
Impedance	75Ω (external)
Return loss	> 35dB to 5.5MHz

Serial (SDV) Outputs (4)

Format	EBU Tech.3267 ANSI / SMPTE T14.22/082
Data rate	270 Mb/s
Connector	BNC
Impedance	75Ω
Return loss	> 15dB 5-270MHz
Amplitude	800mV p-p (terminated)
DC offset	0V +/- 0.5V
Rise and fall times	0.75-1.5 ns
Jitter	< 0.2 UI p-p
Drive length	up to 250m (Belden 8281)

Video Performance
(These figures to not apply when in VHS decode mode on the V1667/SY-VHS product).

Y frequency response	< 0.2dB to 5.5MHz
Y non-linearity	< 1.0 %
Chrominance non-linearity	< 1.0 %
2T pulse	< 1 % K
2T pulse / bar	< 0.5 % K
Chroma/luma timing error	< 7 ns
Subcarrier rejection	> 45 dB
Signal to noise ratio	> 68 dB (weighted)

Miscellaneous

Power consumption	8W approx.	Frame Synchroniser **NOT** fitted.
	10W approx.	Frame Synchroniser fitted.
Insertion delay	7µs	Frame Synchroniser **NOT** fitted.

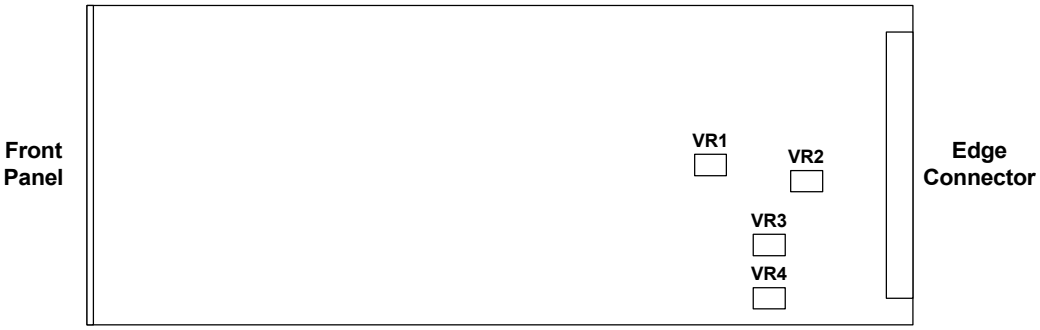
8. APPENDIX

8.1 On Board Adjustable Components

Circuit Reference	Description
VR1	Syncs to picture timing alignment.
VR2	625/525 line standard discrimination.
VR3	Luminance gain alignment:- 525 input
VR4	Luminance gain alignment:- 625 input

Note: The table above is included for information only. Users are strongly advised not to adjust these components, as to do so may mis-align the related function.

Location of on-board adjustable components

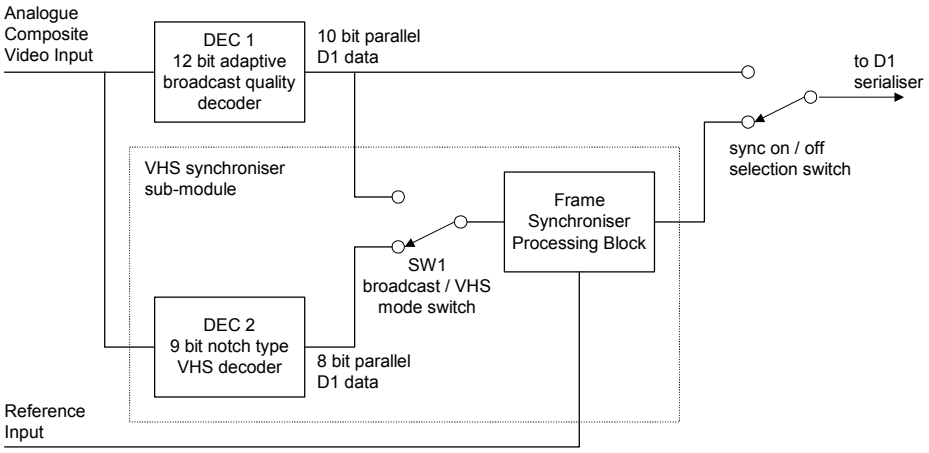


8.2 On Board Switches

Switch	Position	Description
SW5-1	ON	Not used
	OFF	
SW5-2	ON	Not used
	OFF	
SW5-3	ON	Modified adaption algorithm.
	OFF	Standard adaption algorithm:- normal position.
SW5-4	ON	Not used
	OFF	

8.3 VHS Input Option

This option is available **ONLY** on the **V1667/SY–VHS** product.



V1667/SY-VHS Product:- Functional Block Diagram

The difference between the VHS and standard frame synchroniser modules is the inclusion of a second decoder (DEC 2 in the block diagram above) and a broadcast / VHS mode switch (SW1 above).

This second decoder has a 9 bit ADC at its input, and produces an 8 bit parallel D1 output. It has a wide pulling range on its clock generation phase locked loop, which allows it to lock to and decode the output of a VHS tape recorder. It offers a simple notch type decoding architecture, which is ideally suited to this application. Furthermore, DEC 2 has been configured to apply automatic gain control (Video AGC) and automatic chrominance gain control (ACGC) to the input signal, as the output from a typical VHS recorder can vary greatly on its nominal luminance and chrominance gain levels.

Switch SW1 allows selection between broadcast and VHS decoding modes, to suit the application. The user is advised to select the output from the VHS decoder (DEC 2) only when non-timebase corrected signals (typically VHS recorder outputs) are applied to the unit. Under ALL other input conditions the output from the normal (broadcast) decoder should be selected, as the processing performance (linearity, SNR, picture quality, etc..) is far superior.

Please note that the VHS decoder block (DEC 2) will only function with either PALI or NTSC input standards.

8.3.1 Selection of VHS Decode Mode

Ensure the decoder is in the top page of normal (broadcast) decode mode front panel operation, and that no parameter is selected.

Depress the **Select** and **Up** (▲) buttons simultaneously.

Keep both buttons depressed for approximately 1 second until the **+**, **Cal** and **-** LEDs become illuminated simultaneously. This indicates that the decoder has entered the VHS decode mode.

To return to normal (broadcast) decode mode repeat the procedure described above.

8.3.2 Parameter Selection and Adjustment

This table shows all the adjustable **Parameters** in each **Page** when in VHS decode mode.

	Top Page	Page 1 (SIG)	Page 2 (TIM)	Page 3 (ANC)	ENG.
A			V Timing		
B			H Timing		
C					
D					
E			Timing Reset		

There are **NO** adjustable parameters within the **top page** of VHS front panel operation (ie video gain, chroma gain, setup and phase are not selectable or adjustable). The VHS decoder chip has been forced into Automatic Gain Control (AGC) and Automatic Chrominance Gain Control (ACGC) modes, hence these picture adjustments are not available.

To enter the **timing page** of VHS front panel operation follow the procedure described in Section **5.1 Timing Page Entry**.

There are two adjustable parameters within the **timing page** of VHS front panel operation. These are V timing offset and H timing offset. Adjustment ranges for these two parameters are the same as in normal (broadcast) decode mode.

8.4 An Introduction to Vislock Processing

8.4.1 What is VisLock?

Vislock is a patented method of converting an NTSC composite analogue signal to serial digital form then subsequently re-converting back to NTSC with negligible loss of picture quality. This enables digital and analogue plant to be mixed in a high quality installation.

8.4.2 How does it work?

When a composite NTSC signal is decoded it is split into its luminance and colour difference components. This process is never perfect, even using the highest quality decoders, and in practice some of the luminance picture information passes into the colour difference path. This results in spurious colour effects known as cross-colour. Also, some of the subcarrier used to convey the colour information in the original NTSC inevitably passes into the decoded luminance. This may appear as a moving dot pattern on vertical edges of coloured areas or “hanging dots” on horizontal edges.

After repeated decoding and re-encoding processes these effects increase, and the final signal may suffer significant loss of both luminance and chrominance resolution.

In the decoder the Vistek VisLock system embeds subliminal data information into its serial digital output. This data passes with the video signal to downstream encoders and provides them with information about the original NTSC signal. By using this information the encoder can re-assemble the NTSC signal exactly in the same way as it was separated.

Because of the precise separation of luminance and chrominance in the V1667 it is possible to re-assemble the NTSC signal without any significant loss of quality, even after repeated decoding and re-encoding processes.

8.4.3 Does the added data degrade my picture?

The data is transmitted outside the analogue NTSC picture area and at a very low level. This ensures it is invisible to the viewer of the digital image.

8.4.4 Will digital equipment in the path pass the VisLock signal?

As the Vislock data is integrated within the active picture area of the serial digital video signal, it is transmitted accurately through most professional digital video plant including switchers, routers, synchronisers, audio embedders and de-embedders, caption and logo inserters etc.

Certain equipment such as standards converters and effects generators may destroy the relationship between subcarrier and line frequency such that after processing it is impossible to accurately re-assemble the NTSC signal. However, these units often significantly reduce many of the re-encoding impairments.

8.4.5 How is VisLock Implemented?

The Vistek V1667 decoder and V1668 encoder modules are now available with VisLock, no additional equipment is required. The V1667 decoder converts the NTSC to serial digital (SDI) format and inserts the VisLock data. When the serial digital signal is subsequently converted back to NTSC in a VisLock compatible V1668 encoder the added data is read and the signal timed to ensure that optimum encoding quality is achieved and the signal timed to the genlock reference signal.