



VISTEK V1635S 24-BIT AUDIO VARIABLE & TRACKING MODULE USER GUIDE

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VISTEK V1635S 24-bit audio variable & tracking delay module

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1. DESCRIPTION

The V1635S is a broadcast quality 24-bit audio variable and tracking delay unit which forms part of the Vistek V1600 range of interface products. It is a 3U high card which is fitted into either a V1601 or V1603 rack, from which it receives its power. A passive rear module with screw terminal connections, is required for all signal interconnections.

Input to the unit is either a stereo pair of analog audio inputs or an AES digital audio stream, selectable by panel function. Output from the unit is a stereo pair of analog outputs and an AES digital audio stream of the same signal. The V1635S is fully compatible with the Vistek DART remote system, allowing status information to be read and control settings invoked by a DART compatible rack controller.

INPUTS

Selection between the inputs is made by panel control or DART remote controller

DIGITAL INPUT (CHANNELPAIR B)

- 1 x AES3-1992 balanced 110Ω digital audio channels, $Z_{out} = 110\Omega$ (or AES3id 75Ω unbalanced with special rear module).
- The two AES inputs need not be the same sampling frequency as each other, or the output, since the unit performs asynchronous sampling rate conversion.

ANALOG INPUT (CHANNELPAIR A)

- 2 x Analog differential quasi-balanced outputs with $Z_{in} > 20k\Omega$.
- Max input level: +28dBu = 0dBFS. Input sensitivity adjustable by on-card switch from +14dBu = 0dBFS to +28dBu = 0dBFS in 1dB steps.

OUTPUTS

The single output is available in both analog and digital form

DIGITAL OUTPUT (CHANNELPAIR B)

- 1 x AES3-1992 balanced 110Ω digital audio channels, $Z_{out} = 110\Omega$ (or AES3id 75Ω unbalanced with special rear module).
- Sampling frequencies of 32kHz, 44.1kHz, 48kHz are provided (96kHz will be available shortly).
- AES outputs A and B can reference-locked to an NTSC/PAL video source, a separate AES reference source, or can be free-running to the internal crystal oscillator.
- AES channel status output to AES3-1992. Channel status present on the input is passed to the output, amended appropriately for the setting in use.

ANALOG OUTPUT (CHANNELPAIR A)

- 2 x Analog differential quasi-balanced outputs with $Z_{out} < 50\Omega$.
- Max Output level: 0dBFS = +28dBu. Output level adjustable by on-card switch from 0dBFS = +14dBu to 0dBFS=+28dBu in 1dB steps.



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FUNCTIONS

- Panel Selectable/DART controlled **Delay** from 0ms to 2500ms may be applied to the output.
- Panel Selectable/DART controlled **A/B Swap** selects the input source.
- Panel Selectable/DART controlled **Test Tone** of 997Hz at -18dBFS (-18dBu) may be applied to either or both digital or analog output.
- Panel Selectable **Reference Source** can be external Video (48kHz only), external AES reference (32kHz, 48kHz), or internal free-running crystal oscillator at 32kHz, 44.1kHz or 48kHz.
- Panel Selectable **Sample rate** can be 32kHz, 44.1kHz, 48kHz (or soon to be provided) 96kHz.
- Minimum throughput delay (MTD) is typically 1.5ms.
- **Tracking delay** from from MTD+0 to MTD+40ms is provided. Tracking input is a TTL level pulse width modulated (PWM) input pulsetrain with repetition time up to 165ms. Tracking pulse widths from below 4 μ s to 84ms are recognised.
- Tracking delay resolution is one sample period (22 μ s at 48kHz sampling rate).
- Delay tracking employs a polyphase filtering DSP algorithm that ensures low noise and distortion during delay tracking (typically -60dB) and the constrained rate of delay change ensures very small pitch change, typically 0.15%.
- Panel Selectable/DART controlled **Input Gain** in the range -16.00dB . . +15.75dB in 0.25dB steps may be applied to each input channel.

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2. INSTALLATION

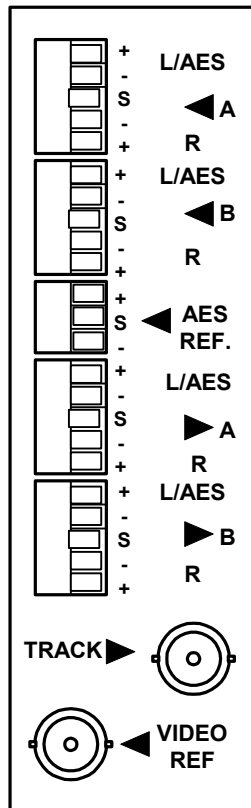
2.1 Rear Panel Connections

The standard 3U Screw terminal rear panel is shown below. Other panel variants are similarly marked. Table 2.1 overleaf describes the connections to the unit for screw terminal panels.

Notes:

1. Certain connections are **reserved**. If indicated as such do not connect anything to these connections.
2. Grounds/screens (S) are connected to chassis on all outputs and inputs and should be connected to all cable screens to minimize hum and noise.
3. On units with analog output option, neither (+ or -) output should be grounded.
4. The TRACK input accepts a pulsetrain of active high TTL-level pulses at either NTSC or PAL frame rate (33/40ms). The pulses should be are PWM modulated in direct 1:1 proportion to the required delay. In other words the pulse width (high) equals the required delay. Pulse widths shorter than 0.5µs or longer than 40ms are ignored by the V1635S.

Table 2.2 describes connections to the unit when D-type panels are used. The V1635S is designed to use a common rear panel for all variants of the module. Pins that are 'greyed out' are **reserved** and should not have any connections made to them.





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Table 2.1

Description of V1635S rear panel connections

SIGNAL	SOURCE	COMMENTS
POWER	Rack PWR Header	+15V nominal (9-35V) at 10W max
DART bus	Rack DART header	Vistek DART Rack controller
A ◀ (IN) L/AES (+-) R (+-)	Ext. Analog source Ext Analog source	L Analog input R Analog input
B ◀ (IN) L/AES (+-) R (+-)	External AES source Do Not Connect	AES3/AES3id digital input Reserved
A ▶ (OUT) L/AES (+-) R (+-)	V1635S V1635S	L Analog output R Analog output
B ▶ (OUT) L/AES (+-) R (+-)	V1635S Do not connect	AES3/AES3id digital output Reserved
AES ◀ (IN) REF	External AES reference source	AES3/AES3id digital input for reference
VIDEO ◀ (IN) REF	External video reference source	525/625 line analog studio grade reference 75Ω/Hi-Z
TRACK ◀ (IN)	External video Synchroniser	TTL-level PWM pulsetrain at PAL/NTSC frame rate. Pulse width = delay

Table 2.2

Description of V1635 rear panel connections for D-type rear panel assemblies

D15F Input connector					
Pin	Analog	AES	Pin	Analog	AES
1	A left in -				
2	A right in -		9	A left in +	
3	GND	GND	10	A right in +	
4		AES Ref in -	11	GND	GND
5		AES B in -	12		AES Ref in +
6			13		AES B in +
7	GND	GND	14		
8	GND	GND	15	GND	GND

D15F Output connector					
Pin	Analog	AES	Pin	Analog	AES
1	A left out -				
2	A right out -		9	A left out +	
3	GND		10	A right out +	
4	GND		11	GND	
5		AES B1 out -	12	GND	GND
6			13		AES B1 out +
7	GND	AES B2 out -	14		
8	GND	GND	15	GND	AES B2 out +

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2.2 Output Wordlength Setting

The digital audio output wordlength is normally 24 bits. It may be set to **20 bits** by **closing** jumper LK1.

2.3 Video Reference Input Impedance

The video reference input impedance is 75Ω when jumper LK3 is **closed**. It is high impedance when jumper LK3 is open to facilitate video reference daisy chaining.

2.4 AES Reference Input Impedance

The AES reference input impedance is **110/75Ω** when jumper LK4 is **closed**. It is high impedance when LK4 is open, facilitating reference daisy chaining. Daisy chain length is limited to 4 modules.

2.5 MIL/MOL Adjustment

A rotary Hex Switch is provided for adjusting the the **MIL (Maximum Input Level)** of the analog inputs.

MIL is adjustable in 1dB steps from +14dBu to +28dBu.

A rotary Hex Switch is provided for adjusting the **MOL (Maximum Output Level)** of the analog outputs.

MOL is adjustable in 1dB steps from +14dBu to +28dBu.

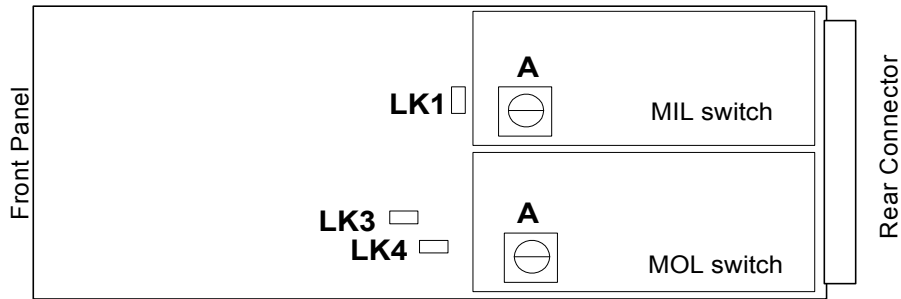
MIL/MOL setting versus switch position for both analog inputs and outputs is shown in the table below.

Switch setting	MIL/MOL for 0dBFS
0	+14
1	+15
2	+16
3	+17
4	+18
5	+19
6	+20
7	+21
8	+22
9	+23
A	+24
B	+25
C	+26
D	+27
E	+28
F	reserved



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The figure below shows location of all jumpers and switches that are fitted on the V1635S.

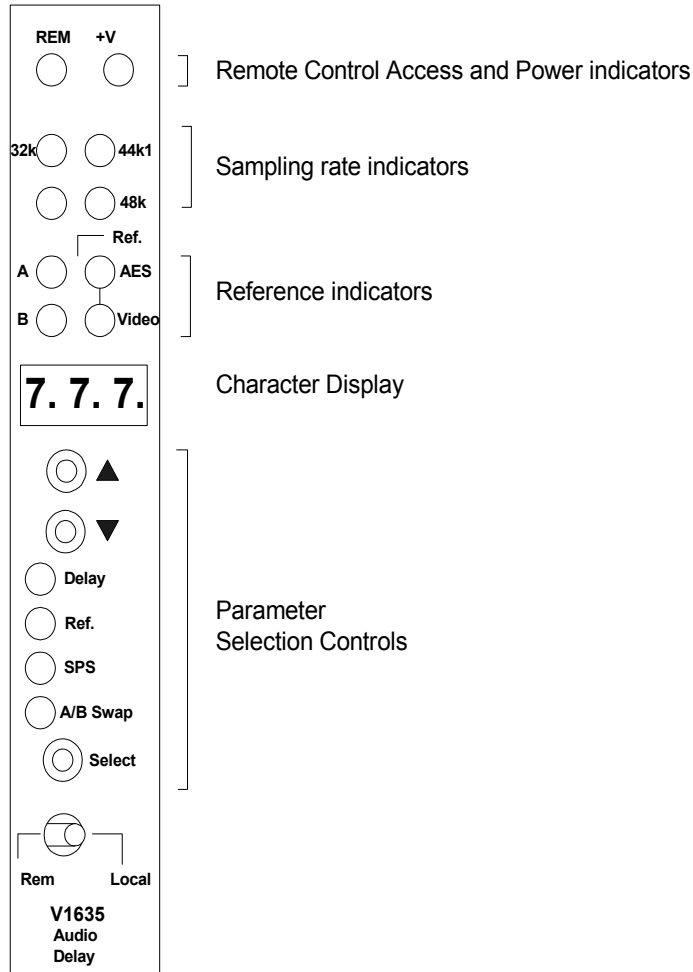


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3. OPERATION

3.1 Front Panel Controls and Indicators



3.1.1 Remote Control Access and Power Indicators

The green V+ LED is lit when the unit's on-board power supply is delivering voltage. The yellow REM LED is lit whenever the unit is accessed by the Rack Controller for the DART remote system.

3.1.2 Sampling Rate Indicators

These LEDs indicate the sampling rate of the AES digital outputs, as selected by the Parameter Selection Controls. On variants with analog outputs the LEDs show the internal sampling rate.



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3.1.3 Reference Indicators

These LEDs indicate the present reference source, as selected by the Parameter Selection Controls. When Free-Running (internal crystal oscillator) is selected, none of the LEDs are lit, and when an external AES or Video reference is selected and is present, the appropriate LED will be lit continuously. If the selected external AES or Video reference fails, the LED will flash and the V1635S will default to free-running mode until the reference recovers.

3.1.4 Character Display

Used for displaying parameters which have numeric or alphanumeric values

3.1.5 Parameter Selection Controls

These are used for selection of, and adjustment of, operating parameters when the REM/LOCAL switch is set to LOCAL.

3.2 Adjustment of Operating Parameters

3.2.1 General

The V1635S has three *pages* (**Page 0**, **Page 1** and **Page 2**) of panel adjustment modes, each page allows adjustment of one or more *parameters*. Conceptually the procedure is not unlike setting a digital alarm clock or watch.

- Panel adjustment pages can only be invoked if the **REM/LOCAL** switch on the panel is set to **LOCAL**.
- Pressing the **SELECT** button on its own invokes the panel adjustment modes of **Page 0**
- Pressing the **SELECT** button while holding in the ▲ button invokes the panel adjustment modes of **Page 1**. The ▲ button is analogous to a 'SHIFT' key on a computer keyboard when selecting pages of adjustment modes.
- Pressing the **SELECT** button while holding in the ▼ button invokes the panel adjustment modes of **Page 2**. The ▼ button is analogous to an 'ALT' key on a keyboard when selecting pages of adjustment modes.
- Once any panel adjustment page has been selected, repeated pressing of the **SELECT** button allows the user to scroll through the various parameters available on the page. A row of LEDs above the **SELECT** button indicates which *parameter* is presently selected for adjustment.
- For any given parameter selected for adjustment, the value of the parameter may be increased or decreased by pressing the ▲ or ▼ keys respectively. The *value* of the parameter is indicated either on the character display or the respective sets of LEDs above the character display.
- Holding the or ▲ or ▼ buttons down will cause the value of the parameter to auto increment and autodecrement respectively. The longer the button is held down, the faster the rate of autoincrement or autodecrement.
- Once a parameter has been adjusted to the desired value, the Panel Adjustment mode is exited by pressing the **SELECT** button until all four of the LEDs above the **SELECT** button are off.
- The V1635S has non volatile memory storage that automatically saves the values of all the operating parameters set in **LOCAL** mode so that on power-up or when the **REM/LOCAL** switch is switched from **REM** to **LOCAL**, the last settings made in **LOCAL** mode will be restored. Parameter adjustments take effect immediately but are only saved to non-volatile memory on the V1635S when the adjustment mode is exited.

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The following table indicates the available Panel Adjustment modes on the two pages.

LED indicator	Page 0		Page 1		Page 2	
	Parameter	Adjust range	Parameter	Adjust range	Parameter	Adjust range
Delay	Delay	0ms to 2500ms	Test Tone	A,B Off/A,B on	Input Gain A1	-16.00dB...+15.75dB
Ref.	Reference	Free, AES, Video	-		Input Gain A2	-16.00dB...+15.75dB
SPS	Sample rate	32, 44.1, 48kHz	-		Input Gain B1	-16.00dB...+15.75dB
A/B Swap	Input select	A, B	-		Input Gain B2	-16.00dB...+15.75dB

3.2.2 Delay Adjustment

(i) A fixed delay may be applied to all four analog channels as a group and the present setting may be seen on the character display as a number when **Page 0** Panel Adjustment mode has been entered and **Delay** selected as a parameter.

- By Panel Selection the delay value may be adjusted from 0ms to 2.5 seconds. Adjustment from 0 to 99ms is in 1ms steps, and adjustment from 100ms upwards is in 10ms steps. From 0 to 999ms, the delay value is displayed in ms and from 1.0s upwards it is displayed in seconds.
- The DART interface can control the delay in 1ms steps across the range.

Note: Changing the adjustable delay will cause a temporary disruption of audio for a time not less than the difference between old and new delay settings.

(ii) Operation of the tracking delay is transparent to the user and no adjustment is provided. In LOCAL mode the unit will always track delay if input pulses are found at the TRACK socket. If the tracking pulsetrain is absent or fails, the V1635S will maintain delay at the last valid setting. On power-up the tracking delay is set to zero so that if no tracking pulsetrain is input, no additional delay will result.

In REMOTE mode the tracking mechanism may be enabled or disabled. Additionally, the tracking delay value is readable as a separate parameter.

(iii) The V1635S has a minimum throughput delay of approximately 1.5ms.

3.2.3 Reference Setting

- The reference source may be selected and the present setting may be seen on the Ref LEDs when **Page 0** Panel Adjustment mode has been entered and **Ref.** selected as a parameter. The selectable options are **Free Run** (any sampling rate), **AES REF** (32kHz, 48kHz), or **Video** (48kHz).
- If an external reference fails, the appropriate LED will flash and the V1635S will default to **Free Run** mode with reference from the internal crystal oscillator.



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3.2.4 Sample Rate Select

- The sample rate of the V1635S may be selected and the present setting may be seen on the SPS LEDs when **Page 0** Panel Adjustment mode has been entered and **SPS** selected as a parameter. The selectable options are **32kHz**, **44.1kHz** or **48kHz** and refer to the internal and digital output sampling rate.

3.2.5 A/B Swap (Input Select)

This selects the input source and the present setting may be seen on the character display as a letter combination when **Page 0** Panel Adjustment mode has been entered and **A/B Swap** selected as a parameter.

- When analog input A is selected the character display shows **-A-**
- When digital input B is selected the character display shows **-b-** .

3.2.6 Test Tone

A test tone of 997Hz may be invoked on either or both the analog or digital outputs and the present setting may be seen on the character display as a number combination when **Page 1** Panel Adjustment mode has been entered and **Test Tone** selected as a parameter. The table below explains the available Test Tone selections:

Display	Test Tones
0 0	No test tones selected
1 0	Test tone on Analog outputs only
0 1	Test tone on Digital outputs only
1 1	Test tone on Analog and Digital outputs

The test tone is the same frequency (± 1 Hz) for all available sample rates, but the output amplitude depends on the output type as follows:

- On the digital outputs, the test tone is -18dBFS.
- On the analog outputs the test tone is 0dBu.

3.2.7 Input Gain

Gain on each of the four inputs A1, A2, B1, B2 may be varied in the range $-16.00\text{dB} \dots +15.75\text{dB}$. The gains are applied in the signal chain before the A-B switch and are invoked 'on the fly'. The module is shipped with 0dB gains set on all inputs. The present setting of gain may be seen on the character display as a deciBel number when **Page 2** Panel Adjustment mode has been entered and **Input Gain A1** through **Input Gain B2** selected as a parameter. A trailing decimal point after the third digit is used to indicate non-integer gains; the user should count the switch presses between integer values in order to establish the desired fractional value - each press changes the gain by 0.25dB. In REMOTE mode, control software can be tailored to apply 'ganged pot' gains if desired.

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4 DART INTERFACE

4.1 General

The V1635S is a Class 4 DART module with a serial EEPROM for reading and writing card details through the DARTbus in the same manner as other V1600 range cards. In addition the unit has several read and write registers, details of which may be found in document *scsm1635.doc*. Settings of operating parameters made via the DART interface are not stored in non-volatile memory by the V1635S, and NV memory in the remote control system is used for storing these settings.