V1640A

SDI VIDEO SYNCHRONISER

INSTALLATION and OPERATION

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SDI VIDEO SYNCHRONISER

INSTALLATION AND OPERATION

1. DESCRIPTION

The V1640A SDI Video Synchroniser is a full broadcast specification Frame Synchroniser forming part of the Vistek V1600 range of interface products. It is a 3U high module which can be fitted to either the 1U V1601 or 3U V1603 chassis from which it receives its power. It replaces the existing V1640 module with which it is fully compatible. The main improvements over its predecessor is that local adjustment of the timing offsets is possible without removing the unit from the rack, and full control over DART has been implemented. There are some other minor operational improvements which are detailed later in this manual. Mechanically the unit has been improved since it is now built on a single PCB, rather than using two.

When fitted in either the V1601 or the V1603 racks passive rear modules are required to interface to the outside world. Different rear modules are required for the two chassis. The rear modules are common to many other Vistek video modules.

The unit automatically operates in either 625/50 or 525/60 formats depending on the input signal. Normally the Black and Burst reference will be of the same standard, but in the case of it being different the unit will operate according to the SDI input and set itself to minimum delay. This has been implemented for use in those areas where the input signal may originate in either standard, and will be either synchronised or passed through a Standards Converter which will in itself synchronise the signal.

There is a choice of action in the event of signal loss. The unit can either Freeze or cut to Black. Provided a reference is connected the output timing is not affected by the loss of the input signal .

When operating in with 625/50 signals the unit works as a Line Synchroniser. This means that it can handle cuts on the input signal with less picture disturbance than usual, provided the cut is done on one of the designated switching lines, 6 or 7. The relative timing of the two signals on each side of the cut should be within approximately 20 lines.

A TTL output is available which indicates the amount of delay being applied to the signal. This can be used in a suitable tracking audio delay (such as the Vistek V1639) to ensure that video and audio can stay timed correctly.

The front panel enables direct control of most functions within the unit. It is also used to switch control from the front panel to the remote DART system. The unit contains non-volatile memory so that when any parameters are set up locally they are still available after a power-down. Since the timing offsets are often so important to an installation, an internal DIL switch is available to lock them out. This prevents 'accidental' adjustments of the timing. Adjustment is always available over DART, since the control system has its own built in safeguards.

The user may selectively pass or blank non-active video signals. Separate control is available over the Vertical Blanking data, such as Teletext or Insertion Test Signals, and ancillary data, such as embedded digital audio.

When operating in 525 mode later versions have the ability to selectively blank Line 21 on either field to remove Closed Caption information. This can only be donelocally on a DIL switch.

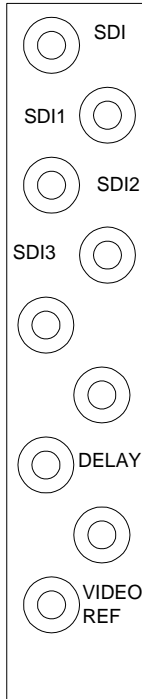The unit is fully controllable over the DART remote control system.

The output of the unit has full EDH signals applied, but there is no EDH detection on the input.
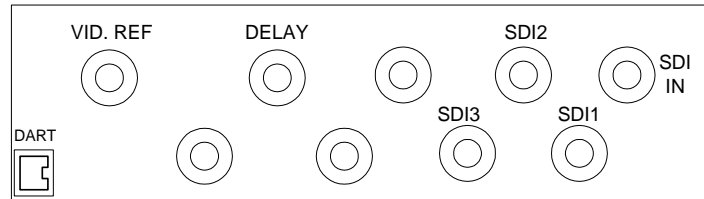
2. INSTALLATION

2.1 REAR PANEL

Two rear panels are available depending on the type of chassis into which the unit is fitted:

3U (V1603)

1U (V1601)

2.2 REAR PANEL CONNECTIONS

SIGNAL	CONN	DESCRIPTION
SDI IN	BNC	SDI Video Input
SDI 1, 2, 3	BNC	3 off SDI Video Outputs
DELAY	BNC	TTL Delay Pulse
VID. REF	BNC	Video Reference Input. An internal switch enables 75Ω termination.
DART	RJ45	DARTNET connection. Only used in on position in 1U rack.

2.3 POWER CONSUMPTION

The V1640A power consumption is **6.5W**

2.4 INSERTION DELAY

The insertion delay is, of course, variable over a frame. If the input and reference frame rates are different then the delay will vary. At some stage there will be a frame drop or a frame repeat and just before or just after there will be a point of minimum insertion delay. There is hysteresis in the frame discontinuity, to avoid rapid toggling, so the minimum delay depends on the drift direction:
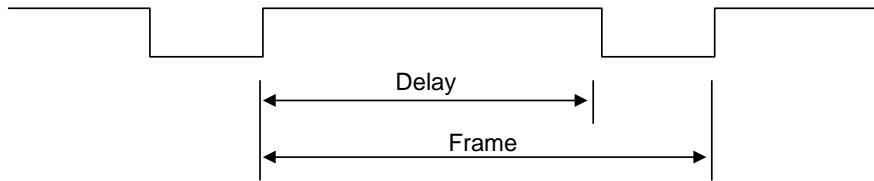
Minimum Delay (Increasing): **1.65μs**

Minimum Delay (Decreasing): **1.05μs**

The minimum delay, as set from the front panel or through DART, is **1.7μs**.
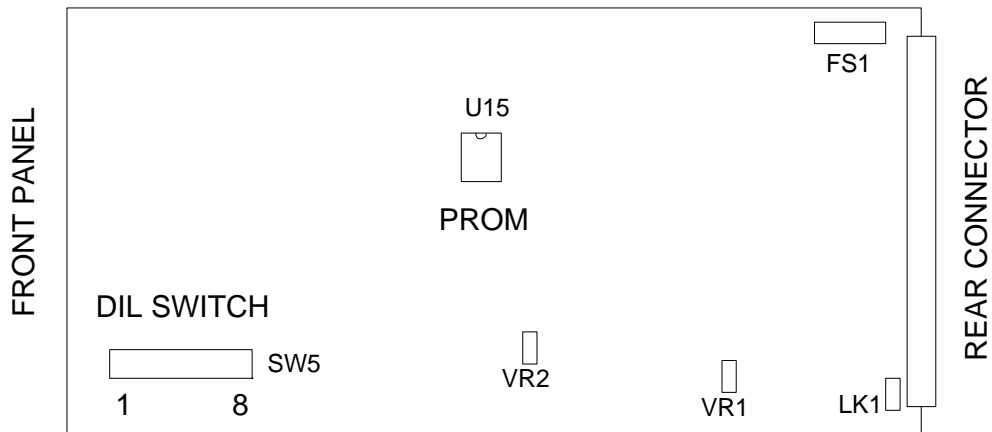
2.5 DELAY O/P

The Delay O/P signal is a TTL levels rectangular wave. The period is the same as the frame rate (40ms for 625/50 and 33.3ms for 252/60) but the mark-space ratio varies according to the amount of delay.

The minimum pulse width, either positive or negative, is 37ns.

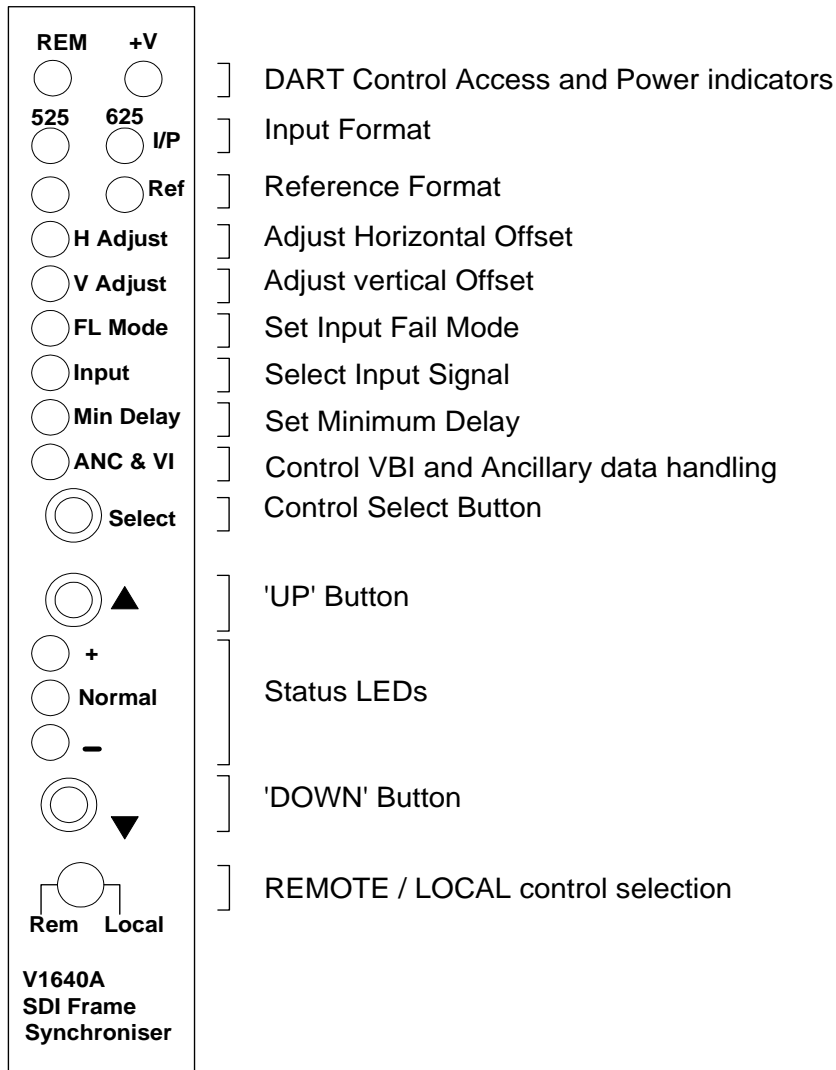## 2.6 INTERNAL HARDWARE

2.6.1 MAIN BOARD

The significant items on the main board are described here:

FS 1	Input power fuse, 3A.
SW 5	Internal configuration switches, S1 at the left. See section 3.11 for details. Note that each switch is UP or DOWN. Ignore the 'OFF; indication on the switch block.
U15	The 8 pin DIL PROM that contains the firmware for the programmable device. In the event of upgrades in the field it is most likely that this is the device that will need to be changed.

LK 1	Enables termination of the video reference:
	        UP = Open
	        DOWN = Terminated

VR 1	Factory adjustment for reference standard select. Adjust for 18ms on TP 49
VR 2	Factory adjustment for oscillator centre frequency. Adjust for 27MHz on TP 39.

3. **OPERATION**

3.1 FRONT PANEL

REM +V	DART Control Access and Power indicators
525 625 I/P	Input Format
Ref	Reference Format
H Adjust	Adjust Horizontal Offset
V Adjust	Adjust vertical Offset
FL Mode	Set Input Fail Mode
Input	Select Input Signal
Min Delay	Set Minimum Delay
ANC & VI	Control VBI and Ancillary data handling
Select	Control Select Button
▲	'UP' Button
+ / Normal / –	Status LEDs
▼	'DOWN' Button
Rem Local	REMOTE / LOCAL control selection

**V1640A
SDI Frame
Synchroniser**

3.2 CONTROL

The V1640A can be controlled from either the front panel, shown above, or through the DART remote control Network. If DART is used then any DART controller, with knowledge of the V1640A can be used. Vistek can provide either the V1605 1U control panel or VIEWFIND which is a PC based universal control system. Any DART controller can be used, provided it has 'knowledge' of the V1640A.

The control source, Local or Remote, is selected by the toggle switch on the front panel. The REM LED does not indicate the selection of remote control, but 'blips' to show access by the Rack Controller, if fitted. Only the position of the toggle switch indicates that remote control has been selected.

When in Local control the front panel allows the user to set up all the parameters, and can show how most of them are set. All the status LEDs on the front panel are active for Local or Remote control so that they always show the operating conditions.

When under Remote Control the Parameter Select sequence is still active, although it is not possible to change anything from the Local panel. This means that the user can still monitor the state of the unit while under Remote Control.

3.3 INDICATIONS

3.3.1 POWER

The power LED, marked +V, indicates that the 5V VCC power rail is present on the board. This shows not only that power has been applied to the rear, but also that the on board regulator is functioning.

There is a fuse on the unit in series with the power input, and if this has 'blown' then the +V LED will be OFF, as will the other LEDs.

There are other power rails on the unit (3.3V and ±5V) which are generated from the VCC, rather than directly from the board supply. The +V LED may still be on even if these supplies have failed.

3.3.2 REM

This LED indicates that the unit is being accessed remotely by the DART system. It does NOT reflect the position of the REM/LOC switch. The LED is not permanently ON, but blinks occasionally when data is actually being transferred to or from the unit.

3.3.3 INPUT PRESENCE and FORMAT

This pair of LEDs indicate the presence and format of the input signal. The unit detects whether the input is D1 525/60 or D1 625/50 and lights one of the LEDs accordingly. If there is no input signal then neither LED is ON. This is the only panel indication of input signal fail.

3.3.4 REFERENCE PRESENCE and FORMAT

This pair of LEDs indicate the presence and format of the analogue reference signal. The unit detects whether the input is 525/60 or 625/50 and lights one of the LEDs accordingly. If there is no reference then neither LED is ON. This is the only panel indication of there being no reference.

It is quite possible to operate the unit with opposite formats on the input and reference. In this case the unit will default to the input signal format, ignoring the reference completely, and set itself to minimum insertion delay.

3.3.5 PARAMETERS

These LEDs indicate that one of the parameters has been selected for adjustment. Pressing the SELECT button repeatedly selects each parameter in sequence. Only when a parameter has been selected can it be adjusted by the   and   buttons.

Note that there is one sequential position when no parameter is selected. This is the 'idle' state where nothing can be affected by accident.

There is a time-out of either 68 secs (525/60) or 82 secs (625/50) so that if no adjustment is made to a parameter within that time then it will return automatically to the 'idle' state. (Early units had a shorter time-out of 34 and 41 seconds.)

Later sections discuss each of these adjustment parameters in more detail.

Under certain conditions it may not be possible to select the timing adjustment parameters; the details are in section 3.4.

3.3.6 STATUS LEDs

These three LEDs give a guide as to the state of the variable parameters. It is clearly not possible to give a full representation using only three LEDs but the following table shows how most of the important information is conveyed.

PARAMETER	LEDs +	N	-	DESCRIPTION
none (Idle)				Normal
				Minimum Delay is selected
H Adjust				Delay >1 Field, Outside Hysteresis zone
				Delay >1 Field, In Hysteresis zone
				Delay <1 Field, In Hysteresis zone
				Delay <1 Field, Outside Hysteresis zone
V Adjust				Vertical Offset = +127 lines
				0 < Vertical Offset < +127 lines
				Zero offset
				-128 lines < Vertical Offset < 0
				Vertical Offset = -128 lines
FL Mode				Freeze field on Input Fail
				Black on Input Fail
Input				Freeze Frame
				Freeze on Field 2
				Freeze on Field 1
				SDI Input signal
				Black
				Internal 100% Colour Bars (**not** broadcast quality)
Min Del				Minimum Delay OFF
				Minimum Delay SET
Anc & VI				Pass VBI, Blank Ancillary
				Blank Both
				Pass Both
				Blank VBI Pass Ancillary

3.4 LOCAL PARAMETER SELECTION

This table is a list of the local parameters that can be adjusted.

H Adjust	Horizontal Offset Adjustment
V Adjust	Vertical Offset Adjustment
FL Mode	Signal Fail Mode
Input	Input Source
Min Delay	Minimum Delay
ANC & VI	Ancillary Data and Vertical Interval data

There are two conditions during which it is not possible to select **H Adjust** and **V Adjust**. If **Min Delay** is active then the output timing is not adjustable from the front panel, and there is a non-standard display in the idle state. Secondly if the **Lock-Adj** DIL switch is set (S2 on SW 5) then they will not be selected; see section 3.11.2. In either case the parameter selection will pass straight from Idle to FL Mode.

3.5 SETTINGS MEMORY

All local parameter values are stored in a non-volatile memory, so they do not have to be set up each time the unit is powered. When a value is changed it is only stored into the memory when the parameter selection is changed. This means that if you alter a parameter and then remove the power (or remove the unit from the chassis) before pressing SELECT or allowing the time-out to happen, then the new value will not have been stored.

3.6 OFFSET ADJUSTMENTS

The output timing can be offset from the reference using two parameters. The first allows horizontal adjustment over a full line, while the second allows vertical adjustment over -128 to +127 lines. The reference will be either the external analogue video signal, or the D1 input itself. This means the unit may be used as delay line.

The status LEDs give some indication during horizontal adjustment as shown in section 3.3.6, and during vertical adjustment show which direction the offset is, and whether it is at its maximum.

If the unit has **Min Delay** or **Lock-Adj** set then the timings cannot be adjusted.

3.7 I/P FAIL MODES

The V1640A has sophisticated monitoring on the SDI input, so it handles intermittent signals in a 'user-friendly' manner. Minor disturbances to the TRS data (roughly equivalent to the Sync pulses in an analogue video signal) cause short freezes of the data. However if the input fails completely, which is defined by either a loss of the input 270MHz or a sequence of erroneous TRS signal then the unit goes into its Fail mode.

This Fail mode can be either a freeze to the last 'good' field that has been stored, or a cut to black, as set on the **FL Mode** parameter. The normal operation is to freeze the picture, but sometimes this can be a disadvantage when installing or setting up a system when the user might actually want to know that the input has failed.

3.8 INPUT

Although titled **Input**, this parameter selects the signal source that is passed out of the V1640A. There are five options as follows:

> Freeze Frame
> Freeze Field 2
> Freeze Field 1
> SDI Input
> Digitally Generated Black
> 100% Colour Bars

Any of the Freeze functions actually cause a whole frame to be frozen, and if a Field Freeze is chosen then the output processing ensures that only one of the fields is displayed. Under these conditions a single input field will be displayed on both output fields. This will reduce any blurr caused by motion at the point of freezing, but the vertical resolution will also be reduced.

Since the whole frame is frozen all three freeze options are available without having to re-freeze the input signal.

The Digital Black and Colour Bars are generated on the output side of the V1640A but the input processing and front panel indications are still active. The Colour Bars are so-called 'hard' bars in that they have no transition edge shaping. This means that they contain very high frequencies and will produce ringing on all transition after a DAC.

3.9 MINIMUM DELAY

The unit can be set into a **Minimum Delay** mode without having to actually adjust the timings, which would lose their settings. The actual minimum delay for both formats is as defined above in section 2.4. The main advantage of the Minimum Delay is to ignore the reference even though it is still connected.

Because the timing adjustments have no effect when **Min Del** is active, it is not possible to select them as a parameter. It is also indicated on the Idle menu by both the **+** and **-** LEDs being on.

3.10 ANC. DATA AND VBI

In some installations it may be desirable to blank either the Vertical Blanking Interval data and/or the Ancillary data. The VBI often contains Teletext or Insertion Test signals which occupy the active video portions of the vertical interval; they may be passed through the V1640A.

An SDI signal may contain Ancillary data in the horizontal blanking between the EAV and SAV TRS signals. Often this data is embedded digital audio, and should be removed from the V1640A output. This is because the any Frame Synchroniser, including the V1640A, can introduce discontinuities in the frame sequence when the input and reference signals are not synchronous which will cause a major disturbance to digital audio.

The 'normal' setting for the V1640A is to pass the VBI data, but to blank the Ancillary data.

If the Ancillary data is set to blank then ALL information between the EAV and SAV is removed, not just audio data.

If the VBI is set to be blanked then the active portions of the following lines are removed depending on the standard:

	625/50	525/60
Field 1	9 - 22	12 - 20
Field 2	321 - 335	274 - 282 (11 - 19)

3.11 INTERNAL SETTINGS

An eight way DIL switch on the PCB (SW 5) is used to set up some internal parameters as shown here:

S	Title	Description	UP	Down (= OFF)
1	DEF STD	Default Standard (used when no I/P and no Ref)	625/50	525/60
2	LOCK ADJ	Lock local control of timing adjustments	Free	LOCKED
3	REF FL MODE	Reference Fail Mode	Norm	Min delay
4	Field 1 Line 21	Selectively blank this line in 525 mode only	Pass	Blank
5	Field 2 Line 21	Selectively blank this line in 525 mode only	Pass	Blank
6	reserved			
7	reserved			
8	reserved			

For normal operation all switches should be set to UP.

3.11.1 DEFAULT STANDARD

This switch sets the operating standard when there is no input or reference. This can be useful during system installation when an output SDI signal may be needed of the correct format with no input or reference. For example the non broadcast quality colour bars may be used.

The unit does 'remember' which standard it is operating on even after the SDI input and reference have been removed, so this setting is only really used when the unit is powered up without any signals.

3.11.2 ADJUSTMENT LOCK OUT

To avoid accidental adjustment of the timing values this switch should be set down. Make sure that the values you want are properly stored in the non-volatile memory before removing the unit from the chassis (see section 3.5).

When the Adjustment Lockout is active it is not possible to select the H Adjust and V Adjust positions.

The DART remote control system can still change the timing values independently of this switch setting.

3.11.3 REFERENCE FAIL MODE

This switch changes the output when the reference fails. Normally the unit will switch its locking reference to the SDI input signal (if present) and continue to provide an output and the adjustment offsets are still applied. If this switch is set DOWN then the unit will go into minimum delay and the adjustment parameters will have no effect.

In either case if there is no input either, when the reference fails, then the output will free-run from its internal crystal oscillator. The unit will operate in the same standard that was last applied.

3.12 EDH

The unit contains an EDH (Error Detection and Handling) chip on its output stages. This is permanently set to generate mode, so it produces correct EDH data whatever the state of the input signal.

4. TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSE AND CURES
Cannot select any parameter on Front Panel.	Is power applied? Observe the +5V LED.
Cannot select Hadj or Vadj parameters, but others are OK.	**Min Del** parameter is set. Section 3.9. **Lock-Adj** is set. Section 3.11.2.
Changing Hadj and Vadj has no effect.	No reference and **REF FL MODE** is DOWN so setting minimum delay. Section 3.11.3.
Not Synchronising	Check that a reference is applied. Check that the reference is the same format as the SDI input, otherwise the unit tracks the SDI input. Check that the measurement apparatus is connected in a suitable manner.
O/P Black	No I/P, and **FL Mode** set to Cut to Black. Section 3.7 Input Selection set to Black
Can select a parameter, but cannot change anything.	The unit is probably in REMOTE mode. You can still select a parameter to see how it has been set over DART, but cannot change anything unless you are in LOCAL mode.