VISTEK V1681

VALID GENERATOR

USER GUIDE

VISTEK V1681 valid generator

Contents

VISTEK V1681 valid generator

1.   DESCRIPTION

The V1681 generator is the counterpart of the V1682 reader, which together, make up the VALID (Video & Audio Line-up and ID) system. The basic function of the V1681 is to generate the VALID test signal, which comprises: a background test-pattern, user selectable captions, central rotating circle, and black timing flash. Along with the video signal, audio tones are generated, which are output from the selected audio option if fitted (either analogue or AES), and/or embedded into the SDI output stream.

Along with a set of commonly used test-patterns, there are two 75% colour bar test patterns designed to give visual indications of correct aspect ratio conversion and correct alignment through the video chain. These two patterns also contain luminance and modulated pulses for chroma/luma gain/delay, and frequency response checks.

Movement is provided, in the form of a central rotating circle, which shows up freeze conditions in the video chain. User configurable caption allow source identification. Also, to provide audio channel identification, the audio output can be configured to cut between tone and an externally supplied voice ident, which may be synchronised via a TTL level control signal.

The test tone outputs are of different frequencies on channels A and B (997 and 440Hz respectively) in order to identify channel, while the left and right channels may be identified by breaks in the tone – one in the left channel, and two in the right, the sequence repeating every 4 seconds. The audio breaks are synchronised to the rotation of the centre circle, and the black cross 'flash' in the screen centre.

When in generate mode, the unit can either be synchronised to the incoming SDI, locked to an analogue black and burst reference, or free-run.

The unit may also function in a video pass through mode, so it may be used 'in-line'. When the unit is passing video, it offers audio multiplexing and de-multiplexing facilities, allowing audio already embedded in the SDI stream to be outputted in either AES or analogue form (dependent on the fitted audio module), and/or embed AES or analogue audio into the SDI stream.

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2.   INSTALLATION

Due to the large amount of IO available on the V1681, a variety of rear panels are available. Presently there are four; two for the 3U chassis, V1606, and another two for the 1U chassis, V1601. The L type rears provide most of the possible facilities, except for the last two SDI outputs, but the audio connections are on a less convenient multi-pole connector. This means that if separate audio connections are needed then a 'break-out' box will be required. The P type rears provide direct unbalanced AES audio connection on BNC connectors, but not all signals are available.

This manual has generally been written assuming that one of the L type rear panels is being used with access to all signals.

2.1   3U Rear Panels

For the 3U Chassis two types of rear panel are available. The 16VR3L provides connections for all possible I/O using a high density D-type connector for the audio and other ancillary signals, such as GPI and AES reference. For those applications where unbalanced audio is used and not all connections are needed, then a nine BNC panel is available, the 16VR3P. This has the advantage of simpler cable connections, but at the expense of losing some signals.

Connection details are given in Section 2.3.

16VR3L   16VR3P
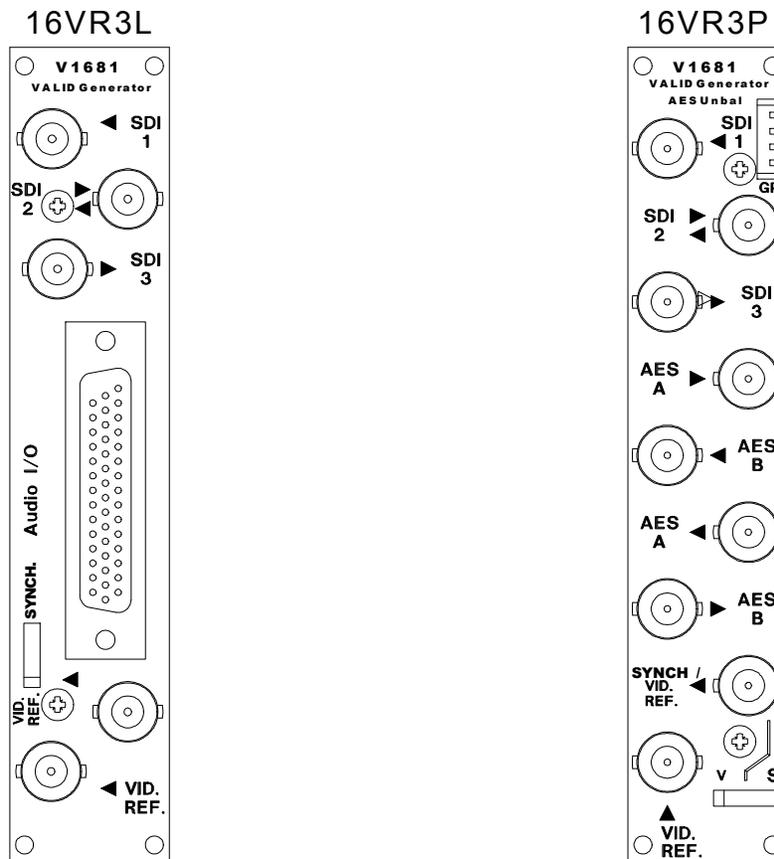
2.2   1U Rear Panels

For the 1U Chassis two types of rear panel are also available. The 16VR1L provides connections for all possible I/O using a high density D-type connector for the audio and other ancillary signals, such as GPI and AES reference. For those applications where unbalanced audio is used and not all connections are needed, then a nine BNC panel is available, the 16VR1P. This has the advantage of simpler cable connections, but at the expense of losing some signals.

Connection details are given in Section 2.3.
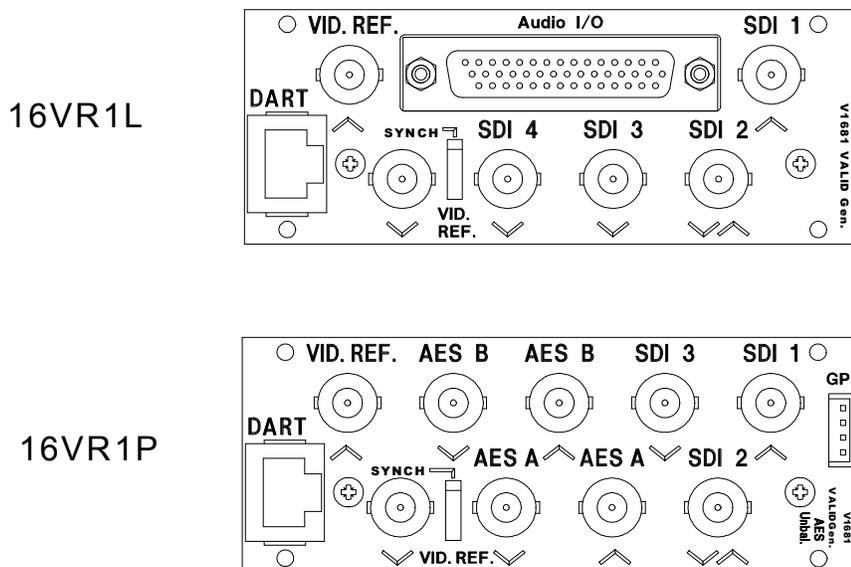
16VR1L

16VR1P

2.3   Connections

2.3.1   SDI BNCs

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

Rear Type	SDI 1	SDI 2	SDI 3	SDI 4
16VR3L	Input 1	I/P 2 or O/P 2 or SDI Buffer	Output 1	N/a
16VR3P	Input 1	I/P 2 or O/P 2 or SDI Buffer	Output 1	N/a
16VR1L	Input 1	I/P 2 or O/P 2 or SDI Buffer	Output 1	Output 3
16VR1P	Input 1	I/P 2 or O/P 2 or SDI Buffer	Output 1	N/a

Note: The three options for SDI 2 are by a pair of links on the main PCB (LKs 2 and 3). It is important that both links are set up the same way.

2.3.2   Reference BNCs

The last two BNCs on each rear panel are used as follows:

BNC	Description
Vid. Ref.	Video Reference
Synch Vid. ref.	Dual purpose connector as set by the switch on the rear panel. Either a direct Loop output of the Video reference or a TTL audio ident generator synchronisation pulse.

2.3.3   AES BNCs

These are only available on the 16VR3P and 16VR1P rear panels. They provide for unbalanced AES inputs and outputs for channels A and B. With these rear panels it is not possible to have the second AES outputs.

2.3.4   Audio I/O

On the 16VR1L and 16VR3L rear panels there is a 44 way connector in the same footprint size as a standard 25 way D type connector. It is used for all the audio connections, both digital and analogue, although many of them share pins, and other signals. Of course whether the audio signals are analogue or digital (or present at all) depends on the type of module fitted to the unit.

If the HDD socket is to be used for audio and connected with multi-way cable it is essential that the audio pairs, both analogue and digital, are individually screened.

The signals to and from the pins on this connector are as shown in this table:

Pin	Signal		Pin	Signal		Pin	Signal	
	Analogue	Digital		Analogue	Digital		Analogue	Digital
15	GND	GND	30	GPI_3	GPI_3			
14	ALinP	AESAinP	29	GND	GND	44	ALinN	AESAinN
13	ARinP	AESAin75	28	GND	GND	43	ARinN	AESAin0
12	BLinP	AESBinP	27	ID_SYNC_75	ID_SYNC _75	42	BLinN	AESBinN
11	BRinP	AESBin75	26	GND	GND	41	BRinN	AESBin0
10	GND	GND	25	GPI_2	GPI_2	40	GND	GND
9	ALoutP	AESA1outP	24	GND	GND	39	ALoutN	AESA1outN
8	ARoutP	AESA1out75	23	AESREFinP	AESREFinP	38	ARoutN	AESA1out0
7	BLoutP	AESB1outP	22	AESREFinN	AESREFinN	37	BLoutN	AESB1outN
6	BRoutP	AESB1out75	21	GND	GND	36	BRoutN	AESB1out0
5	GND	GND	20	GPI_1	GPI_1	35	GND	GND
4	AESCinP	AESA2outP	19	GND	GND	34	AESCinN	AESA2outN
3	AESCin75	AESA2out75	18	AESREFin75	AESREFin75	33	AESCin0	AESA2out0
2	AESDinP	AESB2outP	17	AESREFin0	AESREFin0	32	AESDinN	AESB2outN
1	AESDin75	AESB2out75	16	GND	GND	31	AESDin0	AESB2out0

Notes:
1.   Pin 1 is at the bottom

2.3.5   GPI

The 16VR1P and 16VR3P panels have a separate Molex connector for external GPI connection. (On the other panels the Audio I/O connector is used). The connections are:

Pin	Signal
1	GND
2	GPI 1
3	GPI 2
4	GPI 3

2.4   Signal Specifications

SIGNAL	TYPE	COMMENTS
Power (No Module)	9.8W	Supplied from rack
Power (A-A Module)	12.5W	Supplied from rack
Power (A-D Module)	12.5W	Supplied from rack
Power (D-A Module)	11.7W	Supplied from rack
Power (D-D Module)	10.6W	Supplied from rack
Power (H-H Module)	TBD	Supplied from rack
SDI Inputs and Outputs	BNC	SDI Video to SMPTE 259M Max cable length >200m
Video Reference	B+B	Any 1V Composite video may be used, but Black & Burst is recommended.
Audio, Analogue	Balanced	$Zin = 20k\Omega$ $Zout = <50\Omega$
Audio, Digital (AES)	Balanced	$Zin = 110\Omega$ $Zout = 110\Omega$ Input Sample rate 32–48kHz Output Sample rate 48kHz
Audio, Digital (AES)	Unbalanced	$Zin = 75\Omega$ $Zout = 75\Omega$ Input Sample rate 32–48kHz Output Sample rate 48kHz
AES Reference	Balanced	$Zin = 110\Omega$ or HI Z Sample rate 48kHz
AES Reference	Unbalanced	$Zin = 75\Omega$ or HI Z Sample rate 48kHz
ID SYNC 75	TTL, 75R	Positive pulse, high during external voice ident cycle.
GPI	5V pull-up via 4K7	Connect to GND to activate.

2.5   GPI Connections

There are three GPI inputs to the V1681. Depending on the type of rear panel being used they are either connected through the high density D-type connector or through the 4 pin Molex connector as shown in Sections 2.3.4 and 2.3.5.

They have an internal pull-up resistor of 4K7 to +5V and should be made active by grounding the relevant pin.

The status of the GPI pins can be monitored in the **STATUS > GPI Sta** menu. A typical display in this menu would show :

1↓ 2↓ 3↓

The arrows indicate the status of each 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 use of the GPIs is described in Section 5.7.

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2.6 Hardware

2.6.1 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'.
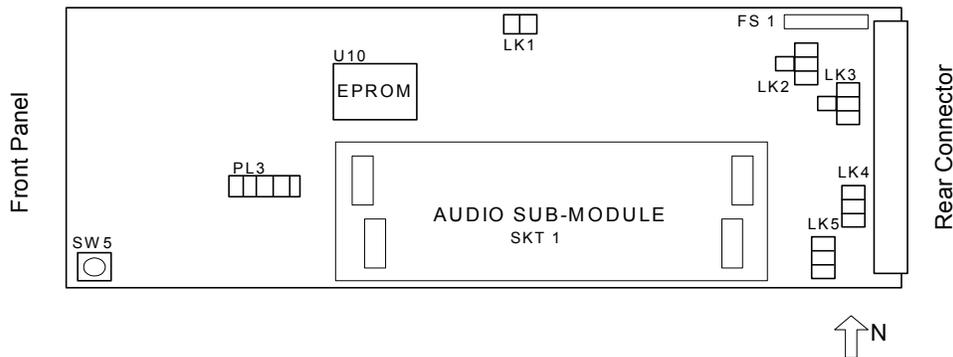
2.6.2 Links and Switches

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

ITEM	Title	Section	Comments
FS 1	Fuse		In series with the +15V input to the module.
SW 5	RESET		Used to reset the internal microcontroller and DSP.
SKT 1	Audio Sub-module		Various sub-modules are available for the different audio options. See section 2.8.
PL 3	JTAG Connector		For development and test use only. (May not be fitted).
LK 1	JTAG enable		Never used in operation. (May not be fitted).
LK 2, 3	Define BNC 2		North – Buffered Output West – SDI Input 2 South – SDI Output 2
LK 4	AES REF Term		North – High Z South – Terminated
LK 5	Video REF Term		North – High Z South – Terminated

2.6.3 Fuse

There is only one fuse on the V1681 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.

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2.7   Front Panel

```
REM    +V
  ○     ○          ]    DART Control Access and Power indicators
SDI   VALID
  ○     ○          ]    Video Signal Status

VALID GN                 Display


       ○  Select   ]    SELECT Button
    +  ○
MENU  ▲  ○ Cal      ]    CAL and OFF LEDs
Buttons
    -  ▼  ○

       ○           ]    REMOTE / LOCAL control selection
  Rem  Local

  V1681
  VALID
  Gen.
```
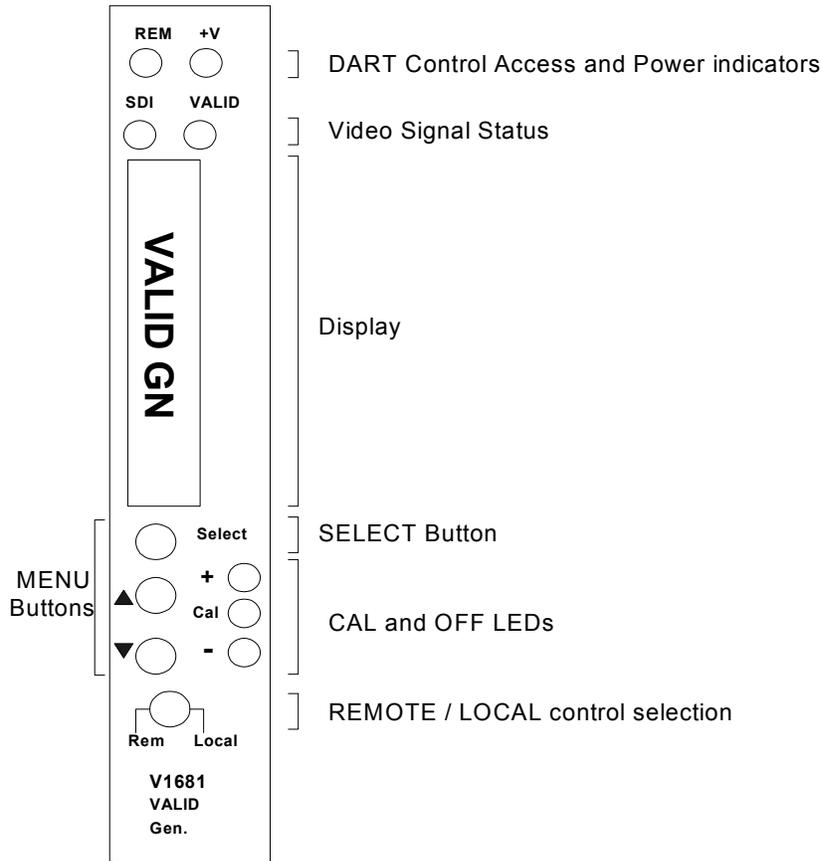
The front panel on the V1681 is a considerable advance on what is usually available on single module interface equipment. It provides the user with total control and monitoring of the unit without the need to consult manuals and read unlabelled indications. While this kind of control is generally available 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.

2.7.1   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 +5V is present on the board. This is derived from the +15V distributed through the rack. The V1681 does have many power rails, but only the main +5V is indicated here. It will, of course, be off if the fuse, FS1, were to have been blown.

SDI   Indicates that a D1 signal is being received.

VALID   Indicates that a VALID test signal is being generated. This LED 'winks every 4 seconds, in synchronised to the 'black flash' in the video output.

2.7.2　　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.

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 they will change the values.

The menu system is described in more detail later in Section 3.1.2.

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.

2.7.3　　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.

2.8　　Audio I/O Sub-Modules

Various audio sub-modules are available for the V1681 depending on the audio requirements.

To change the module remove the V1681 from the chassis and carefully remove the existing one, if fitted, by lifting evenly at both ends. To fit a new one check the orientation by aligning the offset connectors and place the module carefully. Push it home evenly at both ends. It may be stiff but do not force it aggressively since if the connectors are not mating correctly then one or more of the pins may get bent.

The details of the analogue and digital audio signals are given in Section 2.4.

These are the available modules:

Type	Part No.	Description
AA	130-2920	Analogue Audio In and Out – Both channels
DD	130-2930	Digital Audio In and Out – Both channels
AD	130-2940	Analogue Audio In and Digital Audio Out – Both channels
DA	130-2950	Digital Audio In and Analogue Audio Out – Both channels
HH	130-3090	Hybrid: Channel A - Analogue Audio In and Out 　　　　Channel B – Digital Audio In and Out

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3. SYSTEM CONTROL

3.1 Local Control

3.1.1 Start up

Local control and monitoring of the V1681 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 i.e. '**VALID GN'**.

3.1.2 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. **VALID GN.**
Main Menu	The Main menu items, such as **VIDEO**, **AUDIO** etc. These items are all in Upper Case.
Sub Menu	Menu items under each main heading, such as **Vid O/P** or **SDI Src** under the `VIDEO` 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 usually offers a selection of options e.g. `Analog` / `Group 1` / `Group 2`. 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 7.

3.1.3 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 output audio multiplexer to embed on group 2.

Action	Display	Comments
Select	`VALID GN`	Top Level
Select	`VIDEO`	Video main menu
▼	`AUDIO`	Audio main menu
Select	`Aud I/P`	
▼	`ID I/P`	
▼	`Aud O/P`	
▼	`Mux Grp`	Multiplexer group selection menu
Select	`None`	
▼	`Mux Gp 1`	
▼	`Mux Gp 2`	

3.1.4 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**.

3.1.5 High Level Signal Status

There are two LEDs on the top of the front panel to indicate that the SDI input is present, and that the unit is set up to generate a 'VALID' test signal. However there is no direct indication as to the format the SDI input, 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 Video Reference status directly. In each case this will show the signal presence and if it is there then what format it is.

These indications are still at the Top Level, so a single press of the Select button will immediately move down the menu tree.

3.1.6 Variable Calibration

Most variables have a calibrated or normalised value. In the listing of all the variables in Section 7 the normalised value 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.

3.2   Remote Control

In addition to being controlled with the menu system on the front panel the V1681 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 V1605 1U hardware panel, 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. One exception to this rule is the caption text (See Section 5.3).

4.   SYSTEM OVERVIEW

This section covers the basic set-up of the unit for use with the V1681 VALID generator.

4.1   System Overview

The V1681 is the generator end of the VALID system. Its role is to generate a 'VALID' test-pattern, with associated audio tones, the V1682 receiver locks on to the audio and video measuring audio video delay, and checking audio channel connections and levels.

The unit may either be locked to either an SDI stream, analogue black and burst reference, or allowed to free-run.

4.2   Test Pattern Generation

A number of test patterns can be generated by the V1681, all but the pluge test pattern may be used for lip-sync measurements. The output pattern may be altered in the **VIDEO > Vid O/P** menu. This menu also offers an option to pass input SDI through the system, this option is called '**Program**', and will be covered more in Section 5.1.3; it should be noted that '**Program**' is the default output.

Details of the available test patterns can be found in Section 5.1.2.

The recommended test patterns for normal use are the aspect identified colour bars, however all test-patterns may be used for audio/video delay measurement, although the pluge pattern may give unreliable results. Captions, centre circle and source information can also be inserted into all test patterns.

It is important that, for audio/video delay measurements, the black cross flash is enabled as this is the primary video time marker. The flash may be turned on and off with the control **VIDEO > Flash**. This control defaults to '**On**', but should only be turned off if a clean test-pattern is required for non-timing measurement purposes.

4.3   Test Tone Generation

The V1681 has an internal test-tone generator that, when the unit is generating a 'VALID' test pattern, produces tone on both stereo output pairs. Channel A (1&2) produces a 997kHz tone, while channel B (3&4) produces a 440kHz tone, thus distinguishing the stereo pairs. Left (1&3) and right (2&4) channels are identified by a sequence of short breaks in the tone as shown below in Figure 4.1. Also shown, at the bottom of the diagram, are representations of the rotating circle inset. The colour shown is the colour observed at the top (12 o'clock) position on the circle through the audio sequence.

VISTEK V1681 valid generator
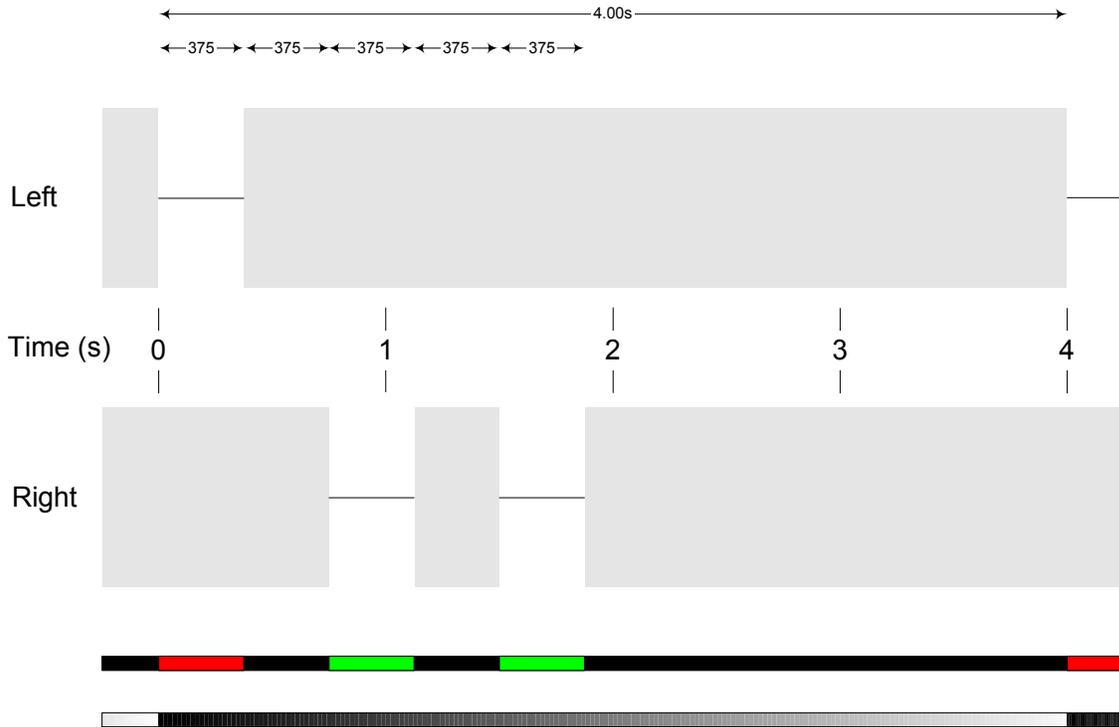
Figure 4.1 – VALID Test Tone Sequence

In the default mode of operation, the unit outputs test-tone if a VALID test pattern is being generated, and the selected audio input if the output (**VIDEO > Vid O/P**) is set to '**Program**'. The tone may periodically be interrupted by an external voice ident generator. For more information on external ident see Section 5.4.

To enable audio multiplexing, the required group must be set up in **AUDIO > Mux Grp**. This control defaults to '**None**', so, in the default state, no audio will be multiplexed. In order to multiplex, the selected group must be empty or blanked, for more information on audio multiplexing see Section 5.6.2.

The audio test tone level is fixed at the analogue level of 0dBu. Digital outputs form the unit generate the digital representation of 0dBu. Due to the lack of any international standard as to the relationship of analogue and digital domains, the relationship must be set-up for the local system. The relationship is defined by the Maximum Analogue Level, or MAL, which is the highest analogue level that can be represented in the digital domain. The system MAL can be set up in the **AUDIO > MAL** menu.

In order to avoid automatic muting by downstream audio devices (and subsequent 'soft restart' which could cause problems at the receiver end), the audio breaks are not complete silence, the tone is in reduced in level by 60dB.

It should be noted that, in whatever mode of operation the unit is in, the same audio will be produced at every audio output of the unit, for example, any audio coming from the analogue output (if fitted), will also be embedded into the out-going SDI stream.

5. SYSTEM OPERATION

5.1 Video Controls

5.1.1 SDI Format Selection

The V1681 operates in both 525 and 625 line formats, when the unit is generating a test pattern the format can be selected in the **VIDEO > Format** menu. The options available are `Auto`, `525` and `625`. When in `Auto` mode the unit output format follows the SDI input or analogue video reference, the SDI input taking priority if it is present. The default format in `Auto` mode is 625, however if the input fails the unit will stay in the current format unless the power is cycled.

The selected format has no effect if the SDI output is selected as `Program` in the **VIDEO > Vid O/P** menu, in this mode the unit always follows the input SDI.

5.1.2 Test Pattern Selection

The output test pattern may be chosen in the **VIDEO > Vid O/P** menu. The options available are shown below. '`Program`' is a special case where the chosen SDI input is passed through to the output, and is described further in Section 5.1.3).

Vid O/P selection	Description
Program	SDI input passed to output (see Section 5.1.3)
Bars16x9	16 x 9 aspect identified colour bars
Bars 4x3	4 x 3 aspect identified colour bars
Bars100%/SMTE bars	100% colour bars (625 only) / SMPTE bars (525 only)
Bars 75%	75% colour bars
Plse+Bar	2T luma pulse + 4T & 10T modulated pulses + White Bar
5 Step	5 step luma + chroma ramp
Sweep60%	60% amplitude luma + chroma sweep
M Burst	Multiburst
EQ Path	SDI equaliser stress pattern
PLL Path	SDI PLL stress pattern
SDI Matr	PLL + equaliser stress matrix
Pluge	Pluge monitor line-up signal

5.1.3 Program

The `Program` option selected in the **VIDEO > Vid O/P** menu is a special case of unit operation where the unit passes the SDI input through to its output. Also available in this mode are audio multiplex, and de-multiplex capabilities, allowing an analogue or AES audio input to be embedded into the outgoing SDI stream, and/or dis-embed audio from the incoming SDI stream and output it in AES or analogue form. The availability of the AES/Analogue audio inputs/outputs depends on the audio sub-module fitted (See Section 2.8).

Normally when the unit is switched into `Program` mode the units audio outputs follow i.e. the unit stops generating tone, and passes the selected audio input (See Section 5.6.1) to all available audio outputs. This 'tracking' may however be disabled by turning off the audio video ganging in the **AUDIO > A/V gang** menu. When **A/V gang** is set to `Separate`, the audio output is always defined by the by the **AUDIO > Aud O/P** menu, however, when it is set to `Ganged`, the output is defined by the **Aud O/P** menu when in test pattern mode, and by the **AUDIO > Aud I/P** menu when in `Program` mode.

The switch between `Program` and a test-pattern is clean (assuming an SDI input is present), the output test-patterns being effectively 'overlaid' over the incoming SDI, thus the timing of a video path is unaltered by inserting the test-pattern.

5.1.4 Ancillary Data

Ancillary data is all the information embedded in the D1 data between the EAV and SAV TRSs. In most installations this is digital audio and EDH data but can include any other data that is embedded using the appropriate standard.

The ancillary data space while the unit is generating a test-pattern always starts clean – i.e. no data is passed from the SDI input. Embedded audio data and EDH may be inserted by the V1681 into the empty ancillary space. However when the unit is in 'Program' mode, and the D1 source is external, the ancillary data space may already have data in it.

It is not possible to re-multiplex audio into the a group that is already present on the video. It is possible to append a different group number so that for example if the input audio is on Group 1 the processed audio can be re-multiplexed onto Group 2 quite successfully (but see note below). But if you want to replace the audio in Group 1 with its processed equivalent then you must remove the original Group 1. It is not possible to selectively remove a single group so you must remove all the ancillary data.

The V1681 provides the ability to blank the ancillary data with the video processing. This provides a 'clean sheet' for the re-multiplexing process and is the only way to replace audio within an existing group. Ancillary blanking can be turned on in the **ENG'ING > Anc Blnk** menu which has options `Anc Pass` and `Anc Blnk`. It should be noted that this control only appears in the menu tree when the unit is in 'Program' mode, preventing 'blind' operation.

Incidentally this blanking will also remove the EDH signal from the input, but this is usually replaced on the output anyway. However there can be a problem if the output EDH is disabled and the original EDH is passed through (Ancillary Data pass) since the original EDH does not relate to the processed data. This will result in EDH errors on downstream detection equipment. EDH is described further in Section 5.1.5.

Note: To append one group of audio onto existing ancillary data one it is essential that the original SDI signal conforms to the standard for embedded data and leaves no gaps between the EAV and the data. Some test equipment, notably the Tektronix TSG422 signal generator, does not conform and it is not possible to successfully append data onto its output.

5.1.5 EDH Insertion

EDH is a method of embedding data within the ancillary data space which carries a measurement of the video and other data. By regenerating the equivalent measurement at the receiving end it is possible to check that the data has been received correctly.

The V1681 does not process the EDH data on the incoming SDI video, but it does regenerate new EDH data on the output. EDH is always put in the same place, so the new data will overwrite the old.

The generation of the new data can be disabled in the **ENG'ING > O/P EDH** menu. Care must be taken when the unit is operating in 'Program' mode, if the new EDH generation is disabled and the old EDH is being passed through because it will probably not correctly represent the data. In this case the Ancillary Data really ought to be blanked as described in Section 5.1.4.

5.1.6 SDI Input Selection

The unit has the option of a second SDI input (link selectable – See Section 2.6.2). The units input may be switched (if the option is selected) using the **VIDEO > SDI Src** menu. It should be noted that this may not be a clean switch. The availability of the second SDI input can be checked in the **STATUS > SDI I/P2** menu (See Section 5.8.5).

This control defaults to the primary SDI input.

5.1.7 Black Flash Control

For audio video timing measurements to be made with a V1682 VALID reader, both audio and video signals are time marked. The main timing reference in the video is a black cross which is flashed up over the generated test pattern.

If just a basic test pattern is desired without timing measurements the black flash may be turned off with the control **VIDEO > Flash** which has two options **On** and **Off**.

The default for this control is the flash on.

5.1.8 Centre Circle Control

A precisely dimensioned circle may be overlaid over the test pattern. The circle is exactly proportioned for the current aspect ratio, and if correctly displayed should be exactly circular. The centre circle may also provide movement, with a rotating inset which rotates once every 4 seconds, synchronised to the black flash, and audio tone sequence.

The centre circle has two controls associated with it : **VIDEO > Circle**, and **VIDEO > Def AR**. The former is used to turn the circle on and off, and change the inset type, the latter selects the default aspect ratio of the circle. Some test patterns however, namely the aspect identified colour bars, force the aspect ratio of the circle, because they are specifically either 16:9 or 4:3 test patterns.

The **VIDEO > Circle** control has four options : **Off**, **Cir Stat**, **Red / Grn**, **Comet**, the default being **Comet**.

5.2 VITS

Vertical interval test patterns can be inserted along with any of the available test-patterns (although cannot be inserted into the incoming SDI feed). Two sets of VITS are available in both 525/60 and 625/50 modes (NTC7 & FCC in 525 and VITS & UK ITS in 625). The lines into which these are inserted are fixed.

5.2.1 525/60 VITS

There are two groups of VITS lines available in 525/60 mode, which are independently selectable in the **VERT INT** menu. There are two options within the VITS menu, **VERT INT > FCC**, and **VERT INT > NTC 7**, each of these has options '**On**' and '**Off**'. The VITS lines which each of these options insert are shown below:

FCC	VITS Line
Line 17	FCC Multi-burst
Line 18	FCC Composite
NTC-7	
Line 16	NTC-7 Composite
Line 279	NTC-7 Combination

5.2.2   625/50 VITS

There are two groups of VITS lines available in 625/50 mode, which are independently selectable in the **VERT INT** menu. There are two options within the VITS menu, **VERT INT > VITS**, and **VERT INT > UK ITS**, each of these has options '**On**' and '**Off**'. The VITS lines which each of these options insert are shown below:

VITS	VITS Line
Line 17	Pulses + Bar + Luminance 5 step
Line 18	60% Multi-burst
Line 330	2T pulse + bar + Modulated 5 step
Line 331	50% Luminance with chroma modulation
UK ITS	
Line 19	Pulses + Bar + Modulated 5 step
Line 20	Modulated 50% luma + modulated black.

5.3   Captions

Four user adjustable caption strings can be overlaid over any of the generated test patterns. The text, size, position and colour of these captions may all be altered from the front panel. The size, position and colour may by the DART control system, however currently, caption text may only be entered through the front panel.

5.3.1   Selecting A Caption

Controls in the **CAPTION** menu only apply to one of the four captions at any one time. The caption to which the controls act is selected in **CAPTION > Capt Sel**, the top option in the **CAPTION** menu, and should have the following options :

```
Capt A
Capt B
Capt C
Capt D
```

In order to edit the desired caption, select it in the **Capt Sel** menu, come up a level by holding **select** down for about 1 second. The other options in the **CAPTION** menu will now apply to the chosen caption.

5.3.2   Caption On/Off Controls

In should be pointed out early on, to avoid confusion, that there are actually two places where captions can be turned on and off. The control **VIDEO > Captions** is global, and applies to all four captions; whereas the **CAPTIONS > On/Off** control applies to individual controls only.

The global control overrides the individual controls, so even if in the **CAPTIONS** menu the caption is on, it will not be inserted if all captions are turned off in the **VIDEO** menu.

NOTE : This control only affects the caption selected for editing, see Section 5.3.1.

5.3.3   Editing Caption Text

Captions are entered using the three front panel buttons after selecting **Text** in the **CAPTION** menu, and, at this present time, are only editable from the front panel.

When editing the caption text, the **select** button is used to move along a character, and the ▲ and ▼ buttons are used to edit that character. The last character of the string should be a terminator, which, when displayed is a flashing ▓ character and is the first character in all character sets, just before 'space' and 'A'.

When a terminator is inserted, all following text will disappear, however it will not be forgotten until the **text** menu is exited. If the terminator is removed before exiting the **text** menu, the further text will reappear. This enables overwriting of a long string with a shorter one without having to reset all following characters.

To minimise the number of button pushes, the character set has been broken into four sections: upper case, lower case, numbers, and symbols. To change character set, hold down the ▲ and ▼ buttons together. There are some characters which are common to more than one of the sets for ease of access e.g. brackets are included in both symbols and numbers. A full list of available characters is shown in Figure 5.1 User Caption Character Set.

When the character set is changed, the position in the list (as shown in Figure 5.1) will be maintained e.g. if the current character is a capital 'E', changing set will move to a lower case 'e', changing again will move to the number '4' etc.

Capitals	⠿	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Lower Case	⠿	a b c d e f g h I j k l m n o p q r s t u v w x y z
Numbers	⠿	0 1 2 3 4 5 6 7 8 9 + – ( ) \
Symbols	⠿	. , : ; \ " ` ' ? ! # & @ $ % ( ) [ ] { } * + – < = > / \ _	

Figure 5.1 User caption character set

5.3.4   Position

Captions are always horizontally central to the picture, but the operator has control of the vertical positions, which can be found in the **CAPTIONS > Position** menu. There are 12 vertical positions that the text can occupy. When moving text, it should be noted that when one caption overwrites another, one will be partially or totally obscured.

Caption positions are limited to the top and bottom thirds of a picture, with position 1 to 6 being in the top third of the picture, and 7 to 12 in the lower third.

NOTE : This control only affects the caption selected for editing, see Section 5.3.1.

5.3.5   Colour

Each caption has an individual colour assigned to it, all captions defaulting to white. The colour control can be found in menu **CAPTIONS > Colour**. The following colours are selectable :

```
White      Green
Black      Magenta
Yellow     Red
Cyan       Blue
```

NOTE : This control only affects the caption selected for editing, see Section 5.3.1.

5.3.6   Size

There are three sizes available for the captions : large, medium, and small, which can be adjusted in the **CAPTIONS > Size** menu option. For most instances the larger sized text will be most applicable, and is the default, however for longer messages e.g. web addresses or telephone numbers, a smaller font might be more applicable.

NOTE : This control only affects the caption selected for editing, see Section 5.3.1.

5.4 Video Reference

Internally generated SDI can free-run, or may be locked to either an analogue black and burst reference, or lock to an external SDI input. There are no controls associated with the locking mechanism as the reference selection is entirely determined by reference presence.

There is a priority order associated with applied references as follows :-

- Given no reference the unit will free-run.
- If an SDI signal is connected to the unit, this is always used as the locking source irrespective of the presence of an analogue reference.
- The analogue reference input is only used if it is present, and there is no SDI input connected to the unit.

In the situation where an SDI reference is supplied, the output timing when generating test-patterns is exactly co-incident with the output timing if the unit is passing its SDI input. This allows for entirely clean switching between test-patterns and the selected SDI input. This ensures that if the unit is inserted into a signal path, the timing of the system will remain unaltered whether the unit is generating a test-pattern or passing video.

The SDI output when locked to an analogue reference in nominally co-timed to the reference.

5.4.1 SDI Status

The presence of an SDI input is indicated on the front panel by the green SDI LED (See Section 2.7.1), and is also indicated in the menu system in **STATUS > SDI I/P**, which also indicates the format (525/625) of the SDI input as shown below.

Display	Meaning
IP FAIL	No SDI input detected
IP 625 ✓	625/50 SDI input detected
IP 525 ✓	525/60 SDI input detected

5.4.2 Analogue Reference Status

The analogue reference status is not indicated by front panel LEDs but can be checked in the menu system in **STATUS > REF I/P** in a similar fashion to the SDI I/P status.

Display	Meaning
No Ref	No reference input detected
RF 625 ✓	625/50 reference input detected
RF 525 ✓	525/60 reference input detected

5.5 External Voice Ident

In many scenarios, where several audio channels are being monitored, it is useful to have voice identification of an audio source. For this purpose, an external audio ident generator can be connected to the V1681. The external audio can then be inserted at regular intervals into the tone sequence.

To provide ident generator synchronisation, a TTL output is provided by the V1681 to trigger such a generator. The trigger signal is raised high for the entire duration of the that the V1681 is keying in ident audio.

VISTEK V1681 valid generator

5.5.1 ID Input

An external ID source may connected to any of the units audio inputs, which may or may not be the same as the main audio input for program material. The ID audio input is selected in the **AUDIO > ID I/P** menu. This can be either an embedded group in the input SDI, or an AES / Analogue input dependent on the sub-module fitted.

The menu options are shown below for digital, analogue, and no input module respectively :-

AES
Group 1
Group 2
Group 3
Group 4

Analog
Group 1
Group 2
Group 3
Group 4

Group 1
Group 2
Group 3
Group 4

ID input channels are transferred on a one to one relationship with output channels, i.e. the channel A left ID input will be output on output channel A left etc.

5.5.2 ID Timing

Both the length of the ID, and the rate of repetition are user adjustable. The rate of repetition can be set in the **AUDIO > Aud O/P** menu which has the following options :-

Ton-Glts
Ton Cont
Aud I/P
Mute
ID mix
ID 16s
ID 32s
ID 64s
ID 128s

This menu is where both ID is enabled, and the repeat rate is specified, so if **ID 32s** is chosen, the selected ID input will be inserted into the output test tone every 32 seconds etc. The default set up of the unit is to insert a 4s ident at the period specified.

The duration of the ident audio is also adjustable in the **ENG'ING > ID Time** menu. This has options of 4,8,16 and 32 seconds.

It is important to note that the two controls cannot be set up in such a way that no tone will ever get generated, e.g. the if the **AUD O/P** control is set to **ID 32s**, the maximum allowable **ID Time** is 16s as any longer duration would prohibit any tone insertion. This is enforced in the menu system – only allowable times will appear in the **ID Time** menu option.

5.5.3 External ID Synchronisation

External audio ID generators can be synchronised to the insertion sequence by means of a TTL level signal generated by the V1681. The ID Sync output goes to a TTL logic high for the duration of the ident sequence, e.g. if **ID Time** is set to 16s, the ID Sync output will be raised to a TTL high for the full 16s, the rising edge marking the start of the ident sequence. So an external generator should be triggered from this rising edge.

The ID Sync output from the unit has a nominal impedance or 75Ω, but is expected to typically drive a high-Z TTL input. If the signal is terminated, it should be noted that the signal level will be halved, possibly causing threshold problems. For connection information see Section 2.3.

5.5.4 ID Level

The audio level of the ID input can be adjusted using the four gain controls – **AUDIO > Gain *XX***, where ***XX*** represents the channel (AL/AR/BL/BR). These gain controls also apply to the standard audio input.

5.5.5 ID Mix

An option is available to mix together the audio ID input, and the output tone, and can be invoked by setting the **AUDIO > Aud O/P** to **ID mix**. This option can useful if an external ID generator is not able to be synchronised to the V1681. It is important however that the external ID generator does not generate audio continuously, as this will stop the V1682 reader from making correct measurements. The breaks in the external audio must be at least 12 seconds long in order for correct measurements to be made.

Wherever possible the ID audio should be switched in rather than mixed, for both measurement reliability, and audibility which will be degraded by the presence of tone.

5.6 Audio Processing

Although the V1681 is primarily designed for use as a signal source, the unit provides full audio multiplexing and de-multiplexing facilities when passing through the SDI input. This enables the unit to be placed in a signal path, and used either to provide an analogue/AES monitoring output, or for embedding an external audio source into a program feed.

5.6.1 Audio Input Selection

There are two selections for audio input, one is used for an external audio ident input (see Section 5.5.1), the other selection is for 'Program' audio, which will be discussed here.

The audio input selection can be found in **AUDIO > Aud I/P**, and generally only affects the unit while test tones are disabled, either by selecting '**Program**' as the video output, or by forcing the audio output to reflect the input by setting the **AUDIO > Aud O/P** option to '**Aud I/P**'.

The audio input may be either an AES/Analogue input through a fitted sub-module, or audio de-multiplexed from the incoming SDI stream. The options available for the audio input are dependent on the audio sub-module fitted to the unit, shown below for AES, analogue and no sub-module respectively :

AES
Group 1
Group 2
Group 3
Group 4

Analog
Group 1
Group 2
Group 3
Group 4

Group 1
Group 2
Group 3
Group 4

5.6.2 Audio Multiplexing

The selected audio input or test-tone may be multiplexed into the incoming SDI input, or internally generated test-pattern. Some limitations apply to the audio multiplexing into an external SDI source, mainly that audio cannot be embedded onto an already occupied group unless the unit blanks the entire ancillary data space.

Selection of desired multiplex group is done in the **AUDIO > Mux Grp** menu which has the following options:-

None
Group 1
Group 2
Group 3
Group 4

If the option **None** is selected all audio multiplexing is disabled. The selection of any other option will attempt to embed on the chosen group. In the event of the selected group already being occupied, the unit will not embed unless ancillary blanking is turned on (see Section 5.1.4), it should be noted however that the ancillary blanking feature blanks the whole ancillary data space removing all embedded groups, and any other embedded data.

5.6.3   Multiplexer Resolution

The audio multiplexer can either embed standard 20bit audio or embed extended 24bit data. The multiplexer resolution may be set in the **ENG'ING > Aud Bits** menu which has the options:

`OP 20bit` and `OP 24bit`

The default for this control is 20 bit resolution.

5.6.4   MAL (Maximum Analogue Level) Set Up

The VALID system works in both analogue and digital domains, and therefore must be aware of the relationship between the two domains. The relationship is set up by specifying the maximum analogue level in dBu that may be represented in the digital system (MAL). This parameter is adjustable from +12 to +24dBu, and may be found adjusted with the **AUDIO > MAL A/B** menu option.

The V1681 VALID generator always generates a test tone level of 0dBu in the analogue and digital domains, however because the relationship between them is variable, the digital level with respect to full scale will change as the MAL control is adjusted. In order for correct level measurements to be made, both reader and generator must have the same MAL setting, OR a compensating gain must be applied when going between regions with different digital level representations.

It should be noted that when the unit is only using analogue I/O the MAL control still sets the internal headroom of the unit, so should still be set up correctly for the system.

5.6.5   Audio Gain

Each of the four audio input channels has an audio gain adjustment available which may be found in the **AUDIO > Gain *XX*** where ***XX*** can be **A1**, **A2**, **B1**, or **B2**. The gains have a range of -16dB to +15dB in 1 dB steps.

The audio gain controls only effect the levels of the audio inputs, and do not effect the output tone levels as these are fixed at 0dBu.

5.6.6   Direct Audio

Through the audio processing path in the unit, audio data is passed through either one or two sample rate converters, while there is very little degradation indeed to the audio quality through this process, the data is changed on a sample by sample basis. While in most cases the sample rate conversion will cause no problems, there can be scenarios where it is undesirable. The direct audio option may be turned on in the **ENG'ING > Aud Dct** menu, which has the options `Normal` and `Direct`.

When using direct audio, it is very important that, if the data is being multiplexed or de-multiplexed, the data MUST be synchronous to the SDI video.

VISTEK V1681 valid generator

5.7 GPI control

The V1681 has three external GPIs so that external hardware can simply select certain parameters. The GPI inputs all have a 4k7 pull-up resistor to +5V, and expect external hardware should take the pin to Ground to activate the GPI.

The pin numbers on the high density D-type and Molex connectors are in this table:

Signal	HD Type	Molex
GPI 1	Pin 20	Pin 2
GPI 2	Pin 25	Pin 3
GPI 3	Pin 30	Pin 4

Various functions can be selected for each of the GPIs and there is no difference between them, other than that there is a priority ranging from GPI 1 (highest) to GPI 3 (lowest). Thus of two GPI input controls conflict, the lower numbered GPI will win.

The GPI controls are set up in the three **CONFIG > GPI *X*** menus where *X* represents **1**,**2** or **3**. The options available are :

Display	Function
Off	GPI disabled (default)
Cap A	Caption A on
Cap B	Caption B on
Cap C	Caption C on
Cap D	Caption D on
Vid Byp	Force SDI I/P to O/P
Aud Byp	Force Aud I/P to Aud O/P
16x9 bar	Generate 16x9 ARC bars
4x3 Bar	Generate 4x3 ARC bars
VITS On	Generate VITS
SDI2 sel	Enable 2nd SDI input.

5.8 Status Menu

5.8.1 Status Overview

The status menu has read only controls reflecting the input statuses, hardware profile, firmware revision.

5.8.2 Options

The **STATUS > Options** status displays any options fitted to the unit. The unit currently only has the basic option, so this will always read 'VALID'.

5.8.3 Sub-Module Identification

There are several audio I/O sub-modules available for the V1681. The module fitment can be identified from the front panel. Modules are available with analogue or AES inputs and outputs, or m mixture e.g. analogue inputs, digital outputs. The module type is shown in the **STATUS > Sub-Mod** menu.

Sub-Mod	Module Type
ᵐ AI/O	Module has analogue inputs and outputs
ᵐ DI/O+DO	Module has AES inputs and outputs + auxiliary AES outputs
AI+DO+DO	Module has analogue inputs, and AES outputs + auxiliary AES outputs
DI+AO	Module has AES inputs, and analogue outputs
ᵐ None	There is no audio sub-module fitted

It should be noted that the audio multiplexing and de-multiplexing facilities are available irrespective of the module fitted. This information is also echoed in the **STATUS > Mod I/Ps** and **Mod O/Ps** menus.

5.8.4 Input Statuses

The status of all inputs (other than analogue) may be checked within the **STATUS** menu.

The SDI input can be monitored under **STATUS > SDI I/P**, which will report on of three things :

Display	Meaning
IP FAIL	No SDI input detected
IP 625 ✓	625/50 SDI input detected
IP 525 ✓	525/60 SDI input detected

The selected AES input may be verified (an audio input from an embedded audio group also counts as an AES input) in the **STATUS > AES A** and **AES B** menu displays, which may either display **No AES A** or **AES A OK**. It should be noted that, if an analogue input is selected, both of these statuses will show an AES failure.

The AES reference status may be checked in **STATUS > AES Ref**, this will report either **RF AES ✓** or **RF AES x**.

5.8.5 Second SDI Input

The V1681 has an optional second SDI input. It can be determined from the front panel whether this input is present or not in the **STATUS > SDI I/P2** menu. This will report **SDI 2 OK** if the second SDI input is available, or **SDI 2 NA** if it is not.

For information on how to change the second SDI input option see Section 2.6.2.

For information on input selection see Section 5.1.6.

5.8.6 Embedded Groups

It maybe useful to know which audio groups are present on the incoming SDI input. This information may be found in the **STATUS > I/P Grps** menu. Occupied groups are shown by the group number being displayed, as shown in the table below.

I/P groups	Display
none	None
1	1 - - -
2 & 4	- 2 - 4

5.8.7 De-Multiplexer Status

The status of the audio de-multiplexer can be found in **STATUS > DMX Aud**, which reports the presence, and resolution (20 or 24 bit) of audio being de-multiplexed. The status reported is that of the input group selected in the **AUDIO > Aud I/P** menu, if a non-embedded audio input is selected, the status of group 1 will be reported.

The status displayed will be one of the following three :

Display	Meaning
No DMX	No usable audio detected on selected group
DMX 20bt	20 bit audio being de-muxed from selected group
DMX 24bt	24 bit audio being de-muxed from selected group

5.8.8 Multiplexer Status

The status of the audio multiplexer is available under **STATUS > Mux Grp**. This indicates whether or not audio is being embedded as selected in the **AUDIO** menu. This status will either report **MUX OK** if all is well, or **MUX over** if the unit has been instructed to overwrite an existing group without first blanking the ancillary data space.

For further information on ancillary blanking, see Section 5.1.4

5.8.9 GPI Status

Although GPIs are currently unused on the V1682, this status indicates the levels of the 3 GPI inputs to the unit (an up arrow indicating that the input is held high).

5.8.10 Firmware Versions

There are four separate items of software/firmware in the V1682 and they all have separate version numbers. These can be read on the following read only menus:

STATUS	Softver	0.00.00	The operating code
STATUS	DSPver	0.00.00	The Audio DSP code
STATUS	Audiover	0.00.00	The Audio FPGA data
STATUS	Videover	0.00.00	The Video FPGA data

6.   CALIBRATION

This section describes how to calibrate the unit as it is done in the factory. The V1681 and its 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 **CALIB > Cal Mode**, which is used to set the unit into a known state for calibration. The options available are '**Cal On**' and '**Cal Off**'.

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.
2. By going up to the Top Level Menu
3. By re-powering the unit.
4. 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. Similarly if you go into a DAC calibration menu it will produce tone onto that channel.   For obvious reasons this should not be done on a unit that is being used On Air.

6.2   Free-Run Frequency

The V1681 has 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 on the V1681 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.

Now monitor the clock frequency on TP 50 (Issue B and C PCB), or compare the output picture movement on a monitor with an accurate external reference and adjust the frequency in the **CALIB > CntrFreq** menu.

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

6.3 Analogue Audio Sub-Modules

The audio sub-modules with analogue interfaces, both inputs and outputs, need to be calibrated. This operation is to 'trim out' the small errors in the components.

The ADC and DAC sections are adjusted separately, but if an A-A module is fitted then the DAC adjustment should be done first.

The calibration values relate directly to the sub-module and not the main board, and they are stored on the sub-module itself. This means that there is no need to re-calibrate a sub-module if it is moved from one board to another.

6.3.1 DAC

By turning Calibrate Mode ON and selecting one of the DAC sub-menus the unit will automatically generate tone with an MAL of +18dBFS.

To calibrate the frequency set the unit to generate Tone by turning Cal Mode ON and selecting one of the DAC sub-menus.

```
CALIB      Cal Mode   Cal On
```

Connect the outputs in turn to a high quality analogue audio analyser and adjust each of the four channels for 0dBu on:

```
CALIB   DAC A(L)
CALIB   DAC A(R)
CALIB   DAC B(L)
CALIB   DAC B(R)
```

6.3.2 ADC

There is no need to change the internal settings to calibrate the ADCs, so it is not necessary to turn Calibrate Mode ON.

Connect the inputs from a high quality audio generator to the inputs at +16dBu and the outputs to an analyser. Set MAL to +18dBFS, and adjust the level +16dBu.

```
CALIB   ADC A(L)
CALIB   ADC A(R)
CALIB   ADC B(L)
CALIB   ADC B(R)
```

7. FRONT-PANEL MENU TREE

The next section shows the menus available on a V1681.

Some menu items may only appear with certain configurations.

```
                              ┌──────────┐
                              │  sleep   │
                              └────┬─────┘
                              ┌────┴─────┐
                              │ VALID GN │
                              └────┬─────┘
┌─────────┬─────────┬──────────┬──────────┬─────────┬──────────┬──────────┬──────────┐
│ VIDEO   │ AUDIO   │ VERT INT │ CAPTIONS │ STATUS  │ ENG'ING  │ CALIB    │ CONFIG   │
└────┬────┴────┬────┴────┬─────┴────┬─────┴────┬────┴────┬─────┴────┬─────┴────┬─────┘
  ┌──┴───┐ ┌───┴───┐ ┌───┴───┐ ┌────┴────┐ ┌───┴────┐ ┌──┴─────┐ ┌──┴─────┐ ┌──┴─────┐
  │Vid O/P│ │Aud I/P│ │FCC¹   │ │Capt Sel │ │Options │ │A/V gang│ │Cal Mode│ │GPI 1   │
  │SDI Src│ │ID I/P │ │NTC-7¹ │ │On/Off   │ │Sub-Mod │ │ID Time │ │ADC A(L)│ │GPI 2   │
  │Flash  │ │Aud O/P│ │VITS²  │ │Text     │ │Mod I/Ps│ │Anc Data³│ │ADC A(R)│ │GPI 3   │
  │Circle │ │Mux Grp│ │UK ITS²│ │Position │ │Mod O/Ps│ │Aud Gang│ │ADC B(L)│ │Banner  │
  │Captions││Gain A1│ │norm   │ │Colour   │ │SDI I/P │ │Aud Bits│ │ADC B(R)│ │Password│
  │Format │ │Gain A2│ └───────┘ │Size     │ │REF I/P │ │Aud Dct │ │DAC A(L)│ │Options │
  │Def AR │ │Gain B1│           │norm     │ │SDI O/P │ │O/P EDH │ │DAC A(R)│ │TestMode│
  │Norm   │ │Gain B2│           └─────────┘ │AES A   │ │Free-run│ │DAC B(L)│ └────────┘
  └───────┘ │MAL    │                       │AES B   │ │Sleep   │ │DAC B(R)│
            │norm   │                       │AES Ref │ │LEDLevel│ │CntrFreq│
            └───────┘                       │SDI I/P2│ │norm    │ │norm    │
                                            │I/P Grps│ └────────┘ └────────┘
                                            │DMX Aud │
                                            │Mux Grp │
                                            │GPI STA │
                                            │Soft Ver│
                                            │DSP Ver │
                                            │AudioVer│
                                            │VideoVer│
                                            └────────┘
```

[1] Available with 525/60 video only.
[2] Available with 625/50 video only.
[3] Available only when the video output is selected as 'Program'

8.   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 which module type 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**'.

8.1   Video Output – `VIDEO`

VIDEO	Vid O/P	Program	n	Pass video from SDI input selected in SDI Src
		Bars16x9		16 : 9 Aspect Identified Bars
		Bars 4x3		4 : 3 Aspect Identified Bars
		Bars100% SMPTEbar		100% Bars in 625 mode / SMPTE bars in 525
		Plse+Bar		10T, 4T & 2T Pulse + Bar
		5 Step		Luma + Chroma 5 Step
		Sweep60%		60% amplitude sweep
		M Burst		60% amplitude multi-burst.
		EQ Path		Equaliser stress pathological signal
		PLL Path		PLL stress pathological signal
		SDI Matr		SDI stress matrix
		Pluge		
	SDI Src	SDI 1	n	SDI Input selection
		SDI 2		If fitted.
	Flash	Flsh On	n	VALID cross timing flash on/off control
		Flsh Off		
	Circle	Comet	n	Centre circle options
		Red/Grn		
		Cir Stat		
		Cir Off		
	Captions	Off	n	Global caption control. There are also individual
		On		Caption on/off controls in **CAPTIONS** menu
	Format	Fmt Auto	n	Format follows SDI I/P or Ref.
		Fmt 625		Force 625 output
		Fmt 525		Force 525 output
	Def AR	4x3	n	Default aspect ratio when not forced by test
		16x9		Pattern. (Aspect Identified Bars force aspect)

8.2 Audio – AUDIO

This menu is only available if the Audio Processing option is fitted.

AUDIO	Aud I/P	> Module	n	Either **Analog / Digital /** not available
		>Group 1		Embedded group 1
		>Group 2		Embedded group 2
		>Group 3		Embedded group 3
		>Group 4		Embedded group 4
	ID I/P	Module	n	Source for voice ID if used
		Group 1		
		Group 2		
		Group 3		
		Group 4		
	Aud O/P	Ton-Glts	n	GLITS tone – Required for timing measurements
		Ton-Cont		Continuous 997Hz tone
		Aud I/P		Selected Audio Input
		Mute		Silence
		ID mix		ID I/P mixed with GLITS Tone
		ID 16s		GLITS tone with ident every 16s
		ID 32s		GLITS tone with ident every 32s
		ID 64s		GLITS tone with ident every 64s
		ID 128s		GLITS tone with ident every 128s
AUDIO (cont)	Mux Grp	Mux None	n	Multiplxer Off
		Group 1		Multiplex onto group 1
		Group 2		Multiplex onto group 2
		Group 3		Multiplex onto group 3
		Group 4		Multiplex onto group 4
	Gain A1	-16dB		
		+0dB	n	Audio input gain channel AL (1dB steps)
		+15dB		
	Gain A2	-16dB		
		+0dB	n	Audio input gain channel AR (1dB steps)
		+15dB		
	Gain B1	-16dB		
		+0dB	n	Audio input gain channel BL (1dB steps)
		+15dB		
	Gain B2	-16dB		
		+0dB	n	Audio input gain channel BR (1dB steps)
		+15dB		
	MAL A/B	MA +12dB		Maximum analogue level
		MA +24dB		n at +18dB

VISTEK V1681 valid generator

8.3   Vertical Interval – `VERT INT`

525 / 60 Mode

`VERT INT`	`NTC-7`	`MTC-7Off`	n	Only available in 525
		`NTC-& On`		
	`FCC`	`FCC  Off`	n	Only available in 525
		`FCC   On`		

625 / 50 Mode

`VERT INT`	`VITS`	`VITS Off`	n	Only available in 625
		`VITS  On`		
	`UK ITS`	`UK   Off`	n	Only available in 625
		`UK    On`		

8.4   Caption Controls – `CAPTIONS`

`CAPTIONS`	`Select`	`Capt A`	n	Selects caption to which rest of menu applies
		`Capt B`		
		`Capt C`		
		`Capt D`		
	`On/Off`	`On`	n	Individual caption on/off control
		`Off`		
	`Text`	`Vistek ■`		Caption test entry. Hold ▲▼ together to change Character set (Upper case / Lower case / Numerical / Symbol). Select to move caret.
	`Position`	`1`	n	Vertical position of selected caption
		`12`		
	`Colour`	`White`	n	Caption colour
		`Black`		
		`Yellow`		
		`Cyan`		
		`Green`		
		`Magenta`		
		`Red`		
		`Blue`		
	`Size`	`Large`	n	Caption text size
		`Medium`		
		`Small`		

8.5 Operating Conditions – STATUS

STATUS	Options	VALID		
	Sub-Mod	DI/O+DO		For example: Digital Input & Output
	Mod I/Ps	AB⊠--		
	Mod O/Ps	--⊠AB		
	SDI I/P	IP 625 ✓		SDI input status
		IP 525 ✓		
		IP FAIL		
	REF I/P	RF 625 ✓		Black & Burst reference status
		RF 525 ✓		
		NO REF		
	SDI O/P	OP 625 ✓		SDI Output Format
		OP 525 ✓		
	AES A	AES A OK		AES Channel A status
		No AES A		
	AES B	AES B OK		AES Channel B status
		No AES B		
	AES Ref	RF AES ✓		AES reference status
		RF AES x		
	SDI I/P2	SDI 2 NA		SDI second input presence
		SDI 2 OK		
	I/P Grps	None		No groups occupied.
		1 - - -		SDI input has Group 1 only is occupied
		- 2 - -		SDI input has Group 2 only is occupied
		- - 3 -		SDI input has Group 3 only is occupied
		- - - 4		SDI input has Group 4 only is occupied
		- 2 - 4		Group 2 and 4, for example, occupied
	DMX Aud	No DMX		Demultiplexer inactive
		DMX 20bt		Demultiplexing 20 bit audio
		DMX 24bt		Demultiplexing 24 bit audio
	Mux Grp	MUX OK		Multiplexer OK
		MUX over		Multiplexer group occupied. Multiplexing is off
	GPI STA	1↓ 2↓ 3↓		↓ → Inactive. ↑→Active.
	Soft Ver	01.00.05		The operating code
	DSP Ver	00.01.01		The Audio DSP code
	AudioVer	01.02		The Audio FPGA data
	VideoVer	01.03		The Video FPGA data

8.6 Engineering – `ENG'ING`

ENG'ING	A/V gang	Ganged	n	Tone / Program audio linked to video selection
		Separate		Tone / Program audio independent of video
	ID Time	4s	n	Length of voice ident
		8s		
		16s		
		32s		
	Anc Blnk	Anc Pass	n	Ancillary Data Space Blanking
		Anc Blnk		
	Aud Gang	Ganged	n	
	Aud Bits	OP 20bit	n	Multiplex standard 20 bit audio
		OP 24bit		Multiplex extended 24 bit audio
	Aud Dct	Normal	n	
		Direct		Bypass SRC for non-audio data
	O/P EDH	EDH On	n	Output EDH insertion On
		EDH Off		Output EDH insertion Off
	Free-run	Free Off	n	Lock to Reference
		Free On		Free-Run system clock (ignore any reference)
	TPs	TPs Norm	n	Test Patterns in active picture only
		TPs FF		Full Field Test Patterns to include the VBI
	Sleep	5 min	n	Variable 1 to 30 minutes, 0 = no sleep
	LEDLevel	▨▨▨		

8.7 Calibration – `CALIB`

	Cal Mode	Off	n	
		On		
	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		
	CntrFreq	+127		
		Frq= +0	n	
		-128		

8.8 Configuration – `CONFIG`

CONFIG	GPI X	OFF	n	GPI X Off
		Cap A		GPI X controls caption A on / off
	X=1,2,3	Cap B		GPI X controls caption B on / off
		Cap C		GPI X controls caption C on / off
		Cap D		GPI X controls caption D on / off
		Vid Byp		GPI X output to SDI input
		Aud Byp		GPI X forces audio output to selected audio input
		16x9 bar		GPI X forces 16:9 Aspect Identified Bars
		4x3 bar		GPI X forces 4:3 Aspect Identified Bars
		VITS on		GPI X turns VITS on
		SDI2 sel		GPI X selects second SDI input
	Password	0		
	Options	VALID		
	TestMode	Off	n	
		On		Password required

8.9 Test Mode – TEST

TEST	Aspect R			
	TP AR			
	AUD ERRA			
	AUD ERRB			
	DMX STA			
	DSP OPFL			
	SRC VERS			
	StatFlgs			
	GPI FUNC			