V1639

4-Channel Audio Shuffler

Includes: V1639AA, V1639DD, V1639DA, V1639AD

User Guide

Issue: 9.0

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Contents

1 Description

The V1639 is a broadcast quality 24-bit audio shuffle module 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.

Depending on the build option chosen, input to the unit is either two stereo pairs of analog audio inputs or two AES digital audio streams. Output from the unit is either two stereo pairs of analog outputs or two AES digital audio streams. The V1639 is fully compatible with the Vistek Viewfind PC-based remote system and the Vistek V1605 remote control panel, allowing status information to be read and control settings invoked by a DART compatible rack controller.

INPUTS

AES OPTION

- 2 x AES3-1992 balanced 110Ω digital audio channels, Z_{out} = 110Ω (or AES3id 75Ω unbalanced with special rear module).
- Input sample rates of 32-96kHz are supported.
- 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 OPTION

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

OUTPUTS

AES OPTION

- 2 x AES3-1992 balanced 110Ω digital audio channels, Z_{out} = 110Ω (or AES3id 75Ω unbalanced with special rear module).
- Sampling frequencies of 32kHz, 44.1kHz, 48kHz are provided.
- 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 OPTION

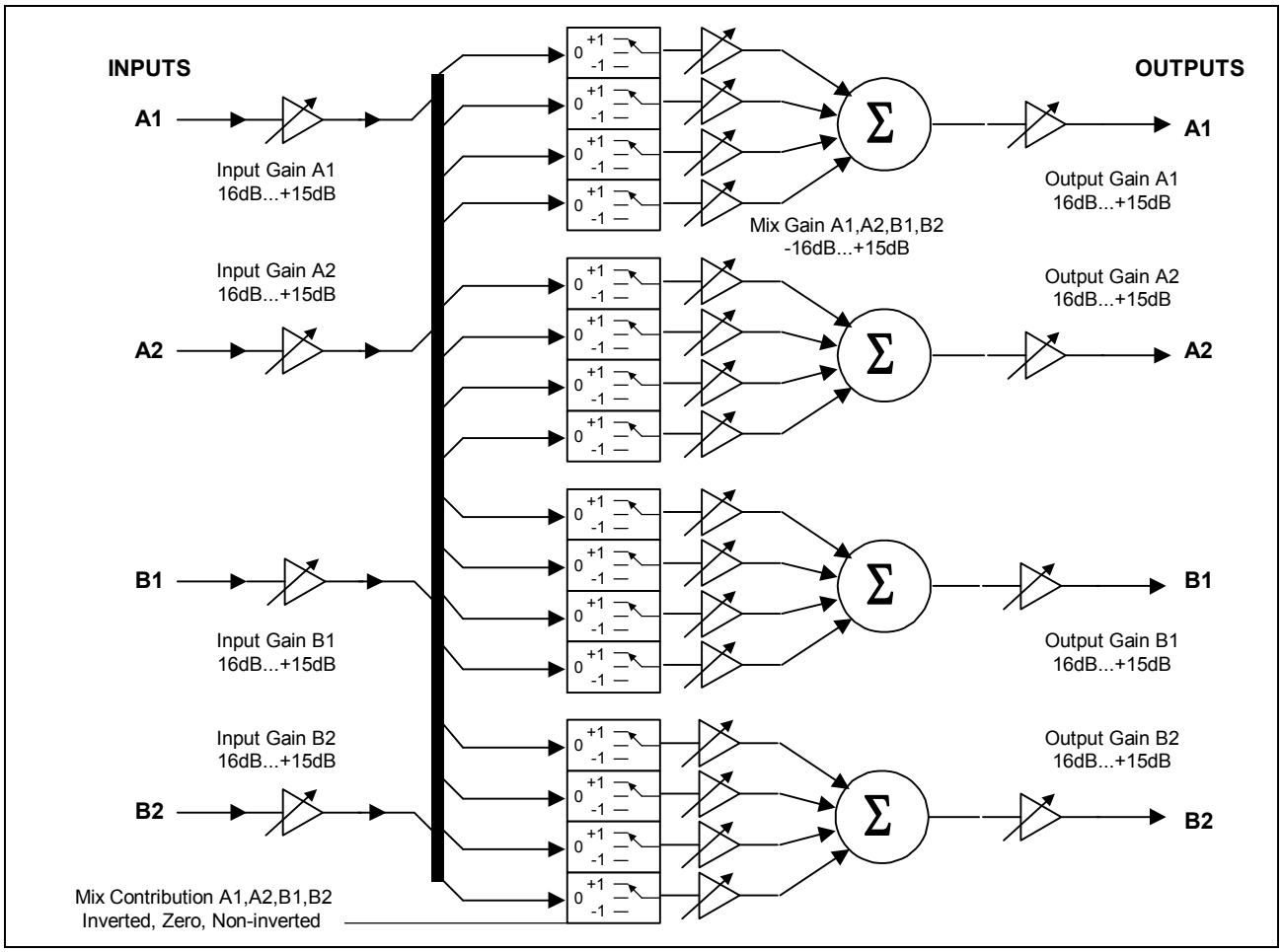
- 4 x Analog differential quasi-balanced outputs with Z_{out} < 50Ω
- Max Output level: 0dBFS = +28dBu. Output level adjustable by on-card switches from 0dBFS = +14dBu to 0dBFS=+28dBu in 1dB steps.

FUNCTIONS

- Panel Selectable/DART controlled **Output Pair Gain** from -16dB to +15dB may be applied to each output pair. Both outputs in a pair are subject to the same gain value.
- Panel Selectable/DART controlled **Input Pair Gain** from -16dB to +15dB may be applied to each input pair. Both inputs in a pair are subject to the same gain value.
- Panel Selectable/DART controlled **Mix** allows each of the four output channels A1, A2, B1 and B2 to comprise non-inverted, inverted or zero contributions from each of the four input channels A1, A2, B1, B2.
- Panel Selectable/DART controlled **Mix Gain** allows the gain of each input which contributes to an output mix to be adjusted in the range -16dB to +15dB.
- Preset configurations allow the non-volatile saving or loading of up to 7 configurations; each configuration consists of Output Pair Gain, Input Pair Gain, Mix and Mix Gain.
- Panel Selectable/DART controlled **Test Tone** of 997Hz at -18dBFS/-18dBu may be applied to either or both A and B channelpair outputs
- Panel Selectable **Reference Source** can be external Video, external AES reference, or internal free-running crystal oscillator. If the build option has analog outputs the reference is fixed at free run. Video reference is available on 48kHz only, AES reference at 32kHz and 48kHz.
- Panel Selectable **Sample rate** can be 32kHz, 44.1kHz, 48kHz. If the build option has analog outputs the internal sample rate is fixed at 48kHz
- Control source may be Panel switches (LOCAL mode) or DART (REMOTE mode)

Vistek V1639 4-Channel Audio Shuffler

A block diagram of the V1639 is shown below.



2 Installation

2.1 Rear Panel Connections

The standard V16AR3H balanced 3U Screw terminal rear panel is shown below in Fig 2.1.1. This provides either analog or AES inputs, and either analog or AES outputs. The 1U panels with screw terminal connectors are similarly marked. Table 2.1.1 describes the connections to the unit when these panels are used.

Fig 2.1.1

V16AR3H balanced 3U Screw Terminal Rear Panel

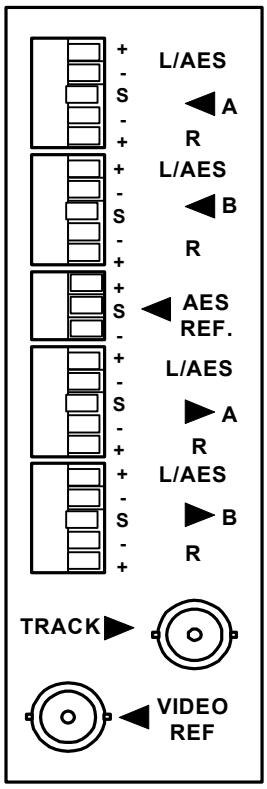


Table 2.1.1

Rear panel connections for V16AR3H balanced rear panel assemblies

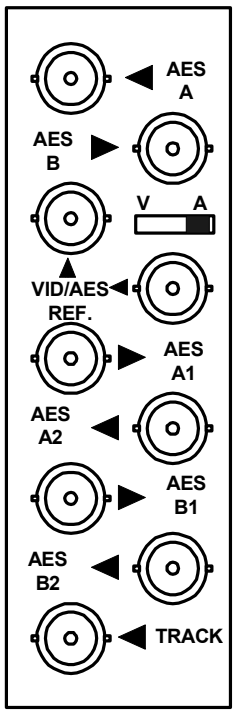
Connector			Analog	AES
A 3 (IN)	L/AES (+/-)	+	A Left In +	AES A In +
		-	A Left In -	AES A In -
		s	GND	GND
	R	-	A Right In -	No connect
		+	A Right In +	No connect
B 3 (IN)	L/AES (+/-)	+	B Left in +	AES B In +
		-	B Left In -	AES B In -
		s	GND	GND
	R	-	B Right In -	No connect
		+	B Right In +	No connect
AES 3 (IN)		+	AES REF In +	AES REF In +
REF.	s		GND	GND
		-	AES REF In -	AES REF In -
A 4 (OUT)	L/AES (+/-)	+	A Left Out +	AES A Out +
		-	A Left Out -	AES A Out -
		s	GND	GND
	R	-	A Right Out -	No connect
		+	A Right Out +	No connect
B 4 (OUT)	L/AES (+/-)	+	B Left Out +	AES B Out +
		-	B Left Out -	AES B Out -
		s	GND	GND
	R	-	B Right Out -	No connect
		+	B Right Out +	No connect
TRACK 3 (IN)			No connect	No connect
BNC				
VIDEO REF 3 (IN)			Video REF. In	Video REF. In
BNC				

The standard V16AR3N unbalanced BNC rear panel is shown below in Fig. 2.1.2. This provides only AES inputs, and AES outputs. Two sets of AES outputs are provided; these are denoted AESA1, AESA2, AESB1 and AESB2 etc. The 1U panels with screw terminal connectors are similarly marked. The labelling on these panels is self explanatory.

This rear panel has a Reference Loop available, so that an AES or video reference may be daisy chained through up to 5 V1639's. There is only one reference input connector, which is shared for AES reference and Video reference. A slide switch alongside the reference input connector is used to select whichever reference is used. If an AES reference is used, the switch slider must be moved towards the 'A' position. If a Video reference is available, the switch must be moved towards the 'V' position. The BNC connector marked 'TRACK' is No Connect.

Fig 2.1.2

V16AR3N unbalanced 3U BNC Rear Panel



Variants of rear panel exist which are customised for analog input and digital output and vice versa. These have screw terminals for analog inputs and outputs and BNC connectors for AES input and output. The connections to these hybrid rear panels may be deduced from those of the standard unbalanced and balanced rear panels.

The V16AR3W balanced rear panel has two 15-way D-type connectors and is shown below in Fig 2.1.3.

Pinouts of these D-Connectors are given in Table 2.1.3. Note that each AES output has both pairs available. Video reference input is on BNC. The BNC labelled 'TRACK' is No Connect.

Fig 2.1.3

V16AR3W balanced 3U D-type Rear Panel

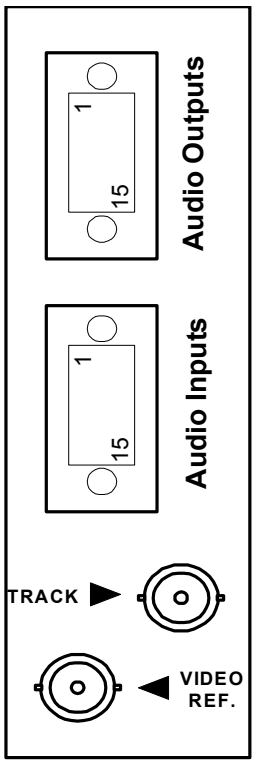


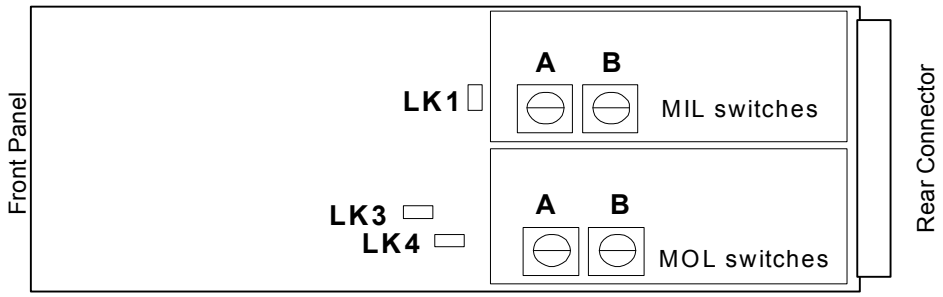
Table 2.1.3

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 -	AES A in -			
2	A right in -	No connect	9	A left in +	AES A in +
3	GND	GND	10	A right in +	No connect
4	AES Ref in -	AES Ref in -	11	GND	GND
5	B left in -	AES B in -	12	AES Ref in +	AES Ref in +
6	B right in -	No connect	13	B left in +	AES B in +
7	GND	GND	14	B right in +	No connect
8	GND	GND	15	GND	GND

D15F Output connector					
Pin	**Analog**	**AES**	**Pin**	**Analog**	**AES**
1	A left out -	AES A1 out -			
2	A right out -	No connect	9	A left out +	AES A1 out +
3	GND	AES A2 out -	10	A right out +	No connect
4	GND	No connect	11	GND	AES A2 out +
5	B left out -	AES B1 out -	12	GND	GND
6	B right out -	No connect	13	B left out +	AES B1 out +
7	GND	AES B2 out -	14	B right out +	No connect
8	GND	GND	15	GND	AES B2 out +

The figure below shows location of all jumpers and switches that may be fitted across the range of V1639 variants.



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. A maximum of 4 modules may be daisy chained.

2.5 MIL/MOL Adjustment

On V1639 options with analog inputs two rotary Hex Switches are provided for adjusting the **MIL** (**M**aximum **I**nput **L**evel) of the analog inputs for each channelpair A and B. **MIL** is adjustable in 1dB steps from +14dBu to +28dBu.

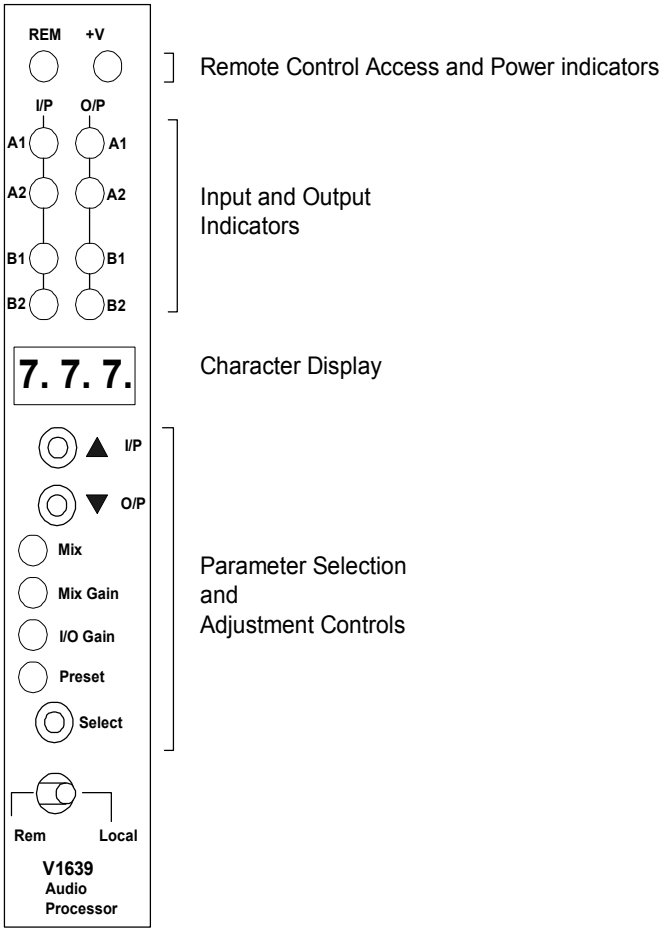
On V1639 options with analog outputs, two rotary Hex Switches are provided for adjusting the **MOL** (**M**aximum **O**utput **L**evel) of the analog outputs for each of the channelpairs A and B. **MOL** is adjustable in 1dB steps from +14dBu to +28dBu.

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

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 Input and Output Indicators

During Mix Edit these LEDs indicate the present output and the inputs that contribute towards the mix for the present output. The Input LEDs also indicate which input is selected for editing.

3.1.3 Character Display

Used for displaying parameters which have numeric or alphanumeric values.

3.1.4 Parameter Selection Controls

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

3.2 Adjustment Of Operating Parameters

3.2.1 General

The V1639 has two *pages* (**Page 0** and **Page 1**) 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 p button invokes the panel adjustment modes of Page 1. In other words, the p button behaves like a 'SHIFT' key on a typewriter when selecting pages of adjustment modes. By this analogy, Page 0 corresponds to lower case and **Page 1** corresponds to upper case letters on a typewriter.
- 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.
- The p or q keys have multiple functions and are used to either increase or decrease the value of a parameter selected for adjustment, or to select secondary options. The *value* of the parameter is indicated either on the character display or the respective sets of Input/Output LEDs above the character display.
- 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 V1639 has non volatile memory storage. All operating parameters set in **LOCAL** mode are stored non volatile. All preset configurations, whether saved from **LOCAL** mode or **REMOTE** mode, are stored non-volatile. Configurations set in **REMOTE** mode are not saved non volatile - unless saved as a preset - as the convention is that these are stored in the rack controller. On power-up in either mode, the last used configuration in **LOCAL** mode will be invoked. If the V1639 is in **REMOTE** mode the **LOCAL** mode settings will remain in force until a rack controller overwrites them. ***NOTE: In local mode the parameter values will be invoked immediately during adjustment, but will only be saved to non-volatile memory when Panel Adjustment mode is exited.***

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

LED indicator	Page 0		Page 1	
	Parameter	**Adjust range**	**Parameter**	**Adjust range**
Mix	Contribution	non-inv, zero, inv	Reference	Free,AES, Vid
Mix Gain	Mix gain	-16dB. . . +15dB	Sample rate	32kHz. . .48kHz
IO Gain	In/Out Gain	-16dB . . .+15dB	Test Tone	A,B off . . . A,B on
Preset	Preset no.	1. . 7	-	

3.2.2 Reference Setting

The reference source may be selected and the present setting may be seen on the character display when the **Page 1** Panel Adjustment mode has been entered and the **Mix** LED is on.. The selectable options will depend on the V1639 variant as follows:

- On cards with analog outputs, only **Free Run** reference may be selected (display shows **0**).
- On cards with digital outputs, the reference may be set to **Free Run**, **AES** or **Video** which correspond to display of **0, C, d** respectively. Video reference is only available at 48kHz and AES reference is available at 32kHz and 48kHz.
- If an external reference fails, the display will flash **4.4.4** and the V1639 will default to **Free Run** mode with reference from the internal crystal oscillator.

3.2.3 Sample Rate Select

The sample rate of the V1639 may be selected and the present setting may be seen on the SPS LEDs when **Page 1** Panel Adjustment mode has been entered and **Mix Gain** LED is on. The selectable options will depend on the V1639 variant as follows:

- On cards with analog outputs, the SPS refers to the internal sample rate and is fixed at **48kHz,** indicated by display of **48**.
- On cards with digital outputs, the SPS refers to the internal and output sample rate and may be set to **32kHz, 44.1kHz** or **48kHz,** indicated by display of **32, 44, 48** respectively**.**

3.2.4 Test Tone

A test tone of 997Hz may be invoked on both channels of either or both A and B channelpairs 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 the **IO Gain** LED is on. The table below explains the available Test Tone selections

Display	Test Tones
0 0	No test tones selected
1 0	Test tone on channelpair A only
0 1	Test tone on channelpair B only
1 1	Test tone on both channelpairs

The test tone is the same frequency (± 1 Hz) for all available sample rates, but the output amplitude depends on the V1639 variant as follows:

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

3.2.5 Setting Up the Mixpath and Mix Gains

3.2.5.1 General

- Each of the four outputs A1, A2, B1 and B2 has associated with it four *Mix Paths*, each being designated by an *input number* and an *output number*, so that Mix Path m->n designates the path from input m to output n. Because there are four inputs and four outputs there are a total of 16 Mix Paths. For example, output A1 has the four Mix Paths: A1->A1, A2->A1, B1->A1 and B2->A2.
- Each Mix Path has three possible *contribution* values, **+1, 0** and **-1,** which describe the contribution input m has to output n which may be non-inverted, zero or inverted. A zero contribution means that input m is not present in the mix for output n.
- *Mix Gain* is the gain with which an input m contributes to output n, provided the contribution is non-zero. The V1639 allows the gain of the contribution to be adjusted in the range -16dB. . . +15dB in 1dB steps.
- *I/O Gain* is gain that may be applied to the individual inputs and/or outputs. The V1639 allows independent control of inputs (A1,A2,B1,B2), and outputs (A1,A2,B1,B2). The I/O Gain operates independently of, and in addition to, the Mix Gain, and the overall gain from input m to output n is the dB sum of Input Gain(m) + MixGain(m->n) + Output Gain(n).

Note that it is the user's responsibility to monitor output levels and ensure that clipping does not take place.

Setup of the mix and gains by Panel Controls comprises Page 0 Panel Adjustments with the primary sequence as shown below:

SELECT -> [Edit Mix] ->
SELECT -> [Adjust Input Gain(A1)] ->
SELECT -> [Adjust Input Gain(A2)] ->
SELECT -> [Adjust Input Gain(B1)] ->
SELECT -> [Adjust Input Gain(B2)] ->
SELECT -> [Adjust Output Gain(A1)] ->
SELECT -> [Adjust Output Gain(A2)] ->
SELECT -> [Adjust Output Gain(B1)] ->
SELECT -> [Adjust Output Gain(B2)] ->
SELECT -> [Preset mode] ->
SELECT -> Exit Page 0.

Each of the parameter adjustment modes will now be discussed.

3.2.5.2 Selecting the Mix Path m->n

The Mix Path is edited as the first adjustment parameter on Page 0. By pressing Select, the user enters the Mix mode and the Mix LED is lit. Initially no other LEDs are lit.

- Momentarily pressing the q O/P key will cause the A1 O/P LED to be lit, indicating that the mix for output A1 is now being edited.
- Repeated momentary pressing of the q O/P key will cause the selected output to step cyclically from A1 - A2 - B1 - B2 - off, with the corresponding O/P LED being lit.
- Holding the q O/P key in will cause the direction of stepping to reverse.
- Pressing SELECT when no I/P or O/P LEDs are on will cause the V1639 to exit Mix mode.
- Note that it is only possible to exit Mix Mode when no outputs are selected and no O/P LEDs are lit.

During selection of each of the outputs A1 through B2, LEDs lit in the column of I/Ps indicate all the inputs which have a non-zero contribution to the selected output. For example, if when O/P LED B1 is lit, I/P LEDs A1 and B1 are also lit, it means that inputs A1 and B1 contribute towards output B1.

When an output n is selected, as indicated by the appropriate O/P LED being lit, the input m for the Mix Path m->n is selected by momentarily pressing the p I/P key. This will cause the A1 I/P LED to flash, indicating that the Mix Path A1->n is selected for edit. Pressing the p I/P key again will cause the A2 I/P LED to flash, and in this the Mix Path m->n may be selected, with O/P LED n lit and I/P LED m flashing.

3.2.5.3 Editing the contribution for Mix Path m->n

With the desired Mix Path m->n selected as described above in 3.2.5.2 the *contribution* of the selected input to the selected output is displayed on the character display as shown in the table below:

Contribution	Description
1	Input m is present in output n
0	Input m is not present in output n
-1	-1 x (Input m) is present in output n

The contribution of m->n may be changed by holding in the p **I/P** key, which causes the displayed contribution to cyclically step through the available settings of 1, 0, -1 at a slow rate.

- Holding in the p **I/P** key causes continued scrolling through the contribution options for m->n.
- Releasing the p **I/P** key causes the presently displayed contribution to be invoked for m->n.
- Momentarily pressing the p **I/P** key causes the selected input to step forward from m to m+1 and the selected input will cyclically scroll through A1 - A2 - B1 - B2 - off.

3.2.5.4 Adjusting the Mix Gain for Mix Path m->n

With the desired Mix Path m->n selected as described above in 3.5.2.2, and a non-zero contribution selected as described above in 3.5.2.4, the **Mix Gain** may be adjusted by pressing **SELECT**. The **Mix** LED will go off and the **Mix Gain** LED will be lit to indicate the mode and the present value of the Mix Gain for m->n will be displayed in dB on the character display. The adjustment range is -16dB to +15dB in 1dB steps.

- Mix Gain mode cannot be entered if the contribution m->n is zero.
- Pressing p **I/P** key will cause the indicated Mix Gain to increase by 1 dB and pressing the q **O/P** key will cause it to decrease by 1 dB.
- Holding in either the p **I/P** key or the q **O/P** key will respectively cause the indicated Mix Gain to auto increment or decrement until the maximum or minimum value is reached.
- The displayed value of Mix Gain is invoked immediately.
- Pressing the **SELECT** key will cause the V1639 to exit the **Mix Gain** mode and return to the **Mix** Mode.

3.2.6 Adjusting the I/O Gain

The **I/O Gain** mode may be entered by pressing **SELECT** when the V1639 is in the **Mix** mode with no outputs selected, i.e. by momentarily pressing **SELECT** twice from normal running mode. The **IO Gain** mode consists of eight sequential adjustment modes for gain on Inputs (A1,A2,B1,B2) followed by Outputs (A1,A2,B1,B2). The **I/O Gain** LED will be lit for all 8 of these modes and the appropriate I/P or O/P LEDs will be lit to show which I/O is currently selected. The I/O Gain for the selected I/O pair is displayed in dB on the character display and the adjustment range is -16dB to +15dB in 1dB steps.

- Pressing p **I/P** key will cause the indicated I/O Gain to increase by 1 dB and pressing the q **O/P** key will cause it to decrease by 1 dB.
- Holding in either the p **I/P** key or the q **O/P** key will respectively cause the indicated I/O Gain to auto increment or decrement until the maximum or minimum value is reached.
- The displayed value of I/O Gain is invoked immediately.
- Pressing the **SELECT** key will cause the V1639 to proceed to the next I/O pair and it should be noted that there is no cyclic scroll on these modes.
- Pressing **SELECT** when O/P LEDs B1, B2 are lit will cause the V1639 to exit **I/O Gain** mode and proceed to **Preset** mode.

3.2.7 Presets

3.2.7.1 Selecting a preset

The **Preset** mode may be entered by pressing **SELECT** when the V1639 is in the **I/O Gain** outputs(B) mode, or by momentarily pressing **SELECT** ten times from normal running mode. On entering **Preset** mode the currently selected preset number $k \in \{1..7\}$ will be displayed on the character display.

Note that selecting a preset does not imply that the preset configuration will be loaded or saved - it is merely choosing a number.

- Pressing p **I/P** key will perform a cyclic scroll through the preset numbers. The scroll will auto increment if the p **I/P** key is held in and the desired preset is selected by releasing the p **I/P** key when the preset number is displayed.
- Pressing **SELECT** will cause the V1639 to exit **Preset** mode and return to normal running mode.

3.2.7.2 Loading a Preset

A configuration consisting of all Mix Path, Contribution, Mix Gain and I/O Gain data previously saved to preset number k, may be loaded and invoked when preset k is selected and the q **O/P** button is momentarily pressed. Confirmation of this action is given on the character display, which will display **k - -** where k is the preset number. This display will remain until the preset number is changed or one or more of the settings are changed.

3.2.7.3 Saving a Preset

The present configuration consisting of all Mix Path, Contribution, Mix Gain and I/O Gain data may be saved to a preset number k when preset k is selected and the q **O/P** button is held in. The character display will confirm when the save has been done by displaying **- - k** where k is the preset number. This display will remain until the preset number is changed or one or more of the settings are changed.

Note that in LOCAL mode the save to preset does not become non-volatile until the user exits Preset mode and returns the V1639 to normal running mode. In remote mode the save to non-volatile memory is immediate.

4 Dart Interface

The V1639 has 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 32 control and status bits in 4 registers that DART may read or write. In present revisions of the V1639 use is made *of refreshed write messages* and *miscellaneous i²c read messages* together with a system of flags designed to stimulate Rack Controller reads when data from the V1639 has changed.

This allows full control of all card parameters from either the Vistek Viewfind PC-based remote control system or the Vistek V1605 remote control panel. Further details of the data assignments for DART-based remote control may be found in document **scms1639.doc**.

The following points are of note:

- DART has access to the same block of parameters data as the Panel Controls, which means that either control source may be used to change the setup. The parameter values that DART reads are the present values, irrespective whether they have been set by DART or by the Panel Controls.
- When in LOCAL mode the V1639 will commit the parameters block to non-volatile storage on exit of the **Page 0** or **Page 1** adjustment mode.
- When in REM mode the module *does not* save the parameters to non-volatile storage. The remote parameters should be stored non volatile in the rack controller.
- The parameters written by DART in REM mode constitute a separate control source from the parameters set up on the panel in LOCAL mode. By switching the REM/LOCAL switch it is possible to switch the V1639 between these two parameter sets.