TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Feb 02
1.0	Fixed minor typos	Mar 04
1.1	Fixed minor typos	Jul 04
1.2	Updated list of test signals, fixed minor typos	Jul 05
1.3	Fixed formatting	Jul 07

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1. OVERVIEW

The 7725VBI-K is a device that is a multi-function VBI keyer. Every program input vertical interval video line can be programmed to pass upstream video, blank the line, insert any VBI line from the SDI Key input, insert a selectable VITS (vertical interval test signal), or insert a user captured test signal. The unit provides the capability to store different VBI configurations as presets and recall them from the card edge control or via 8 opto-isolated GPI inputs. The 7725VBI-K is setup via a card edge control and an on screen display.

This unit is often used in critical on-air applications and hence bypass relay protection of the program video path is provided.

Features:

- One SDI 525 or 625, 270 Mb/s component digital program video input.
- Video input relay bypass for power failure bypass protection.
- One SDI 525 or 625, 270 Mb/s component digital Key video input.
- One composite analog video output with On Screen Menu text.
- A comprehensive on screen menu is available to configure the various features of the module.
- 128 different presets for storing VBI keying configurations.
- Up to 64 line patterns may be captured from any key input line and stored in User Memories for later insertion on any VBI line.
- Extensive library of Factory preset test signals.
- Each line of VBI independently programmable to pass, blank, insert from key signal, insert from user memory or insert factory test signal.
- On Air Preset configuration selected with GPI or Menu selection.
- Non-volatile memory protects current configuration in case of power loss.
- Fully hot swappable from front of frame.

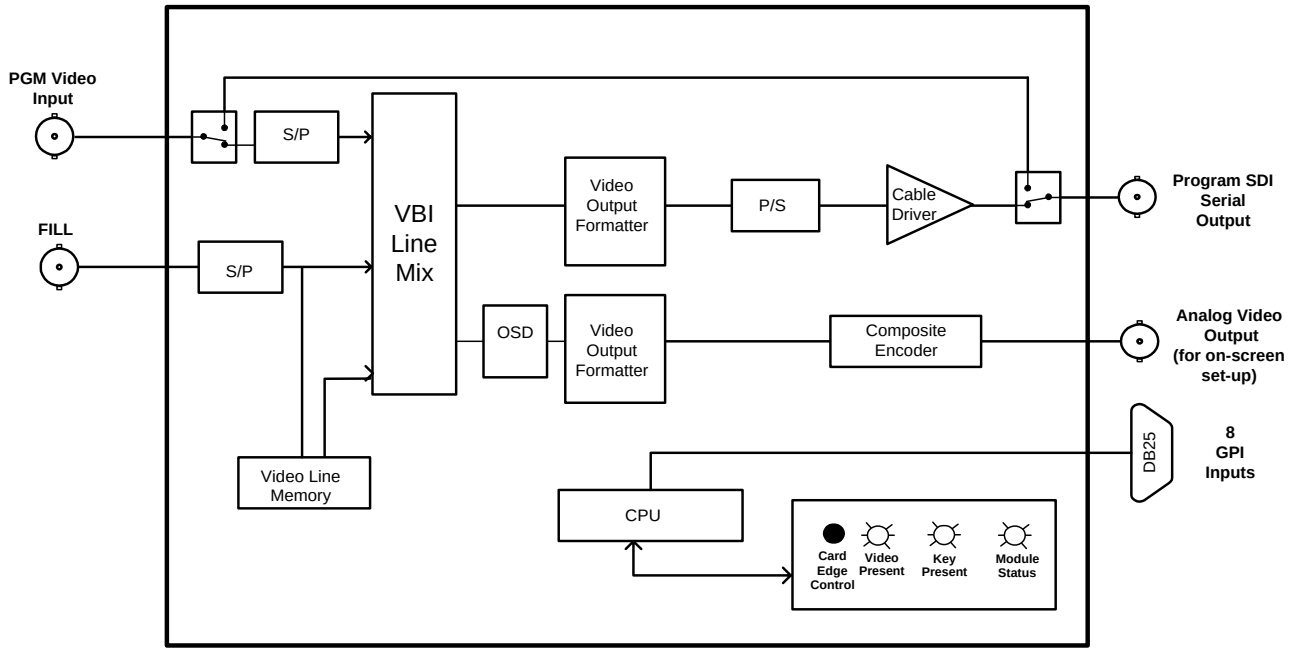

Figure 1-1: 7725VBI-K Block Diagram

The following sections outline several possible applications.

1.1. MASTER CONTROL OUTPUT CHAIN PROTECTION

Typically there are several units "chained" together on the output of a master control switcher. Units such as caption encoders, A.M.O.L. encoders, VITS inserters, data encoders, etc. are typically connected in series in the program output so that if one unit fails the network output will fail. The 7725VBI-K allows you to have one point of insertion in the program output path.

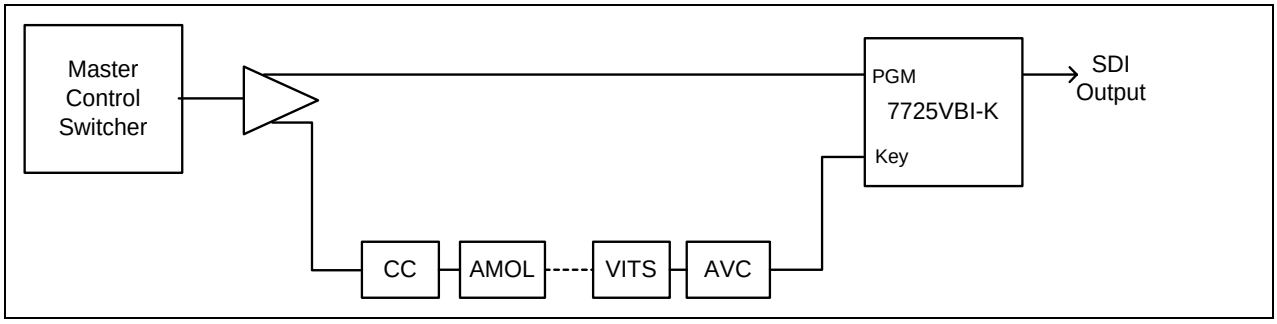

Figure 1-2: Master Control VBI Insertion Application

1.2. SQUEEZE BACK CC BYPASS

This application shows Line 21 caption squeeze back bypass also known as VBI bridging. Some processing devices modify or destroy VBI data such as captioning or VITC. An example of this occurs with some DVE's during a squeeze back application. The 7725VBI-K device will provide a bypass of VBI around the processing device.

Figure 1-3: VBI Data Bridge Application

1.3. VBI LINE SHUFFLER

By providing the same feed to both inputs of the 7725VBI-K the unit will allow the user to modify the VBI and move lines as necessary.

Figure 1-4: VBI Line Shuffle Application

2. INSTALLATION

The 7725VBI-K comes with a companion rear plate that has five BNC connectors and one 25 pin female D connector. Modules occupy two slots in the 7700FR-C frame. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

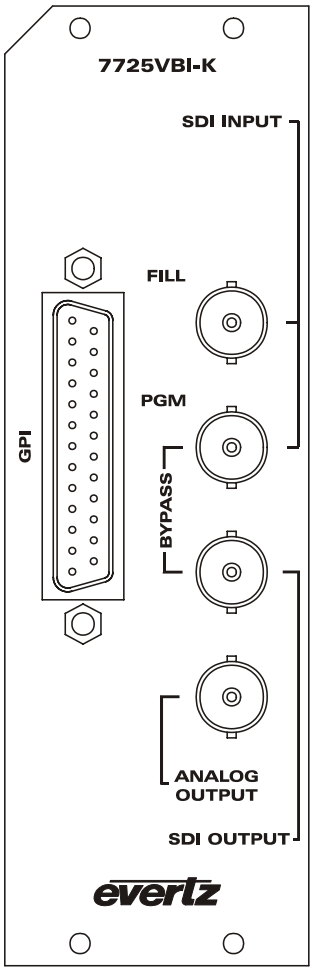

Figure 2-1: 7725VBI-K Rear Panel

2.1. VIDEO IN AND OUT

FILL This BNC connector is used to supply the signal that you want to insert into the VBI of the program video. Supply a 10-bit serial digital video signal compatible with the SMPTE 259M-C standard. This input will be referred to as the Key input throughout this manual.

PGM Input BNC connector is used to supply the program video to the inserter. Supply a 10-bit serial digital video signal compatible with the SMPTE 259M-C standard.

SDI OUTPUT There is one BNC connector that contains the PGM input video with the VBI signals inserted. This output is protected by a bypass relay, which will activate in the event of power loss to the module.

ANALOG OUTPUT This BNC connector contains the PGM input video with the VBI signals as an analog composite video signal and is used for monitoring purposes. The analog output is also used to display the On Screen programming menu.

2.2. GENERAL PURPOSE INPUTS

Table 2-1 shows the pinout of the 25 pin Female D GPI connector. The GPI's are active low with internal pull up resistors (4.7k Ohms) to +5V.

To make an input active, lower the signal to near ground potential (i.e. connect to shell or chassis ground). This can be done with a switch, relay, TTL drive, GPO output or other similar method. Figure 2-2 shows the input circuit for the General Purpose inputs. The *GPI Mode* menu item is used to configure the operation of the GPI inputs. (See section 5.7)

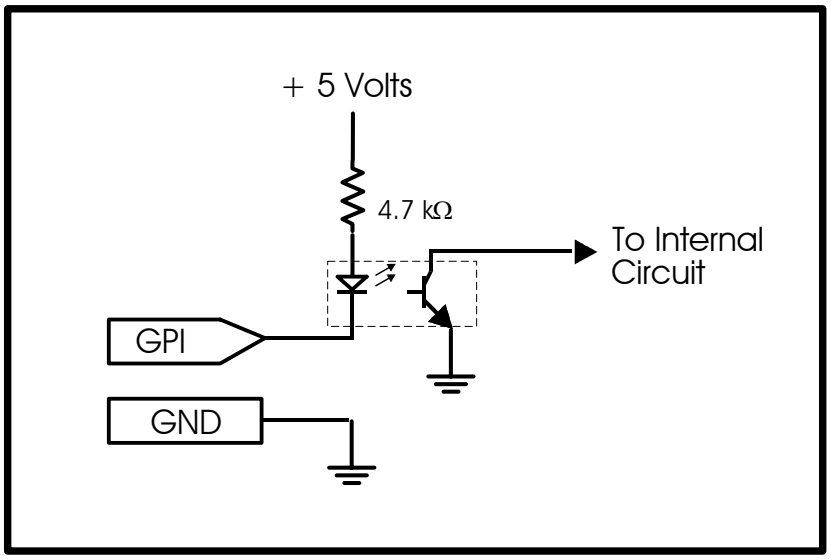

Figure 2-2: GPI Input Circuitry

DB-25	Name	Description
1	---	Not used
2	---	Not used
3	GPI1	General Purpose Input 1
4	GPI2	General Purpose Input 2
5	---	Not used
6	---	Not used
7	---	Not used
8	---	Not used
9	---	Not used
10	---	Not used
11	GPI3	General Purpose Input 3
12	GPI4	General Purpose Input 4
13	GPI5	General Purpose Input 5
14	GPI7	General Purpose Input 7
15	GPI8	General Purpose Input 8
16	---	Not used
17	---	Not used
18	---	Not used
19	---	Not used
20	---	Not used
21	Ground	Ground
22	---	Not used
23	---	Not used
24	---	Not used
25	GPI6	General Purpose Input 6
Shell	GND	Ground

Table 2-1: GPI Pinouts

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard:	SMPTE 259M-C
Number of Inputs:	1 for Program video (PGM) 1 for Key Signal to insert (FILL) PGM and FILL need to be synchronous and timed w.r.t. each other (+/- 1/2 line)
Connector:	BNC input per IEC 60169-8 Amendment 2
Equalization:	Automatic 250m (min) @ 270 Mb/s with Belden 8281 or equivalent cable
Return Loss:	> 15 dB

3.2. SERIAL VIDEO OUTPUTS

Number of Outputs:	1 (Bypass Protected)
Connector:	BNC per IEC 60169-8 Amendment 2
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	470ps nominal
Overshoot:	<10% of amplitude
Wide Band Jitter:	< 0.2UI (Reclocked)
Return Loss:	> 15 dB

3.3. ANALOG VIDEO OUTPUT

Standard:	NTSC (SMPTE 170M), PAL ITU624-4
Number of Outputs:	1
Connector:	BNC per IEC 60169-8 Amendment 2
Signal Level:	1V nominal
DC Offset:	0V +/- 0.1V
Return Loss:	>35 dB up to 5MHz
Frequency Response:	0.8 dB to 4 MHz
Differential Phase:	<0.9deg. (<0.6deg. typical)
Differential Gain:	<0.9% (<0.5% typical)
SNR:	>56 dB to 5MHz (shallow ramp)

3.4. GENERAL PURPOSE IN/OUT

Number of Inputs:	8
Type:	Opto-isolated, active low with internal pull-ups to +5V
Connector:	Female DB-25
Input signal:	Closure to ground
Signal Level:	+5V nominal

3.5. ELECTRICAL

Voltage:	+12VDC
Power:	6 Watts.
EMI/RFI:	Complies with FCC regulations for class A devices. Complies with EU EMC directive.

3.6. PHYSICAL

7700 or 7701 frame mounting:

Number of slots: 2

4. STATUS INDICATORS AND DISPLAYS

4.1. STATUS INDICATOR LEDS

There are two LEDs on the main board that indicate general module health.

LOCAL FAULT: This Red LED indicates poor module health and will be On if a local input power fault exists (i.e.: a blown fuse) or if the module fails to boot (e.g.: upgrade jumper left on). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good and the module has booted successfully.

There are three other LEDs on the sub-module.

LD2 (RUN): This Green LED will be blinking when the module is operating normally.

LD3 (KEY VIDEO): This Green LED indicates the presence of a valid Key video input signal.

LD4 (PGM VIDEO): This Green LED indicates the presence of a valid Program video input signal.

5. ON SCREEN MENUS

5.1. NAVIGATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton at the front card edge are used to navigate a set of on-screen menus used to configure the card. To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently selecting. There is also a line of text at the bottom of the screen to give instructions about the function of the menu item. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu options, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the *Back* or *Exit* commands.

Throughout the descriptions of the On Screen Menu items, default values are shown in <u>underlined</u> text.

5.2. TOP LEVEL MENU STRUCTURE

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Module Status	Shows module Status (Video standard, Key Standard, Preset Control, Active Preset and Delay).
User Capture	Used to Capture signals to the User Signal Memories.
Edit Presets	Main configuration section used to configure each of the 128 Presets.
Active Preset	Selects which preset is active.
GPI Mode	Configures how the GPI inputs will work.
Utilities	Miscellaneous utilities such as firmware version, firmware upgrade, and clearing out the preset and user capture memories.

5.3. DISPLAYING THE MODULE STATUS

The *Module Status* menu item is used to display the current status of the module. It brings up a screen that displays the following items:

PGM Video	Displays video standard and video present status
Key Video	Displays video standard and video present status
Preset Control	Displays if preset is being set from GPI or manually from the menu
Active Preset	Displays the active preset number
Delay Lines	Displays the delay being applied to time the Key Video to the PGM video

Table 5-1: Module Status

5.4. WORKING WITH THE USER SIGNAL MEMORIES

The 7725VBI-K VBI Inserter has the ability to capture up to 64 line patterns from any VBI line and store them in User Memory locations for later insertion on any VBI line. The *User Capture* menu is used to Capture signals to the various user memories.

Source Video Line	Selects the line number of the Key Video signal that will be captured.
User Memory Destination	Selects the user memory location where the signal will be stored.
Start the User Capture	Captures selected line to the user memory when set to *Yes.*

5.4.1. Capturing Lines to the User Line Memories

First you need to choose the line that you wish to capture from the Key Input. Select the *Source Video Line* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the line number that you want to capture. Press the pushbutton again to save this value.

Next you need to choose the user memory location where you will store the captured line. Select the *User Memory Location* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the user memory location where you want to store the captured signal. Press the pushbutton again to save this value. There are 64 user memory locations available for storage.

Next select the *Start Capture* menu item using the toggle switch and press the pushbutton. Use the toggle switch to change the value to “yes”. Press the pushbutton to capture the selected source line to the selected user memory location. If you use the toggle switch to change the value to *cancel*, pressing the pushbutton will exit the menu without capturing anything.

The capture process may take a few seconds to complete.

5.5. CONFIGURING THE USER PRESETS

The 7725VBI-K VBI Inserter has 128 memory locations to store VBI Line Configuration presets. Each preset contains a complete set of VBI line signal settings. The *Edit Presets* menu is used to configure each of the preset memories.

Edit Preset	Selects the Preset number that you will be changing.
Edit VBI Config	Selects the desired processing for each VBI line of the preset
Display VBI Config	Provides a quick overview of the preset and shows the processing for all VBI lines.

5.5.1. Selecting one of the Preset Memories to View/Edit

First you need to choose the Preset number that you wish to edit. Select the *Edit Preset* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the preset number that you want to change or view. Press the pushbutton again to save this value.

5.5.2. Configuring the VBI Processing for a Preset

First select the preset you want to edit using the *Edit Preset* menu. (See section 5.5.1) Then select the *Edit VBI Config* menu item using the toggle switch and press the pushbutton. You will be presented with the following menu options.

5.5.2.1. Selecting the VBI Line Number

EDIT PRESETS
Edit VBI Config
Output Line
10

Select a particular line of the VBI to configure. The permitted line numbers include lines for both field 1 and field 2 of the input video standard. The valid VBI lines are shown below.

	Field 1	Field 2
NTSC	8-32, 253-262	271-295, 516-525
PAL	6-30, 303-312	319-343, 616-625

5.5.2.2. Selecting the Signal Source for a VBI Line

EDIT PRESETS
Edit VBI Config
Line Source
Program
Key Input
User
Factory
Blank

Select the source line that you want keyed onto the selected VBI Line.

Select *Program* to pass through the program video unchanged.

Select *Key Input* to insert a line from the Key video over the program video. Select the specific line of the Key video you want inserted using the *Source Line* menu item.

Select *User* to insert a line from one of the User Memories over the program video. Select the specific User memory you want inserted using the *Source Line* menu item.

Select *Factory* to insert one of the factory supplied signals over the program video. Select the specific factory signal you want inserted using the *Source Line* menu item.

Select *Blank* to blank the selected line of the program video.

5.5.2.3. Selecting the Signal Line Number You Want Inserted

EDIT PRESETS
- *Edit VBI Config*
  - *Source Line*
    - *Line or source number*

The function of this menu item depends on the setting of the *Line Source* menu item.

Line Source = Program: This menu item does nothing.

Line Source = Key Input: Select a particular line of the Key Video to insert. The permitted line numbers include lines for both field 1 and field 2 of the input video standard.

Line Source = User: Select a captured line stored in one of the User Memories to insert.

Line Source = Factory: Select one of the Factory supplied signals to insert. See Table 5-2 for a list of the Factory supplied test signals and their signal numbers.

5.5.2.4. Selecting How Much Delay You Want Added to the Source Line

EDIT PRESETS
- *Edit VBI Config*
  - *Add Frames of Delay*
    - *0*
    - *0 to 6*

This menu item allows the user to add one or more frames of delay to the Key Video line before it is inserted. This menu only takes effect when the *Line Source* menu item is set to Key Input.

5.5.2.5. Factory Supplied Test Signals

The following test signals are available within the 7725VBI-K VBI inserter.

	Name	Name
Number	NTSC	PAL
1	100% White	100% White
2	50% Gray	50% Gray
3	75% SMPTE Colourbars	CCIR Line 17
4	100% SMPTE Colourbars	CCIR Line 18
5	FCC Composite	CCIR Line 330
6	FCC Multiburst	CCIR Line 331
7	GCR System C	75% Colourbars
8	GCR Waveform	100% Colourbars
9	Linear 5 Step Staircase	GCR System C
10	Multiburst 100% / 4.2 MHz	Linear 5 Step Staircase
11	Multiburst 60% / 4.2 MHz	Multiburst 100% / 5.8 MHz
12	Modulated 5-Step Staircase	Multiburst 60% / 5.8 MHz
13	Modulated Ramp	Modulated Staircase
14	Multipulse 4.2 MHz	Pulse & Bar
15	NTC7 Combination	Modulated Ramp
16	NTC7 Composite	Ramp
17	Ramp	Shallow Ramp
18	Red Line	Sin (X)/X
19	Shallow Ramp	Sweep 60% to 5.5 MHz
20	Sin (X)/X 4.75 MHz	Sweep 100% t0 5.5 MHz
21	Sweep 60% / 4.2 MHz	
22	Sweep 60% / 5.5 MHz	
23	Valid Ramp	
24	VIRS	
25	75% Full Field Colourbars	
26	100% Full Field Colourbars	

Table 5-2: Factory Programmed Test Signals

5.5.3. Viewing the VBI Processing for a Preset

First select the preset you want to view using the *Edit Preset* menu. (See section 5.5.1) Then select the *Display VBI Line* menu item using the toggle switch and press the pushbutton. The screen will show each line of the VBI and the action that will be formed on it. The *Source* column shows whether the Program video will be passed through, whether the line will be keyed from the Key video, one of the User Memories, or one of the factory supplied test signals. Use the toggle switch to scroll through the complete range of VBI lines. Press the pushbutton to return to the *Edit Presets* menu.

5.6. CHOOSING THE ACTIVE PRESET

The 7725VBI-K VBI Inserter has 128 memory locations to store user defined VBI Line Configuration presets. Each preset contains a complete set of VBI line signal settings.

ACTIVE PRESET
0
0 to 127
GPI

This menu item allows the user to determine the active preset or to configure the GPI inputs to recall the active preset.

When this menu item is set to one of the preset numbers, that preset will become active when you press the pushbutton.

When this menu item is set to *GPI*, then the GPI inputs will control which preset is active. The GPI inputs operate in one of two modes controlled by the *GPI Mode* menu item.

5.7. CONFIGURING THE GPI INPUTS

GPI MODE
One-Hot
Binary

The 7725VBI-K VBI Inserter has 8 GPI inputs that can be used to recall one of the presets remotely. This menu item is used to configure one of two GPI modes.

When this menu item is set to *One-Hot* the 8 GPI inputs will activate presets 1 to 8 respectively when they are closed to ground. Preset 0 will be selected when none of the GPIs are active

When this menu item is set to *Binary*, the GPI inputs 1 to 7 are binary encoded to select one of the 128 presets. When GPI input 8 is closed to ground, then the preset selected by GPI inputs 1 to 7 will become active.

5.8. CONFIGURING MISCELLANEOUS FUNCTIONS

The *Utilities* menu is used to configure various miscellaneous items.

Upgrade	Allows the user to upgrade the module firmware.
Factory Reset	Clears all the Card Configuration menus and sets the Presets to pass all VBI lines. User memories are **not** cleared.
Reset User Memories	Clears all User Memories.
About…	Displays the module firmware and hardware version information.

5.8.1. Initiating a Software Upgrade

- *Utilities*
  - *Upgrade*
    - *Yes*
    - *Cancel*

This menu item is used to initiate an upgrade of the module firmware.

In addition to the firmware upgrade support detailed in this manual (See the *Upgrading Firmware* section of this manual for more information), you can initiate an upgrade with this command. This will allow you to upgrade the software without unplugging the card and changing the upgrade jumper.

After selecting the upgrade operation, you must change the command to *Yes* and press the pushbutton before the upgrade can take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

After the upgrade has finished, the unit will automatically restart and run in normal operating mode.

5.8.2. Restoring the 7725VBI-K to its Factory Default Configuration

- *Utilities*
  - *Factory reset*
    - *Yes*
    - *Cancel*

This menu item is used to restore all controls back to their factory defaults.

After selecting the reset operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all parameters will be set to their factory default. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

5.8.3. Clearing the User Memories

- *Utilities*
  - *Clear User Memories*
    - *Yes*
    - *Cancel*

This menu item is used to remove all captured lines from the User memories.

After selecting the clear operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all user memories will be cleared. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

5.8.4. Accessing Information About this Module and its Firmware

- *Utilities*
  - *About…*

This menu item lists the particulars about this module and the firmware residing within it. It gives quick access to information about revisions that can be used to determine when upgrades are required.

6. JUMPERS AND LOCAL CONTROLS

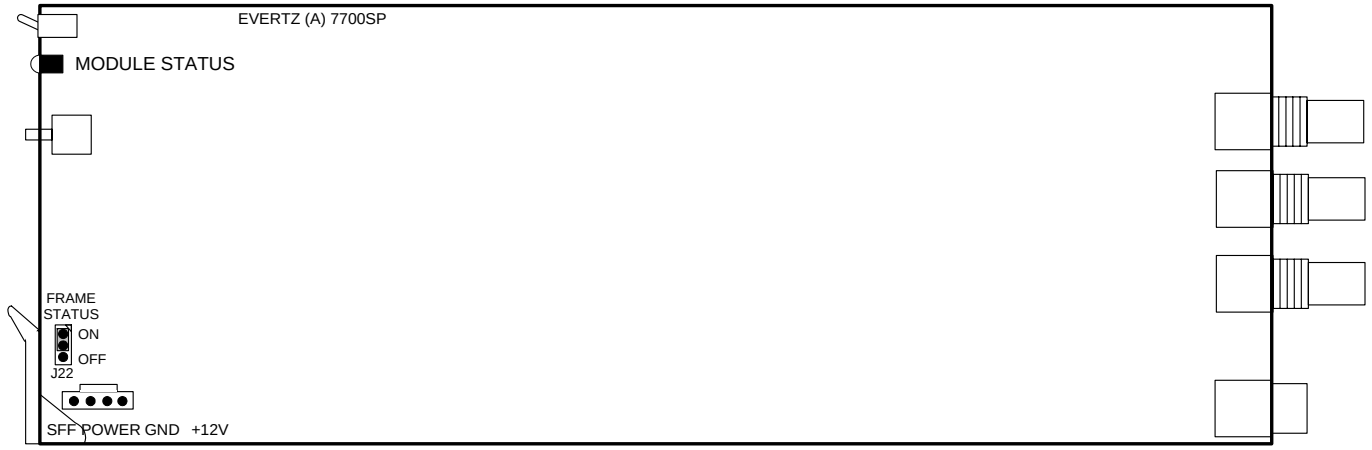

Figure 6-1: Location of Jumpers on Main Board (7700SP)

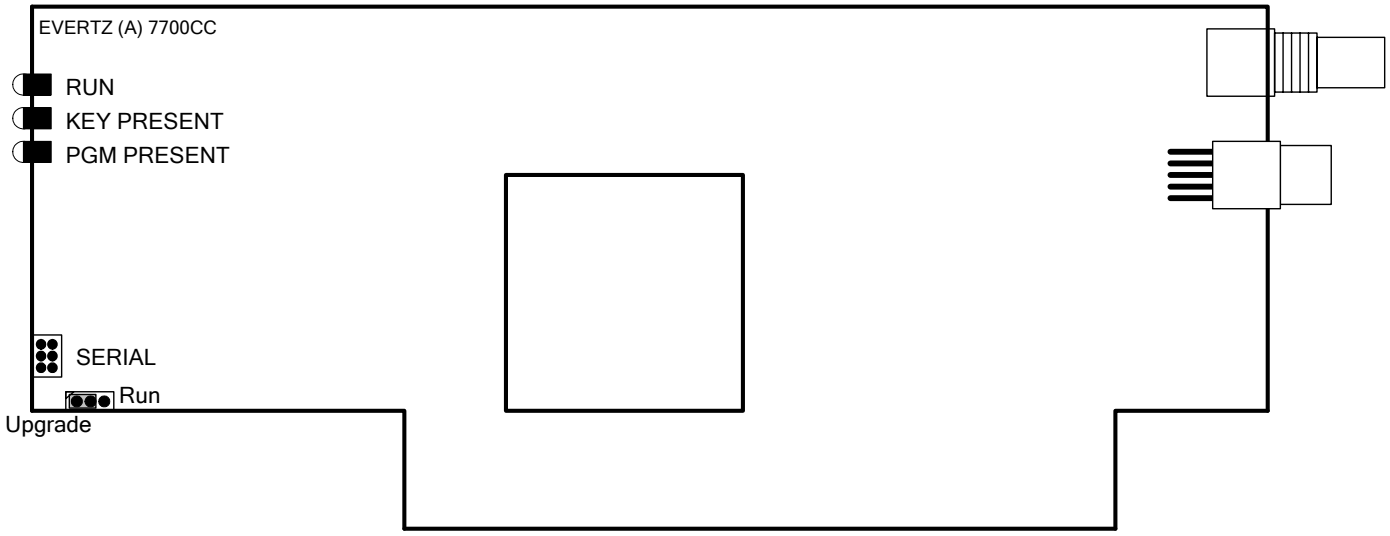

Figure 6-2: Location of Jumpers on Submodule (7700CC)

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J22, located at the front of the main board, determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (default)

When this jumper is installed in the Off position local faults on this module will not be monitored.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE The UPGRADE jumper located on the top module at the bottom, front is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. Firmware upgrades can also be initiated from the *Utilities* menu (See section 5.8.1) See the *Upgrading Firmware* section in the front of the binder for more information.

To upgrade the firmware in the module using the manual procedure, pull the module out of the frame. Move the jumper into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto SERIAL header at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section in the front of the binder of this manual. Once the upgrade is completed, remove the module from the frame, move the jumper into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

To upgrade the firmware in the module using the *Upgrade* menu item, install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto SERIAL header at the card edge. Go to the *Upgrade* menu item as described in section 5.8.1. Complete the upgrade as described in the *Upgrading Firmware* manual. Once the upgrade is complete, remove the upgrade cable. The module is now ready for normal operation.