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## REVISION HISTORY

<b><u>REVISION</u></b>	<b><u>DESCRIPTION</u></b>	<b><u>DATE</u></b>
1.0	Original Version	Mar 00
1.1	Minor typographical errors fixed 4:3 marker support marked as future	Mar 00
1.2	Model V-A changed to VA, new rear panel drawing Gender of Audio/Aux I/O connector changed	May 00
1.3	VGA Monitor Specifications added Removed discontinued Audio Output option	July 00
1.4	Dual-link functionality added Supported by software version 2.1	Aug 00
1.5	Fixed description of Local Fault LED	Oct 00
1.6	Added more detail to video input specification	Jan 01
1.6.1	Remove Preliminary watermark	May 02
1.7	Added input to output delay specification	Jun 04

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## 1. OVERVIEW

The 7730DAC-HD is a professional quality digital to analog converter for HDTV. The 7730DAC-HD supports all signal standards specified in SMPTE 240M, SMPTE 274M and SMPTE 296M.

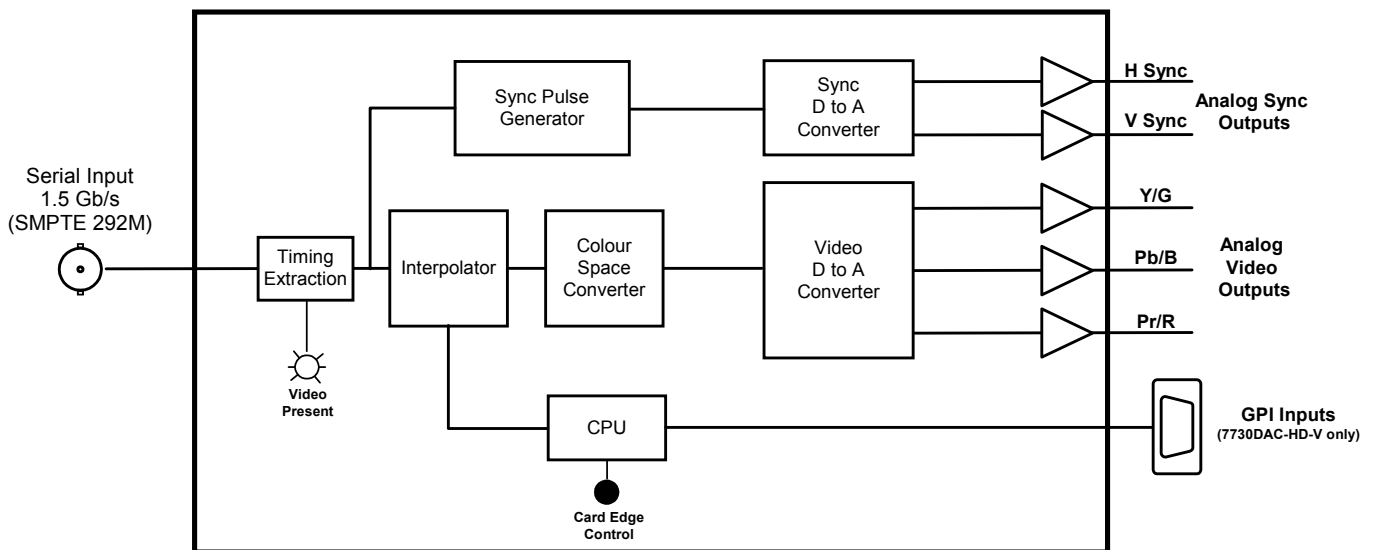
The 7730DAC-HD is available in 2 different versions to meet a variety of applications. (See specifications for complete information)

Model	Video DAC Outputs	GPIO
7730DAC-HD	4 BNCs	---
7730DAC-HD-V	15 Pin VGA	6 on 15 pin D

Card edge control allows the user to select between YPrPb, RGB or VGA style analog outputs with a variety of sync output options. User controlled 4:3 alignment markers also allow for convenient framing of the video signal. Dual-link 4:4:4 input format is supported when using two cards in parallel. With two different passive rear modules the 7730DAC-HD can easily interface to either standard broadcast monitors or VGA computer monitors.

### Features:

- Support for all SMPTE 274 and 296M video formats
- Full 10 Bit Broadcast quality
- 4:4:4 interpolated component output
- Card edge selectable YPrPb, RGB or VGA outputs with bi-level or tri-level sync
- GPI controllable 4:3 alignment markers
- Dual-link 4:4:4 input format supported with two cards (auto-timing to be implemented in the future)
- BNC rear connector plates for use with standard broadcast monitors
- 15 pin VGA connector plates for use with VGA computer monitors
- Front panel LEDs indicate video presence, module faults



**Figure 1: 7730DAC-HD Block Diagram**

## 2. INSTALLATION

The 7730DAC-HD series modules come with a companion rear plate. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.

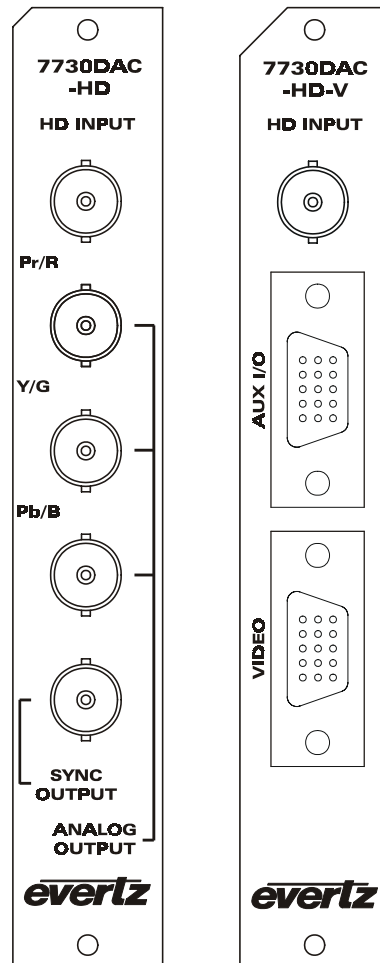


Figure 2: 7730DAC-HD Rear Panels

### 2.1. VIDEO IN AND OUT

**HD INPUT** Input BNC connector for 10-bit serial digital video signals with embedded audio, compatible with the SMPTE 292M standard. The 7730DAC-HD automatically selects the video standard.

#### 2.1.1. Video Output - BNC Rear Panel

**ANALOG OUTPUT** There are three BNC connectors with Y, Pr, Pb or RGB outputs from the 7730DAC. These outputs can have either bi-level or tri-level sync superimposed. The output signals available are selected using DIP switches 1 to 4. (See Table 4)

**SYNC OUTPUT** The SYNC output can be programmed for bi-level or tri-level HD sync depending on the settings of DIP switches 1 to 4. (See Table 4)

### **2.1.2. Video Output - 15 Pin D Connector Rear Panel**

**VIDEO** This female HD 15 pin D connector is compatible with standard VGA monitor connectors. The outputs can be programmed as standard VGA signals or Y, Pb, Pr or RGB outputs from the 7730DAC. These outputs can have either bi-level or tri-level sync superimposed. The output signals available are selected using DIP switches 1 to 4. (See Table 4) When the VGA mode is selected you can connect a standard VGA monitor using a straight through VGA Cable. When other modes are selected you can connect a standard broadcast monitor using the 15 pin D to BNC adapter cable provided with the module.

<b>Pin #</b>	<b>Name</b>	<b>Description</b>
1	R	Red
2	G	Green
3	B	Blue
4	--	Not connected
5	--	Not connected
6	AGND	Video Analog Ground
7	AGND	Video Analog Ground
8	AGND	Video Analog Ground
9	--	Not connected
10	AGND	Video Analog Ground
11	--	Not connected
12	--	Not connected
13	Hsync	Horizontal Sync
14	Vsync	Vertical Sync
15	--	Not connected

**Table 1: Video I/O Pinout**

## **2.2. AUX I/O**

The **AUX I/O** (7730DAC-HD-V) connector is used for general purpose Inputs. Table 2 shows the pinout of the male high density DB-15 connector.

<b>Pin #</b>	<b>Name</b>	<b>Description</b>
1	GPI4	General Purpose Input 4 – future use
2	Vext	External voltage for GPI's
3	---	---
4	---	---
5	---	---
6	GND	Ground
7	GPI2	General Purpose Input 2 – future use
8	GPI3	General Purpose Input 3 – future use
9	---	---
10	---	---
11	GPI1	4:3 Marker enable/ disable
12	---	---
13	---	---
14	---	---
15	---	---

**Table 2: Audio and Aux I/O Pinout**

### **2.2.1. Connecting the General Purpose Inputs**

The GPI's are active low with internal pull up resistors (4.7k Ohms) to the Vext pin. By default the Vext pin is connected to +5V supplied from the module to provide power to the GPIO opto-isolator circuitry. In this configuration the user can activate GPIs simply by connecting the GPI input pins to Ground. This can be done with a button, switch, relay or an open collector transistor.

Alternately, the user can disconnect the internal +5 volts and connect an external power source for the opto-isolator circuitry. See section 6.3 for information on configuring the Vext jumper. The externally supplied Vext voltage must be greater than the voltage supplied to GPI by at least 5v.

Figure 3 shows the input circuit for the General purpose inputs.



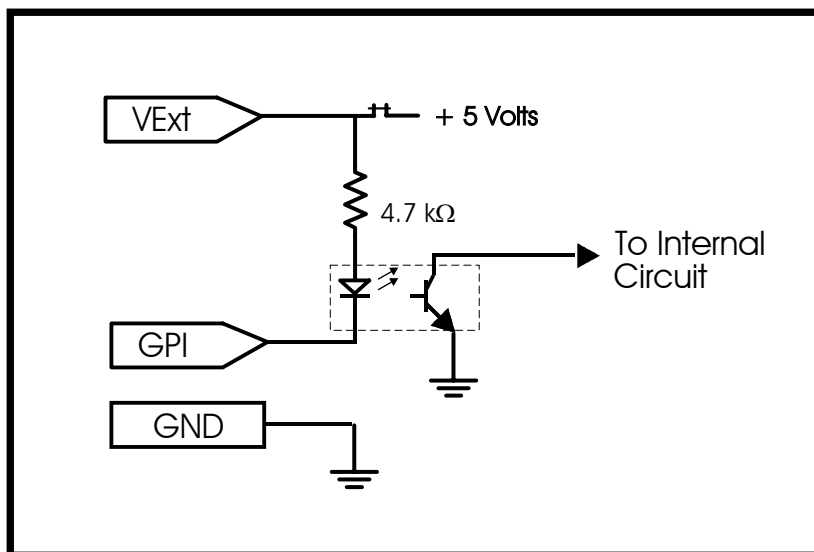


Figure 3: GPI Input Circuitry

### 3. SPECIFICATIONS

#### 3.1. VIDEO INPUT

**Standard:** 1.485 Gb/sec SMPTE 292M  
Standards supported are:  
SMPTE 240M (1035i)  
SMPTE 274M (1080i, 1080psF, 1080p [except 1080p/60 and 1080p/59.94]  
SMPTE 296M.(720p)  
**Connector:** 1 BNC per IEC 60169-8 Amendment 2.  
**Equalization:** Automatic 125m @ 1.5Gb/s (Belden 1694)

#### 3.2. ANALOG VIDEO OUTPUTS

**Standard:** SMPTE 240M, 274M, 296M – same as input  
**Connectors:** 7730DAC-HD: 4 BNC per IEC 60169-8 Amendment 2.  
7730DAC-HD-V 15 pin high density female D type  
**Signal Level:**  
    **Video:** 1Vpp nominal YPrPb/RGB or 0.7Vpp nominal VGA - Selectable as per Table 4  
    **Sync:** 300mV or 4V  
**Impedance:** 75 ohm  
**DC Offset:** 0V  $\pm$ 0.1V  
**Return Loss:** > 45 dB up to 30 MHz

#### 3.3. INPUT TO OUTPUT PROCESSING DELAY

**Processing Delay:** 800nsec

### 3.4. GENERAL PURPOSE INPUTS

**Number of Inputs:** 4  
**Type:** Opto-isolated, active low with internal pull-ups to Vext pin.  
May be internally jumpered to +5V  
**Connector:** Male High Density DB-15  
**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.

## 4. STATUS LEDS

### 4.1. MODULE STATUS LEDS

The location of the status LEDs is shown in Figure 6.

**MODULE OK** This Green LED will be On when the module is operating properly.

**LOCAL FAULT** This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when input video is lost or there is a fault in the module power supply.

**SIGNAL PRESENT:** This Green LED will be On when there is a valid HDTV video signal present at the module input.

## 5. CARD EDGE CONTROLS

The 7730DAC-HD is equipped with an 8 position DIP switch to allow the user to select various output signals available formats. The On position is down, or closest to the printed circuit board. . Table 3 gives an overview of the DIP switch functions.

DIP Switch	Function
1	Video Output signal select
2	
3	
4	
5	Aspect Ratio Marker enable
6	Dual-link input format enable
7	Not used
8	Not used

**Table 3: DIP Switch Functions**

### 5.1. SELECTING THE OUTPUT SIGNAL FORMATS

When the 7730DAC is operating in the single link 4:2:2 mode, (DIP switch 6 Off) DIP switches 1 to 4 are used to select the combination of output signals present on the video output connectors as shown in Table 4. When dual Link is enabled (DIP switch 6 On) DIP switches 1 to 4 are redefined as shown in Table 8. The VGA mode is only available on models equipped with the VGA style Video Output connector. When using the VGA output mode, the VGA monitor must have sufficient resolution and vertical resolution to display the input video. Table 5 shows the minimum requirements for each video format supported by the 7730DAC-HD.

DIP Switch*				Description	Pr / R	Y / G	Pb / B	Sync
1	2	3	4					
Off	Off	Off	Off	YPrPb with Tri Level	Pr + Tri-level Sync	Y + Tri-level Sync	Pb + Tri-level Sync	Tri-level Sync
On	Off	Off	Off	YPrPb with Bi Level	Pr + Bi-level Sync	Y + Bi-level Sync	Pb + Bi-level Sync	Bi-level Sync
Off	On	Off	Off	RGB with Tri Level	R+ Tri-level Sync	G + Tri-level Sync	B + Tri-level Sync	Tri-level Sync
On	On	Off	Off	RGB with Bi Level	R + Bi-level Sync	G + Bi-level Sync	B + Bi-level Sync	Bi-level Sync
Off	Off	On	Off	RGB Tri Level on G	R	G + Tri-level Sync	B	Tri-level Sync
On	Off	On	Off	RGB Bi Level on G	R	G + Bi-level Sync	B	Bi-level Sync
Off	On	On	Off	VGA	R	G	B	H & V Sync
On	On	On	Off	RGB Tri Level Ext.	R	G	B	Tri-level Sync
Off	Off	Off	On	RGB Bi Level Ext.	R	G	B	Bi-level Sync

**Table 4: Video Output Selection Switch Settings (Dual-link Disabled)**

Video Format	Minimum Horizontal Resolution	Minimum Vertical Resolution	Minimum Vertical Refresh Rate
1080i/60 (59.94)	1920 dots	1080 lines	60 (59.94) Hz
1080i/50	1920 dots	1080 lines	50 Hz
1080p/24sF (23.98)	1920 dots	1080 lines	48 (47.97) Hz
1035i/60 (59.94)	1920 dots	1080 lines	60 (59.94) Hz
720p/60 (59.94)	1280 dots	720 lines	60 (59.94) Hz

**Table 5: Minimum VGA Monitor Specifications**

## 5.2. CONTROLLING THE ASPECT RATIO MARKERS

DIP switch 5 controls whether the aspect ratio markers will be enabled.

DIP 5	FUNCTION	DESCRIPTION
Off (default)	Use GPI 1	The markers will be On when the GPI 1 input is closed to ground.
On	On	The markers will be On all the time.

**Table 6: 4:3 Marker Switch Settings**

## 5.3. ENABLING DUAL-LINK DATA INPUT

DIP switch 6 controls whether or not the 7730DAC-HD will interpret the input data stream as dual-link 4:4:4:4 formatted data, which allows for full bandwidth chroma. A single 7730DAC-HD module will only process two dual-link data channels; therefore, two 7730DAC-HD modules are necessary to process all four channels.

DIP 6	FUNCTION	DESCRIPTION
Off (default)	Dual-link disabled	Video data is processed as being 4:2:2 formatted.
On	Dual-link processing enabled	Video data is processed as being two channels of dual-link 4:4:4:4 formatted video.

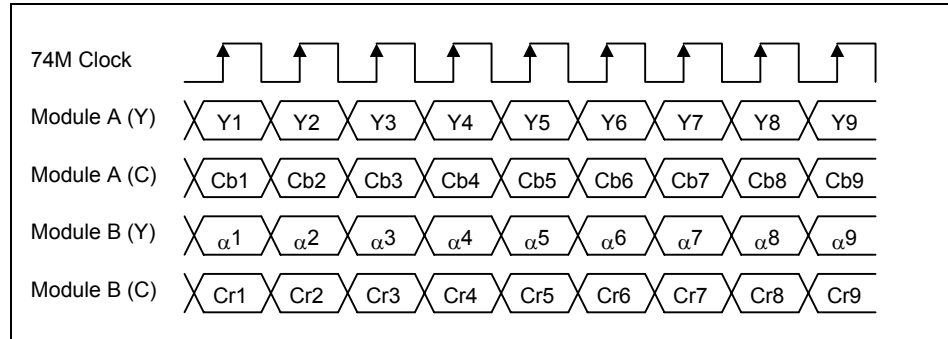
**Table 7: Dual-link DIP switch settings**

When operating in dual-link mode, DIP switches 1 to 4 (see Table 8) are used to indicate the input colour space of the video data and the output sync format. In dual-link mode, the colour space converter on the 7730DAC-HD is always bypassed. DIP switches 1 to 4 should be set to identical values on both modules.

DIP Switch*				Description	Input Data Colour space	Module A Output				Module B Output			
1	2	3	4			Y/G	Pb/B	Pr/R	Sync	Y/G	Pb/B	Pr/R	Sync
Off	Off	Off	Off	YPrPb with Tri Level	YCbCr	Y + Tri	Pb + Tri	Tri		$\alpha$ + Tri	Pr + Tri	Tri	
On	Off	Off	Off	YPrPb with Bi Level	YCbCr	Y + Bi	Pb + Bi	Bi		$\alpha$ + Bi	Pr + Bi	Bi	
Off	On	Off	Off	RGB with Tri Level	RGB	G + Tri	B + Tri	Tri		$\alpha$ + Tri	R + Tri	Tri	
On	On	Off	Off	RGB with Bi Level	RGB	G + Bi	B + Bi	Bi		$\alpha$ + Bi	R + Bi	Bi	
Off	Off	On	Off	RGB Tri Level on G	RGB	G	B	Tri		$\alpha$	R	Tri	
On	Off	On	Off	RGB Bi Level on G	RGB	G	B	Bi		$\alpha$	R	Bi	
Off	On	On	Off	VGA	RGB	G	B	H&V		$\alpha$	R	H&V	
On	On	On	Off	RGB Tri Level Ext.	RGB	G	B	Tri		$\alpha$	R	Tri	
Off	Off	Off	On	RGB Bi Level Ext.	RGB	G	B	Bi		$\alpha$	R	Bi	

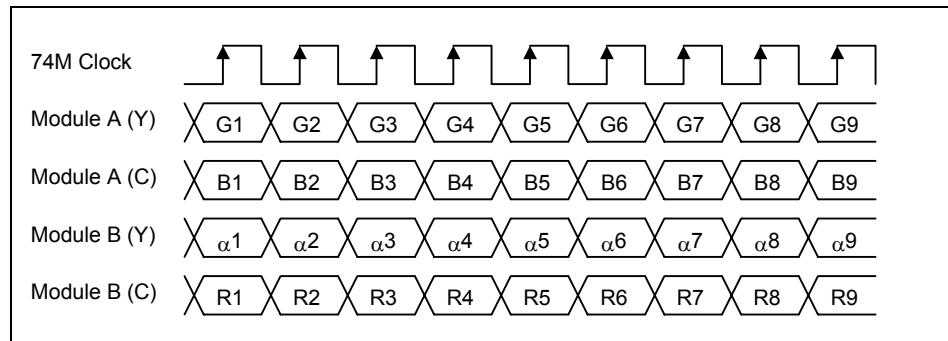
**Table 8: Video Output Selection Switch Settings (Dual-link Enabled)**

Figure 4 shows the required input data format and timing when running two 7730DAC-HD modules in dual-link Y:Cb:Cr:A mode (YCbCr colour space).



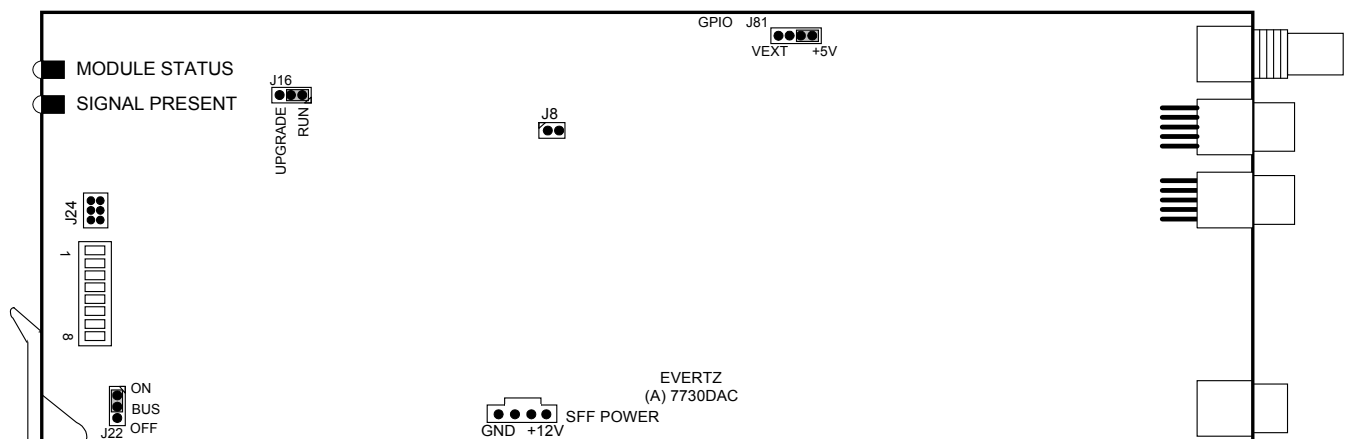
**Figure 4: Dual-link input data format (Y:Cb:Cr:A)**

Figure 5 shows the required input data format and timing when running two 7730DAC-HD modules in dual-link G:B:R:A mode (RGB colour space).



**Figure 5: Dual-link input data format (R:G:B:A)**

## 6. JUMPERS



**Figure 6: Location of Jumpers**

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

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

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper. (Default)

When this jumper is removed, local faults on this module will not be monitored. For convenience you may re-install the jumper so that only one side is connected.

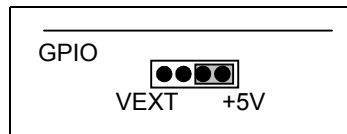
## 6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

**UPGRADE** The UPGRADE jumper J16 located at near the top of the module near the MODE jumper block is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section of this manual for more information.

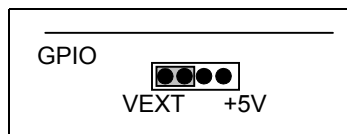
To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

## 6.3. PROVIDING POWER TO THE GENERAL PURPOSE INPUTS

**VEXT** The GPIO jumper J81 is located at the top of the module approximately two thirds of the way to the back. When this jumper is installed in the +5V position (the two pins closest to the rear of the module) the GPI inputs will be pulled up to +5 volts.



When the jumper is installed in the *VEXT* position (the two pins closest to the front of the module) the GPI inputs will be pulled up to a user supplied voltage connected to pin 2 of the AUX I/O connector.



See section 2.2.1 of this manual for more information on connecting the GPI inputs.