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REVISION HISTORY

REVISION	**DESCRIPTION**	**DATE**
1.0	Released Version	January 2005

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1. OVERVIEW

The PKG7771MFD-HD, HDTV Decompression Codec converts a 270Mb/s SDTi (SMPTE 305M) input signal containing HDCAM compressed data with embedded AES audio, into a SMPTE 292M (1.485Gb/s) component serial digital stream with embedded or separate AES audio. An additional stereo analog audio channel is also available for local monitoring. The PKG7771MFD-HD supports 1080i/59.94, 1080p/29.97sF, 1080p/23.97sF, 1035i/59.94, and 720p/59.94 video formats.

The PKG7771MFD-HD is composed of two sets of cards, the PKG7771MFD and the 7771MFCD-D.
The PKG7771MFD-HD occupies four card slots and is housed in the standard Evertz 3RU frame that holds up to 15 modules.

Features:
- Industry proven HDCAM video decompression for origination quality video
- Supports 720p/59.94, 1080i/59.94, 1080p/29.97sF, 1080p/23.98sF and 1035i/59.94 formats
- Automatic detection of 720p/1035i/1080i active lines
- Detection of uncompressed SD or compressed HD input stream and outputs GPO control for downstream equipment.
- Outputs up to four channels of uncompressed embedded AES audio
- Audio delay processing to match video compression/decompression delay
- Four separate stereo AES unbalanced outputs
- One stereo analog audio output
- Re-embeds original VANC data in outgoing HD-SDI stream
- Fully hot swappable from front of frame
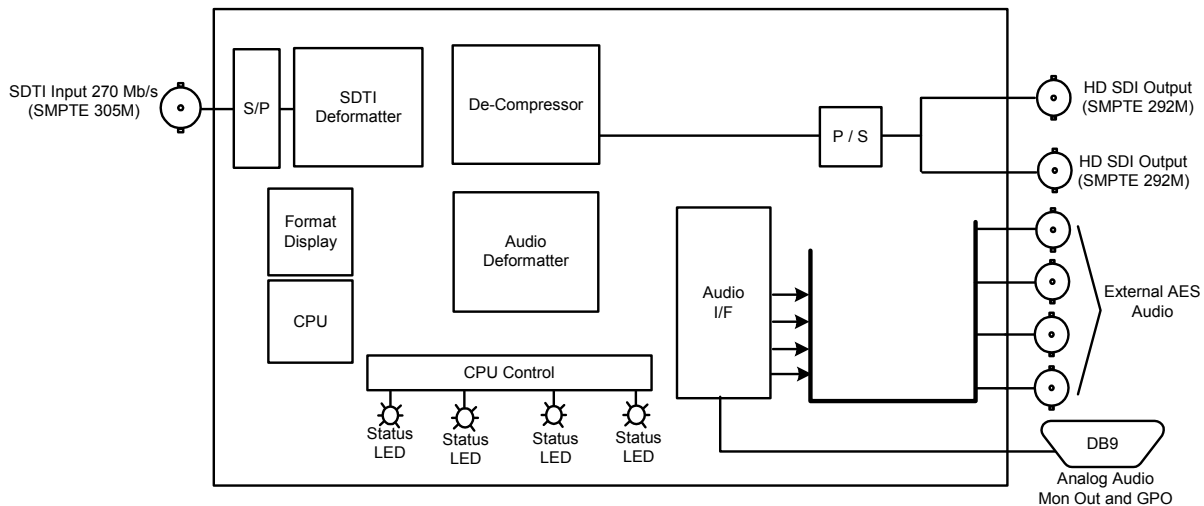
Figure 1: PKG7771MFD-HD Block Diagram

2.   INSTALLATION

The PKG7771MFD-HD comes with a companion rear plate that has nine BNC connectors, and one DB-9 connector occupying four slots in the 7700FR frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
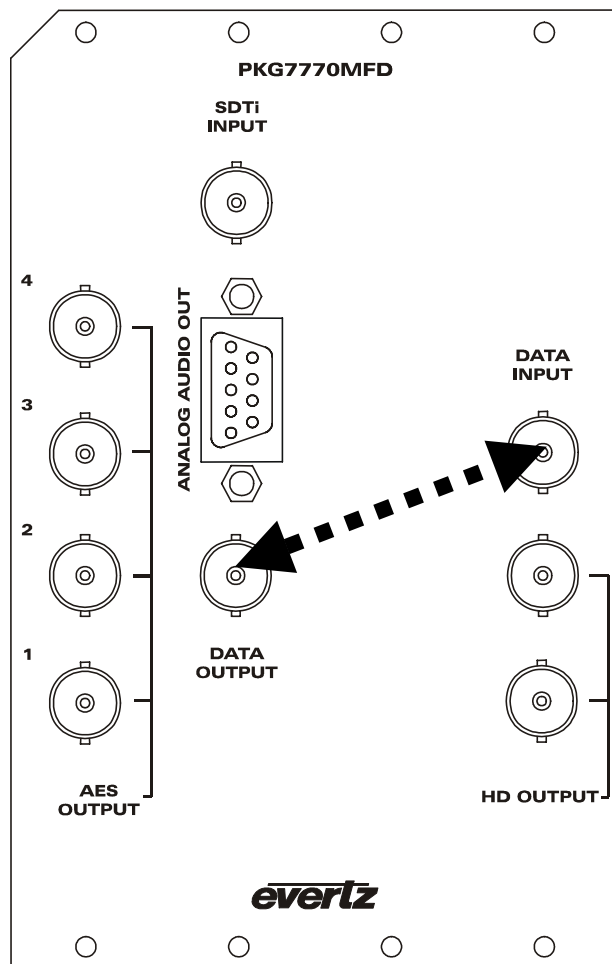
Figure 2: PKG7771MFD-HD Rear Panel

2.1.   VIDEO CONNECTIONS

Connect a source of SDTi compressed HD serial component video, compatible with the SMPTE 259M and SMPTE 305M standards, to the BNC labeled **SDTi INPUT**. See Table 2 for a list of the video formats supported. Uncompressed HD video output, compatible with the SMPTE 292M standard, is available on the **HD OUTPUT** BNCs.

2.2.   DATA CONNECTIONS

The PKG7771MFD-HD requires an external BNC jumper in order to transfer the Video/Audio DATA from the PKG7771MFD card to the 7771MFCD-D card. See Figure 2 dotted line as reference. Connect the DATA OUTPUT BNC from the PKG7771MFD to the DATA INPUT BNC of the 7771MFCD-D.

2.3.   AUDIO CONNECTIONS

The PKG7771MFD-HD has the ability to de-embed up to 4 uncompressed AES audio streams (8 channels) from 2 groups on the compressed video input. The de-embedded audio can be either re-embedded on the HD video output or output as AES audio on the 4 BNCs labeled **AES OUTPUT**. Selection of the audio destination and embedding group is done by DIP switch (see section 5.5).

A 9 pin D connector labeled **ANALOG AUDIO OUT** contains 2 balanced analog audio outputs. The connector pinout is shown in Table 1. See sections 5.4 to 5.8 for more information about the analog audio outputs.

Pin #	Name	Description
1	A1-	Audio 1 (Left) - Output
2	Gnd	Signal Ground
3	A2+	Audio 2 (Right) + Output
4	Gnd	Signal Ground
5	Gnd	Signal Ground
6	A1+	Audio 1 (Left) + Output
7	A2-	Audio 2 (Right) - Output
8	GPO	General Purpose Output
9	Gnd	Signal Ground

Table 1: 9 Pin D Connector Pin Definitions

2.4.   GENERAL PURPOSE OUTPUT CONNECTION

A pair of pins on the 9 pin D connector labeled **ANALOG AUDIO OUT** contains a general purpose output. The connector pinout is shown in Table 1. See section 4.3 for more information about the operation of the general purpose output.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT:

Standard:	SMPTE 259M-C (270Mb/s)
	SMPTE 305M data formatting
Number of Inputs:	1
Connector:	BNC per IEC 60169-8 Amendment 2
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Return Loss:	>15dB @ 270Mb/s

3.2. SERIAL VIDEO OUTPUT:

Standard:	SMPTE 292M (1.485Gb/s)
Number of Outputs:	2
Connector:	BNC per IEC 60169-8 Amendment 2
Signal Level:	800mV nominal
DC Offset:	0V +/- 0.5V
Rise and Fall Time:	<200ps nominal
Overshoot:	<10% of amplitude
Return Loss:	>15dB up to 1.0Gb/s

SDTi Input	HD Output				
	Common Name	Pixels / Active Lines	Frame Rate	Progressive /Interlace	SMPTE Standard
525/29.97	1080i/59.94	1920 x 1080	29.97	I	274M
525/29.97	1080p/29.97sF	1920 x 1080	29.97	P (sF)	274M
525/29.97	720p/59.94	1280 x 720	29.97	P	296M
625/25	1080p/25sF	1920 x 1080	25	P (sF)	274M
525/23.98	1080p/23.98sF	1920 x 1080	23.98	P (sF)	274M
525/29.97	1035i/59.94	1920 x 1035	29.97	I	260M

Table 2: Video Output Formats

3.3. AES AUDIO OUTPUTS:

Standard:	SMPTE 276M, single ended AES, Dolby E
Number of Outputs:	4
Connector:	BNC per IEC 60169-8 Amendment 2
Sampling Rate:	48khz
Impedance:	75Ω
Resolution:	24-bit

3.4.   MONITORING ANALOG AUDIO OUTPUTS:

Number of Outputs: 2
Type: Balanced analog audio
Connector: Female DB-9
Output impedance: 66Ω
Signal Level: 0db FS >20dB, into high impedance load
                     (>10K Ω)
                     Not good for low impedance loads (i.e. 600Ω)
Frequency Response: 50Hz to 20khz: +/- 0.20dB
SNR: >85dB (50Hz to 20kHz)
THD+N: 65dB @ 1kHz, 0dB FS, typical

3.5.   SYSTEM DELAY (COMPRESS + DECOMPRESS):

Video: 9 Frames
Audio: 9 Frames

3.6.   GPO:

Number of Outputs: 1
Connector: 1 pin on DB9
Type: TTL

3.7.   ELECTRICAL:

Voltage: +12VDC
Power: 16 Watts
EMI/RFI   Complies with FCC Part 15 Class A
                     EU EMC Directive

3.8.   PHYSICAL:

7700 frame mounting: 4 slots

3.9.   ORDERING INFORMATION:

PKG7771MFD-HD   Multi-Format HDTV (720p/1035i/1080i) to
                 270Mb/s SDTi De-compression CODEC Package

3.10. ORDERING OPTIONS:

Rear Plate must be specified at time of order
Eg: Model + 3RU
Rear Plate Suffix
+3RU 3RU Rear Plate for use with 7700FR-C Multiframe

3.11. ENCLOSURES:

7700FR-C 3RU Multiframe which holds 15 modules

4.   STATUS INDICATORS AND DISPLAYS

The PKG7771MFD-HD has 14 LED Status indicators and a 4 digit alphanumeric display on the front card edge to show operational status of the card at a glance. Figure 3 shows the location of the LED's, display and card edge DIP switches.
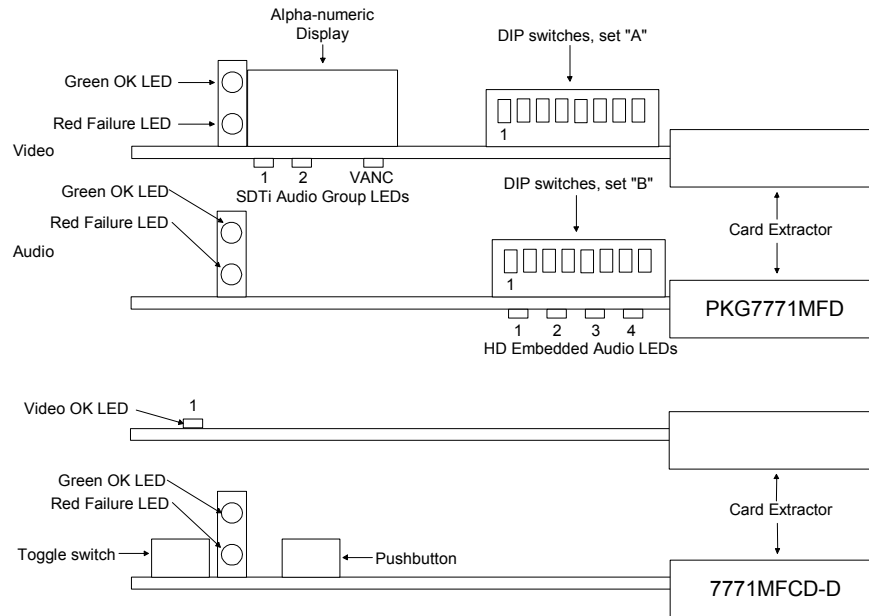
Figure 3: LED and Switch Locations

4.1.   PKG7771MFD STATUS AND INDICATOR LEDS

4.1.1. Module Status LEDs

Two large LED's on the front of the bottom board for the PKG7771MFD indicate the general health of the module

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of valid embedded audio in group 1 or group 2 of the SDTi input or if a local input power fault exists on the bottom board (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper on the bottom board.

MODULE OK: This Green LED indicates good module health. It will be On when both audio groups 1 and 2 are present, and board power is good.

Two large LED's on the front of the top board indicate the presence of video to the module. DIP switches 1 to 3 on the top board are used to select the video standard (see section 5.1). The alphanumeric display will show the video standard in use (see section 4.1.4).

VIDEO FAULT: This Red LED will be On during the absence of valid video input of the selected standard or if a local input power fault exists on the top board (i.e.: a blown fuse). This condition can also be reported to the frame through the FRAME STATUS jumper on the top board.

VIDEO OK: This Green LED will be On when a valid video signal of the selected standard is present.

4.1.2. SDTi Audio and VANC Present LEDs

There are three small LED's on the back side of the top board that indicate the presence of embedded audio groups 1 and 2 and embedded VANC on the SDTi input.

GROUP 1 PRESENT: This Green LED indicates the presence of Group 1 embedded audio.

GROUP 2 PRESENT: This Green LED indicates the presence of Group 2 embedded audio.

VANC PRESENT: This Green LED indicates the presence of VANC data in either Group 3 or group 4.

4.1.3. HD Output Embedded Audio Present LEDs

There are four small LED's on the backside of the bottom board that indicate the presence of embedded audio on the HD video output.

GROUP 1 PRESENT: This Green LED indicates the presence of Group 1 embedded audio.

GROUP 2 PRESENT: This Green LED indicates the presence of Group 2 embedded audio

GROUP 3 PRESENT: This Green LED indicates the presence of Group 3 embedded audio

GROUP 4 PRESENT: This Green LED indicates the presence of Group 4 embedded audio

4.1.4. DOT-MATRIX DISPLAY

The 4-digit alphanumeric display located on the card edge of the top board is used to display the video standard in use. If manual video standard selection is set (DIP switch 1 On) then the display will always display the selected standard. If auto standard selection is set (DIP switch 1 Off) the alpha-numeric display will read AUTO until a valid input standard is detected. When valid input video is detected the detected standard will be displayed. The following messages will be displayed.

`AUTO`	Auto video standard selected, and no video present
`59`	1080i/59.94 or 1080p/29.97sF
`720`	720p/59.94
`35`	1035i/59.94
`23`	1080p/23.98sF
`SD`	SDI input, not an SDTi compressed stream

4.2. 7771MFCD-D STATUS AND INDICATOR LEDS

4.2.1. Module Status LEDs

Two large LED's on the front of the bottom board for the 7771MFCD-D indicate the general health of the module. See Figure 3: LED and Switch Locations

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of valid embedded audio in group 1 or group 2 of the SDTi input or if a local input power fault exists on the bottom board (i.e.: a blown fuse).

MODULE OK: This Green LED indicates good module health. It will be On when both audio groups 1 and 2 are present, and board power is good.

4.2.2. Video Present LED

The Green LED on the top board of the 7771MFCD-D module is on when valid Data is received from the PKG7771MFD board. See Figure 3: LED and Switch Locations

4.3. GPO FUNCTION

The GPO output (pin 8 on the 9 pin D connector) is for use in switching downstream equipment between SD and HD mode. When the PKG7771MFD-HD detects a non SDTi (i.e. SDI) video in it will set this output to 5V. At this time "SD" will be displayed on the dot-matrix display. When SDTi input video is found this output will be 0V (ground).

5. CARD EDGE CONTROLS

The PKG7771MFD-HD is equipped with two 8 position DIP switches on the PKG7771MFD, to allow the user to select various functions. The DIP switch on the bottom card (SET B) is used to control the embedding of audio on the SDTi input. The DIP switch on the top card (SET A) is used to set the input video standard. All positions are assigned sequentially such that the first position is located at the top of the DIP switch (farthest from to the card ejector). The On (closed) position is down, or closest to the printed circuit board. The Off (open) position is up, or farthest from the printed circuit board.

Table 3 and Table 4 give an overview of the DIP switch functions. Sections 5.1 to 5.8 oulines each DIP switch function.

Please refer to Figure 3: LED and Switch Locations for card edge LED and Switch locations.

DIP Switch	Function
1	Group 1 Source Select
2	Group 1 mapping from Input Embedded Groups
3	
4	Group 2 Source Select
5	Group 2 mapping from Input Embedded Groups
6	
7	Group 2 enable/disable
8	Auto/Manual Audio selection

Table 3: Bottom Board DIP Switch Functions (Set B)

DIP Switch	Function
1	Auto/Manual Video Format Selection
2	Video Standard Selection
3	
4	AES input's Sample Rate Converter enable/disable
5	Embedded and External Audio Delay Control
6	
7	Analog monitor audio channel source
8	

Table 4: Top Board DIP Switch Functions (Set A)

5.1. SELECTING THE OUTPUT VIDEO STANDARD (SET A)

DIP switches 1 to 3 on the top card control the selection of the output video format. DIP switch 1 selects whether the input video format will be automatically detected or set using DIP switches 2 and 3.

DIP 1	DIP 2	DIP 3	Video Standard
Off	---	---	Auto
On	Off	Off	1080p/23.98sF
On	Off	On	1035i/59.94
On	On	Off	720p/59.94
On	On	On	1080i/59.94 or 1080p/29.97sF

Table 5: Video Standard Switch Settings

5.2. SELECTING HOW THE AUDIO WILL BE OUTPUT (SET A)

DIP switch 4 on the top card controls whether sample rate conversion is enabled on the AES outputs.

DIP 4	AES output sample rate converter
Off	Disabled
On	Enabled

Table 6: AES Output Sample Rate Converter Enable/Disable Switch Settings

5.3. SELECTING AUDIO DELAY CONFIGURATIONS (SET A)

The PKG7771MFD-HD will automatically compensate for delay when either External or Embedded Audio is required. DIP 5 must be set to match the AES Audio Source input configuration of the PKG7771MFC-HD and the AES Audio output of the PKG7771MFD-HD.
Eg. If HD-SDI video with 4 External Audio is compressed with the PKG7771MFC-HD and HD-SDI video with embedded audio is required on the output of the PKG7771MFD-HD de-compressor, DIP 5 should be set OFF, and DIP 6 should be set ON. Please note that DIP 5 and 6 do not turn these audio features on or off. The are used to configure the audio delay to resolve any "lip sync" issues.

DIP 5	PKG7771MFC-HD Audio Source Select
Off	AES External Audio
On	Embedded Audio

Table 7: Audio Source Select DIP Switch Settings

DIP 6	PKG7771MFD-HD Audio Destination Select
Off	AES External Audio
On	Embedded Audio

Table 8: Audio Destination DIP Switch Select

5.4. SELECTING THE ANALOG AUDIO SOURCE CHANNEL (SET A)

The PKG7771MFD-HD supports two groups of audio or 4 stereo pairs however only has one stereo pair of analog monitor output. DIP switches 7 and 8 on the top card select which of the four stereo channels transported is output to the analog monitor channels.

DIP 8	DIP 7	Monitor source
On	On	Group one, channel one
On	Off	Group one, channel two
Off	On	Group two, channel one
Off	Off	Group two, channel two

Table 9: Video Standard Switch Settings

Volume Control

5.5. SELECTING HOW THE AUDIO WILL BE OUTPUT (SET B)

Up to 2 groups of 4 audio channels can be de-embedded from the 270 Mb/s SDTi bit stream and either be re-embedded on the HD video output or output as AES audio. DIP switch 1 on the bottom board controls

whether group 1 will be output as AES1 and AES2 or embedded on the HD output. When DIP switch 1 is set for HD embedded audio, DIP switches 2 and 3 are used to select which group on the HD output will be used to embed the audio according to Table 10

DIP 1	DIP 2	DIP 3	Audio Group 1 Destination
Off	---	---	AES outputs 1 and 2
On	Off	Off	HD Output group 1
On	Off	On	HD Output group 2
On	On	Off	HD Output group 3
On	On	On	HD Output group 4

Table 10: Audio Group 1 Destination Selection Switch Settings

DIP switch 4 on the bottom board controls whether group 2 will be output as AES3 and AES4 or embedded on the HD output. When DIP switch 4 is set for HD embedded audio, DIP switches 5 and 6 are used to select which group on the HD output will be used to embed the audio according to Table 11.

DIP 4	DIP 5	DIP 6	Audio Group 2 Destination
Off	---	---	AES Outputs 3 and 4
On	Off	Off	HD Output group 1
On	Off	On	HD Output group 2
On	On	Off	HD Output group 3
On	On	On	HD Output group 4

Table 11: Audio Group 2 Destination Selection Switch Settings

5.6.   SELECTING IF AUDIO GROUP 2 IS ENABLED OR DISABLED (SET B)

DIP switch 7 on the bottom board allows the second audio group to be output or not (whether embedded in HD or output as AES). When audio selection is manually controlled this switch should reflect the encoders setting.

DIP 7	Audio Group output
Off	Disabled
On	Enabled

Table 12: Audio Group 2 Enable/Disable Switch Settings

5.7.   AUDIO OUTPUT AUTO/MANUAL SELECTION (SET B)

DIP switch 8 on the bottom board controls whether the destination for the embedded audio data is determined automatically or by DIP switches 1 through 7 on the bottom board. Note: if VANC transport on the encoder is turned off or an SDTi stream from another product is input and this switch is set to auto (off) then group 1 will be embedded to group 1 of the HD output video and group 2 if it is present will be embedded to group 2 of the HD output video.

| DIP 8	Auto Audio destination
Off	enabled
On	disabled

Table 13: Auto/Manual Audio Output Switch Settings

5.8.   ANALOG AUDIO MONITOR VOLUME

The toggle switch is used to control the volume of the analog audio outputs. Pressing the switch up (away from the card ejector) increases the volume, and pressing the switch down (towards the card ejector) decreases the volume.
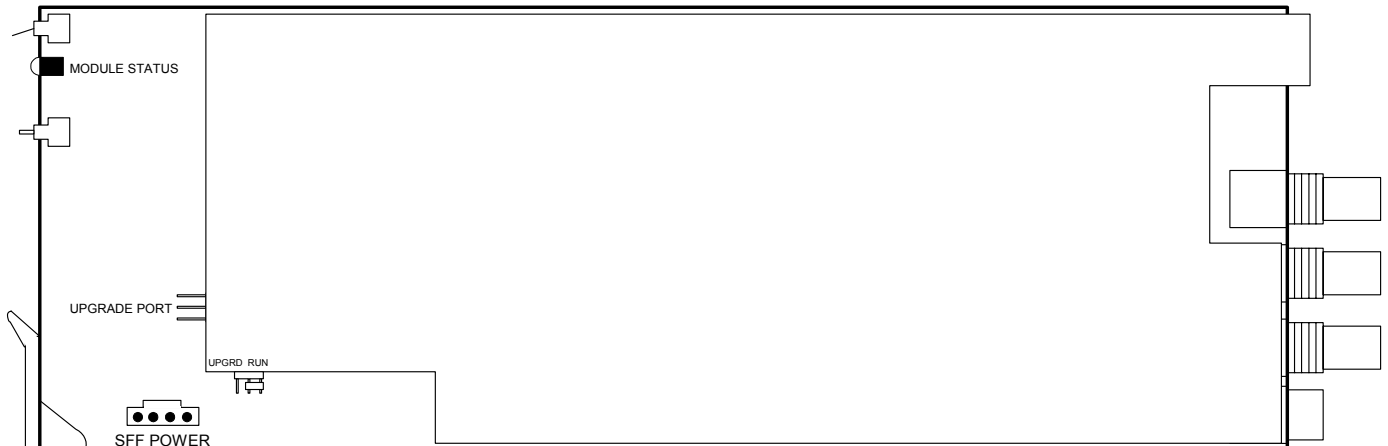
6. JUMPERS

Several jumpers, located at the front of the modules are used to preset various operating modes. Figure 4, Figure 5, and Figure 6 Location of Jumpers (7771MFCD-D) show the location of the jumpers on the bottom and top boards.
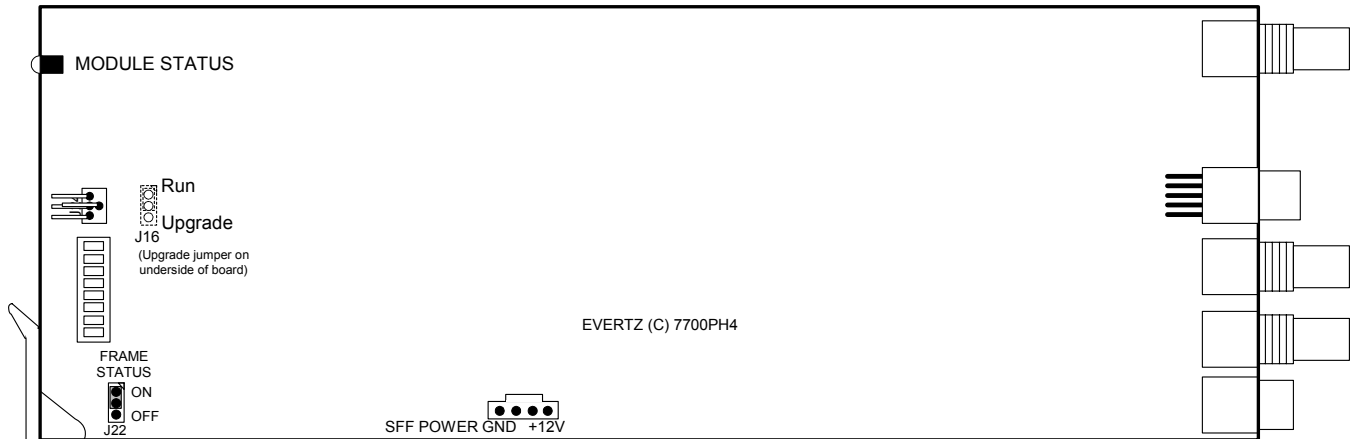
Figure 4: Location of Jumpers Bottom Board (PKG7771MFD)

Figure 5: Location of Jumpers Top Board (PKG7771MFD)

Figure 6 Location of Jumpers (7771MFCD-D)

6.1.   SELECTING WHETHER LOCAL FAULTS ON THE BOTTOM BOARD OF THE PKG7771MFD WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J4 on the bottom board determines whether local faults (as shown by the Local Fault indicator) on the bottom board 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.   SELECTING WHETHER LOCAL FAULTS ON THE TOP BOARD OF THE PKG7771MFD WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J4 on the top board determines whether local faults (as shown by the Local Fault indicator) on the top board 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.

6.3.   CONFIGURING THE PKG7771MFD MODULE FOR FIRMWARE UPGRADES

	The UPGRADE jumper J16 is installed on the underside of the PKG7771MFD bottom board.

UPGRADE   The UPGRADE jumper J16 on the bottom board 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* chapter of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move the UPGRADE jumper into the *UPGD* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto the SERIAL header 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 the UPGRADE jumper into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.4.   CONFIGURING THE 7771MFCD-D MODULE FOR FIRMWARE UPGRADES

> **The UPGRADE jumper J15 is installed on the underside of the 7771MFCD top board.**

UPGRADE   The UPGRADE jumper J15 on the top board 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* chapter of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move the UPGRADE jumper into the *UPGD* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto the SERIAL header 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 the UPGRADE jumper into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.