TABLE OF CONTENTS

Figures

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Oct 2006
0.2	First Card Release	Mar 2007
1.0	Added –F2 version manual entries and backwards compatibility notes with the 7707MT-HD transmitter	May 2008
1.1	Added table format throughout section 4.2	Apr 2009
1.2	Removed references to VistaLINK® enabled functionality	May 2009
1.3	Updated output power specifications	Aug 2010
1.4	Updates made to Selecting Audio De-embedding Groups section	Sept 2010

WARNING

> **Never look directly into an optical fiber. Non-reversible damage to the eye can occur in a matter of milliseconds.**

1.   OVERVIEW

The 7707MRA-HD is a fiber optic receiver for one HD or SD digital video signal, accompanied by four AES audio signals, serial data, two GPI and two GPO signals. Audio and control signals are de-embedded from the HD, SD, or SDTi video signal that is applied to the optical input. The 7707MRA-HD is designed to operate with a companion 7707MTA-HD transmitter, to permit communication over fiber optic cable with low latency.

Monitoring and control of card status and parameters is provided locally, at the card-edge. This card occupies one card slot and can be housed in either a 1RU frame, which will hold up to three modules, or a 3 RU frame, which will hold up to 15 modules.

Features
- HD/SD video, AES audio, serial data, and GPIO conveniently presented in a single product
- Supports HD-SDI and SDI video
- Provides de-embedding of audio and control signals from HD-SDI (SMPTE 292M), SD-SDI (SMPTE 259M-C), or SDTi (SMPTE 305.2M)
- Demultiplexes up to 4 AES audio, bi-directional RS-232/422 and 2 GPIO with HD-SDI or SDI
- Supports all SMPTE 292M (1.485Gb/s) rates/standards
- Supports 525/625 line component 4:2:2 SDI @ 270Mb/s
- Dolby^{TM} E compatible
- Built in jitter attenuation
- Transparently passes DVB-ASI (without embedded audio, serial data and GPIO)
- Controllable audio output interface for balanced or unbalanced AES
- Selectable AES pop-reduction minimizes clicks due to audio interruptions or errors
- Bi-directional serial port accommodates RS-422, RS-232, or RS-485 data up to 153Kbaud
- Comprehensive signal and status monitoring via four-digit card-edge display
- SC/PC (retractable cover optional), ST/PC, or FC/PC fiber connector options
- Fully hot-swappable from front of frame
- Local display of optical signal strength, video, audio and data presence, video and AES formats, GPI and GPO status
- Accepts any wavelength in the 1270nm to 1610nm range
- Optical output wavelengths of 1310nm, 1550nm, and up to sixteen CWDM wavelengths (ITU-T G.694.2 compliant)
- Occupies a single or dual card slot and can be housed in the 1RU 7701FR frame which holds up to three single or dual slot modules, the 3RU 7700FR-C frame which has a 15 slot capacity, the portable 3RU 350FR frame which has a 7 slot capacity, or a standalone enclosure which holds a single module
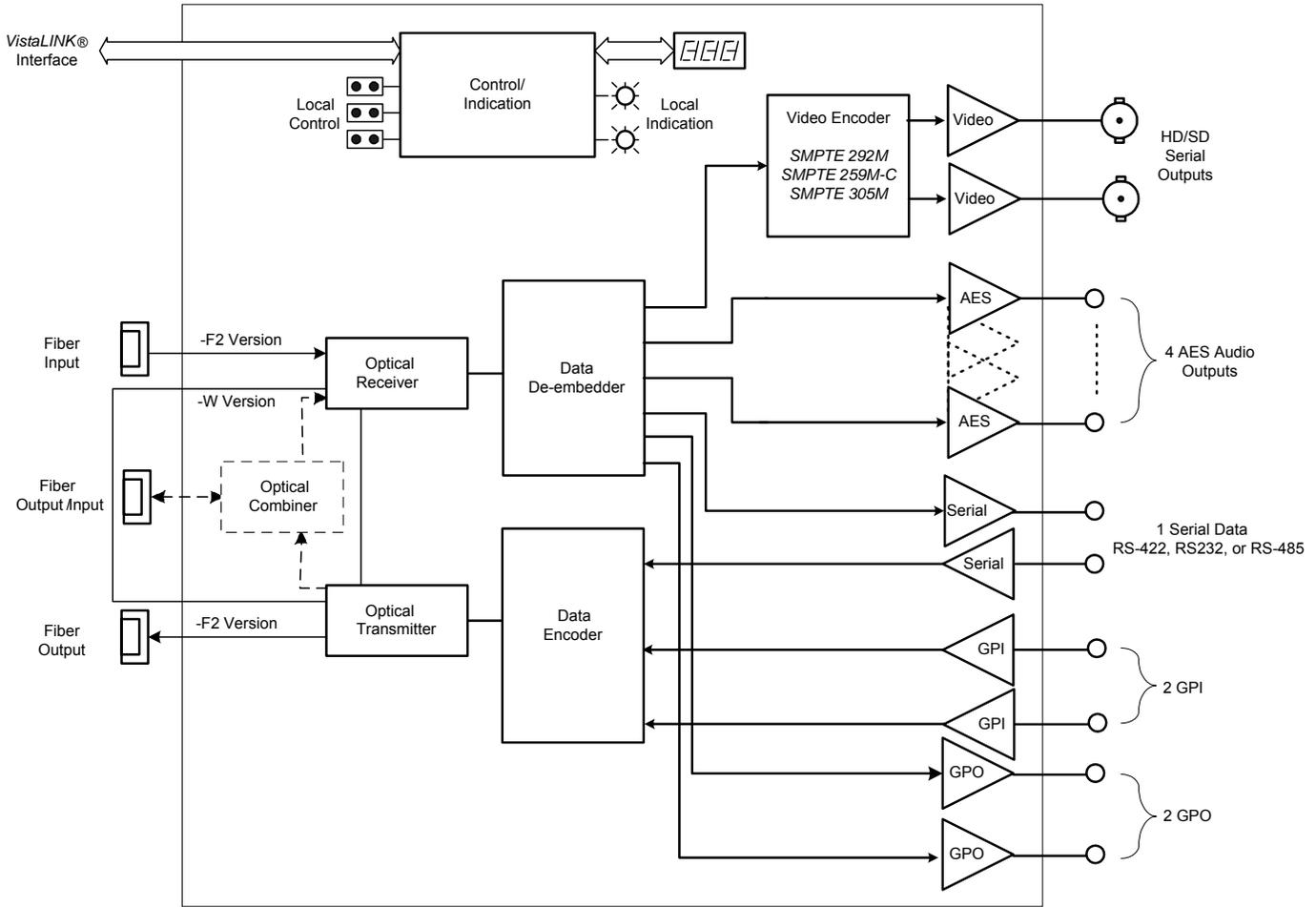
Figure 1-1: 7707MRA-HD Block Diagram

2.   INSTALLATION

Each 7707MRA-HD module comes with a companion rear plate that has two BNC connectors, a multi-pin removable terminal block, and an SC/PC (shown), ST/PC or FC/PC optical connector. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.
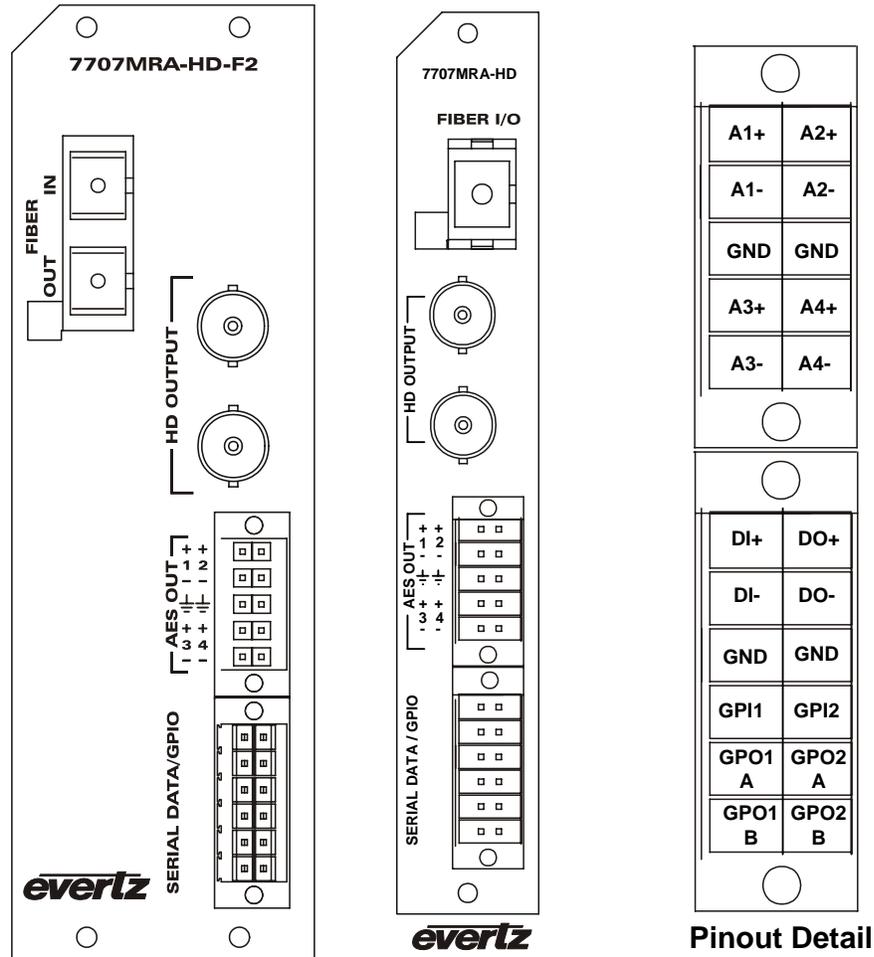
Figure 2-1: 7707MRA-HD Rear Plates & Pin Out
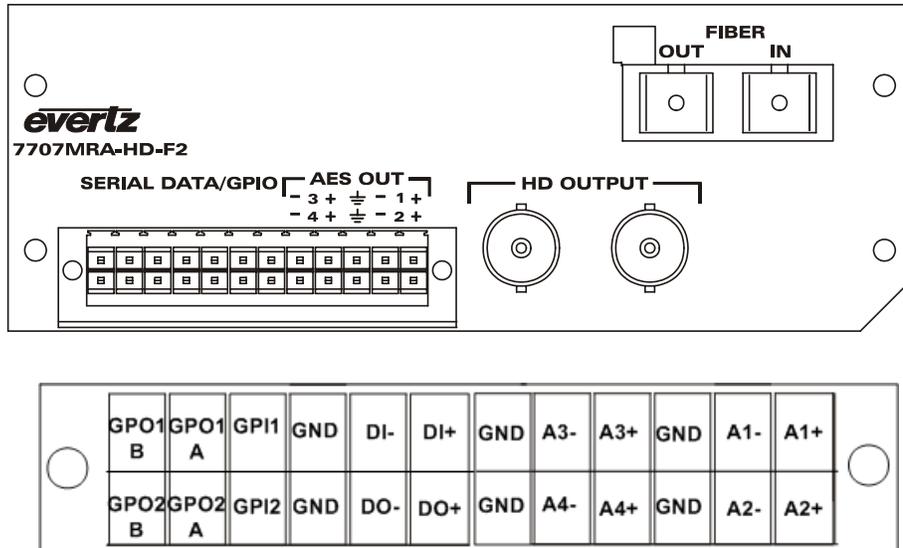
Pinout Detail

Figure 2-2: 7707MRA-HD Rear Plates & Pin Out (1RU version)

2.1.1. Electrical Signal Connections

HD/SD OUTPUT: Reclocked, level-restored, loop-back output BNC connectors for serial digital video signals compatible with HD-SDI (SMPTE 292M), SD-SDI (SMPTE 259M-C), DVB-ASI and SDTi (SMPTE 305.2M) standards. See section 3.1 for video output specifications.

AES OUTPUT: AES audio output connections of the removable terminal block. The 7707MRA-HD has four AES audio outputs, designated as A1, A2, A3, and A4. Each of these four channels has a positive and negative terminal associated with it, and is able to output balanced or unbalanced AES. See section 4.2.8 for details about configuring the output type. Balanced and unbalanced audio signals are connected as follows:

Balanced - Connect positive and negative audio signals to the corresponding positive and negative terminals of the 7707MRA-HD. Signal amplitude, rise/fall times, and impedance are automatically adjusted to match balanced AES specifications when the output type is configured through the card-edge menu.

Unbalanced - Connect unbalanced audio signals to the positive output terminal of the 7707MRA-HD. Leave the negative output terminal unconnected. Signal amplitude, rise/fall times, and impedance are automatically adjusted to match unbalanced AES specifications when the output type is configured through the card-edge menu.

See section 3.2 for AES audio output specifications.
See section 4.2.8 AES audio output type configuration instructions.

SERIAL I/O: Bi-directional serial data connections of the removable terminal block. The 7707MRA-HD accommodates one channel of RS-422, RS-232, or RS-485 serial data. Data input connections are labeled DI, while data output connections are labeled DO. The card must be configured for use with RS-422, RS-232, or RS-485, as described in section 4.2.9. Serial data connections are assigned per the data type selected. RS-422, RS-232, and RS-485 signals are connected as follows:

RS-422 - Connect positive and negative RS-422 input and output signals to the corresponding positive and negative terminals of the 7707MRA-HD. Bi-directional data will be communicated to and from the companion 7707MTA-HD.

RS-232 - Connect each RS-232 input data signal to the negative DI terminal (DI-) of the 7707MRA-HD. The companion 7707MTA-HD will output each signal on the corresponding negative DO terminal (DO-). Likewise, serial data signals applied to the companion 7707MTA-HD will be output from the 7707MRA-HD.

RS-485 - Operation with RS-485 requires that DI and DO terminals be connected together. The DI+ terminal should O- terminal. Connect positive and negative RS-485 signals to the corresponding positive and negative terminals of the 7707MRA-HD. Bi-directional data will be communicated to and from the companion 7707MTA-HD.

See section 3.3 for serial data specifications.
See section 4.2.9 to 4.2.14 for serial data configuration instructions.

GPI: General Purpose Input connections of the removable terminal block. The General Purpose Inputs are active-low, opto-isolated connections.

GPO: The General Purpose Output is dry-contact relay closure. The A and B terminals are jumper selectable as normally open or normally closed, via a jumper on the I/O board.

See section 3.4 and 3.5 for GPIO specifications.

2.1.2. Optical Signal Connections

For details about link operation, see sections 4.1 and 4.2.

2.1.2.1.   Single Fiber Version

FIBER I/O: This is the optical input/output of the 7707MRA-HD module. The connector is a female SC/PC (shown), ST/PC, or FC/PC connector as specified at the time of purchase. This input/output should be connected to the FIBER I/O connector of a companion single-fiber 7707MTA-HD-W module with a suitable fiber optic cable.

The 7707MRA-HD is designed to work with single-mode fiber optic cable. The 7707MRA13-HD-W transmits at the 1310nm wavelength.

The optical output can be configured to operate in continuous or discontinuous mode as described in section 4.2.7. If discontinuous mode is selected, while the optical input to the 7707MRA-HD is invalid (LINK…LOS condition, section 4.2.1) then this optical output will be disabled. If continuous mode is selected, while the optical input is invalid, then this optical output will contain invalid information, but will still output.

2.1.2.2. Dual Fiber Versions

FIBER IN: This is the optical input to the dual-fiber 7707MRA-HD-F2 version of the module. The connector is a female SC/PC (shown), ST/PC, or FC/PC connector as specified at the time of purchase. This input should be connected to the FIBER OUT connection of a companion dual-fiber 7707MTA-HD-F2 module with a suitable fiber optic cable. The dual fiber 7707MRA-HD-F2 version accepts input wavelengths from 1270nm to 1610nm, accommodating standard, CWDM or DWDM transmission schemes. When connected directly to a companion dual-fiber module, the 7707MRA-HD-F2 is compatible with multi-mode fiber optic cable. If not connected directly (i.e. connected through CWDM, DWDM, WDM, or splitter/combiner) the 7707MRA-HD-F2 is compatible only with single-mode fiber optic cable.

FIBER OUT: This is the optical output of the dual-fiber 7707MRA-HD-F2 version of the module. The connector is a female SC/PC (shown), ST/PC, or FC/PC connection as specified at the time of purchase. This optical output is available in 1310nm, 1550nm, and up to sixteen CWDM wavelengths (ITU-T G.694.2 compliant). This output should be connected to the FIBER IN connector of a companion dual-fiber 7707MTA-HD-F2 module with a suitable fiber optic cable. The output wavelength is marked on the rear panel of each 7707MRA-HD-F2. When connected directly to a companion dual-fiber module, the 7707MRA-HD-F2 is compatible with multi-mode fiber optic cable. If not connected directly (i.e. connected through CWDM, DWDM, WDM, or splitter/combiner) the 7707MRA-HD-F2 is compatible only with single-mode fiber optic cable. The optical output can be configured to operate in continuous or discontinuous mode as described in section 4.2.9.

If discontinuous mode is selected, while the optical input to the 7707MRA-HD is invalid (LINK…LOS condition, section 4.2.1) then this optical output will be disabled. If continuous mode is selected, while the optical input is invalid then this optical output will contain invalid information, but will still output.

2.2. CARE AND HANDLING OF OPTICAL FIBER

2.2.1. Safety

CLASS 1 LASER PRODUCT

Background colour: yellow
Triangular band: black
Symbol: black

2.2.2. Assembly

Assembly or repair of the laser sub-module is done only at Evertz facility and performed only by qualified Evertz technical personnel.

2.2.3. Labeling

Certification and Identification labels are combined into one label. As there is not enough room on the product to place the label it is reproduced here in the manuals.

- There is no date of manufacture on this label as it can be traced by the bar code label placed on the Printed circuit board of each Evertz plug-in module.
- The Model number is: 7707MRA13-HD-W.
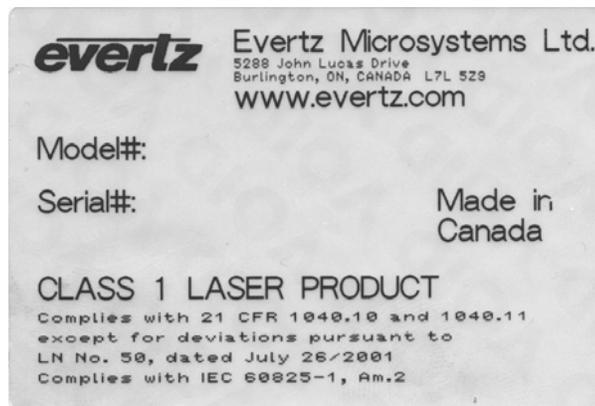
Figure 2-3: Reproduction of Laser Certification and Identification Label

2.2.4. Handling and Connecting Fibers

☞ | **Never touch the end face of an optical fiber. Always keep dust caps on optical fiber connectors when not connected and always remember to properly clean the optical end face of a connector before making a connection.**

The transmission characteristics of the fiber are dependent on the shape of the optical core and therefore care must be taken to prevent fiber damage due to heavy objects or abrupt fiber bending. Evertz recommends that you maintain a minimum bending radius of 5 cm to avoid fiber-bending loss that will decrease the maximum attainable distance of the fiber cable. The Evertz fiber optic modules come with cable lockout devices, to prevent the user from damaging the fiber by installing a module into a slot in the frame that does not have a suitable I/O module. For further information about care and handling of the fiber optic cable see section 1 of the Fiber Optics System Design section of this manual binder.

3.   SPECIFICATIONS

3.1.   SERIAL DIGITAL VIDEO OUTPUT

Number of Outputs:	2 (regenerated)
Standards:	SMPTE 292M (HD-SDI), SMPTE 259M-C (SD-SDI), SMPTE305.2M (SDTi), DVB-ASI (audio outputs, serial data and GPIO will not be present)
Connector:	1 BNC per IEC 61169-8 Annex A
Signal Level:	800mV Nominal
DC Offset:	0V $\pm$ 0.5V
Rise Fall Time:	150ps nominal @1.485Gb/s
	600ps nominal @270Mb/s
Overshoot:	<10% of amplitude
Return Loss:	>15dB up to 1.5Gb/s
Alignment Jitter:	<0.2UI

3.2.   AES AUDIO OUTPUTS

Number of Signals:	4 (user selectable for balanced or unbalanced)
Standards:	AES3-2003 (Balanced AES), SMPTE 276M (Unbalanced AES)
Connector:	Removable terminal strip
Sampling Rate:	48KHz
Resolution:	up to 24 bits
Signal Level:	
Balanced:	1Vp-p $\pm$0.1V
Unbalanced:	3.5Vp-p $\pm$0.1V Differential
Rise/Fall Times:	
Balanced:	20ns $\pm$5ns
Unbalanced:	35ns $\pm$5ns
Return Loss:	> 15dB to 6MHz
Wideband Jitter:	< 10nsp-p, with conditions of minimum to maximum cable length
Latency:	<1ms @ 48 kHz, <1.2ms @ 32 kHz
SRC Enabled:	add 3.3 ms (SRC on the companion 7707MTA-HD-W)
Pop Minimization Enabled:	add 4 ms
Impedance:	
Balanced:	110Ω
Unbalanced:	75 Ω

3.3.   SERIAL DATA

Number of Signals:	1 input/output
Connector at Breakout:	Multi-pin Removable Terminal Block
Signal Type:	RS-422, RS-232, or RS-485 (selectable)
Input Termination:	High impedance
Input Failsafe Bias:	5KΩ to 5V on DI+ (selectable)
Baud Rate:	Up to 153Kb/s (selectable

3.4. GENERAL PURPOSE INPUTS

Number of Signals:	2
Connector at Breakout:	Multi-pin Removable Terminal Block
Type:	Opto-isolated, Active low
Input Voltage:	
Safe Voltage Range:	-20V to +10V
Off Condition (min):	+3.5V
On Condition (max):	+2.5V (active low)
Input Current (min):	1mA
Input Current (max):	10mA (internally limited)

3.5. GENERAL PURPOSE OUTPUTS

Number of Signals:	2
Connector at Breakout:	Multi-pin Removable Terminal Block
Output Type:	Dry contact relay closure to GPO COMMON, normally open or normally closed configuration is jumper selectable
Output Current (min):	100mA

3.6. OPTICAL INPUTS/OUTPUTS

Number of Connections:	2 (1 Input plus 1 Output for –F2 version)
	1 (-W version)
Connector:	Female SC/PC, ST/PC or FC/PC
Return Loss:	> 14 dB
Rise and Fall Time:	200 ps nominal
Fiber Size:	9 μm core / 125 μm overall
Wavelengths:	Transmit on 1550nm, back channel receive on 1310nm (-W only)
	Transmit of 1310 nm, 1550nm, CWDM, DWDM (-F2 only)
Output Power:	-8 dBm (-1dBm for companion 7707MTA-HD-W)
	-7 dBm (-F2 version with 1310nm FP Laser)
	0 dBm (-F2 version with CWDM DFB Laser)
	+7dBm (-F2 version with DWDM DFB Laser)
Input Optical Sensitivity:	-28 dBm (-W version), -21dBm for companion 7707MRA13-HD-W
	-23 dBm (-F2 version), -28 for High Sensitivity (-H version)
Maximum Input Power:	-1dBm

3.7. ELECTRICAL

Voltage:	+12VDC
Power:	12W

3.8. PHYSICAL

7700 or 7701 frame mounting

Number of slots:	1 (-W version)
	2 (-F2 version)

4.   STATUS INDICATORS AND DISPLAYS

The 7707MRA-HD has 9 LED Status indicators and a 4 digit alphanumeric display on the front card edge to show operational status of the card at a glance. The card edge pushbutton is used to select various options on the alphanumeric display. Figure 4-1 displays the locations of the indicators and pushbutton.
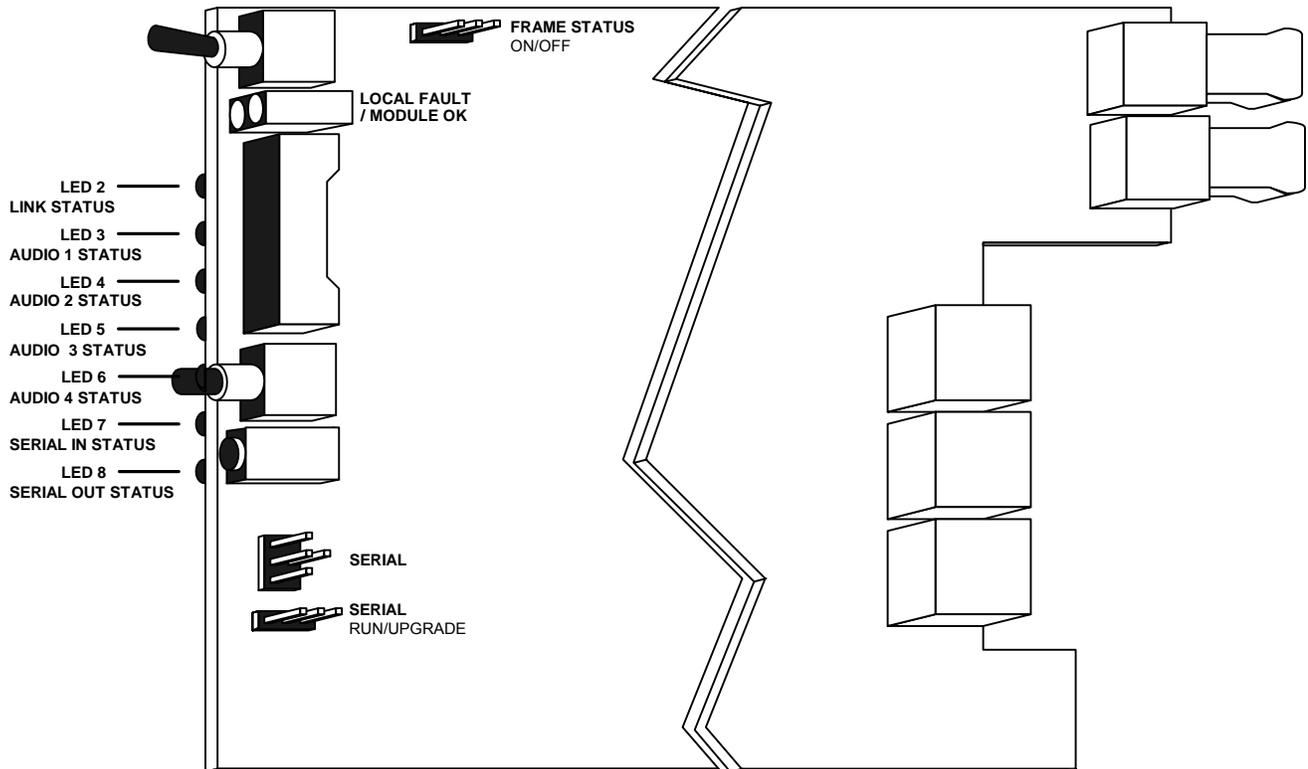
Figure 4-1: Location of Status Indicators and Jumpers

4.1.   STATUS INDICATOR LEDS

Two large LEDs at the front card-edge indicate operational health of the module as follows:

MODULE OK: This green LED indicates good module health. It will be on while a valid signal is present at the video input, the output laser is operating properly, and the card power is good.

LOCAL FAULT: This red LED indicates poor module health. Three conditions could cause this fault indication to be active: No valid signal is present at the video input, operation of the output laser is erroneous, or if a card power fault exists (i.e. a blown fuse). The LOCAL FAULT indication can also be reported to the frame by setting the FRAME STATUS jumper.

There are seven small LEDs on the back of the card-edge that indicate signal presence. Some of these LEDs are Bi-colour, and able to illuminate as red or green. The functions of these LEDs are as follows:

LED 2, LINK STATUS: This LED indicates the status of the Fiber Input. When a valid optical input signal is detected the LED will be green. When CRC errors are detected within the input video signal, (with error detection enabled, see section 4.2.20) the LED will flash red. If no valid optical signal is detected on the fiber input of the 7707MRA-HD the LED will remain off.

LED 3, AUDIO 1 STATUS: This LED indicates the status of Audio Output 1. When a valid output audio signal is detected the LED will be green. If no audio is detected on the first audio output of the 7707MRA-HD the LED will remain off.

LED 4, AUDIO 2 STATUS: This LED indicates the status of Audio Output 2. When a valid output audio signal is detected the LED will be green. If no audio is detected on the first audio output of the 7707MRA-HD the LED will remain off.

LED 5, AUDIO 3 STATUS: This LED indicates the status of Audio Output 3. When a valid output audio signal is detected the LED will be green. If no audio is detected on the first audio output of the 7707MRA-HD the LED will remain off.

LED 6, AUDIO 4 STATUS: This LED indicates the status of Audio Output 4. When a valid output audio signal is detected the LED will be green. If no audio is detected on the first audio output of the 7707MRA-HD the LED will remain off.

LED 7, SERIAL IN STATUS: This LED indicates the status of Serial input data. When a valid input signal is detected the LED will be green. When parity errors are detected (with error detection enabled and parity information present, see section 4.2.21) the LED will flash red. If no data is detected on the serial data input of the 7707MRA-HD the LED will remain off.

LED 8, SERIAL OUT STATUS: This LED indicates the status of Serial output data. When a valid output data signal is detected the LED will be green. If no output serial data is detected the LED will remain off

4.2. DOT MATRIX DISPLAY

Additional signal and status monitoring is provided via the 4-digit dot-matrix display located at the card-edge. The card-edge pushbutton and toggle-switch are used to navigate through the display menu. Figure 4-2 provides a quick reference to the display menu structure.

The most recent user selection will be maintained in non-volatile memory in the event of power loss to the module.

Pushbutton ?

Menu Level 1	Menu Level 2	Menu Level 3	Menu Level 4	Menu Level 5
Indications				
LASR...ERR (Laser Error) Supersedes **LINK...LOS** (Fiber-Link Loss) Supersedes **OK** (Ay-Okay)				
Selections	**Selections**	**Selections**	**Indications**	
STAT (Status)	**FIN** (Fiber-Link Input)	**STD** (Video Standard)	**Standards Per Table** **LOS** (Loss of Video)	
		GRP1 (Audio Group 1) **GRP2** (Audio Group 2) **GRP3** (Audio Group 3) **GRP4** (Audio Group 4)	**Indications** **FREE** (Group Unused) **USED** (Group Used) **LOS** (Loss of Video)	
	GPI1 (GPI Input 1) **GPI2** (7707MRA-HD Only)	**Indications** **ON** (Active) **OFF** (Inactive)		
	GPO1 (GPO Output 1) **GPO2** (7707MRA-HD Only)	**Indications** **ON** (Active) **OFF** (Inactive) **LOS** (Loss of Link)		
	PWR (Optical Power)	**Indications** **0** to **-40** (dBm Value) **OVR** (power over max) **LOW** (power under min)		
	VER (Software Version)	**Indications** **Software Version**		
	BACK (Abort)			
	Selections	**Selections**	**Selections**	
CTRL (Control)	**FOUT** (Fiber-Link Output)	**LASR** (Laser Enable Mode)	**CONT** (Continuous) **DISC** (Discontinuoust)	
	VOUT (Video Output)	**Selections** **GEN** (Output On LOS)	**Selections** **BLK** (Black Active Picture) **GRAY** (Gray Active Picture) **OFF** (Generation Off)	
		HCLN (Output Hanc Cleaning)	**Selections** **ON** (Clean Output Hanc) **OFF** (Pass Output Hanc)	
	AES1 (AES Output 1) **AES2** (AES Output 2) **AES3** (AES Output 3) **AES4** (AES Output 4)	**Selections** **TERM** (Termination)	**Selections** **BAL** (Balanced 100Ω) **UBAL** (Unbalanced 75Ω)	
		GEN (Output on LOS)	**Selections** **ON** (Silence) **OFF** (Generation Off) **SOFT** (Silence + Soft-switch)	
	SER (Serial Data)	**Selections** **TYPE** (Data Type)	**Selections** **232** (RS-232) **422** (RS-422) **485** (RS-485)	
		RATE (Baud Rate)	**Selections** **Selections Per Table**	
		BIAS (Failsafe Bias)	**Selections** **ON** (Bias On) **OFF** (Bias Off)	
	EMBD (De-embedding)	**Selections** **A1+2** (AES1 and AES2) **A3+4** (AES3 and AES4)	**Selections** **GRP1** (Audio Group 1) **GRP2** (Audio Group 2) **GRP3** (Audio Group 3) **GRP4** (Audio Group 4) **NONE** (Don't De-embed)	
		SER (Serial Data)	**DID** (Data ID)	**Selections** **50** (DID=50) to **5F** (DID=5F)
			SDID (Secondary Data ID)	**Selections** **1** (SDID=1) to **FF** (SDID=FF)
		GPIO (GPIO Data)	**Selections** **LN** (Vanc Embed Line)	**Selections** **0** (Line 0) to **2047** (line 2047) **NONE** (Don't Embed)
			DID (Data ID)	**Selections** **50** (DID=50) to **5F** (DID=5F)
			SDID (Secondary Data ID)	**Selections** **1** (SDID=1) to **FF** (SDID=FF)
	EDET (Error Detection)	**Selections** **FIN** (Fiber-Link Input)	**Selections** **ON** (Indicate Errors to LED) **OFF** (Disable Error Indication)	
	JACK (Monitor Jack)	**Selections** **CHAN** (Audio Channel)	**Selections** **AUD1** (Audio 1) **AUD2** (Audio 2) **AUD3** (Audio 3) **AUD4** (Audio 4)	
		VOL (Volume)	**Selections** **0** to **50** (Arbitrary Range)	
	DISP (Display Orientation)	**Selections** **HORZ** (Horizontal) **VERT** (Vertical)		
	FRST (Factory Reset)	**Selections** **NO** (Abort) **YES** (Accept)		
	BACK (Abort)			

? Toggle Switch ?

Figure 4-2: Card Edge Menu Structure

4.2.1. Displaying Warning Status Indications

Upon entering menu level 1 on power up, or following a configuration selection, the default display selection will indicate the warning status of the 7707MRA-HD. This warning status indication can also be entered while already in menu level 1, by using the toggle switch. During normal operation, while no warnings conditions are active, the `OK` indication will be displayed. Three warning indications can supersede this display state. The following list describes possible indications for this menu item, listed in order of display priority:

`LASR…ERR`	Laser Error Warning. Flashing indication alternates between `LASR` and `ERR`
`LINK…LOS`	Video Loss of Optical Signal. Flashing indication alternates between `LINK` and `LOS`
`OK`	Okay. No warning conditions are active.

4.2.2. Displaying the Standard of Input Video

The card-edge display of the 7707MRA-HD can report the signal standard present at the fiber optic input. To indicate the input video standard, select the `STAT` (Status) menu item in menu level 1 followed by `FIN` (Fiber Input) and `STD` (Video Standard) menu items.

```
STAT
  FIN
    STD
      1080i/60
      1080i/59.94
      1080i
      /50
      1035i/60
      1035i/59.94
      1080i/48
      1080i/47.96
      720p/60
      720p/59.94
      SDTI-N270
      SDTI-P270
      DVB-ASI
      N270
      P270
      LOS
```

`1080i/60`	1080i/60 standard is present
`1080i/59.94`	1080i/59.94 standard is present
`1080i/50`	1080i/50 standard is present
`1035i/60`	1035i/59.94 standard is present
`1035i/59.94`	1035i/59.94 standard is present
`1080i/48`	1080i/48 standard is present
`1080i/47.96`	1080i/47.96 standard is present
`720p/60`	720p/60 standard is present
`720p/59.94`	720p/59.94 standard is present
`SDTI-N270`	SDTi standard is present, with 525i structure.
`SDTI-P270`	SDTi standard is present, with 625i structure.
`DVB-ASI`	DVB-ASI standard is present
`N270`	525i standard is present
`P270`	625i standard is present
`LOS`	Loss of signal. No valid video signal is detected at the selected input

4.2.3. Displaying the Embedded Audio Status of Input Video

The 7707MRA-HD allows the user to monitor the status of input video embedded audio groups. This allows for easy identification of active groups. To view the current status of input video embedded audio groups, select the STAT (Status) menu item in menu level 1, followed by the FIN (Fiber Input) and GRP1, GRP2, GRP3 or GRP4 (Audio Groups 1 through 4) menu items.

STAT
FIN
GRP1
GRP2
GRP3
GRP4
FREE
USED
LOS

FREE   The monitored audio group is unused in applied input video.
USED   The monitored audio group is used in applied input video.
LOS   No video input detected.

4.2.4. Displaying the GPI Status

The 7707MRA-HD can display the status of the GPI inputs. To indicate the GPI input state, select the STAT (Status) menu item in menu level 1, followed by the GPI1 or GPI2.

STAT
GPI1 / GPI2
ON
OFF

ON   GPI is active.
OFF   GPI is inactive.

4.2.5. Displaying the GPO Status

The 7707MRA-HD can display the status of the GPO outputs. To indicate the GPO status, select the STAT (Status) menu item in menu level 1, followed by the GPO1 or GPO2.

STAT
GPO1 / GPO2
ON
OFF
LOS

ON   GPO is active.
OFF   GPO is inactive.
LOS   Loss of optical link input signal.

4.2.6. Displaying the Received Optical Power

The 7707MRA-HD is equipped with an on-board optical power meter and can report the power to the card edge display in units of dBm. To indicate the input strength of the received signal, select the STAT (Status) menu item in menu level 1 followed by the PWR (Optical Power) menu item.

```
STAT
   PWR
       -40 to 0
       LOW
       OVR
```

-40 to **0**	Power monitoring range (in dBm units)
LOW	Received optical power is less than –40dBm.
OVR	Received optical power is greater than maximum. *CAUTION: Never exceed the maximum specified optical input power for the specific product option that you possess. See section 3.1 for optical input specifications. Exceeding the maximum optical input power can permanently damage the optical receiver.*

4.2.7. Displaying the Firmware Version

Software operating on the 7707MRA-HD has a version number associated with it. This version number can be indicated to the display. By this means, it can be verified that the module is operating with the most recent software. To indicate the software version to the display, select the STAT (Status) menu item in menu level 1, followed by the VER (Software Version) menu item. The following list describes possible indications for this menu selection:

VER x.x BUILD xxx   Software version. Character string scrolls across four digit display

4.2.8. Selecting the Laser Output Mode on LOS

In some applications it is desirable to have the laser output disabled while no input video signal is present at the optical input (LINK…LOS condition). Alternatively, it may be preferable to maintain an optical output signal, even with no input video. The 7707MRA-HD supports both modes of operation. If the continuous mode of operation is selected, while the input to the 7707MRA-HD is invalid (LINK…LOS condition), the output will also contain invalid information, but will still output. To configure the output laser enable mode, select the CTRL (Control) menu item in menu level 1 followed by the FOUT (Video Output) and LASR (Laser) menu items.

```
CTRL
   FOUT
      LASR
         CONT
         DISC
```

CONT	Continuous operation. Laser is always enabled, even without valid video input.
DISC	Discontinuous operation. Laser is disabled when no valid input video is detected.

4.2.9. Selecting the Video Output Mode on LOS

In order to maintain audio transport during input video loss, a generated output video signal may be enabled during this condition. A black or gray active picture may be selected. Alternately, to force a downstream signal loss during this condition, output generation may be disabled. To configure the output mode on LOS, select the `CTRL` (Control) menu item in menu level 1 followed by the `FOUT` (Fiber Output) and `GEN` (Generation) menu items.

CTRL			
VOUT			
GEN			
BLK			
GRAY			
OFF			
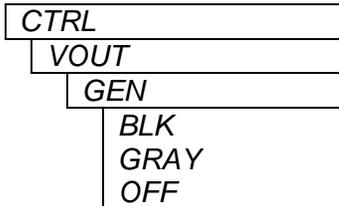
BLK	Enable output generation with black active picture.
GRAY	Enable output generation with gray active picture.
OFF	Disable output generation.

4.2.10. Selecting Output Video HANC Cleaning

With output HANC cleaning disabled, all embedded audio groups present in the optical input video will be passed transparently to the output. With output HANC cleaning enabled, the audio groups that are selected for de-embedding (see section 4.2.7) will be cleaned from the output video. To enable or disable output video cleaning select the `CTRL` (Control) menu item in menu level 1 followed by the `EMBD` (De-embedding) and `HCLN` (Clean Input Hanc) menu items.

CTRL	
VOUT	
HCLN	
ON	
OFF	
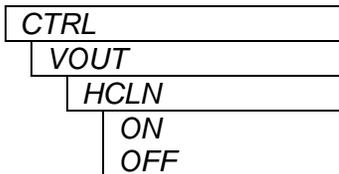
ON	De-embedded audio groups are cleaned from the output video.
OFF	All audio groups pass transparently to the output video.

4.2.11. Selecting Balanced or Unbalanced Audio

The 7707MRA-HDW provides card-edge configuration of AES outputs, as balanced or unbalanced. To configure the output type, select the `CTRL` (Control) menu item in menu level 1 followed by the `AES1`, `AES2`, `AES3` or `AES4` (AES 1 through AES 4) menu items followed by `TERM` (Termination Impedance).

CTRL	
AES1-AES4	
TERM	
BAL	
UBAL	
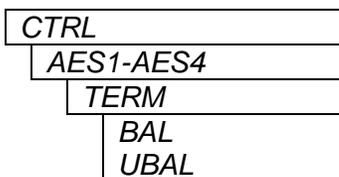
BAL	Configures output impedance, rise/fall times, and amplitude for balanced AES.
UBAL	Configures output impedance, rise/fall times, and amplitude for unbalanced AES.

4.2.12. Selecting AES Pop-Reduction and Generation on LOS

Three AES output generation modes are available during audio loss. With AES output generation disabled (OFF), the output signal is muted (i.e., no electrical transitions). With AES output generation set enabled (ON), the output signal is AES silence. With AES output pop-reduction enabled (SOFT), the output will buffer audio for 4ms, and fade to mute upon the occurrence of errors in input, embedded, or de-embedded audio. This minimizes audible clicks and pops caused by application/removal of audio to the companion 7707MTA-HD-W, or optical link errors. Note that pop-reduction adds 4ms audio latency when enabled. To configure the output type on loss of input, select the `CTRL` (Control) menu item in menu level 1 followed by the `AES1, AES2, AES3` or `AES4` (AES 1 through AES 4) menu items followed by `GEN` (Generation).

CTRL
AES1-AES4
GEN
OFF
ON
SOFT

OFF   Mute AES output during LOS (i.e. no electrical transitions)
ON   Output AES silence during LOS
SOFT   Output AES silence with Pop-reduction during errors or LOS

4.2.13. Selecting the Serial Data Type

The serial data interface of the 7707MRA-HD is configurable as RS-422, RS-232, or RS485. To select the data type, select the `CTRL` (Control) menu item in menu level 1, followed by the `SER` (Serial Data), followed by the `TYPE` (Data Type).

CTRL
SER
TYPE
232
422
485

232   Configures card to transmit RS232
422   Configures card to transmit RS422
485   Configures card to transmit RS485

4.2.14. Selecting the Serial Data Rate

A serial data rate selection is only required for RS-485 data. To select the serial data rate, select the CTRL (Control) menu item in menu level 1, followed by the SER (Serial Data), followed by the RATE (Baud Rate).

CTRL	
SER	
RATE	
300	
600	
1K2	
2K4	
4K8	
9K6	
14K4	
19K2	
38K4	
57K6	
76K8	
115K	
153K	

300	Configures card to transmit at 300Kb/s
600	Configures card to transmit at 600 Kb/s
1K2	Configures card to transmit at 1.2 Kb/s
2K4	Configures card to transmit at 2.4 Kb/s
4K8	Configures card to transmit at 4.8 Kb/s
9K6	Configures card to transmit at 9.6 Kb/s
14K4	Configures card to transmit at 14.4 Kb/s
19K2	Configures card to transmit at 19.2 Kb/s
38K4	Configures card to transmit at 38.4 Kb/s
57K6	Configures card to transmit at 57.6 Kb/s
76K8	Configures card to transmit at 76.8 Kb/s
115K	Configures card to transmit at 115 Kb/s
153K	Configures card to transmit at 153 Kb/s

4.2.15. Selecting the Serial Data Fail Safe Bias

RS-485 applications sometimes require a failsafe bias at the serial data interface, to ensure a known signal state while communications are in an idle state. The 7707MRA-HD provides a configurable failsafe bias to accommodate such requirements. To configure the failsafe bias, select the CTRL (Control) menu item in menu level 1, followed by the SER (Serial Data), followed by the BIAS (Failsafe Bias).

CTRL	
SER	
BIAS	
ON	
OFF	

ON	Enables fail safe bias
OFF	Disables fail safe bias

4.2.16. Selecting Audio De-embedding Groups

This user menu item provides configuration of the de-embedded audio groups. To select the audio de-embedding groups select the `CTRL` (Control) menu item in menu level 1, followed by the `EMBD` (De-embedding) and then `A1+2` (AES 1 and AES 2) or `A3+4` (AES 3 and AES 4) menu items.

```
CTRL
  EMBD
    A1+2
    A3+4
      GRP1
      GRP2
      GRP3
      GRP4
      NONE
```

GRP1   De-embed group 1 to the selected AES outputs (`A1+2` or `A3+4`).

GRP2   De-embed group 2 to the selected AES outputs (`A1+2` or `A3+4`).

GRP3   De-embed group 3 to the selected AES outputs (`A1+2` or `A3+4`).

GRP4   De-embed group 4 to the selected AES outputs (`A1+2` or `A3+4`).

NONE   The selected AES outputs (`A1+2` or `A3+4`) will be mute.

4.2.17. Selecting Serial Data De-embedding Parameters

The 7707MRA-HD de-embeds serial data from horizontal ancillary (HANC) data space of the optical input video. The HANC de-embedding parameters of the 7707MRA-HD should be configured to match embedding parameters of the companion 7707MTA-HD-W. Configuration parameters are provided by selecting the `CTRL` (Control) menu item in menu level 1, followed by the `EMBD` (De-embedding) and `SER` (Serial Data) menu items.

```
CTRL
  EMBD
    SER
      DID
      SDID
```

DID   Data ID
SDID   Secondary Data ID

To configure a desired DID, select the `CTRL` (Control) menu item in menu level 1, followed by the `EMBD` (De-embedding) and `SER` (Serial Data) menu items.

```
CTRL
  EMBD
    SER
      DID
        50 to 5F
```

50 to 5F   Sets the ID used for data de-embedding

To configure a desired SDID, select the secondary data ID line, then select the `CTRL` (Control) menu item in menu level 1, followed by the `EMBD` (De-embedding) and `SER` (Serial Data) menu items.

```
CTRL
  EMBD
    SER
      SDID
        1 to FF
```

1 to FF   Sets the secondary ID used for data de-embedding

4.2.18. Selecting GPIO De-embedding Parameters

The 7707MRA-HD de-embeds GPIO from vertical ancillary (VANC) data space of the optical input video. The VANC de-embedding parameters of the 7707MRA-HD should be configured to match embedding parameters of the companion 7707MTA-HD-W. Configuration parameters are provided by selecting the CTRL (Control) menu item in menu level 1, followed by the EMBD (De-embedding) and GPIO (GPIO Data) menu items.

CTRL	
EMBD	
GPIO	
LN	
DID	
SDID	

LN   Serial data de-embed line
DID   Data ID
SDID   Secondary Data ID

To select the data embedding line, select the CTRL (Control) menu item in menu level 1, followed by the EMBD (De-embedding) and GPIO (GPIO Data) menu items.

CTRL	
EMBD	
GPIO	
LN	
0 to 2047	
NONE	

0 to 2047   Serial Data de-embed line (note available lines for
                       particular standard)
NONE   Disable de-embedding configured by this parameter

To configure a desired DID, select the CTRL (Control) menu item in menu level 1, followed by the EMBD (De-embedding) and GPIO (GPIO Data) menu items.

CTRL	
EMBD	
GPIO	
DID	
50 to 5F	

50 to 5F   Sets the ID used for data de-embedding

To configure a desired SDID select the secondary data ID line, select the CTRL (Control) menu item in menu level 1, followed by the EMBD (De-embedding) and GPIO (GPIO Data) menu items.

CTRL	
EMBD	
GPIO	
SDID	
1 to FF	

1 to FF   Sets the secondary ID used for data de-embedding

4.2.19. Selecting Fiber Input Error Detection

The 7707MRA-HD is capable of detecting CRC or EDH errors in optical input video. To turn error detection on or off select the CTRL (Control) menu item in menu level 1 followed by the EDET (Error Detection) menu items, and then select the FIN (Fiber Input) menu item.

CTRL		
EDET		
FIN		
ON		
OFF		

ON   Enable error detection. Errors will be reported to the card edge LED

OFF   Disable error detection.

4.2.20. Selecting the Headphone Monitoring Jack Channel

The 7707MRA-HD provides a convenient headphone monitoring jack at the card-edge. The monitored audio channel is configured by the user, via the card-edge interface. Volume of the headphone monitoring jack can also be adjusted using the card-edge volume control. To configure the headphone monitoring jack channel, select the CTRL (Control) menu item in menu level 1, followed by the JACK (Audio Jack) and CHAN (Audio Channel) menu items.

CTRL	
JACK	
CHAN	
AUD1	
AUD2	
AUD3	
AUD4	

AUD1   Channel 1 is selected to the headphone monitoring jack
AUD2   Channel 2 is selected to the headphone monitoring jack
AUD3   Channel 3 is selected to the headphone monitoring jack
AUD4   Channel 4 is selected to the headphone monitoring jack

To configure the headphone volume, select the CTRL (Control) menu item in menu level 1, followed by the JACK (Audio Jack) and VOL (Volume) menu items.

CTRL	
JACK	
VOL	
0 to 50	

0 to 50   Sets the volume of the headphone jack

4.2.21. Selecting the Display Orientation

The 7707MRA-HD provides the ability to adjust the orientation of the display. When using a 3RU frame it is convenient to have the text read vertical whereas when using a 1RU frame a horizontal display is desirable. To change the orientation of the display select the CTRL (Control) menu item in menu level 1, followed by the DISP (Display) menu item.

CTRL	
DISP	
HORZ	
VERT	

HORZ   Sets the orientation of the text to horizontal
VERT   Sets the orientation of the text to vertical

4.2.22. Selecting the Factory Reset Configuration

It is convenient to have a quick method of returning all configuration settings to a default state. The 7707MRA-HD provides a factory reset for this purpose. All values that are user configurable will be returned to a known state, as indicated below. To initialize a factory reset, select the `CTRL` (Control) menu item in menu level 1, followed by the `FRST` (Factory Reset) menu item. The following list describes possible user selections for this menu item:

NO   Do not initialize factory reset. Return to the previous menu item, without changes
YES   Initialize factory reset

5.   JUMPERS AND CONTROLS

Several jumpers, located at the front of the module, are used to preset various operating modes. Figure 4-1 shows the locations of the jumpers.

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

The FRAME STATUS jumper 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.

5.2.   CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper 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 the UPGRADE jumper into the *UPGRADE* 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 complete, 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.

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