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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	Nov 01
1.1	Updated Figure 3, status indicator and jumper descriptions	Feb 02
1.2	Added 8 new CWDM wavelengths	Dec 02
1.3	Laser & carrier faults updated	June 03
1.3.1	Added information about DVB-ASI compliant outputs	Aug 03
1.3.2	Corrected Figure 3	Oct 03
1.3.3	Updated *Vista*LINK® monitored parameters, controlled parameters and traps	Sep 04
1.4	Updated safety section and added assembly and labeling sections	Aug 05
1.4.1	Added Jumper information in Section 5.2	Apr 07
1.5	Updated features and specs	Nov 08

WARNING

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

Do not hook up the 7707EO-HD DWDM cards directly with a short fiber optic cable. The 7707EO-HD DWDM cards produce +7dBm of power which will damage the receiver if connected directly.

Do not hook up the 7707EO-HD cards that output more than -7dBm of power (see 7707EO-HD specifications for output power of various laser types) and 7707OE-HD-H high sensitivity receiver cards directly with a short fiber optic cable. The 7707EO-HD cards that produce more than -7dBm of power will damage the receiver if connected directly.

1. OVERVIEW

The 7707EO-HD is a *Vista*LINK® enabled, electrical to optical converter for SMPTE 292M (1.485Gb/s), SMPTE 259M (143-360Mb/s), SMPTE 344M (540Mb/s), DVB-ASI (270Mb/s) and SMPTE 310M (19.4Mb/s) signals. Monitoring and control of card status and parameters is provided locally at the card edge, and remotely via *Vista*LINK® capability. The 7707EO-HD accepts one coaxial SDI input, and provides one reclocked fiber output and two reclocked coaxial SDI outputs.

The fiber output is available in an assortment of optical wavelengths, accommodating standard, CWDM transmission schemes. (See Specifications for complete information)

7707EO13-HD	1310 nm FP	-7dBm output, suitable for distances up to 50 Km
7707EO13-HD-L	1310 nm DFB	0dBm output, suitable for distances up to 75 Km
7707EO15-HD	1550 nm DFB	0dBm output, suitable for distances up to 75 Km

There are several versions with built in isolators specifically suited to coarse wave division multiplexing (CWDM) applications. These versions all have 0dBm output and are suitable for distances up to 75 Km.

7707EO27-HD	1270 nm DFB
7707EO29-HD	1290 nm DFB
7707EO31-HD	1310 nm DFB
7707EO33-HD	1330 nm DFB
7707EO35-HD	1350 nm DFB
7707EO37-HD	1370 nm DFB
7707EO43-HD	1430 nm DFB
7707EO45-HD	1450 nm DFB
7707EO47-HD	1470 nm DFB
7707EO49-HD	1490 nm DFB
7707EO51-HD	1510 nm DFB
7707EO53-HD	1530 nm DFB
7707EO55-HD	1550 nm DFB
7707EO57-HD	1570 nm DFB
7707EO59-HD	1590 nm DFB
7707EO61-HD	1610 nm DFB

There are several versions with built in isolators specifically suited to dense wave division multiplexing (DWDM) applications. The DWDM versions are suitable for distances >50 Km @ 1.5 Gb/s (for DWDM applications contact factory).

7707EODyyy-HD	DWDM DFB laser output, yyy – ITU channel number

The 7707EO-HD 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:

- Supports all SMPTE 292M standards at 1.485Gb/s
- Supports all SMPTE 259M standards with operation from 143Mb/s-360Mb/s
- Supports SMPTE 310M (19.4Mb/s), M2S or DVB-ASI (270Mb/s), SMPTE 344M (540Mb/s), and SMPTE 305M (SDTi) rates
- Auto rate selection, indication and reclocking for all SDI and HD-SDI data rates from 143Mb/s to 1.485Gb/s
- Selectable non-reclock mode for other data rates
- Detection and display of equalization strength, video format, and EDH errors (SDI only)
- Automatic coaxial input equalization to 150m for all rates to 1.485Gb/s (Belden 1694A)
- DWDM wavelengths (ITU-T G.694.1 compliant) also available
- Optical output wavelengths of 1310nm, 1550nm, and up to sixteen CWDM wavelengths (ITU-T G.694.2 compliant)
- Supports single-mode and multi-mode fiber optic cable
- Fully hot-swappable from front of frame
- Comprehensive signal and card status monitoring via four digit card edge display or remotely through SNMP and VistaLINK®
- Can be housed in either a 1RU frame which will hold up to 3 modules, a 3RU frame which will hold up to 15 modules, 3RU portable frame that holds up to 7 modules or a standalone frame which will hold 1 module
- VistaLINK® capability is available when modules are used with the 3RU 7700FR-C or 350FR portable frame and a 7700FC VistaLINK® Frame Controller module in slot 1 of the frame

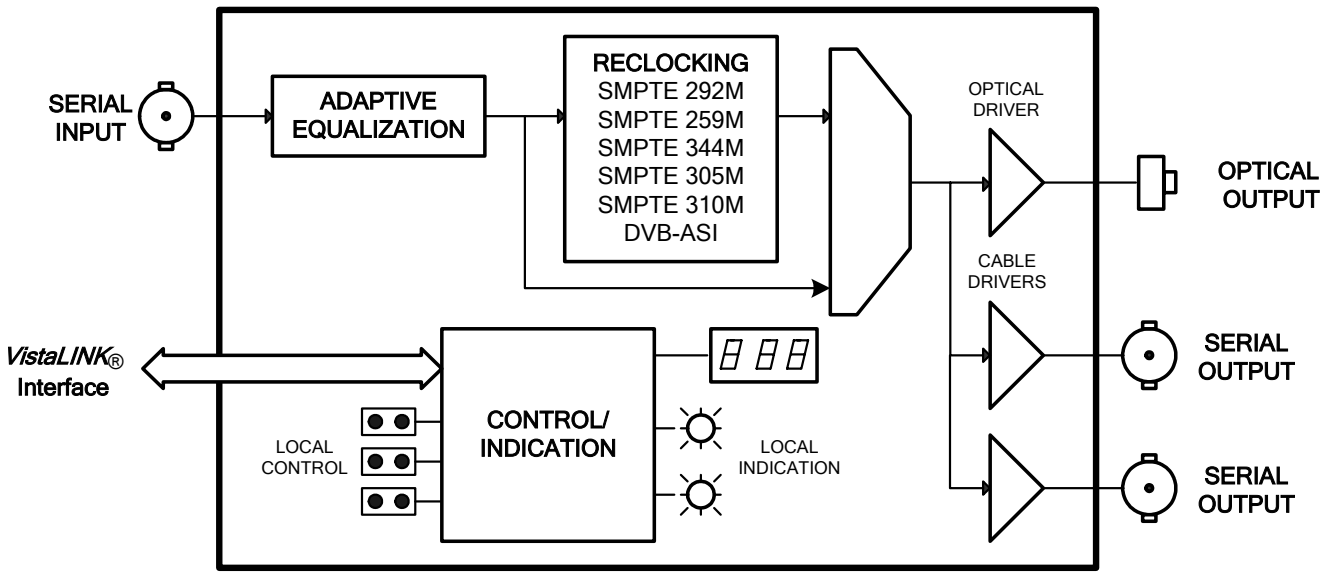

Figure 1-1: 7707EO-HD Block Diagram

2. INSTALLATION

The 7707EO-HD comes with a companion rear plate that has three BNC connectors and one 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.

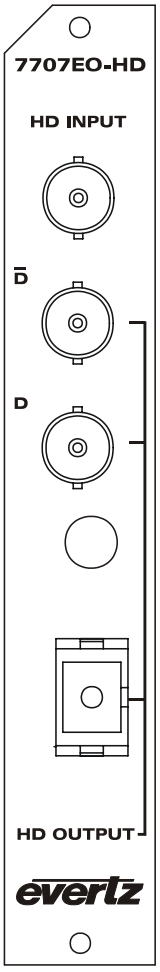

Figure 2-1: 7707EO-HD Rear Panel

2.1. SERIAL DIGITAL COAXIAL CONNECTIONS

HD INPUT: Input BNC connector for 10-bit serial digital video signals compatible with SMPTE 292M, SMPTE 259M, SMPTE 344M, DVB-ASI or SMPTE 310M standards. This input provides adaptive compensation for up to 125m of industry standard Belden 1694A cable at rates to 1.485Gb/s.

HD OUTPUT: There are two BNC connectors with serial component video outputs, compatible with SMPTE 292M, SMPTE 259M, SMPTE 344M, DVB-ASI or SMPTE 310M standards. Reclocking is provided or may be disabled by the user in Non-Reclock mode. The HD Output marked D (the bottom output BNC) maintains the same polarity as the input and is DVB-ASI compliant.

2.2. OPTICAL CONNECTIONS

HD OUTPUT: There is one SC/PC (shown), ST/PC or FC/PC female connector with the video output converted to an optical signal as specified in section 3.3. The optical output laser is enabled only while a valid input signal is detected which is indicated by the SIGNAL VALID LED.

This optical output is available in 1310nm, 1550nm, up to sixteen CWDM wavelengths (ITU-T G.694.2 compliant) and up to 40 DWDM wavelengths (ITU-T G.694.1 compliant). The output wavelength is marked on the rear panel of each module. When connected directly to a companion module, the output is compatible with multi-mode fiber optic cable. If not connected directly (i.e. connected through CWDM, DWDM, WDM, or splitter/combiner) the output is compatible only with single-mode fiber optic cable.

Do not hook up the 7707EO-HD DWDM cards directly with a short fiber optic cable. The 7707EO-HD DWDM cards produce +7dBm of power, which will damage the receiver if connected directly.

Do not hook up the 7707EO-HD cards that output more than -7dBm of power (see 7707EO-HD specifications for output power of various laser types) and 7707OE-HD-H high sensitivity receiver cards directly with a short fiber optic cable. The 7707EO-HD cards that produce more than -7dBm of power will damage the receiver if connected directly.

2.3. CARE AND HANDLING OF OPTICAL FIBER

2.3.1. Safety

CLASS 1 LASER PRODUCT

Background colour: yellow
Triangular band: black
Symbol: black

2.3.2. Assembly

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

2.3.3. 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 bar code label placed on the Printed circuit board of each Evertz plug-in module
- The Model number is one of: 7707EO13-HD, 7707EO13-HD-L, 7707EO15-HD, 7707EOxx-HD, (xx = 27, 29, 31, 33, 35, 37, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61) 7707EODyyy-HD (Dyyy represents ITU Grid Channel: D200, D210, D220, D230, D240, D250, D260, D270, D280, D290, D300, D310, D320, D330, D340, D350, D360, D370, D380, D390, D400, D410, D420, D430, D440, D450, D460, D470, D480, D490, D500, D510, D520, D530, D540, D550, D570, D580, D590, D600)

Figure 2-2: Reproduction of Laser Certification and Identification Label

2.3.4. 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 fiber optic cable see section 3 of the Fiber Optics System Design section of this manual binder.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standards:
Reclocked: SMPTE 292M, SMPTE 259M A, B, C, D, SMPTE 344M, SMPTE 305M, DVB-ASI, M2S, SMPTE 310M
Non-Reclocked: Any bi-level signal type at rates of 19.4 – 1.485Gb/s

Connector: 1 BNC input per IEC 61169-8, Annex A
Equalization: Automatic to 150m @ 1.485Gb/s with Belden 1694A or equivalent cable
Return Loss: > 15dB to 1.5GHz

3.2. SERIAL VIDEO OUTPUTS

Number of Outputs: 2 Per Card
1 output maintains polarity from input to output for DVB-ASI applications.

Connector: BNC per IEC 61169-8, Annex A
Signal Level: 800mV ±80mV
DC Offset: 0V ±0.5V
Rise and Fall Time: <270ps
Overshoot: <10% of amplitude
Return Loss: >12dB to 1.5Ghz
Wide Band Jitter: < 0.2UI (Reclocked)

3.3. OPTICAL OUTPUT

Standard: SMPTE 297M
Number of Outputs: 1
Connector: Female SC/PC, ST/PC or FC/PC
Return Loss: > 14dB
Rise and Fall Time: < 270ps
Wide Band Jitter: < 0.2UI (Reclocked).
Fiber Size: 9 μm core / 125 μm overall
Wavelengths:
Standard: 1310nm, 1550nm (nominal)
CWDM: 1270nm to 1610nm (ITU-T G.694.2 compliant)
DWDM: ITU channel 20 to 60, 100GHz spacing, (ITU-T G.694.1 compliant)

Output Power:
1310nm FP (Standard) -7dBm ± 1dBm
1310nm DFB (L Version) 0dBm ± 1dBm
1550nm & CWDM DFB 0dBm ± 1dBm
DWDM DFB +7dBm ± 1dB

3.4. ELECTRICAL

Voltage:	+12VDC
Power:	8 Watts (Non DWDM) 11 Watts (DWDM)
EMI/RFI:	Complies with FCC Part 15, Class A EU EMC Directive

3.5. COMPLIANCE

Electrical Safety:	CSA Listed to UL 60065-03, IEC 60065 Complies with CE Low voltage directive
Laser Safety:	Class 1 laser product Complies with 24 CFR 1040.10 and 1040.11 IEC 60825-1
EMI/RFI:	Complies with FCC Part 15, Class A EU EMC directive

3.6. PHYSICAL

7700 or 7701 frame mounting:

Number of slots: 1

4. STATUS INDICATORS AND DISPLAYS

The 7707EO-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 displays on the alphanumeric display. Figure 4-1 shows the locations of the indicators, jumpers and pushbutton.

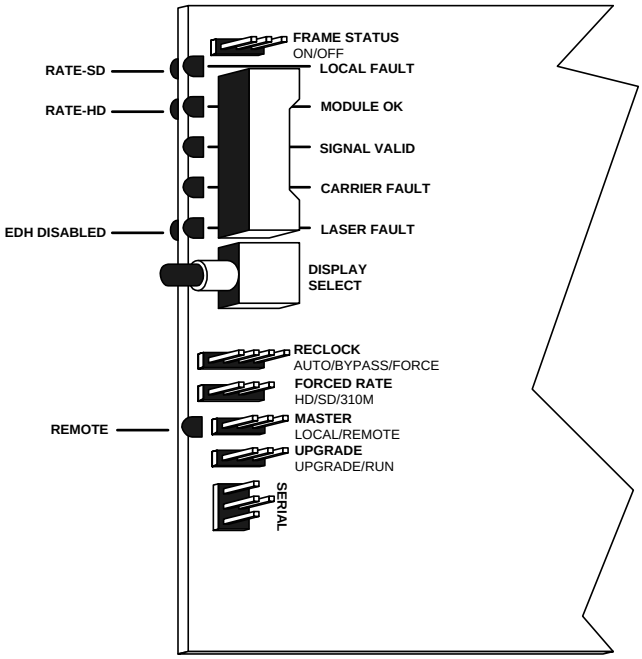

Figure 4-1: Location of Status Indicators and Jumpers

4.1. STATUS INDICATOR LEDS

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of a valid input signal, if a laser fault exists, or if a local input power fault exists (ie: a blown fuse). 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 a valid input signal is present, and the laser and board power are good.

SIGNAL VALID: This Green LED indicates the presence of a valid input signal. The coaxial input is considered valid when the module has attained lock to the signal. If the reclocker is in non-reclock mode, then the input is considered valid when the module detects the presence of a carrier as indicated by the CARRIER FAULT LED.

CARRIER FAULT: This Yellow LED will be On when the cable equalizer detects a weak signal carrier at the coaxial input. The CARRIER FAULT threshold is calibrated to a cable equalization of 150m of Belden 1694A cable @ 1.485 Gb/s.

LASER FAULT: This Red LED indicates poor operation of the optical output laser, leading to limited laser life. The optical output laser is enabled only while a valid input signal is detected as indicated by the SIGNAL VALID LED.

RATE - SD: This Green LED indicates that the reclocker is locked to one of the SD rates.

RATE - HD: This Green LED indicates that the reclocker is locked to the 1.485 Gb/s HD rate.

EDH DISABLED: This Yellow LED indicates that the user has deactivated error detection on the card edge display for SD signals. Press and hold the pushbutton until the LED goes Off to enable EDH detection on card edge display for SD mode.

REMOTE: This Yellow LED located beside the MASTER jumper indicates that local controls of the card are disabled, and that the card is under control of the *Vista*LINK® interface. (See section 6 for information about *Vista*LINK® monitoring and control.)

4.2. DOT-MATRIX DISPLAY

Additional signal and status monitoring is provided via the 4-digit dot-matrix display located on the card edge. The card-edge pushbutton is used to select which data is being displayed in the alphanumeric display. Each time the pushbutton is pressed, the display advances to the next available display. A message indicating what display mode is active is shown for one second. After one second without the pushbutton being pressed, the selected display data is shown.

The following display messages indicate what is being displayed.

EQ	Equalization Strength
STD	Video Standard in Use
EDH	EDH Errors (for SD only)

The details of the equalization strength, video standards, and EDH error displays are described in sections 4.2.1 to 4.2.2.

4.2.1. Displaying The Equalization Strength

To display the Equalization strength, press the pushbutton one or more times until the EQ message is shown on the display. After one second the applied equalization strength will be shown represented as a percentage of the maximum equalizer capability.

EQ
0 – 100%
LOS

The following list describes the available selections.

0% to 100%	Indicates applied equalization (e.g. 1m 1694A coax on input = 0%, 125m = 100%).
LOS	Indicates that no valid input signal is present.

4.2.2. Displaying the EDH Errors

For SD rates EDH errors are displayed in a different manner than optical power, and video standards. When EDH error detection is enabled, the display of EDH errors will take precedence, and overwrite the existing indication with the message EDH. The EDH error display shows if any EDH errors have occurred during the previous 1 second interval. If the EDH errors are continuous, then the display will alternate between the EDH display and the selected video standard or equalization displays, allowing both to be monitored. EDH detection is not available for HD input signals.

To enable the EDH error display, press and hold the pushbutton until the EDH DISABLE LED goes Off. To disable the EDH error display, press and hold the pushbutton until the EDH DISABLED LED turns On.

The EDH error display can only be enabled / disabled when there is a SMPTE 259M or SMPTE 344M input signal.

4.2.3. Displaying the Video Standard

When the reclocker is enabled, the 7707EO-HD detects the Video standards of the signal present at its input. To display the Video Standard, press the pushbutton one or more times until the STD message is shown on the display. After one second the detected video standard will be shown. The following list describes possible displays and their functions.

STD
N143
P177
N270
P270
N360
P360
N540
P540
HD
310M
BYP
LOS

The following list describes the available selections.

N143	SMPTE 259M-A, 143 Mb/s 4Fsc Composite NTSC
P177	SMPTE 259M-B, 177 Mb/s 4Fsc Composite PAL
N270	SMPTE 259M-C, 270 Mb/s 4:2:2 Component 525 line, 4:3
P270	SMPTE 259M-C, 270 Mb/s 4:2:2 Component 625 line, 4:3
N360	SMPTE 259M-D, 360 Mb/s 4:2:2 Component 525 line, 16:9
P360	SMPTE 259M-D, 360 Mb/s 4:2:2 Component 625 line, 16:9
N540	SMPTE 344M, 540 Mb/s 4:4:4 Component 525 line 4:3
P540	SMPTE 344M, 540 Mb/s 4:4:4 Component 625 line 4:3
HD	SMPTE 292M, 1.485 Gb/s
310M	SMPTE 310M
BYP	Indicates reclocker is in non-reclock mode.
LOS	Indicates that no valid input signal is present.

5. JUMPERS AND LOCAL 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 THE RECLOCKING MODE

The RECLOCK jumper allows the user to set the reclocking mode.

RECLOCK: To enable reclocking of the coaxial input signal set the jumper to the AUTO or FORCE positions.

Set the jumper to the AUTO position, and select automatic rate selection and reclocking for 19.4,143/177/270/360/540Mb/s and 1.485Gb/s signals.

Set the jumper to the FORCED position, and the FORCE RATE jumper determines the reclocking rate.

Set the jumper to the BYPASS position to disable reclocking of the coaxial input signal. The timing and duty-cycle of the signal are not reconditioned in this mode.

5.2. SELECTING THE RECLOCKING RATE

The FORCED RATE jumper selects the range of reclock rates when the RECLOCK jumper is set to the FORCE position.

FORCED RATE: Set the jumper to the SD position to select automatic reclocking of SMPTE 259M (143-360 Mb/s), SMPTE 305M (SDTi) and SMPTE 344M (540 Mb/s) rates.

Set the jumper to the HD position to select reclocking of SMPTE 292M (1.485 Gb/s) signals.

Set the jumper to the 310M position to select reclocking of SMPTE 310M (19.4 Mb/s) signals.

To perform the 310M operation the RECLOCK jumper must be set to FORCE, and the FORCED RATE jumper must be set to 310M.

5.3. 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.

5.4. SELECTING WHETHER THE MODULE WILL BE CONTROLLED FROM THE LOCAL CONTROLS OR THROUGH THE *VISTA*LINK® INTERFACE

The MASTER jumper selects whether the module will be controlled from the local user controls or through the *Vista*LINK® interface.

MASTER: When this jumper is installed in the LOCAL position, the card functions are controlled through the local jumpers.

When this jumper is installed in the REMOTE position, the card functions are controlled through the *Vista*LINK® interface. The adjacent yellow LED will be On when *Vista*LINK® control in enabled. This LED is intended to alert the user that local controls are not currently active.

5.5. 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 NOTE 1). 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 (see NOTE 1). 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.

NOTE 1: The Rev (A) boards have incorrect labeling for the *RUN* / *UPGRADE* modes. The jumper labels shown in Figure 4-1 are correct. On Rev (A) boards, for normal RUN operation set the jumper to the *UPGRADE* position (as shown on the board label - away from the front of the module). For UPGRADE operation the jumper must be set to the *RUN* position (as shown on the board label - closest to the front of the board).

6. *VISTA*LINK® REMOTE MONITORING/CONTROL

6.1. WHAT IS *VISTA*LINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager, also known as a Network Management System (NMS), is a computer running special software that communicates with the devices in the network. Evertz VL-Fiber demo Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK® enabled fiber optic products.

2. Managed devices, (such as 7707EO-HD and 7707OE-HD cards), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK® frame controller module, which serves as the Agent.

3. A virtual database, known as the Management information Base (MIB), lists all the variables being monitored, which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK® network, see the 7700FC Frame Controller chapter.

6.2. *VISTA*LINK® MONITORED PARAMETERS

The following parameters can be remotely monitored through the *Vista*LINK® interface.

Parameter	Description
Master Jumper	Indicates whether the card is set in local or remote mode.
Equalization Strength	A range of values describing equalization being applied to the input.
Video Standard	A range of values describing the detected video standard.

Table 6-1: *Vista*LINK® Monitored Parameters

6.3. *VISTA*LINK® CONTROLLED PARAMETERS

When the MASTER jumper is set to the REMOTE position, the following parameters can be remotely controlled through the *Vista*LINK® interface. When the MASTER jumper is set to the LOCAL position the local jumper settings will override the settings configured through the *Vista*LINK® interface.

Parameter	Description
Reclock Mode	Enables or disables signal reclocking.
Rate Mode	Sets the reclocking rate to SMPTE 259M, SMPTE 292M or SMPTE310M rates.

Table 6-2: *Vista*LINK® Controlled Parameters

6.4. *VISTA*LINK® TRAPS

The following parameters can be remotely enabled and monitored through the *Vista*LINK® interface as traps in the Alarm View.

Parameter	Description
Carrier Strength Weak	Indicates that the optical power is approaching the optical receiver sensitivity limits.
EDH Error Present	EDH errors present in the input signal - SD only.
Laser Not OK	Indicates deficient operation of the optical output laser. (The state of the LASER FAULT LED)
Signal Not Present	Indicates the absence of a valid input signal. (The state of the SIGNAL VALID LED)

Table 6-3: *Vista*LINK® Traps