TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	First Version	Jan 03
1.1	Fixed Typos and Formatting	Jul 07
1.2	Minor formatting updates	April 09

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1. OVERVIEW

The 7707BPX-TR Optical Bypass Switch provides a complete solution for redundancy management in wide band optical systems. Automatic switching supports 1+1 redundancy for forward and return optical transmission paths. Adjustable switching thresholds and manual switching functions allow the 7707BPX-TR module to be used in a wide variety of applications.

The 7707BPX-TR provides several methods of monitoring and control. The 7707BPX-TR has integrated *Vista*LINK® technology control and monitoring capability via SNMP. Control and monitoring can also be performed using the card-edge user interface and DOT matrix display, using the Craft Interface Terminal (CIT) serial port or through GPI control inputs. Control and monitoring of the remote-end switch is also possible from the local-end location using an in-band bi-directional Optical Supervisory Channel (OSC). This provides the user with the ability to locally or remotely configure and monitor parameters such as module status, selected input, power level and switching thresholds.

The 7707BPX-TR occupies two card slots and can be housed in either a 3 RU frame, which will hold up to 7 modules, a 1RU frame, which will hold up to three modules, or a stand alone enclosure, which will hold one module.

Features:

- Intelligent auto-switching with input power detection and user definable thresholds
- Comprehensive signal and status monitoring and control:
  - Via SNMP and *Vista*LINK® enabled capability
  - Via four-digit card-edge display and controls
  - Via interface to Craft Interface Terminal (CIT)
  - Via contact closure inputs and outputs
- Control and monitoring of remote end-switch is possible from the local-end location using an in-band bi-directional optical supervisory channel (OSC) operating at 1625nm.
- Optical switch position is maintained during power loss or card failure
- Configuration is maintained during maintenance replacement of card units
- Fully hot-swappable from front of frame with no fiber disconnect/reconnect required
- Accepts any wavelength in the 1270nm to 1625nm range
- Supports Single mode (8-10 μm) fiber optic cable
- SC/PC, ST/PC or FC/PC fiber connector options

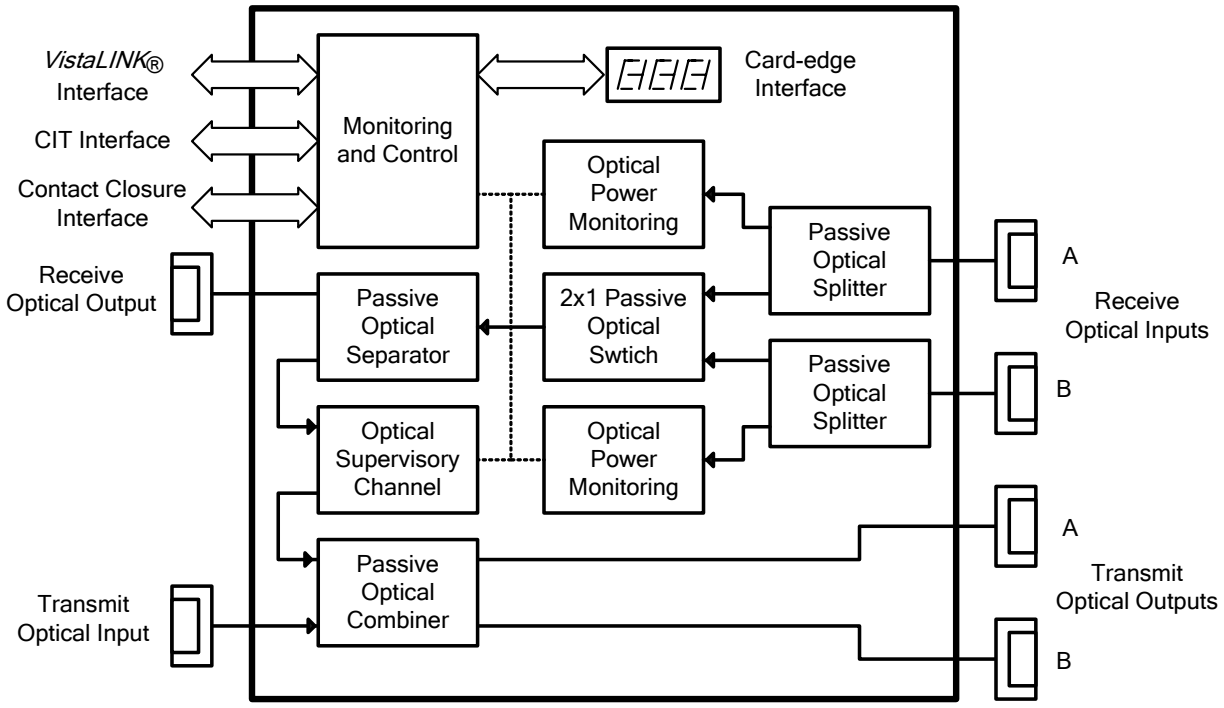

Figure 1-1: 7707BPX-TR Block Diagram

1.1. TYPICAL CONFIGURATION

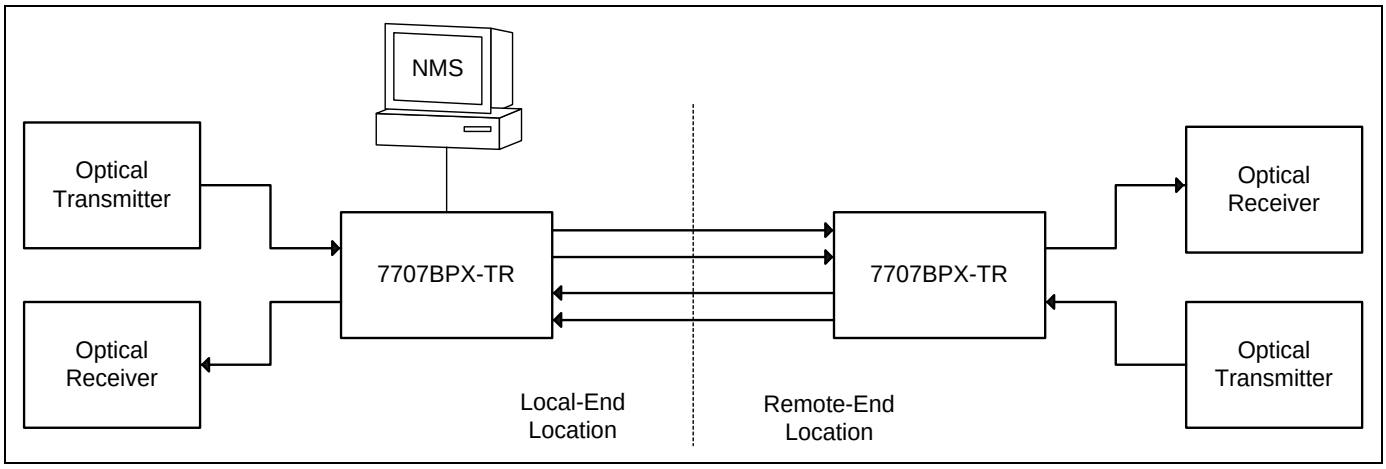

Figure 1-2: Bi-Directional Switch Configuration

2. INSTALLATION

The 7707BPX-TR comes with a companion rear plate that has six SC/PC (shown), ST/PC or FC/PC optical connectors, a DB-9 type connector, and a six pin terminal strip. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

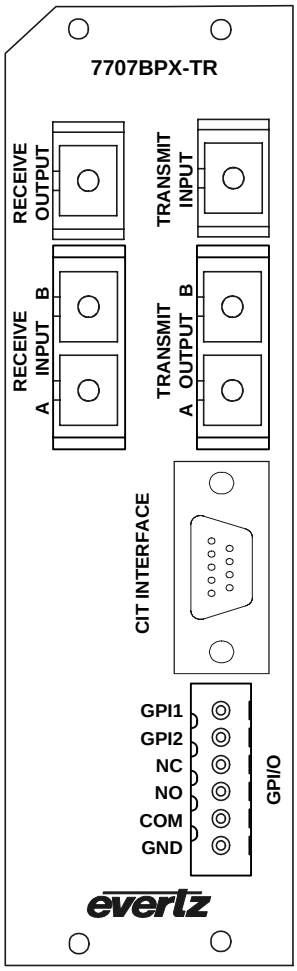

Figure 2-1: 7707BPX-TR Rear Panel

2.1. OPTICAL INPUTS AND OUTPUTS

RECEIVE INPUTS A, B: The dual SC/PC (shown) ST/PC or FC/PC female connectors are the wide band optical inputs to the switch for the incoming signal path. The A connector is for the *Main* input and the B connector is for the *Standby* input.

RECEIVE OUTPUT: This SC/PC (shown) ST/PC or FC/PC female connector is the optical output from the switch for the incoming signal path.

TRANSMIT INPUT: This SC/PC, (shown) ST/PC or FC/PC female connector is the wide band optical input to the splitter/combiner for the outgoing signal path.

TRANSMIT OUTPUTS A, B: The dual SC/PC (shown) ST/PC or FC/PC female connectors are the optical outputs from the splitter/combiner for the outgoing signal path. The A connector is for the *Main* Output and the B connector is for the *Standby* Output.

2.2. GPIO I/O

A 6 pin terminal strip labeled **CONTACT CLOSURE INTERFACE** contains 2 contact closure inputs and 1 contact closure output.

GPI's: The two top pins on the 6 pin terminal strip are used for two contact closure inputs. These inputs are opto-isolated, with an internal current-limited bias to +5V as shown in Figure 2-2.

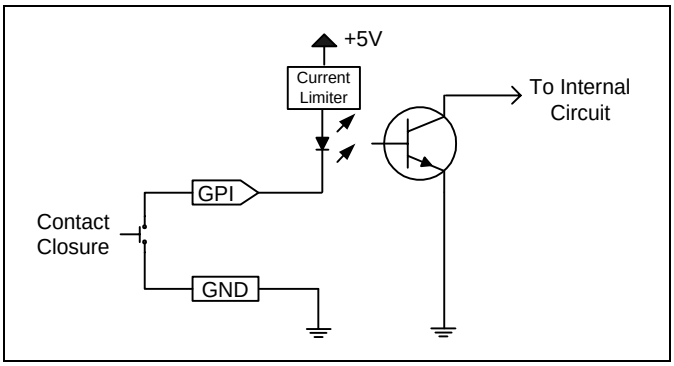

Figure 2-2: Contact Closure Input Circuitry

GPO The NC, NO and COM pins on the 6 pin terminal strip comprise the contact closure output. The contact closure output is a set of normally open and normally closed relay contacts as shown in Figure 2-3.

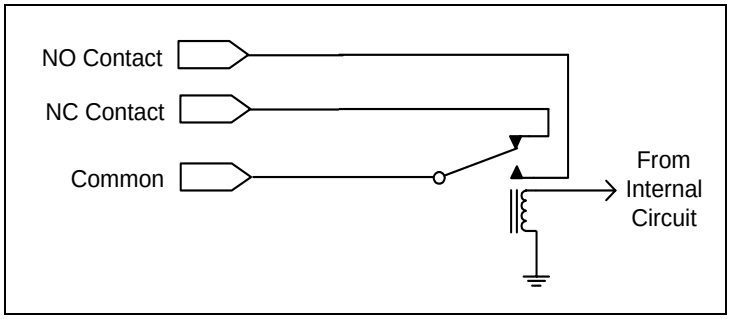

Figure 2-3: Contact Closure Output Configuration

2.3. CIT INTERFACE

A 9 pin female D connector **CIT INTERFACE** contains an RS-232 serial port for control and monitoring via a local PC or Craft Interface Terminal (CIT). See section 6 for information on using the CIT interface.

Pin #	Function
1	---
2	TX
3	RX
4	---
5	GND
6	---
7	---
8	---
9	---

Table 2-1: CIT Interface Connector Pin Definitions

2.4. CARE AND HANDLING OF OPTICAL FIBER

2.4.1. Safety

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

The laser modules used in the Evertz fiber optic modules are Class I, with a maximum output power of 2mW, and wavelengths of either 1310 nm or 1270 to 1610 nm.

2.4.2. Handling and Connecting Fibers

Never touch the end face of an optical fiber.

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 3 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 chapter of this manual.

3. SPECIFICATIONS

3.1. RECEIVE OPTICAL SIGNAL PATH

Number: 2 optical inputs, 1 optical output
Connectors: Female SC/PC, ST/PC or FC/PC
Maximum Insertion Loss: 4dB
Maximum Switch Time: 20 msec
Maximum Input Power: +5dBm
Minimum Input Sensitivity: -33dBm
Minimum Optical Return Loss: TBD
Maximum Optical Crosstalk: -60dB
Switch Loss Repeatability: ±0.1dB
Passband Wavelength: 1270 to 1570nm
Service Channel Wavelength: 1625 ± 25nm
Fiber Size: 9 μm core / 125 μm overall

3.2. TRANSMIT OPTICAL SIGNAL PATH

Number: 1 optical input, 2 optical outputs
Connectors: Female SC/PC, ST/PC or FC/PC
Maximum Insertion Loss: 4dB
Maximum Input Power: +5dBm
Passband Wavelength: 1270 to 1570nm
Service Channel Wavelength: 1625 ± 25nm
Service Channel Optical Power: -3.5dBm
Fiber Size: 9 μm core / 125 μm overall

3.3. GENERAL PURPOSE INPUTS

Number of Inputs: 2
Type: Opto-isolated, active low with internal pull-ups to +5V
Connector: 2 pins plus ground on 6 pin terminal strip
Signal Level: Low: -5 to +2.5 VDC, High: 3.5 to 10 VDC
Maximum Source Current: 15 mA (input shorted to ground)

3.4. GENERAL PURPOSE OUTPUTS

Number of Outputs: 1
Type: Dry Contact relay - normally open and normally closed contact provided
Connector: 3 pins on 6 pin terminal strip

3.5. SERIAL CONTROL PORT (CIT)

Number of Ports: 1 RS-232
Connector: Female DB-9
Baud Rate: 57600
Format: 8 bits, no parity, 2 stop bits and no flow control

3.6. ELECTRICAL

Voltage: +12VDC
Power: 5 Watts

3.7. PHYSICAL

7700 frame mounting: 2 slots
7701 frame mounting: 1 slot

4. CARD-EDGE MONITORING AND CONTROLS

The 7707BPX-TR has 6 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. There is also an audible buzzer to alert the user to module faults or loss of optical input.

4.1. STATUS INDICATOR LEDS

Two large LEDs on the front of the board indicate the general health of the module:

LOCAL FAULT: This Red LED indicates poor module health and will be on during the absence of a valid optical input signal on the Main Input, or if a frame power fault exists (i.e.: 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 optical input signal is present, and the board power is good.

There are four small LEDs beside the LED display that indicate the status of the module.

CH-A POWER: This Red LED indicates when the optical power on Receive Input A is below the switching threshold. (See section 4.2.2)

CH-B POWER: This Red LED indicates when the optical power on Receive Input B is below the switching threshold. (See section 4.2.2)

CH-A ACTIVE: This Green LED indicates that Receive Input A is active and is connected to the Receive Output.

CH-B ACTIVE: This Green LED indicates that Receive Input B is active and is connected to the Receive Output.

4.2. DOT-MATRIX DISPLAY AND CONTROLS

Additional signal and status monitoring and control of the card's parameters are provided via the 4-digit alphanumeric display located on the card edge. To select one of the display modes, press the pushbutton one or more times. Each time the push button is pressed the display advances to the next state. 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. When in a particular display mode, the toggle switch may be used to change values or states of the particular menu item. The following display messages indicate what is being displayed. The details of the each of the displays are described in sections 4.2.1 to 4.2.4.

PWRA Display the optical input power of Receive Input A
PWRB Display the optical input power of Receive Input B
MINA Set the minimum optical power threshold for Receive Input A
MINB Set the minimum optical power threshold for Receive Input B
STAT Display current status of card state
DISP Change the orientation of the Display

4.2.1. Displaying the Optical Power

The 7707BPX-TR detects the optical input power of both Receive Input channels and displays this to the four-digit card-edge display. The following list describes possible values for the PWRA and PWRB display states.

+5 to –40 Optical input power in dBm.
>+5 Optical input power is in excess of +5dBm.
<-40 Optical input power is below -40dBm.

4.2.2. Setting the Optical Power Threshold for Auto Mode Switching

The MINA and MINB display states allow you to define the minimum optical input power threshold before an auto switch function will occur. The optical power threshold may be defined independently for each of the Receive Input channels. To increase the optical power threshold press the toggle switch up. To decrease the optical power threshold press the toggle switch down. An optical input power above the threshold value will be considered valid. An optical input power below the threshold value will be considered invalid. Switching will occur as per the selected mode of operation. The following list describes possible values for the MINA and MINB display states.

+5 to –40 Optical power threshold in dBm.

4.2.3. Displaying the Card Status

The STAT displays show the status of the contact closure inputs and output, and the state of the optical switch. When you first enter the STAT display, the state of Contact Closure Input 1 will be shown. To change to the other status displays, press the toggle switch. The following list describes possible displays and their meaning.

I1-H or **I1-L** Indicates state of Contact Closure Input 1 to be High or Low
I2-H or **I2-L** Indicates state of Contact Closure Input 2 to be High or Low
O-ON or **O-OF** Indicates state of Contact Closure Output to be High or Low
CH-A or **CH-B** Indicates state of optical switch to be Receive Input A or Receive Input B

4.2.4. Changing the Orientation of the Text on the Display

The DISP display allows the user to select a horizontal or vertical orientation for the displays to accommodate mounting the module in the 3RU or 1RU frames. To change the orientations of the display press the toggle switch. The following list describes possible displays and their meaning.

VERT Vertical orientation suitable for modules installed in the 3RU frame.
HOR Horizontal orientation suitable for modules installed in the 1RU frame.

4.3. DIP SWITCH CONTROLS

The 7707BPX-TR is equipped with a 4 position DIP switch to allow the user to select various functions. DIP switch 1 is located at the top of the DIP switch (farthest from to the card ejector). Table 4-1 gives an overview of the DIP switch functions. Sections 4.3.1 and 4.3.2 give a detailed description of each of the DIP switch functions. The On position is down, or closest to the printed circuit board.

DIP Switch	Function
1	Auto Switch Back Enable
2	Manual Control Enable
3	Local Fault Buzzer Enable
4	Dual GPI Control Enable

Table 4-1: DIP Switch Functions

4.3.1. Controlling the Optical Switch Operating Mode

DIP switches 1, 2 and 4 allow the user to select one of four operating modes for the 7707BPX-TR.

DIP 1 Switch Back	DIP 2 Manual Control	DIP 4 Dual GPI Control	Mode Name	Mode Description
---	On	Off	Manual, Single GPI	Switch to input A if GPI1 is Active Switch to input B if GPI1 is Inactive
---	On	On	Manual, Dual GPI	Switch to input A if GPI1 is Active Switch to input B if GPI2 is Active
Off	Off	---	Auto, Without switch back	Switch to input A if GPI1 is Active Switch to input B if GPI2 is Active If both GPIs are inactive then switch to input B if power on input A is below threshold. Use GPI1 to switch back to input A
On	Off	---	Auto, With switch back	Switch to input A if GPI1 is Active Switch to input B if GPI2 is Active If both GPIs are inactive then switch to input B if power on input A is below threshold. Switch back to input A if power on input A is above threshold.

Table 4-2: Operating Mode Switch Settings

4.3.2. Controlling the Local Fault Buzzer

This audible buzzer indicates poor module health and will be on during the absence of a valid optical input signal on the Main Input, or if a frame power fault exists (i.e.: a blown fuse). DIP switch 3 controls whether Local Fault buzzer is enabled or not.

DIP 3	DESCRIPTION
Off	Local Fault Buzzer disabled
On	Local Fault Buzzer enabled

Table 4-3: Local Fault Buzzer Enable Settings

5. JUMPERS

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

The FRAME STATUS jumper J3 located near the back rear 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.

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

The REM/CTL jumper J7 selects whether the module will be controlled from the local user controls or through the *Vista*LINK® interface.

REM/CTL: When this jumper is installed in the CTL position, the card functions are controlled through the local controls.

When this jumper is installed in the REM position, the card functions are controlled through the *Vista*LINK® interface.

5.3. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper J4 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 in the front of the binder 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 J13 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* chapter in the front of the binder. 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. CIT INTERFACE MONITORING/CONTROL

The 7707BPX-TR implements an RS-232 interface for control and monitoring via a local PC or Craft Interface Terminal (CIT). The in-band optical supervisory channel (OSC) extends access to functions of the companion 7707BPX-TR module at the remote end of the link. Commands to control the module are only active when the **REM/CTL** jumper is set to the *REM* position. The following control and monitoring functions are supported:

- Access the interface help menu using the **HELP** command
- Display status information for the local module using the **LSTAT** command
- Display status information for the remote module using the **RSTAT** command
- Set switching thresholds for the local module using the **LTHRESH** commands
- Set switching thresholds for the remote module using the **RTHRESH** commands
- Set switching modes for the local module using the **LMODE** commands
- Set switching modes for the remote module using the **RMODE** commands
- Manually set the state of the local switch using the **LSWITCH** commands
- Manually set the state of the remote switch using the **RSWITCH** commands
- Place the local card into firmware upgrade mode using the **UPGRADE** command

6.1. CONNECTING THE CIT PORT

1. Connect the male end of a 'straight thru' serial cable to the **CIT INTERFACE** DB9 connector on the rear panel. Connect the female end of the serial update cable to the PCs' RS-232 communications port. See Table 2-1 for the pinout of the **CIT INTERFACE** connector.

2. Start the CIT terminal program.

3. Configure the port settings of the terminal program as follows:

Baud	**57600**
Parity	**no**
Data bits	**8**
Stop bits	**2**
Flow Control	**None**

6.2. STATUS INFORMATION COMMANDS

The 7707BPX-TR will report status information of the local and remote modules, using the following commands:

LSTAT <RETURN> Reports the following status information for the local module
RSTAT <RETURN> Reports the following status information for the remote module

```
************************************************
*          Status Of The Local Module          *
************************************************
Optical Power for Channel A is: -41 (+5 to –41)
Optical Power for Channel B is: -5 (+5 to –41)
Threshold for Channel A is: -20 (+5 to –40)
Threshold for Channel B is: -10 (+5 to –40)
State of GPI 1 is: InActive (or Active)
State of GPI 2 is: InActive (or Active)
Switchback Mode is: off (or on)
Auto Manual Mode is: auto (or manual)
Dual GPI mode is: off (or on)
Module Control Selected is: remote (or local)
Current Active Channel is: Channel B (or Channel A)
```

6.3. SWITCHING THRESHOLD CONTROL COMMANDS

The following commands are used to set the switching thresholds of the local and remote 7707BPX-TR modules:

LTHRESH A xxxx <RETURN>	Sets the switching threshold for channel A of the local module
LTHRESH B xxxx <RETURN>	Sets the switching threshold for channel B of the local module
RTHRESH A xxxx <RETURN>	Sets the switching threshold for channel A of the remote module
RTHRESH B xxxx <RETURN>	Sets the switching threshold for channel B of the remote module

Where **xxxx** is the desired threshold value from –40 to +05, representing a dBm optical power level. The **LSTAT/RSTAT** commands may be used to verify the new settings.

6.4. SWITCHING MODE CONTROL COMMANDS

The following commands are used to set the switching mode of the local and remote 7707BPX-TR modules:

LMODE yyyy Z<RETURN>	Sets the switching mode of the local module
RMODE yyyy Z <RETURN>	Sets the switching mode of the remote module

Where **yyyy** is the text string **SWITCHBACK**, **DUALGPI**, or **MANUAL** representing the three DIP switches used to set the switching modes (see section 4.3.1) and **z** is **0** to turn off the mode and **1** to turn on the mode. The **LSTAT/RSTAT** commands may be used to verify the new settings.

6.5. MANUAL SWITCH CONTROL COMMANDS

The following commands are used to manually set the switch state of the local and remote 7707BPX-TR modules:

LSWITCH 0 <RETURN>	Sets the switch state to channel A on the local module
LSWITCH 1 <RETURN>	Sets the switch state to channel B on the local module
RSWITCH 0 <RETURN>	Sets the switch state to channel A on the remote module
RSWITCH 1 <RETURN>	Sets the switch state to channel B on the remote module

These commands are only valid while in the **MANUAL** switching mode. The **LSTAT/RSTAT** commands may be used to verify the new values.

6.6. SOFTWARE UPGRADE CONTROL COMMAND

The **UPGRADE** command may be used to enter the upgrade mode described in the *Firmware Upgrade* section of this manual.

6.7. INTERFACE HELP MENU COMMAND

The **HELP** command may be used to return a brief description of the interface commands.

7. *Vista*LINK® REMOTE MONITORING/CONTROL

7.1. 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 *Vista*LINK® Pro 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 7707BPX-TR 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 *Vista*LINK® 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.

7.2. *Vista*LINK® MONITORED PARAMETERS

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

Parameter	Description
Optical Power A	A range of values describing optical power at the Receive Input A.
Optical Power B	A range of values describing optical power at the Receive Input B.
Input Status A	Receive Input A is the active input.
Input Status B	Receive Input B is the active input.
GPI Input 1 State	Indicates the state of General Purpose Input 1.
GPI Input 2 State	Indicates the state of General Purpose Input 2.
GPO Output State	Indicates the state of the General Purpose Relay Output.
Master Jumper	Indicates the state of the Master Jumper.

Table 7-1: *Vista*LINK® Monitored Parameters

7.3. *Vista*LINK® CONTROLLED PARAMETERS

The following parameters can be remotely controlled through the *Vista*LINK® interface when the **REM/CTL** jumper is set to the *REM* position.

Parameter	Description
Optical Threshold A	Auto mode switching threshold for Receive Input A
Optical Threshold B	Auto mode switching threshold for Receive Input B
Switch back Mode	Switch back Mode (see DIP 1)
Manual Switch Mode	Manual Switch Mode (see DIP 2)
Dual GPI Mode	Dual GPI Mode (see DIP 4)

Table 7-2: *Vista*LINK® Controlled Parameters

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