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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	First release version	Sep 02
1.1	F2-L version added, specs changed Added 8 new wavelengths	Dec 02
1.2	New shutdown features of F2-L added	Jan 03
1.3	Added Application Configuration table	Aug 03
1.4	Updated Sensitivity for Standard Receiver	Aug 04
1.5	Updated safety section and added assembly and labeling sections	Aug 05

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 7707GT DWDM cards directly with a short fiber optic cable. The 7707GT DWDM cards produce +7dBm of power which will damage the receiver if connected directly.

1. OVERVIEW

The 7707GT series Gigabit Ethernet Fiber Transceivers provide an economical method of transmitting 10/100/1000Base-T Ethernet channel over optical fiber. The transceiver is IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX and IEEE 802.3ab 1000BASE-TX compliant, mediates between a 10/100/1000BASE-TX segment. A pair of 7707GT transceivers permits full duplex communication over a single optical fiber or dual fiber. Diagnostic LEDs provide indication of power, linkage and data reception.

Features:

- Auto negotiation for 10/100/1000 speeds, half/full duplex modes
- Link status monitoring indicators
- Optional VistaLINK enabled for remote monitoring and control
- Optical output available in 1310nm, 1550nm and up to sixteen CWDM wavelengths in the 1270nm to 1610nm range
- DWDM (ITU-T G.694.1) wavelengths available
- Supports multi-mode or single-mode fiber
- Fully hot-swappable from front of frame with no fiber or Ethernet channel disconnect required
- SC/PC, ST/PC or FC/PC connector options

Three versions of the 7707GT allow the user to choose the optimal price / performance / features to suit a particular application. The “-F2” version is designed to receive and transmit on the same wavelength over two different fibers and has the lowest insertion loss. This version can operate with Multi-mode or Single-mode fiber. The standard version is designed to receive and transmit on the same wavelength over a single fiber and can operate with Single mode fiber only.

Model	Optical Configuration
7707GT	Single Fiber
7707GT-F2	Dual Fiber

Each version of the 7707GT is available with different output laser options to meet a variety of applications. (See specifications for complete information):

7707GT13 1310 nm FP Laser
7707GT15 1550 nm DFB Laser

There are sixteen wavelengths with built in isolators specifically suited to coarse wave-division multiplexing (CWDM) applications.

7707GT27/7707GT27-F2/7707GT27-F2 1270 nm DFB
7707GT29/7707GT29-F2/7707GT29-F2 1290 nm DFB
7707GT31/7707GT31-F2/7707GT31-F2 1310 nm DFB
7707GT33/7707GT33-F2/7707GT33-F2 1330 nm DFB
7707GT35/7707GT35-F2/7707GT35-F2 1350 nm DFB
7707GT37/7707GT37-F2/7707GT37-F2 1370 nm DFB
7707GT43/7707GT43-F2/7707GT43-F2 1430 nm DFB
7707GT45/7707GT45-F2/7707GT45-F2 1450 nm DFB
7707GT47/7707GT47-F2/7707GT47-F2 1470 nm DFB
7707GT49/7707GT49-F2/7707GT49-F2 1490 nm DFB

7707GT51/7707GT51-F2/7707GT51-F2 1510 nm DFB

7707GT53/7707GT47-F2/7707GT47-F2	1530 nm DFB
7707GT55/7707GT47-F2/7707GT47-F2	1550 nm DFB
7707GT57/7707GT47-F2/7707GT47-F2	1570 nm DFB
7707GT59/7707GT47-F2/7707GT47-F2	1590 nm DFB
7707GT61/7707GT47-F2/7707GT47-F2	1610 nm DFB

The following chart shows some typical applications and power budget calculations.

Fiber Type	Fiber Links	Optical/Link Budget	Transmit Side		Receive Side		Description
			Ordering Product Info	TX Power	Ordering Product Info	RX Sensitivity	
Multi-Mode	2	< 1km	7707GT13-F2	-7dBm	7707GT13-F2	-23dBm	1310nm on Tx & Rx fibers
Single-Mode	2	16dB/45km	7707GT13-F2	-7dBm	7707GT13-F2	-23dBm	1310nm on Tx & Rx fibers
Single-Mode	1	10dB/28km*	7707GT13	-9dBm	7707GT13	-19dBm	1310nm, bi-directional, one fiber
Single-Mode	1(WDM)	20dB/57km	7707GT13L-W	-1dBm	7707GT15-W	-21dBm	1310nm/1550nm, WDM, bi-directional on one fiber
Single-Mode	1(CWDM)	19dB/76km**	7707GTxx-F2	0dBm	7707GTyy-F2	-23dBm	Difference CWDM wavelengths on Tx & Rx, with 8 channel CWDM Mux/Demux**
Single-Mode	1(CWDM)	24dB/96km**	7707GTxx-F2-H	0dBm	7707GTyy-F2-H	-28dBm	Different CWDM wavlenghts on Tx & Rx, with 8 channel CWDM Mux/Demux**
Single-Mode	1(DWDM)	25dB/100km***	7707GTDxxx-F2	+7dBm	7707GTDyyy-F2	-23dBm	Different DWDM wavlenghts on Tx & Rx, with 8 channel DWDM Mux/Demux***
Single-Mode	1(DWDM)	30dB/120km***	7707GTDxxx-F2-H	+7dBm	7707GTDyyy-F2-H	-28dBm	Different DWDM wavlenghts on Tx & Rx, with 8 channel DWDM Mux/Demux***

*With >20dB return loss on fiber Interface
**Assume 8Ch CWDM Mux/Demux loss of 3.5dB
***Assumes 8Ch DWDM Mux/Demux loss of 5dB
Tx Power/Rx Sensitivity are nominal values ± 1dBm
Fiber Loss = 0.35/0.25dB per km @ 1310nm/1550nm

Table 1: Typical Application Configurations

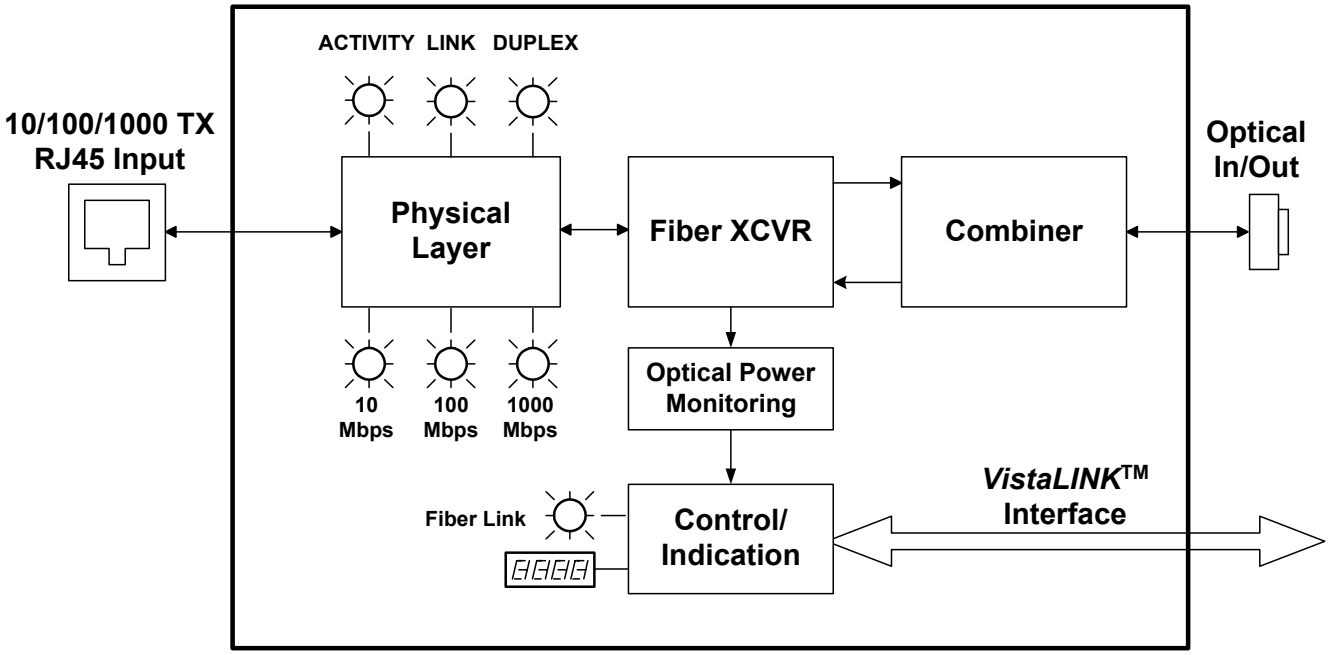


Figure 1: 7707GT Block Diagram

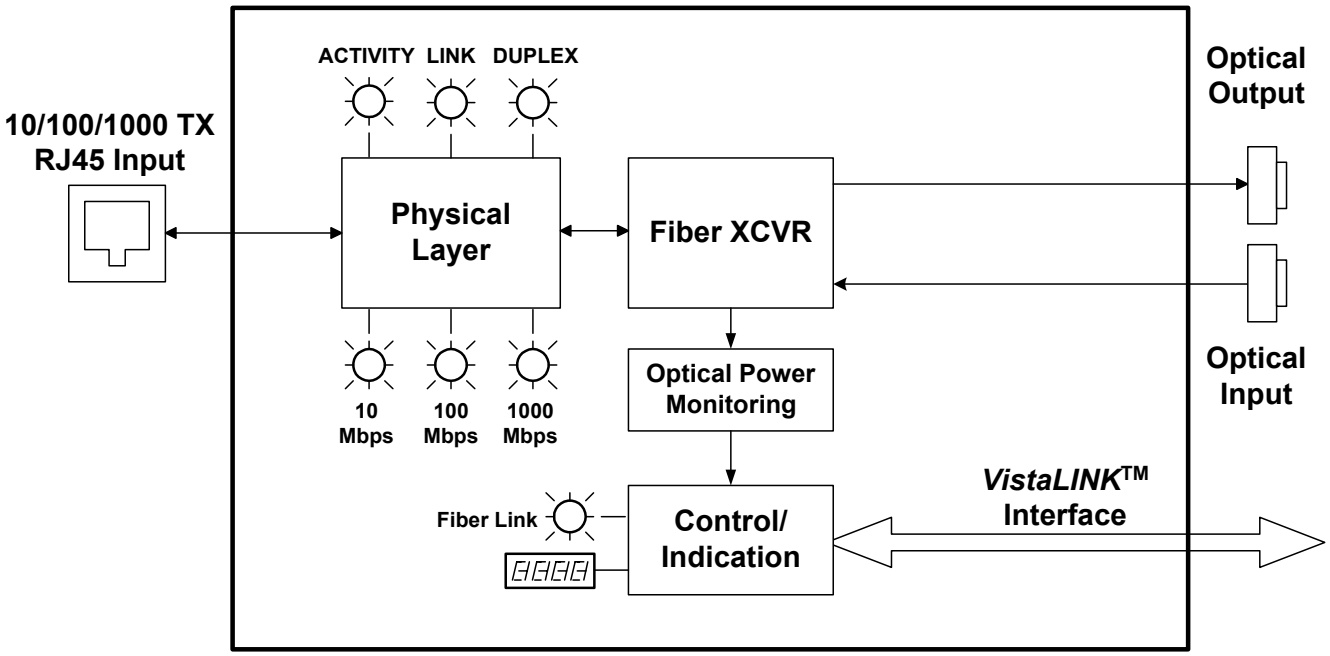


Figure 2: 7707GT-F2 Block Diagram

2. INSTALLATION

The single fiber version 7707GT modules come with a companion rear plate that has two or four RJ45 input connectors and one SC/PC (shown), ST/PC or FC/PC optical connector. The dual fiber versions come with a companion rear plate that has two RJ45 input connectors and two SC/PC, ST/PC or FC/PC optical connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.

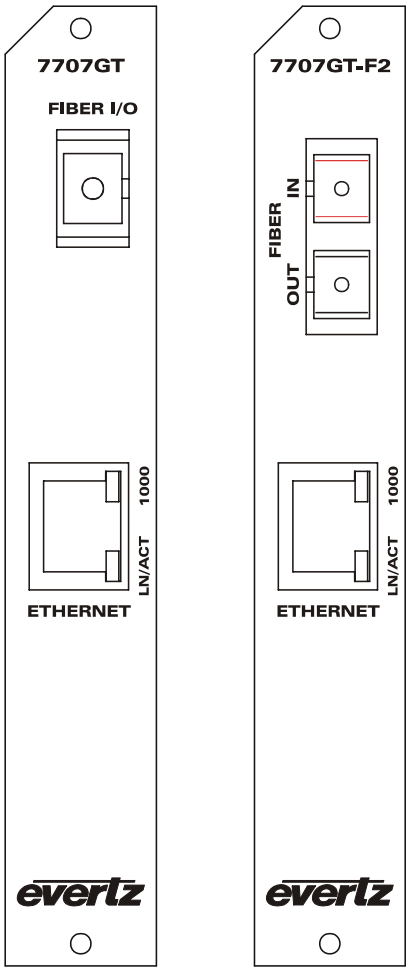


Figure 3: 7707GT Rear panels

2.1. ETHERNET CONNECTIONS

The RJ-45 connectors on the rear panel are for connection to network devices (server, workstation, router switch, etc.) with a 10/100/1000BASE-TX port through a twisted pair cable.

The 7707GT Gigabit Ethernet Transceiver is designed for use with 1000Base-TX twisted pair Ethernet cabling systems. When connecting for 1000Base-TX systems, category 5 UTP cable is required. The maximum cable run between the Gigabit Ethernet Fiber Transceiver and the supporting device is 100 m. Make the network connection by plugging one end of the cable into the RJ-45 receptacle of the Gigabit Ethernet Fiber Transceiver and the other end into a port of the supporting device.

Table 1 shows the cable connections required for 1000Base-T systems.

Pin #	Name	Cable Pair	Description
1	Tx/Rx1+	-------1a------	Transmit/Receive 1 + Output
2	Tx/Rx1-	-------1b-----	Transmit/Receive 1 – Output
3	Tx/Rx2+	-------2a------	Transmit/Receive 2 + Output
4	Tx/Rx2-	-------2b-----	Transmit/Receive 2 – Output
5	Tx/Rx3+	-------3a------	Transmit/Receive 3 + Output
6	Tx/Rx3-	-------3b-----	Transmit/Receive 3 – Output
7	Tx/Rx4+	-------4a------	Transmit/Receive 4 + Output
8	Tx/Rx4-	-------4b-----	Transmit/Receive 4 – Output

Table 1: Ethernet Connector Pin Definitions and Cable Wiring for 1000 Base-T

Devices on the Ethernet network continually monitor the receive data path for activity as a means of checking that the link is working correctly. When the network is idle, the devices also send a carrier signal to one another to maintain the link. The 7707GT rear panel is fitted with two LEDs on each RJ-45 connector to monitor the Ethernet connection on each port.

1000 This Green LED is On when a 1000Base-TX link is established. The LED is Off when a 10Base-T or 100Base-Tx link is established (the LINK LED is On) or if there is no link established (the LINK LED is Off).

LN/ACT This dual purpose Green LED indicates that the 7707GT has established a valid link, and whether the 7707GT is sending or receiving data. The LED will be On when the 7707GT has established a good link, providing a good indication that the segment is wired correctly. The LED will BLINK when the 7707GT is sending or receiving data. The LED will be Off if there is no valid connection.

2.2. OPTICAL CONNECTIONS

The 7707GT modules are designed to work with single-mode or multi-mode optical fiber depending on the version ordered.

2.2.1. Single Fiber version

In order to establish a valid link between a pair of single fiber 7707GT modules, one module must be configured as 'Address A', and the other as 'Address B'. Selection of the correct address is achieved by setting jumper J6. See section 5.3.

FIBER I/O There is one SC/PC (shown), SC/PC with cover flap, ST/PC or FC/PC female connector with the optical input/output from the 7707GT. This connector should be connected to the matching connector of a matching single fiber 7707GT module at the destination end with a suitable fiber optic cable.

All single fiber versions of the 7707GT have their associated transmit wavelength marked on the rear panel and are designed to work with single-mode fiber optic cable.

2.2.2. Standard Dual Fiber version (-F2 version)

FIBER IN There is one SC/PC (shown), ST/PC or FC/PC female connector with the optical input to the module. This connector should be connected to the FIBER OUT connector of a matching dual fiber 7707GT-F2 module at the destination end with a suitable fiber optic cable. The dual fiber 7707GT-F2 versions receive on wavelengths in the 1270 to 1610nm range.

FIBER OUT There is one SC/PC (shown), ST/PC or FC/PC female connector with the optical output from the module. This connector should be connected to the FIBER IN connector of a matching dual fiber 7707GT-F2 module at the destination end with a suitable fiber optic cable. The dual fiber 7707GT-F2 versions transmit on the wavelength marked on the rear panel and are designed to work with either single-mode or multi-mode fiber optic cable.

2.2.3. Long reach Dual Fiber version (-F2-L version)

FIBER IN There is one SC/PC (shown), ST/PC or FC/PC female connector with the optical input to the module. This connector should be connected to the FIBER OUT connector of a matching long reach dual fiber 7707GT-F2-L module at the destination end with a suitable fiber optic cable. The dual fiber 7707GT versions receive on wavelengths in the 1270 to 1610nm range.

Connecting optical signals that are above the maximum input level specification can damage the 7707GT-F2-L modules. The output from the card is greater than this maximum. Therefore do not connect the output of one card directly to the input of another or the card input may be damaged.

FIBER OUT There is one SC/PC (shown), ST/PC or FC/PC female connector with the optical output from the module. This connector should be connected to the FIBER IN connector of a matching dual fiber 7707GT module at the destination end with a suitable fiber optic cable. The dual fiber 7707GT versions transmit on the wavelength marked on the rear panel and are designed to work with either single-mode or multi-mode fiber optic cable.

Optical input powers above –7dBm can physically damage the optical receiver. For normal use of the device in a long haul application (exceeding 7dBm optical loss) this is not an issue. However to help prevent this type of damage during setup, a mechanism built into the cards will protect them if an input power over –7dBm is detected at the input of either of the cards. If an input of greater then –7dBm is detected at the input to either of the cards in a link both cards will take the following action:

- The optical output will be shut down.
- The dot matrix display will show `OVR`
- The red local fault LED will be turned on.

Once the input optical power has been restored to ≤ -7dBm on both cards normal operation can be restored. To restore normal operation either one of the cards must be powered off then on. This can be done by removing a card from the frame and putting it back in or by powering the frame off and back on.

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 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 no 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: 7707GT-13, 7707GT13L-W, 7707GT15-W, 7707GT13-F2
- 7707GTxx (xx = 27, 29, 31, 33, 35, 37, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61)
  7707GTDyyy (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 4: 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. ETHERNET INPUT/OUTPUT

Standard: IEEE 802.3 10BASE-T, 802.3u 100BASE-TX, 802.3ab 1000BASE-TX
- auto-negotiation 10/100/1000Mbps

Connector: RJ-45

Cable Requirements:

10BASE-T: UTP category 3, 4, or 5 cable up to 328 ft/100m (2 Pairs)

100BASE-TX: UTP category 5 cable up to 328 ft/100m (2 pairs)

1000BASE-TX: UTP category 5 cable up to 328 ft/100m (4 pairs)

3.2. OPTICAL INPUT/OUTPUT

Connector:
Single Fiber version: 1 Bi-directional optical connector: SC/PC, ST/PC or FC/PC female housing
Dual Fiber (F2) version: 2 optical connector: SC/PC, ST/PC or FC/PC female housing
Maximum Input Power:
Single fiber versions: 0 dBm
Dual fiber (F2) versions: 0 dBm
Long Reach Dual fiber (F2-L) versions: -7 dBm (See caution note in section 2.2.3)
Input Optical Sensitivity:
Single fiber versions: -20 dBm
Dual fiber (F2) versions: -23 dBm
Long Reach Dual fiber (F2-L) versions: -28 dBm
Fiber Size and Type:
Single Fiber versions: 9 μm core / single mode
Dual Fiber (F2) versions: 9 μm core / single-mode on TX, 62.5 μm core / multi-mode on RX
Long Reach Dual Fiber (F2-L): 9 μm core / single-mode on TX, 62.5 μm core / multi-mode on RX
Output Wavelengths:
Standard: 1310nm, 1550nm (nominal)
CWDM: 1270nm to 1610nm
DWDM: ITU-T G.694.1 compliant
Output Power:
Single fiber version:
1310nm FP (Standard): -9 dBm ±1dBm
-W Version -1 dBm ±1dBm
Dual fiber version:
1310nm FP (Standard): -7 dBm ±1dBm
CWDM DFB: 0 dBm ±1dBm (See caution note in section 2.2.3)
DWDM: +7dBm ± 1dBm

3.3. ELECTRICAL

Voltage: + 12VDC
Power: 8 Watts.
EMI/RFI: Complies with FCC regulations for class A devices.
Complies with EU EMC directive.

3.4. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 1

4. STATUS INDICATORS AND DISPLAYS

The 7707GT has 8 LED Status indicators and a 4 digit alphanumeric display on the front card edge to show operational status of the card at a glance. There are also LED indicators on the RJ-45 connectors. Figure 5 shows the location of the LEDs.

4.1. STATUS INDICATOR LEDS

4.1.1. Module Health 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 when there is insufficient optical input power, an optical transmitter failure or if a local input power fault exists (i.e.: a blown fuse). On the Long reach (-F2-L) version, this indicator will be On also when the input power exceeds the maximum input power specification (-7dBm). When the FRAME STATUS jumper is set to the ON position the LOCAL FAULT indication will also be reported to the FRAME STATUS bus.

MODULE OK: This Green LED indicates good module health. It will be On when a valid optical input signal is present, and the laser and board power are good.

4.1.2. Fiber Link LED

The LED on the back of the board closest to the card top card edge indicates the status of the Fiber link.

FIBER LINK: On the 7707GT this Green LED indicates the presence of a valid optical link between a pair of 7707GT modules.

In order to establish a valid link between a pair of single fiber 7707GT modules, one module must be configured as 'Address A', and the other as 'Address B'. Selection of the correct address is achieved by setting jumper J6. See section 5.3.

On the 7707GT-F2 this Green LED indicates that the 7707GT-F2 has established a valid link with another 7707GT-F2, and whether the 7707GT-F2 is sending or receiving data on the fiber link. The LED will be ON when the 7707GT-F2 has established a good link, providing a good indication that the fiber segment is connected correctly. The LED will BLINK when the 7707GT-F2 is sending or receiving data. The LED will be OFF if there is no valid connection.

4.1.3. Card Edge Ethernet LEDs

The three LEDs on the back side of the module closest to the center of the module indicate the status of the Ethernet port.

ACTIVITY This green LED indicates that the 7707GT is sending or receiving data on the respective Ethernet port. The LED will BLINK when the 7707GT is sending or receiving data. The LED will be OFF if there is no valid connection.

LINK This green LED indicates that the 7707GT has established a valid link. The LED will be ON when the 7707GT has established a good link, providing a good indication that the segment is wired correctly.

DUPLEX This Green LED is Off when the Ethernet link is operating in the half duplex mode, and On when it is operating in the Full duplex mode. In half duplex mode the LED will blink On when a collision occurs on the Ethernet link.

The three LEDs on the front side of the module closest to the center of the module indicate the speed of the Ethernet port.

10 This Green LED is On when a 10Base-T link is established.

100 This Green LED is On when a 100Base-TX link is established.

1000 This Green LED is On when a 1000Base-TX link is established.

4.1.4. Rear Panel Ethernet LEDs

There are two LEDs adjacent to the Ethernet RJ-45 connector on the rear panel that allow you to monitor the Ethernet connection while you are connect the cables.

LN/ACT This dual purpose Green LED indicates that the 7707GT has established a valid link, and whether the 7707GT is sending or receiving data on the respective Ethernet port. The LED will be ON when the 7707GT has established a good link, providing a good indication that the segment is wired correctly. The LED will BLINK when the 7707GT is sending or receiving data. The LED will be OFF if there is no valid connection.

1000 This Green LED is On when a 1000Base-TX link is established. The LED is Off when a 10Base-T or 100Base-TX link is established (the LINK LED is On) or if there is no link established (the LINK LED is Off). This LED should show the same information as the **1000** LED on the card edge.

4.2. DOT-MATRIX DISPLAY

4.2.1. Displaying optical power

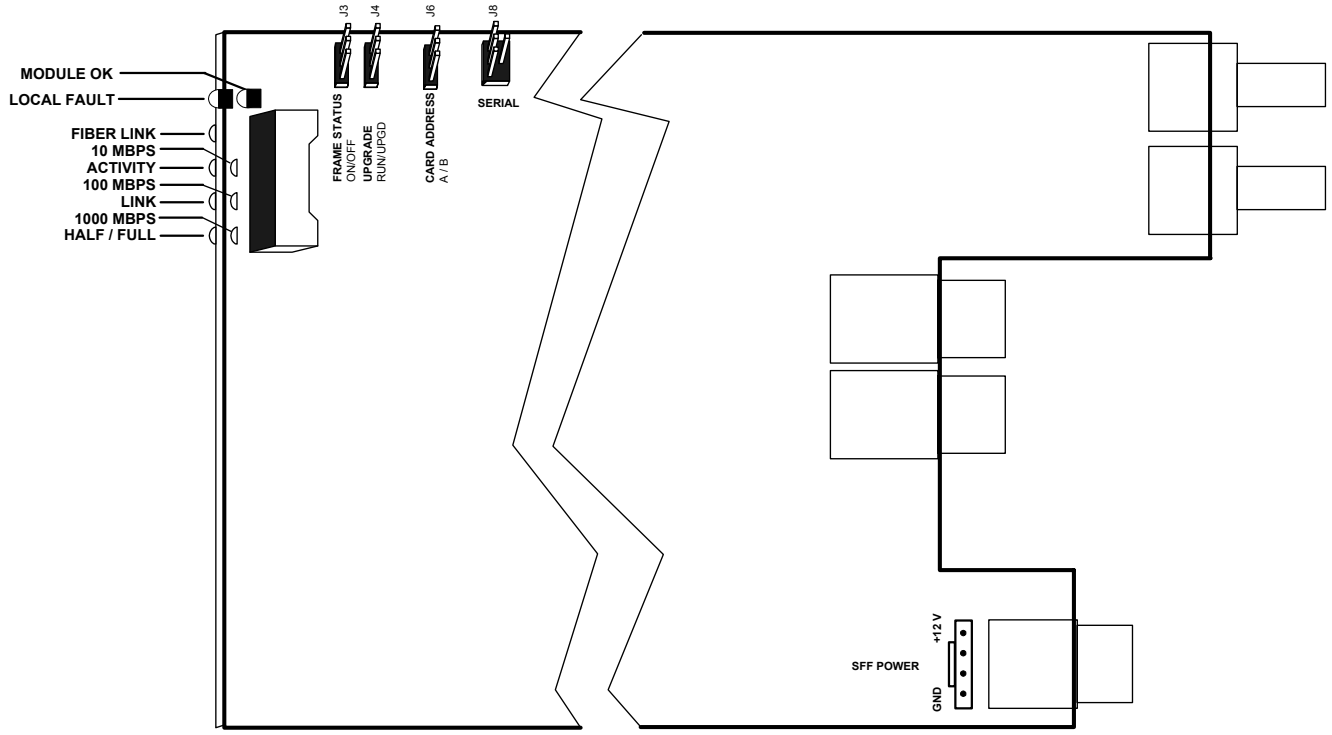
The 7707GT detects the input optical power and displays this on the four-digit card edge display. The following list describes possible displays and their meaning.

LOS Indicates no valid optical link established

OK Indicates optical input power is within acceptable range (> -21 dB for –FC versions, > -24 dB for –F2 versions and –29 dB for –F2-L versions)

OVR On F2-L version indicates that the input power is greater than the maximum allowable level (-7dB) – see section 2.2.3.

5. JUMPERS AND USER ADJUSTMENTS



Note: standard version has one fiber connector, -F2 version has two fiber connectors

Figure 5: LED and Jumper Locations

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

The FRAME STATUS jumper J1 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

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 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* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J4 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto SERIAL header J8 at the top edge of the card. 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 J4 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

5.3. SELECTING THE CARD ADDRESS (SINGLE FIBER VERSION ONLY)

The Card Address jumper allows each 7707GT module to distinguish it's own signal, and that of a sister card at the other end of a fiber link. In the case of an incomplete or damaged fiber link each 7707GT module will see reflections or its own signal. In order to establish a valid link between a pair of 7707GT modules, one module must be configured as 'Address A', and the other as 'Address B'. Selection of the correct mode is achieved by setting jumper J6, at the front of the board. It does not matter which card is selected as Address A and which as Address B, as long as they are different.

6. *VISTA*LINK™ REMOTE MONITORING/CONTROL

6.1. WHAT IS *VISTA*LINK™?

*Vista*LINK™ is Evertz's remote monitoring and control capability 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. For monitoring there needs to be a detecting device that automatically reports all errors to a central alarm and error logging station. We also need to be able to interrogate individual detector devices from the central station to determine the status of individual channels. Finally, we need to be able to configure devices in the network from the 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 7707GT), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz *Vista*LINK™ 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 and 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™ CONTROLLED PARAMETERS

There are no parameters that can be controlled through the *Vista*LINK™ interface.

6.3. *VISTA*LINK™ MONITORED PARAMETERS

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

Parameter	Description
Link OK	Indicates presence of a valid optical link with another 7707GT module (the state of the FIBER LINK LED)
Optical Power	A range of values describing received optical power at the fiber input.
Ethernet Link	Indicates the presence of a valid link on the Ethernet 1 port. (the state of the LINK LED)
Ethernet Speed	Indicates the detected speed of the link on the Ethernet 1 port.
Ethernet Mode	Indicates whether the Ethernet port is operating in the half duplex or full duplex mode. (the state of the DUPLEX LED)
Card Address	Indicates the state of the CARD ADDRESS jumper. On –F2 versions it always returns a value of zero.

Table 2: *Vista*LINK™ Monitored Parameters