



ARTEL VIDEO SYSTEMS _____

MegaLink 1290X

Digital Video Transmission System Installation and Operation Guide

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Declaration of Conformity

We,

Artel Video Systems, Inc.

Located at:
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Marlborough, MA 01752

declare under our sole responsibility that the following product:

MegaLink 1290X

to which this declaration relates, are in conformity with the following standards and other normative documents:

Product Safety: IEC 60950, 2nd Edition (1991)
UL 1950, 3rd Edition/CSA C22.2

EMC: EN55022
EN50082-1
EN55024

The afore mentioned product follows the provisions of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

Name: Chester J. Gapinski
Title: Chief Operating Officer
Date: January, 2002

WARNINGS

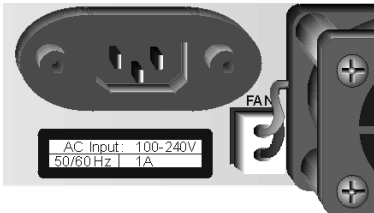
The optical transmission system provided by a optical transmitter constitutes a Class I laser product only when used in accordance with the procedures described in this manual. Laser radiation is restricted to the optical cable, thus preventing human access.

Optical cables must be connected and disconnected only by qualified service personnel. User modification to the system may alter the product classification and create a radiation hazard.

Under certain fault conditions the laser power can exceed Class 1 operation.

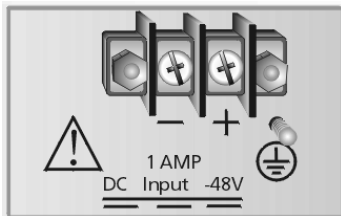


DO NOT, UNDER ANY CIRCUMSTANCES, stare directly into a fiber optic connector. Although the light used in most fiber optic transmissions is not visible to the naked eye, potentially harmful levels of optical laser radiation may be present at the optical output ports and unconnected receive fiber ends. Prior to applying system power, make sure that a fiber cable is connected to the ports (by qualified system personnel) or that a cap is present on the port(s).



In the event of a fault somewhere in the system, a potential shock condition could be present when an AC (or DC) power cord is plugged into a unit, even if the POWER switch is in the OFF position.

Use the power cord itself, not the POWER switch on the front panel, as the primary safety disconnect.



Failure to observe this caution could result in personal injury.

CAUTION

All device and optical component installation, configuration, and reconfiguration must be performed only by qualified service personnel. The use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous exposure to optical radiation.

FEDERAL COMMUNICATIONS COMMISSION NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user must correct the interference at the user's own expense.

Compliance with applicable regulations depends on the use of shielded I/O cables. The user is responsible for procuring the appropriate cables.

CANADIAN EMISSIONS REQUIREMENTS

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur la matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministère des Communications.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Department of Communications.



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About This Guide

This guide provides you with instructions for installing, configuring, and operating a MegaLink 1290X Transceiver unit.

Audience

This guide is intended for the following trained and qualified service personnel who are responsible for installing and operating the MegaLink 1290X:

- System installer
- Hardware technician
- System operator

How to Use This Guide

This section describes the chapters and contents in this guide.

Section	Provides
Chapter 1, "Introduction"	An overview of the MegaLink 1290X product.
Chapter 2, "Installation"	Procedures to unpack, configure, and install the device.
Index	An alphabetical index of topics described in this manual.



Symbols and Conventions

This guide uses the following symbols and conventions to emphasize certain information.

Caution

A caution means that a specific action could cause harm to the equipment or to the data.



Warning

A warning describes an action could result in physical injury, or destruction of property.



Hazard

A hazard is a particular form of warning related expressly to electric shock.

Note: Important related information, reminders, and recommendations.

Italics - Indicate the first occurrence of a new term, book title, and emphasized text.

1. Numbered list - Where the order of the items is important.
- Bulleted list - Where the items are of equal importance and their order is unimportant.

Contacting Artel

World Wide Web

Artel maintains a site on the World Wide Web where information on the company and its products can be found. The URL is:

www.artel.tv

Customer Support

For answers to your technical questions, Artel's Customer Support department can be reached at:

Phone:

(800)225-0228 - USA

+1(508)303-8200 - Outside USA

e-mail:

customercare@artel.com

Technical Publications

Artel Video Systems is committed to providing you with quality technical documentation. Your feedback is valuable and appreciated. Please send comments, suggestions, and enhancements regarding this guide or any Artel documentation to **TechPubs@Artel.com**.

Please include the document title, number, and version in your email.



1

Introduction

This chapter contains the following product information:

- Operational Overview (page 1-2)
- Optical Receiver Functional Description (page 1-4)
- Optical Transmitter Functional Description (page 1-5)
- Transceiver Front Panel Indicators and Controls (page 1-7)
- Transceiver Rear Panel Optical and Electrical Connectors (page 1-11)

Operational Overview

The MegaLink 1290X (hereafter referred to as ML1290X) digital optical transceiver is an optical-to-electrical and electrical-to-optical converter with dual clock recovery and data regenerator circuits. The ML1290X has one optical input connector and is available with either one or four optical outputs. Figure 1-1 on page 1-3 provides a graphic description of the transceiver's major functional blocks.

The *Optical Receiver* converts the light pulses being received from the optical fiber to an electrical bit stream. A crystal controlled phase-locked-loop (PLL) recovers a stable, jitter-free clock from the optical receiver electrical bit stream and uses this clock to re-time (regenerate) the digital data stream. The regenerated optical data signal is sent to a cable driver for electrical output via a rear mounted BNC connector. The regenerated optical data signal is also sent to the transmit source select switch. The optical receiver is equipped with a digital readout optical power meter to monitor the optical power being received from the optical input fiber.

The *Electrical Input* signal, if used, passes through a line receiver with automatic cable equalizer (EQ). The EQ circuit compensates for the signal loss of up to 300 meters of Belden 8281 (or equivalent) coaxial cable. A second crystal controlled phase-locked-loop recovers a stable, jitter-free clock from the electrical input bit stream and uses this clock to re-time (regenerate) the electrical data stream. The regenerated electrical input data signal is sent to the transmit source select switch.

The *Laser Drivers* convert the selected serial bit stream to pulses of light. The selected bit stream modulates one or more optical laser diodes. The output of the laser diodes are coupled to single mode optical fibers for transmission over the user's fiber cable plant.

The *Monitor* circuit allows the regenerated serial digital data signal from either the electrical or the optical input to be output directly via the front panel BNC connector. This function is useful for non-invasive (in-service) evaluation of data integrity, timing jitter, and wander of the digital signal.

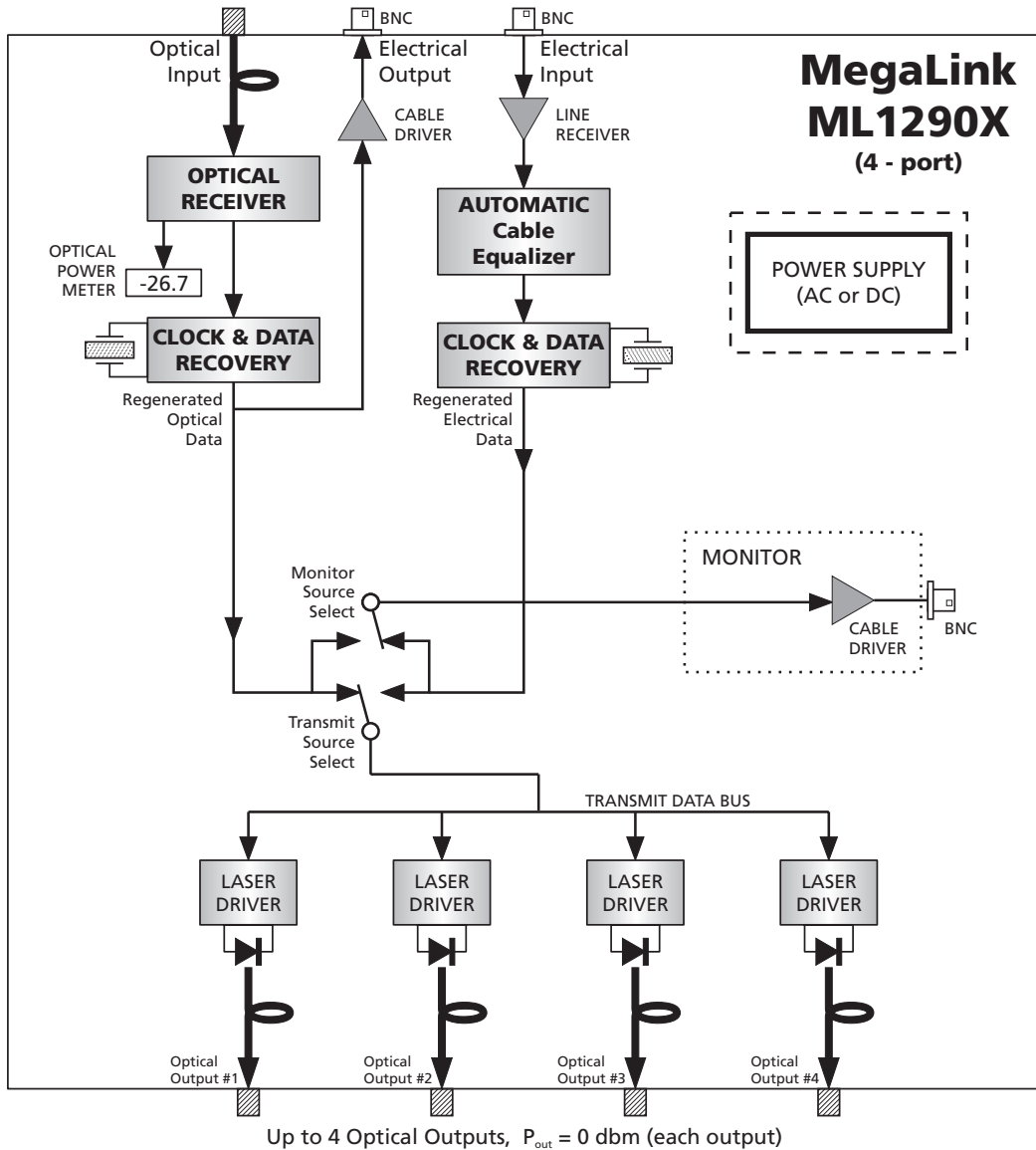


Figure 1-1. ML1290X Block Diagram

Optical Receiver Functional Description

The optical receiver of the ML1290X transceiver unit is equipped with an FC-PC female optical connector. The optical receiver will operate at 1310 nm or 1550 nm wavelengths and can be used with either single mode (9 μm) or multimode (50/125 μm or 62.5/125 μm) fiber cables.

Note: See Chapter 3 for distance limitations when using multimode fiber.
The rated sensitivity of the optical receiver is -34 dBm.
The maximum optical input before overload is -1 dBm.

The optical receiver is equipped with a digital optical power meter and with LOW LIGHT and HIGH LIGHT LED indicators as illustrated in Figure 1-2 below.

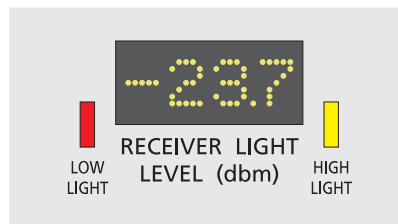


Figure 1-2. Optical Power Meter

The optical power meter is calibrated in dBm @ 1310 nm (0 dBm=1 mW). The resolution of the digital readout is 0.1 dBm, the absolute accuracy is specified at ± 0.5 dBm over a range of 0 to -40 dBm. If the optical input power exceeds -1.0 dBm, the digital indicator will read "HIGH". If the optical input power is less than -40 dBm, the digital indicator will read "LOW".

The LOW LIGHT indicator has a threshold of -34 dBm. When illuminated, it indicates that the optical signal is too low for acceptable reception. A *LOW LIGHT* condition will cause a major alarm indication.

The HIGH LIGHT indicator has a threshold of -1 dBm. When illuminated, it indicates that the optical signal power is too high and may cause an overload (with resulting bit errors) in the optical receiver. A HIGH LIGHT condition will cause a minor alarm indication.

The receiver will not be damaged with optical input powers up to +4 dBm.



Optical Transmitter Functional Description

The optical transmitters of the ML1290X transceiver unit convert the regenerated data signal to pulses of laser light which are coupled into single mode optical fibers.

This product conforms to IEC 825 and is a Class 1 Laser product.

CLASS 1 LASER PRODUCT

IEC 825 CLASS 1 LASER DEVICE

Note: The optical transmitter output is via type FC-PC female connectors.

The user must insure that no dirt particles or other contamination is introduced into the optical connectors. This includes installing the protective caps (included) whenever there is no fiber connected and insuring that a fiber to be installed in a connector is carefully cleaned (using an alcohol wipe and oil-free “canned air” blast).

Failure to keep the optical connectors free of contaminants can result in severely reduced optical output power and reduced range.

Maximum optical return loss (back reflection) in the user’s optical fiber plant must not exceed -25 db. A fiber return loss greater than -25 db may cause instability in the laser output power and result in a high bit error rate.

Although the ML1290X digital video transmission system is primarily intended for 9/125 μm single mode fiber cable plants, it can be used over short distances with multimode fiber if sufficient modal bandwidth can be maintained. The output power launched into the multimode fibers will be the same as the power launched into a single mode fiber.

When used with another ML1290X transceiver unit, the maximum usable transmission distances (using “clean” premium-grade optical fiber) are:

- > 2.7 km (1.7 miles) for 62.5 μm graded-index multimode fiber.
- > 4.4 km (2.7 miles) for 50 μm graded-index multimode fiber.
- > 74 km (46.0 miles) for 9 μm single mode fiber @ 1310 nm.
- > 118 km (73.6 miles) for 9 μm single mode fiber @ 1550 nm.

Note: See “Estimating Fiber Cable Attenuation” in Chapter 3.

The optical output power and bias current of the laser diodes are continually monitored. A minor alarm will be generated if any laser bias current increases beyond a preset limit (indicating that the laser diode is degrading). If the optical output power of any laser decreases by 1.25 db or more below its initial value, a major alarm will be generated.



Transceiver Front Panel Indicators and Controls

Figure 1-3 illustrates the controls and status indicators present on the front panel of the ML1290X transceiver unit.

- 1 POWER Main power switch (AC or DC).
- 2 PWR ON Indicates that the main power is on.
- 3 PWR FAIL Indicates that one or more of the DC system voltages is out of tolerance.
Note: This will also cause the *major alarm* indicator to light and the major alarm relay to be activated. The audible alarm, if enabled, will sound.
- 4 TEMP HIGH Indicates that the internal system temperature limit has been exceeded. This might be caused by a cooling fan failure or an ambient temperature that is too high. The ML1290X is designed to operate at an ambient temperature up to +40° C.
Note: If an over-temperature condition occurs, the *minor alarm* indicator will light and the minor alarm relay will be activated.
- 5 LOW LIGHT Indicates that there is insufficient optical input signal. This may be caused by too much loss in the fiber cable plant, a broken optical fiber, dirty optical connectors, or failure to properly align and seat the optical input/output connectors. The low light indicator will be lit when the optical input power is less than -34.0 dBm.
Note: This failure will cause the *major alarm* indicator to light and the major alarm relay to be activated. The audible alarm, if enabled, will sound.
- 6 RECEIVER LIGHT LEVEL Indicates the average optical power input to the optical receiver. The reading is in dBm (0 dBm = 1 mW @ 1310 nm). The range of the meter is 0.0 dBm to -40.0 dBm. If the optical input exceeds 0.0 dBm the meter will read "HIGH". If the optical input is less than -40.0 dBm the meter will read "LOW". The absolute accuracy over this range is ± 0.5 dBm.

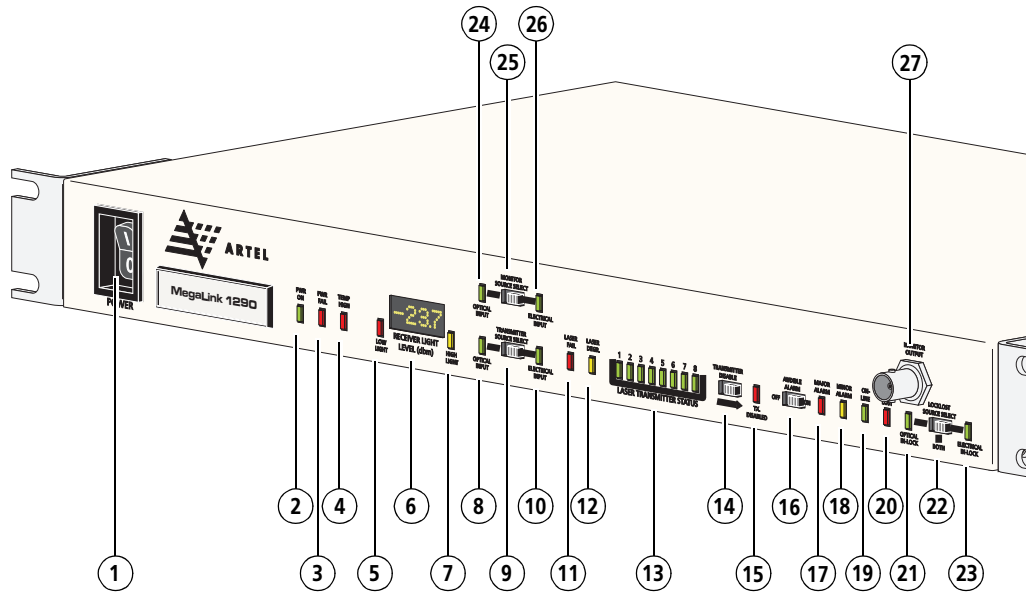


Figure 1-3. Front Panel of the ML1290X

- | | | |
|--|---|--|
| 7 | HIGH LIGHT | Indicates that the power present at the optical input connector is too high and may overload the optical receiver. The HIGH LIGHT indicator will activate when the optical input power is greater than -1.0 dBm. It may be necessary to install an optical attenuator on the input in order to rectify this condition. |
| Note: This failure will cause the <i>minor alarm</i> indicator to light and the minor alarm relay to be activated. | | |
| 8,
9,
10 | TRANSMITTER SOURCE SELECT Switch and Indicators | This switch is set by the user to select either the re-timed (regenerated) optical input data stream or the re-timed (regenerated) electrical input data stream to be sent by the laser transmitters. See Chapter 2 for instructions on setting this switch for various system configurations. |
| Note: If this switch is set to the <i>optical</i> position and optical input is lost, the laser transmitters will be disabled (turned off). If this switch is set to the <i>electrical</i> position and electrical input is lost, the laser transmitters will be disabled (turned off). | | |



- 11 LASER FAIL When illuminated, this indicator signifies that the output power of one or more of the laser diodes has decreased by more than 1.25 db below its initial value, and may, in fact, have failed completely.
- Note:** This failure will cause the *major alarm* indicator to light and the major alarm relay to be activated. The audible alarm, if enabled, will sound. This failure affects service and requires immediate replacement of the transceiver unit.
- 12 LASER DEGR. The *Laser Degrading* indicator is a warning that the bias current required to maintain the laser diode optical power of one or more of the optical transmitters has increased beyond a preset limit.
- Note:** This failure will cause the *minor alarm* relay to be activated. Although the transmitter is still fully functional when this indicator is illuminated, it may signify that a laser diode is nearing the end of its life. The user should consider replacing the transceiver unit at the earliest convenience.
- 13 LASER TRANSMITTER STATUS These indicators notify the user as to which laser transmitters are installed and whether a laser transmitter is malfunctioning. If an indicator is ON, then the associated laser is installed and functioning properly. If an indicator is FLASHING, then the associated laser is installed but malfunctioning. If an indicator is OFF, then the associated laser is not installed. (Indicators 5 - 8 not used.)
- 14 TRANSMITTER DISABLE When this switch is in the *Disabled* position, the laser diode transmitters are shut off and the optical output power drops to zero. This will cause the major alarm indicator to light and the major alarm relay to be activated. The audible alarm, if enabled, will sound.
- The primary use for this switch is to allow the user to test any downstream alarm or protection switching functions without having to remove an optical fiber.
- This switch must be in the *Enabled* position for normal operation.

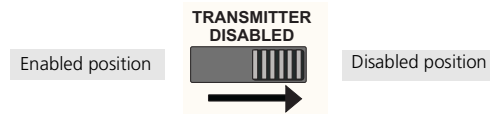


Figure 1-4. Transmitter Disabled Switch

- 15 TX DISABLED This is a warning indicator to alert the user that the transmitter disable switch is in the *Disabled* position.
- 16 AUDIBLE ALARM This switch is used to disable the audible alarm buzzer. If enabled, the audible alarm will activate when a major alarm occurs.

- | | | |
|------------------|---|---|
| 17 | MAJOR ALARM | Indicates that a failure that affects service exists. When this indicator is illuminated, the major alarm relay will be activated. The audible alarm, if enabled, will sound. |
| 18 | MINOR ALARM | Indicates that an abnormal (but non service affecting) condition exists. When this indicator is illuminated, the minor alarm relay will be activated. |
| 19 | ON-LINE | Indicates that the transceiver is operating normally and is outputting valid optical and/or electrical signals. |
| 20 | LOCK LOST | <p>When illuminated, this indicator signifies that an expected input signal (optical or electrical) is not present or the respective clock regenerator circuit is unable to lock to the incoming data stream. The laser diode transmitters will be disabled when this indicator is illuminated.</p> <p>Note: This condition will also cause the <i>major alarm</i> relay to be activated. The audible alarm, if enabled, will sound.</p> |
| 21 | OPTICAL IN-LOCK | Indicates that the optical input signal is present and that the optical clock regenerator is locked to the incoming optical data stream. |
| 22 | LOCKLOST SOURCE SELECT | This three-position switch determines when a <i>lock lost</i> alarm will be generated. It can be set to generate this alarm when the <i>optical</i> signal is lost, when the <i>electrical</i> signal is lost, or when <i>either the optical or the electrical</i> signals are lost. See Chapter 2 for instructions on setting this switch for various system configurations. |
| 23 | ELECTRICAL IN-LOCK | Indicates that the electrical input signal is present and that the electrical clock regenerator is locked to the incoming electrical data stream. |
| 24,
25,
26 | MONITOR SOURCE SELECT Switch and Indicators | When this switch is toward the left, the <i>optical input</i> LED will be illuminated and the monitor will use the regenerated data stream from the optical receiver as its source. When this switch is toward the right, the <i>electrical input</i> LED will be illuminated and the monitor will use the regenerated data stream from the rear panel <i>serial-data-input</i> BNC connector as its source. |
| 27 | MONITOR OUTPUT | The electrical signal provided at this BNC output connector is a buffered, re-timed, and regenerated replica of the electrical or optical input signal, determined by the setting of the monitor source select switch. The output impedance is 75 ohms, the signal amplitude is nominally 0.8 volts peak-to-peak. The signal is AC coupled and conforms to the SMPTE 259M electrical interface standard for serial digital video signals. For correct operation, this signal should be viewed with a device having an input impedance of 75 ohms. |



Transceiver Rear Panel Optical and Electrical Connectors

Figure 1-5 illustrates the optical and electrical connectors present on the rear panel of the ML1290X transceiver units.

- 1 OPTICAL INPUT CONNECTOR
All ML1290X transceiver units are equipped with FC-PC (female) optical connectors and are designed to accept input signals at either 1310 nm or 1550 nm wavelengths, with optical power from -34 dBm to -1 dBm.
CAUTION: Optical input power greater than +4 dBm may damage the optical receiver.
The ML1290X system is specified for operation with 9-micron, single mode optical fiber. Multimode 50/125 μm and 62.5/125 μm fiber can be used for short distance applications (<4.4 km). See Chapter 3 for available loss budgets and setup details.
Note: FC-PC connectors are keyed and can only be mated at one radial orientation.
Note: When not in use (i.e., no fiber installed), the optical connectors should be covered with the provided protective caps. The protective caps prevent subsequent degradation of optical performance due to dirt and moisture.
Note: Care should be exercised when removing or installing units with attached fibers. Remove the optical fiber before withdrawing a unit from its location. Avoid sharp bends, kinks, or twists in the optical fiber.
- 2, 3, 4, 5 OPTICAL OUTPUT CONNECTORS
The ML1290X transceiver units can be ordered with either one or four optical outputs. Unavailable output ports (port locations without optical connectors) will be plugged.
Standard models are supplied with 1310 nm, 0dBm lasers. As an option, all models can be provided with 1550 nm, 0dBm DFB lasers for long-reach applications. All lasers in a given unit are of the same type. As described in Chapter 2, this multiple laser output capability provides a flexible and efficient means for implementing point-to-multipoint systems.

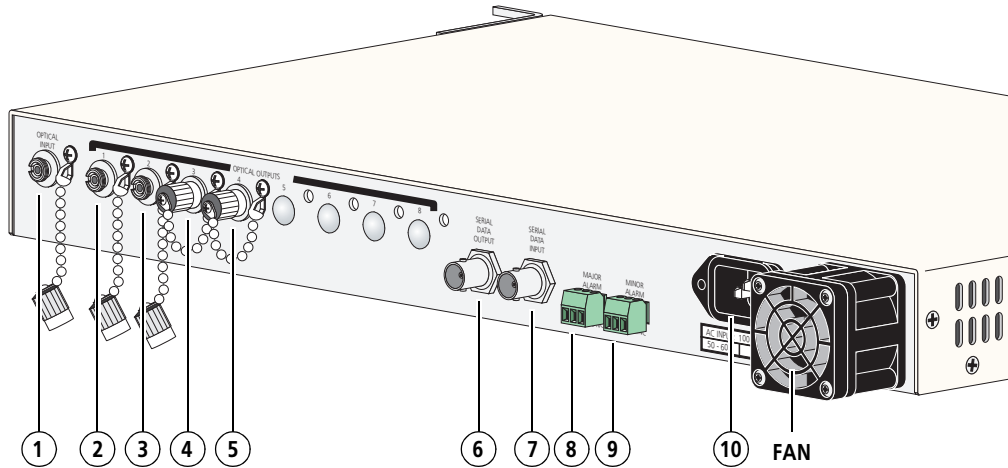


Figure 1-5. Rear Panel of the ML1290X

- | | | |
|---|--------------------|---|
| 6 | SERIAL DATA OUTPUT | <p>The electrical signal provided at this BNC output connector is a buffered, re-timed, and regenerated replica of the optical input signal. The output impedance is 75 ohms, the signal amplitude is nominally 0.8 volts peak-to-peak. The signal is AC coupled and conforms to the SMPTE 259M electrical interface standard for serial digital video signals.</p> <p>The serial data output signal at this connector is present as long as there is an optical input signal. This signal cannot be disabled, interrupted, or modified by any front panel switch settings.</p> |
| 7 | SERIAL DATA INPUT | <p>This BNC electrical input port is internally terminated at 75 ohms and will accept:</p> <ul style="list-style-type: none"> • Signals that comply to the SMPTE 259M electrical interface standard for serial component digital video signals (270 Mb/s) • DVB-ASI signals <p>This port is equipped with an automatic-line-build-out (ALBO) circuit which will correct the timing distortion produced by long runs of coaxial cable. Up to 300 meters of Belden 8281 cable can be used between a <i>serial data output</i> port and a <i>serial data input</i> port.</p> |



- 8, 9 ALARM RELAYS Both major and minor alarm relays are provided by the ML1290X transceiver units. The relays have form “C” contacts, i.e. both *normally open* (NO) and *normally closed* (NC) contacts are provided. Connections to these relays are made via the two, 3-pin, removable screw, wire clamp connectors at the rear of the unit.

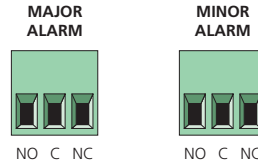


Figure 1-6. Alarm Relay Connectors

The user may connect the relays so that they open on an alarm condition (NC) or close on an alarm condition (NO). All alarm relays will go to the *alarm* state in the event of a total loss of system power. For details on connecting to the alarm relays, see ALARM Relay Connectors (page 2-15).

- 10 POWER ENTRY MODULE AC powered units should be connected to a source of 90 VAC to 254 VAC, 47 Hz to 63 Hz. Units designed for -48 VDC should be connected to a -38.4 VDC to -57.6 VDC power source. The power supply is internally fused. This fuse is not user-serviceable. For details on connecting to the power module, see Power Connection (page 2-16).



2

Installation

This chapter contains the following information for installing and configuring a ML1290X:

- Site Requirements (page 2-2)
- Required Tools and Equipment (page 2-3)
- Unpacking the Unit (page 2-3)
- Installing the Unit (page 2-4)
- Cable and Switch Configurations (page 2-7)
- ALARM Relay Connectors (page 2-15)
- Power Connection (page 2-16)

Site Requirements

Before you select an installation site for the ML1290X, read the electrical, environmental, and physical requirements specified in the product specification sheet shipped with the unit.



Warning

Never stare directly into a fiber optic connector.

Although the light used in most fiber optic transmissions is not visible to the naked eye, potentially harmful levels of radiation may be present at the optical output ports and unconnected transmit fiber ends.

Failure to observe this warning could result in personal injury.



Warning

Do not remove the ML1290X cover.

There are electrical shock hazards present in the unit if the cover is removed, and there are no operator-serviceable components beneath it.

Failure to observe this caution could result in injury and damage to equipment. The warranty is voided if you break the warranty seals.



Required Tools and Equipment

To install the ML1290X as a rack-mounted or wall-mount unit, you need:

- A screwdriver
- Four screws

Unpacking the Unit

1. Remove the unit from the shipping carton. Set aside the packing material in case you need to repackage the unit later.
2. Check the configuration of the unit against the items listed on the packing slip. If you find any discrepancies, report them in accordance with the instruction on Customer Support (page -xvi).

Shipment Contents

The ML1290X shipment contains the following items:

- One ML1290X unit
- 2 three-pin screw wire clamp connectors
- One copy of this manual
- Product specification sheet
- AC power cord (if the unit is an AC unit)

Installing the Unit

The ML1290X can be placed on a flat surface as a free-standing unit or rack-mounted in a standard 48.26 cm (19 inch) wide equipment cabinet. As you position the ML1290X for installation, keep in mind that all cables will connect to the back of the unit.

Refer to the product specification sheet shipped with the unit for environmental specifications.

Cooling Considerations

The ML1290X uses forced air convection cooling as the primary means of cooling the device. Cool ambient air is drawn through the unit by a single axial fan integral to the unit. Note that it is important the location of the device be well ventilated or provided with forced air within the environment to avoid re-circulation of air through the unit.

Figure 2-1 shows the position of the fan and ventilation openings. Care must be taken not to obscure these items with cables, mounting hardware, or other articles that may restrict airflow through the unit. In general, allow 3 inches of clearance around the sides and rear of the unit.

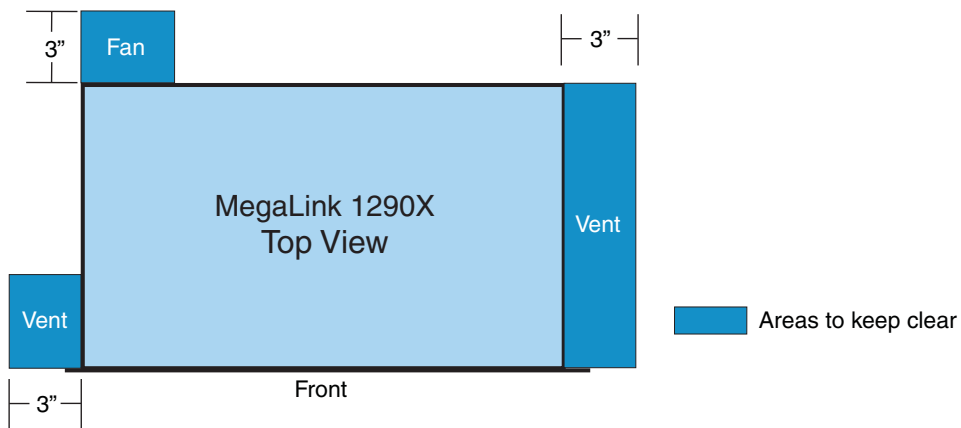


Figure 2-1. Device Ventilation/Cooling



Heat Load

The maximum power dissipation of a ML1290X is 55 W, which is equivalent to approximately 190 BTU/hour. When sizing the cooling requirements for a rack, the total heat output of the equipment in the rack should be used. For example, the total heat output of fifteen (15) ML1290X units installed in a single rack would be about 2850 BTU/hour.

Vertical Spacing

The ML1290X is housed in an enclosure that is 1 RU in height. In general, it is permissible to mount units without leaving a space between adjacent units. However, in racks with poor ventilation (low air flow) or located in areas of high ambient temperatures, heat density considerations may make it necessary to leave a 1 RU space between units. Operation in an environment (within the equipment rack) of over 40 degrees Celsius for extended periods of time is not recommended.

Installing the ML1290X as a Free-standing Unit

To install the ML1290X as a free-standing unit, position the unit on the selected flat surface. Be sure to allow for adequate ventilation as described in Cooling Considerations (page 2-4).

Wall-mounting the Unit

To install the ML1290X as a wall-mounted unit:

1. Remove the three screws securing the mounting brackets to the unit.
2. Rotate the mounting brackets 90° to position the flange parallel to the top of the unit.
3. Replace the three screws to secure the mounting brackets to the unit.
4. Attach the unit to the wall.

Rack-mounting the Unit

Before you rack-mount the unit, determine if you want to flush-mount or mid-mount the chassis into the cabinet. Flush-mounting sets the front edge of the unit even with the front edge of the rack. Mid-mounting causes the front edge of the unit to protrude from the front of the rack.

The ML1290X flush-mounted brackets are factory pre-installed for a flush-mount installation.

To mid-mount the chassis:

1. Remove the three screws securing each mounting bracket to the unit.
2. Rotate the mounting brackets 180° so the flanges are facing the rear of the unit.
3. Replace the three screws to secure each mounting bracket to the unit.

Once the mounting brackets are in position, you are ready to install the unit.

To install the ML1290X into a rack:

1. Raise the unit to the appropriate installation height.
2. Align the screw holes on the mounting brackets with the screw holes on the equipment rack.
3. Install the screws through the mounting brackets on the unit into the mounting brackets on the rack. The unit requires two screws for each side of the chassis.



Cable and Switch Configurations

This section describes in detail the basic configurations the ML1290X was designed for. Each configuration example provides information for attaching the various video cables and configuring the unit's switches.

Table 2-1. Cabling Configurations

Configuration	Description	see page ...
Point-to-Point Transceiver	Bi-directional electrical-to-optical transceiver	page 2-7
Point-to-Point Transmitter	Uni-directional transmission	page 2-8
Point-to-Point and Point-to-Multipoint Repeaters	Repeaters to extend the range of a point-to-point system Fiber spans exceeding 600 km may be constructed by using multiple ML1290X transceivers as repeaters	page 2-9
Digital Video Switch Interface	Dual regenerative electrical-to-optical and optical-to-electrical interface adapters to a digital video routing switch	page 2-11
Inter-Office Switching	Repeater-to-repeater links between geographically diverse video switching centers	page 2-14

Point-to-Point Transceiver

The ML1290X digital optical transceiver may be used as a simple bi-directional electrical-to-optical transceiver, as shown in Figure 2-2. For this configuration, the optical output of one ML1290X transceiver unit is connected to the optical input of a second ML1290X transceiver unit. The optical output of the second transceiver is connected back to the optical input of the first transceiver.

In this configuration, an electrical signal applied to the *serial data input* BNC connector of one transceiver will appear at the *serial data output* BNC connector of the other transceiver.

In this mode, the *transmitter source select* switches must be set to the *electrical* (right) position. The *locklost source select* switches should be set to the *both* (center) position. In addition, the *transmitter disable* switches must be set to the *enabled* (left) position.

The inbound and outbound data streams may be monitored via the front panel mounted BNC connector. The *monitor source select* switch may be set to either the *electrical* or the *optical* position.

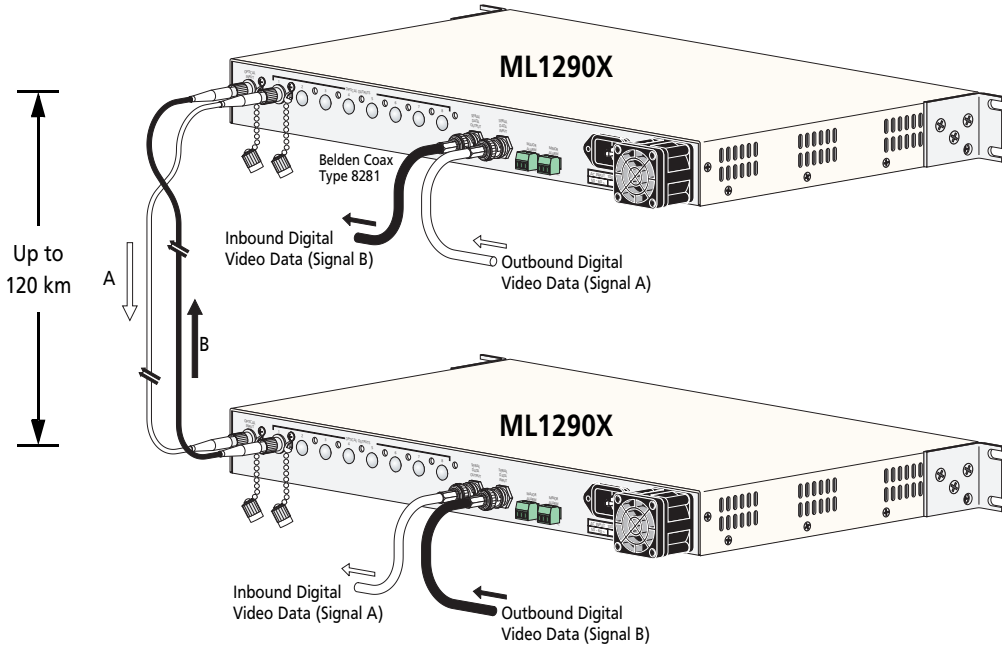


Figure 2-2. Point-to-Point Bi-directional Transceiver Configuration

Point-to-Point Transmitter

The ML1290X transceiver may be used for uni-directional transmission, as shown in Figure 2-3.

The optical output of one ML1290X transceiver unit is connected to the optical input of a second ML1290X transceiver unit.

In this configuration, an electrical signal applied to the *serial data input* BNC connector of one transceiver will appear at the *serial data output* BNC connector of the other transceiver.

The *transmitter disable* switch must be set to the *enabled* (left) position.



The inbound and outbound data streams may be monitored via the front panel mounted BNC connectors.

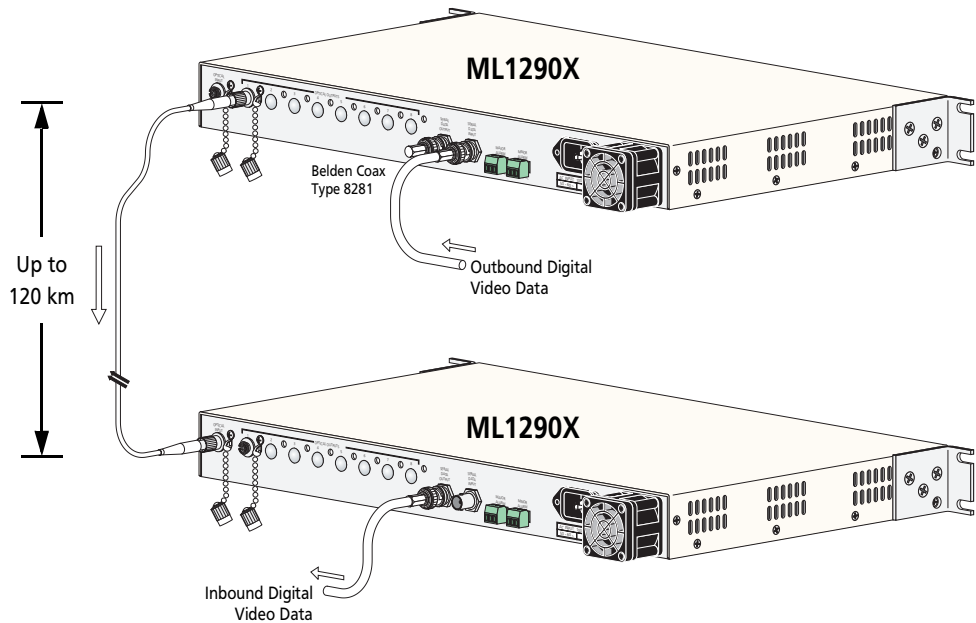


Figure 2-3. Point-to-Point Uni-directional Transmitter Configuration

Point-to-Point and Point-to-Multipoint Repeaters

ML1290X transceivers may also be used as repeaters to extend the range of a point-to-point system. If a multi-output transceiver is used, a point-to-multipoint system can be constructed.

In this configuration, the optical output of a ML1290X transceiver unit is connected to the optical input of a 4-port ML1290X transceiver unit. Two of the four optical outputs of the ML1290X transceiver unit are connected by separate fiber paths to two ML1290X transceiver units. This is shown in detail in Figure 2-4 and Figure 2-5.

In this manner the ML1290X transceiver acts as both a regenerator to increase the total allowable fiber span, and as an amplified optical splitter to permit a point-to-multipoint (inverted tree) distribution system. It should be evident that a linear multi-drop configuration can be created by adding more repeaters to this configuration.

In this configuration, the ML1290X transceiver's *transmitter source select* switch and the *locklost source select* switch must be set to the *optical* (right) position. In addition, the *transmitter disable* switch must be set to the *enabled* (left) position.

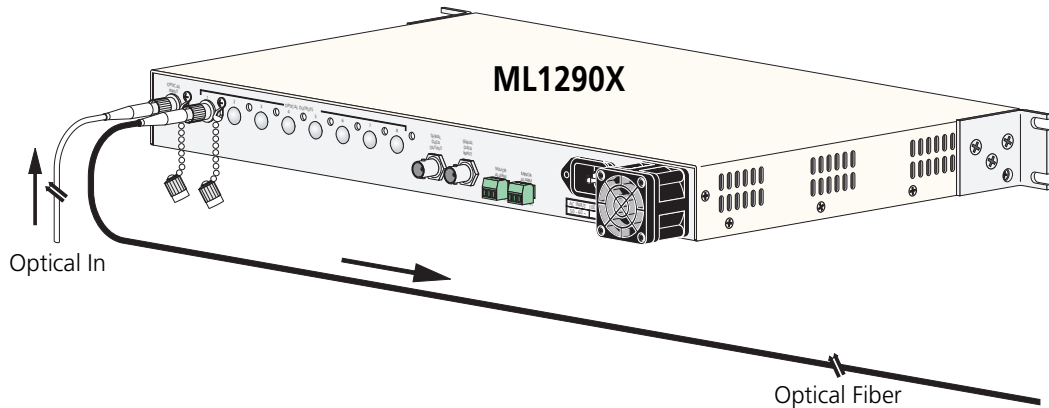


Figure 2-4. Point-to-Point Repeater Configuration

Fiber spans exceeding 600 km may be constructed by using multiple ML1290X transceivers as repeaters spaced uniformly along the fiber route.

Note that if an extended fiber span is not required, then just a multiple output transceiver, such as a ML1290X, could be used to create the multi-drop configuration.

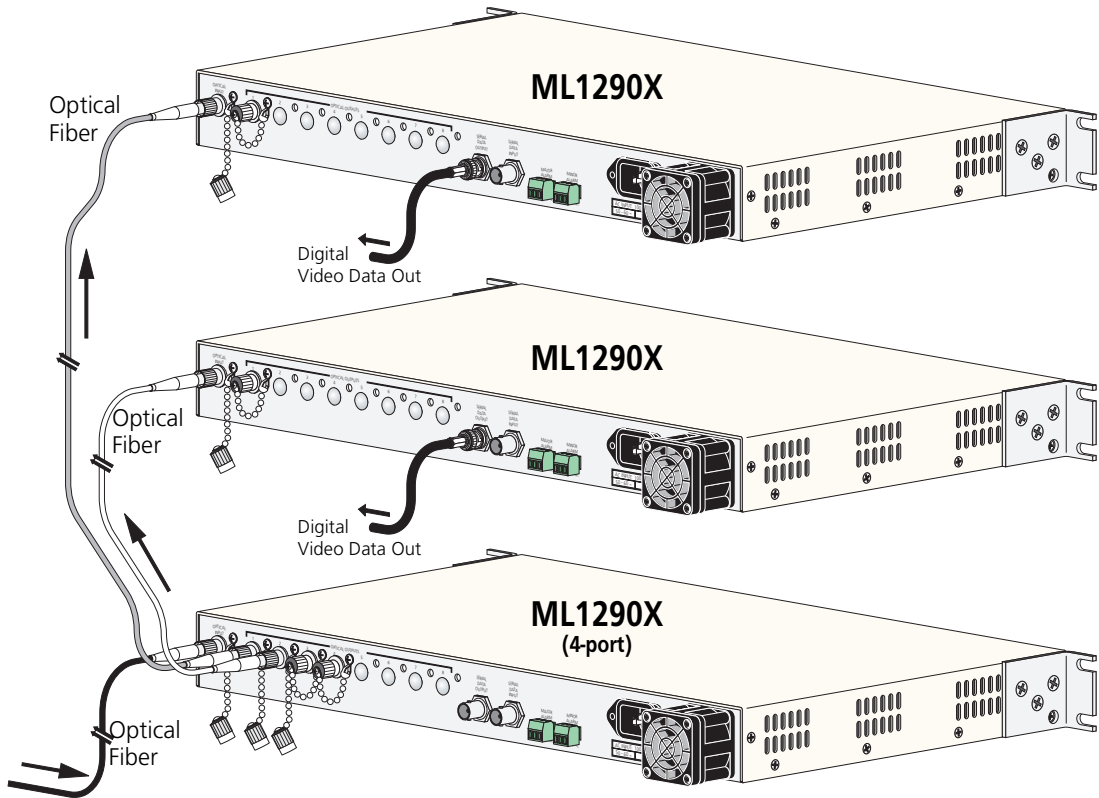


Figure 2-5. Point-to-Multipoint Repeater Configuration

Digital Video Switch Interface

Figure 2-6 illustrates the use of the ML1290X transceiver units as dual regenerative electrical-to-optical and optical-to-electrical interface adapters to a digital video routing switch.

The use of dual re-timing circuits in the ML1290X transceivers insures that all timing jitter is removed from the optical signal before the digital bit stream is sent to the routing switch, and that any timing jitter or signal distortion introduced by the routing switch is removed before the switch's electrical output signal is converted to an optical signal. This feature allows multiple passes of the electrical signal through the routing switch with no degradation of the final signal quality.

In this mode, the *transmitter source select* switch must be set to the *electrical* (right) position. In addition, the *transmitter disable* switch must be set to the *enabled* (left) position.

The *locklost source select* switch must be set to either the *optical* (left) position or the *both* (center) position if an alarm is to be generated when either the optical input signal or the electrical input signal to the transceiver is absent.

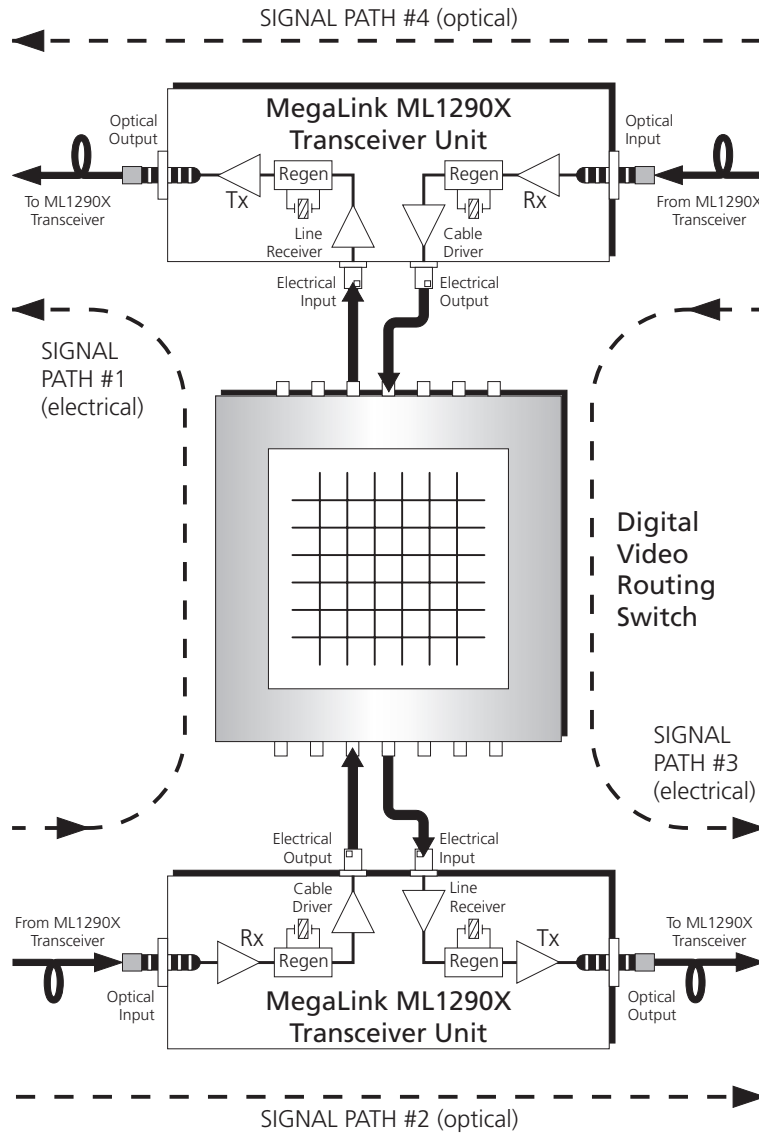


Figure 2-6. ML1290X as Video Switch Interface

Inter-Office Switching

Figure 2-7 illustrates the use of the ML1290X in repeater-to-repeater links between geographically diverse video switching centers. Because the digital signal is fully regenerated at each switching center, no degradation of signal quality occurs, even when the signal is routed through a large hierarchy of switching centers.

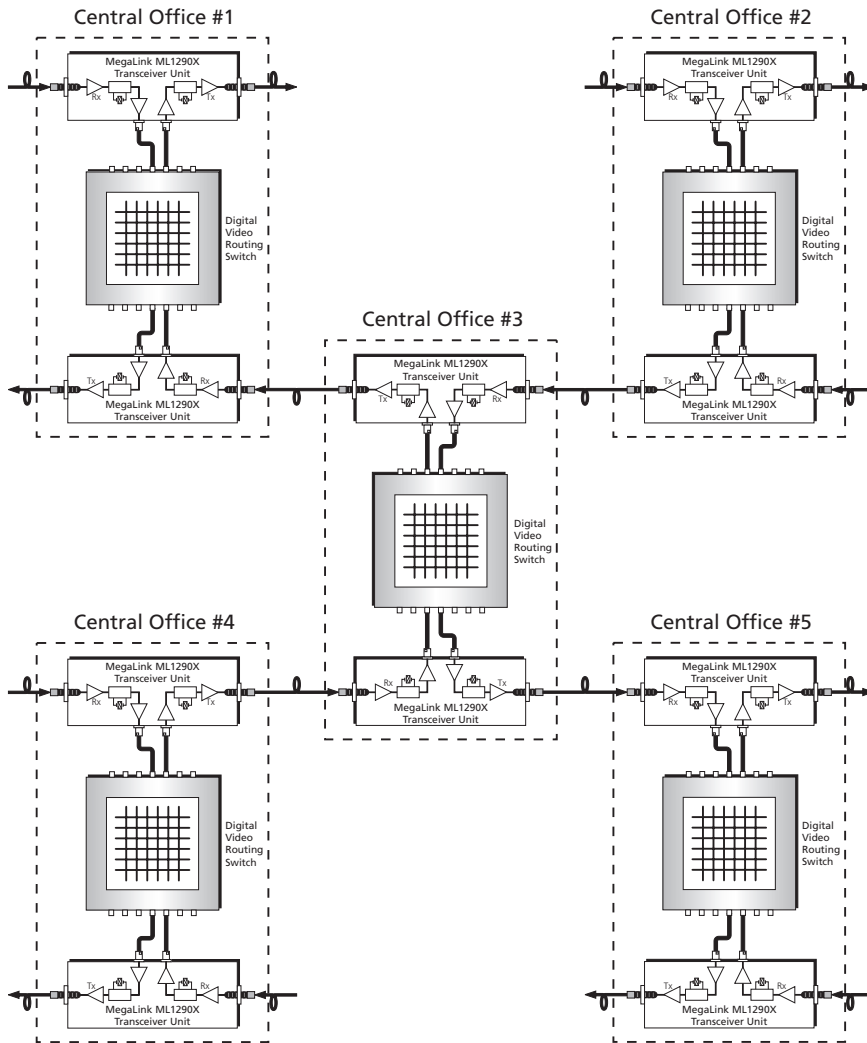


Figure 2-7. Inter-office Repeater Links



ALARM Relay Connectors

Two three-terminal alarm relay contact closures—one for MAJOR alarms and one for MINOR alarms—are located on the ML1290X rear panel.

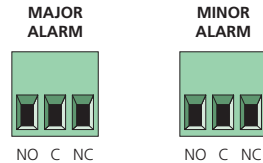


Figure 2-8. ALARM Relay Connectors

These contact closures can be used to connect the unit to an external device (such as a lamp or a horn), which can be activated when the unit detects an alarm condition.

The ALARM relay connectors can be wired as normally closed (NC), in which case the contacts will open when an alarm condition is sensed; or normally open (NO), in which case the contacts will close when an alarm condition is sensed.

To connect an external device to an alarm relay connector, use one of the three-pin removable screw wire clamp connectors shipped with the ML1290X. The connectors accept #24 ... #18 gauge twisted-pair wire.

The alarm relay contact rating is 48 VAC or VDC @ 100 mA. All contact pairs are isolated from chassis ground and from each other. Maximum applied voltage from any contact to chassis ground must be less than 100 VDC. The contacts are not polarity-sensitive.

Power Connection

ML1290X products are available with either an AC or DC power supply. Before you install the AC or DC power cord, refer to the product specification sheet for a complete understanding of the system's electrical and environmental specifications.

AC Connection

The AC connector is located on the rear panel and requires a three-prong IEC 320-C13 115/230 VAC power cord.

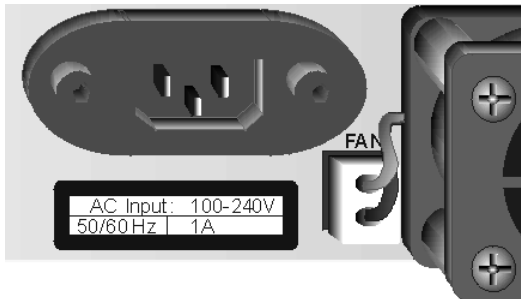


Figure 2-9. AC Connector

To connect an AC-powered ML1290X to a power source:

1. Make sure that the POWER switch is in the 0 (OFF) position.
2. Plug the AC power cord into the power receptacle at the rear of the unit.
3. Plug the power cord into a three-wire grounding receptacle.



DC Connection

The DC versions of the ML1290X have a -48 VDC input connector terminal block.

Caution

When connecting a DC power supply, make sure that you are connecting the ML1290X to a -48 VDC (-38.4 ... -57.6 VDC) source that is isolated from any AC power and is reliably grounded to earth.

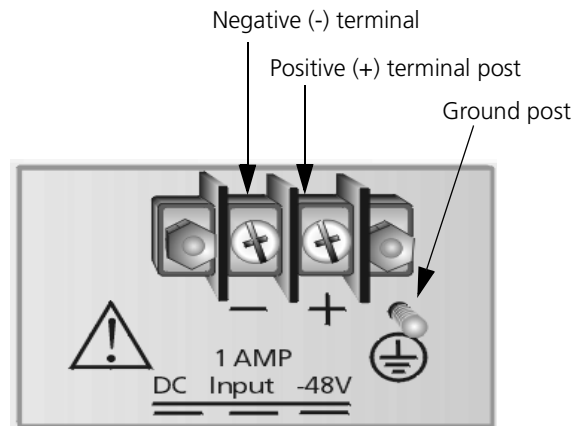


Figure 2-10. DC Power Supply Terminal Block

Caution

Before installing the spade connectors, make sure that the polarity of the DC connections is correct. Reversed polarity can blow the DC input fuse and may cause damage to the power supply.

To connect a DC-powered ML1290X to a power source:

1. Locate the terminal block assembly on the rear of the unit and remove the clip-on protective cover (not shown).
2. Loosen the two terminal post screws marked - and +.
3. Install the DC power source cables and tighten the screws to secure the connectors to the terminal block. Ensure the spade connector terminations are positioned under the screw heads.

4. Secure the ground cable to the ground post.
5. Reinstall the protective cover onto the DC terminal block.
6. Connect the other end of the power cable into an approved safety extra low voltage (SELV) energy output source.

Note: Each ML1290X product consumes less than 55 W from a nominal 48 VDC circuit. For sizing an external protection circuit, slow blow (time delay) fusing, such as a T3.15 fuse with a minimum fuse capacity of 2.5 A per encoder, is recommended. If fast blow (fast-acting) fuses are used, a minimum fuse capacity of 10 A per encoder is recommended to prevent nuisance trips.



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