Calix

Calix E7-2 Installation Guide

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Contents

About This Guide

This document provides a general installation practice for the Calix E7-2 Ethernet service access platform. This document includes guidance for planning, power installation, cabling, and maintenance.

Intended Audience

This document is intended for use by network planning engineers, outside plant engineers, CO technicians, and field support personnel, as well as craft personnel responsible for equipment installation, cabling, and maintenance. Familiarity with standard telecom and datacom terminology and practices, as well as standards-based Ethernet technologies and conventions, is recommended.

Related Documentation

You can access all Calix product documentation, including Calix E7-2 configuration practices, from the Calix Resource Center online at *www.calix.com* (*https://www.calix.com/my-calix*).

Safety Notices

This document uses the following safety notice conventions.

⚠️	**DANGER!** Danger indicates the presence of a hazard that will cause severe personal injury or death if not avoided.
⚠️	**WARNING!** Warning indicates the presence of a hazard that can cause severe personal injury if not avoided.
⚠️	**CAUTION!** Caution indicates the presence of a hazard that can cause minor to moderate personal injury if not avoided.
🛈	**ALERT!** Alert indicates the presence of a hazard that can cause damage to equipment or software, loss of data, or service interruption if not avoided.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT. Fiber optic radiation can cause severe eye damage or blindness. Do not look into the open end of an optical fiber.

CE Marking Conformity

The Calix E7-2 product complies with the Council of European Communities Directive 93/68/EEC. A copy of the CE marking EC Declaration of Conformity for the Calix E7-2 is available upon request. Contact your Calix Sales Engineer for more information.

Chapter 1

Calix E7-2 Product Overview

This chapter introduces the Calix E7-2 Ethernet service access platform and provides a general overview of the E7-2 small form factor chassis and components.

Topics Covered

This chapter covers the following topics:

- Introducing the Calix E7-2
- Product dimensions

Introducing the Calix E7-2

The Calix E7-2 Ethernet service access platform is a compact IP services networking system that provides high performance Ethernet-based transport, aggregation, and FTTP services delivery from an environmentally hardened, small form factor chassis.

Calix E7-2 system

The Calix E7-2 delivers a wide array of high performance applications, including 10GE Ethernet transport, high-density residential triple play services over GPON and point-to-point Ethernet, Metro Ethernet Forum (MEF) compliant business services, mobile backhaul, and protected GE aggregation.

Calix E7-2 shelf views

The Calix E7-2 system consists of the 2-slot E7-2 chassis, a removable fan module, and up to two high capacity line cards in universal card slots.

Calix E7-2 (front)

The Calix E7-2 line cards and fan module install into the front of the E7-2 shelf. When equipped with line cards, the E7-2 front panel also terminates system line interfaces (fibers). The E7-2 fan module is equipped with Craft Ethernet and serial ports for management and features several system status indicators.

Calix E7-2 (rear)

The E7-2 power inputs (A/B), ground, alarm I/O, Craft management, and BITS timing interfaces are located on the rear of the E7-2 shelf. The E7-2 rear panel also has four RJ-21 copper interface connectors.

Calix E7-2 cards

The Calix E7-2 is equipped with two universal line card slots, supporting a flexible array of high capacity line cards, including:

- **Fiber access service line cards**: Calix E7-2 fiber cards provide optical ports for front access termination.
- **Copper access service line cards**: Calix E7-2 copper cards (e.g., VDSL2) terminate on the E7-2 rear panel.

All E7-2 line cards use pluggable transceiver modules for optical and copper-based interfaces, including industry standard SFP, SFP+ and XFP modules. Each port on each card has an LED to indicate an established link and data traffic activity. For detailed information on the E7-2 line cards, see the *Calix E7 User Guide*.

WARNING! The intra-building port(s) copper SFP and SFP+ of the equipment or sub-assembly must use shielded intra-building cabling/wiring that is grounded at both ends.

An E7 'blank' card (equipped with no electronics) ships with every E7-2 shelf. The blank card plugs into either of the two universal slots and is used to maintain emissions and facilitate proper airflow in E7-2 systems with only one line card. Whenever an E7-2 shelf operates with only one line card, a blank card must be installed in the other slot.

Product Dimensions

E7-2 chassis dimensions

The Calix E7-2 chassis exterior dimensions follow:

- Height: 1.7 inches (4.3 cm)
- Width: 17.5 inches (44.5 cm)
- Depth: 11.45 inches (29.1 cm)
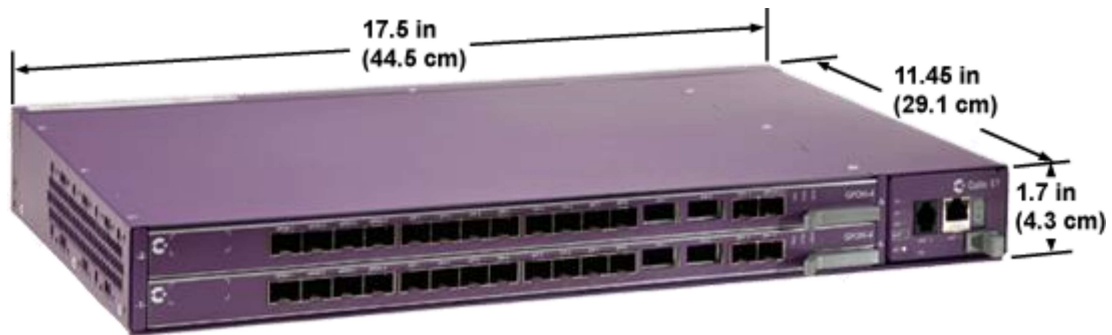
E7-2 fan module dimensions

The Calix E7-2 fan module exterior dimensions follow (FTA shown):

- Height: 1.63 inches (4.1 cm)
- Width: 2.67 inches (6.8 cm)
- Depth: 10.82 inches (27.5 cm)
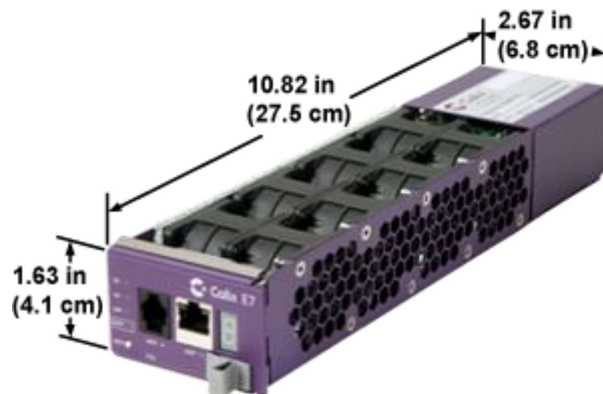
Chapter 2

Installation Considerations

This section discusses general installation considerations and guidelines. Review this information before starting the installation process.

Topics Covered

This section covers the following topics:

- Installation guidelines
- Safety recommendations and notices
- Items required for installation (tools and materials)
- Preparations before you begin

Installation Guidelines

Review the following guidelines before starting installation activities.

General guidelines

Follow these general guidelines and practices:

- Read this document completely before starting any installation activities.
- Only qualified, professional personnel should perform the procedures described in this document.
- Follow standard safety precautions when performing installation and maintenance tasks.
- Always wear standard safety gear when performing installation and maintenance tasks (hardhats/safety headgear, reflective vest, eye protection, insulated gloves).
- For safety, keep bystanders and other unauthorized personnel away from work operations at all times.
- If the E7-2 is to be installed in an outdoor cabinet, do not perform installation activities during thunderstorms or when the threat of lightning is present.
- The E7-2 installation kit includes power and ground cables that are 12 feet (3.66 m) in length. If you cannot locate the E7-2 within 12 feet (3.66 m) of the power/ground source, you must supply your own cables.
- Calix offers a 3rd party DC distribution panel with dual power feed, 10+10 (A+B) GMT fuse positions (Calix part number 100-02234).

Safety Recommendations and Notices

WARNING! The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the Outside Plant (OSP) or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

WARNING! This product should be protected by a surge protector that meets the applicable criteria of GR-974-CORE or GR-1361-CORE. Failure to utilize an appropriate surge protector could result in susceptibility to lightning surges or create a potential hazard due to power faults.

WARNING! Restricted Access Location: Only qualified technical personnel should perform the procedures in this document. These procedures involve potentially hazardous activities that could cause injury to untrained personnel.

DANGER! Risk of high power current surge and electric shock. Read and understand all power procedures before performing tasks. Take necessary precautions and use appropriate insulated tools when working with power. This equipment must be installed, operated, and serviced by qualified technical personnel only.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION PRESENT. Fiber optic radiation can cause severe eye damage or blindness. Do not look into the open end of an optical fiber.

ESD ALERT! Beware of electrostatic discharge. Follow standard ESD precautions. Always wear a grounded ESD wristband to avoid damaging the electronic equipment.

Required Items

Verify that the following items are on hand before you begin the installation.

Calix-supplied items

The Calix E7-2 installation package includes the following items:

Qty	Description
1	Calix E7-2 two-slot chassis (1 RU)
1	Calix E7-2 fan module
1	Calix E7-2 blank line card
4	Rack mounting ears; 19-inches (48.26-cm) (2 ea.) and 23-inches (58.42-cm) (2 ea.)
8	Flathead Phillips screws, 4-40 x .1875 inches (.6 cm) (for attaching mounting ears)
4	Self-tapping mounting screws, 12-24 (for rack mounting)
2	Power cables (A/B feeds bundled together);18 AWG, 12 ft (3.66 m)
1	Ground cable; 8 AWG, 12 ft (3.66 m), plus termination hardware (2 ea. washers, nuts, spare 2-hole ground lug)
4	Cable tie mounts (for RJ-21 connector using a 90-degree exit)
4	Panhead Phillips screws, 4-40 x .25 inches (.6 cm) (for securing cable tie mounts to RJ-21 connectors that use a 90-degree exit)

The following optional equipment is ordered and packaged separately, as required:

- Pluggable transceiver modules (required for line termination)
- Fiber guide suitable for all E7-2 deployments, including ETSI racks
- Cool air intake and rear heat exhaust system to redirect airflow to the rear of the chassis
- RS-232 console cable (DB-9F to RJ-11M) to connect to a PC for console management
- 10-pack of fan tray air filters (for use in indoor/office deployments only)

User-supplied items

The following user-supplied tools and materials are required for installation.

- Power drill with universal sockets and screwdriver bits
- Socket wrench/nut driver set (standard)
- Screwdriver set (standard)

- Cable ties (tie-wraps)
- Wire stripper
- Compression crimping tool
- Digital multi-meter
- Fiber splicer
- Fiber jumpers (be sure the fiber connector type matches the connector type of the module(s) for Ethernet and GPON interfaces)
- Fiber management system (distribution, ducts, raceways, etc.)

Preparations Before You Begin

Complete the following preparations before you begin the installation process.

Site requirements

Before starting the installation, verify that the following conditions are true:

- All materials are onsite and inventoried.
- An equipment rack and grounding system are available
- Minimum clearances are met for each device.
- Access to a -48 VDC power source with fuse-protected distribution is available.
- The installation site has restricted access.
- Cable lengths and wire gauges are adequate for the services provided.
- Thermal budget is accounted for and approved.
- Assignments for power, transport, services, alarms, timing, and other interfaces have been defined.

Determining an installation location

For indoor rack-mounted units, keep the following requirements in mind when choosing an installation location:

- As an environmentally hardened system, the Calix E7-2 is suitable for installation in network telecommunication facilities including outside plant (OSP) locations.
- The E7-2 requires one rack unit (1 RU) of mounting space on a standard 19- or 23-inch (48.26- or 58.42-cm) equipment rack.
- The E7-2 fan module is located on the right side of the unit. The system requires adequate airflow space on the right side (intake) and left side (exhaust) of the unit for proper cooling. For this reason, EIA or 23-inch (58.42-cm) racks are preferred over 19-inch (48.26-cm) telco racks.

   Note: Calix offers an optional cool air intake and rear heat exhaust system to assure adequate airflow. Refer to *Installing an Intake/Exhaust System* (on page 30) for installation instructions.

- Locate the E7-2 near power supply and ground termination locations.

   Note: The power and ground cables supplied with the E7-2 installation kit are 12 feet (3.66 meters) long.

- Power, ground, and alarm wiring at the rear of the E7-2 must be properly secured with strain relief.
- Fibers attached to pluggable transceiver modules on the front of the E7-2 unit must be appropriately dressed and secured with strain relief to avoid exceeding the manufacturer's bend radius standards.

Chapter 3

Installing the Calix E7-2

This section describes how to install the Calix E7-2 chassis and components onto a standard equipment rack.

Topics Covered

This section covers the following topics:

- Installing the E7-2 chassis
- Grounding the E7-2 chassis
- Connecting DC power to the E7-2 chassis
- Installing the E7-2 fan module
- Installing E7-2 line cards

Installing the E7-2 Chassis

This topic describes how to install the E7-2 chassis into an equipment rack.

Calix offers the following rack mount options:

- E7-2 vertical mounting kits for vertical chassis orientation in 19- or 23-inch racks
- E7-2 ETSI rack mounting kit to provide a 75 mm forward offset limitation from the rack mounting rail

To install the E7-2 chassis

1. Get a pair of mounting ears and (8) flat head screws from the installation kit.

   Note: The kit includes two sets of mounting ears, one pair for 19-inch (48.26-cm) racks and another for 23-inch (58.42-cm) racks.

2. Attach (2) mounting ears to the E7-2 chassis using supplied hardware. You can install the ears in a flush-mount or projection-mount position as required.


3. Mount the E7-2 chassis onto the equipment rack:

   a. Identify the E7-2 mounting location on the rack.

   b. Position the E7-2 chassis against the rack at the identified location, aligning its ear holes with the counterpart holes on the rack.

   c. Install (4) mounting screws to secure the unit in place.

To install an E7-2 vertical mounting frame

1. Identify the exact mounting location on the equipment rack for the E7-2 mounting frame. The frame requires approximately 22 inches (55.88 cm) of vertical rack space.

2. Install the mounting frame's top bracket as follows:

   a. Orient the bracket with its equipment-mounting flange on the top.

   b. Position the bracket against the rack at the identified location, aligning the bracket's mounting holes with counterpart holes on the rack.

   c. Attach the top bracket to the rack using (4) supplied mounting screws (2 per side).
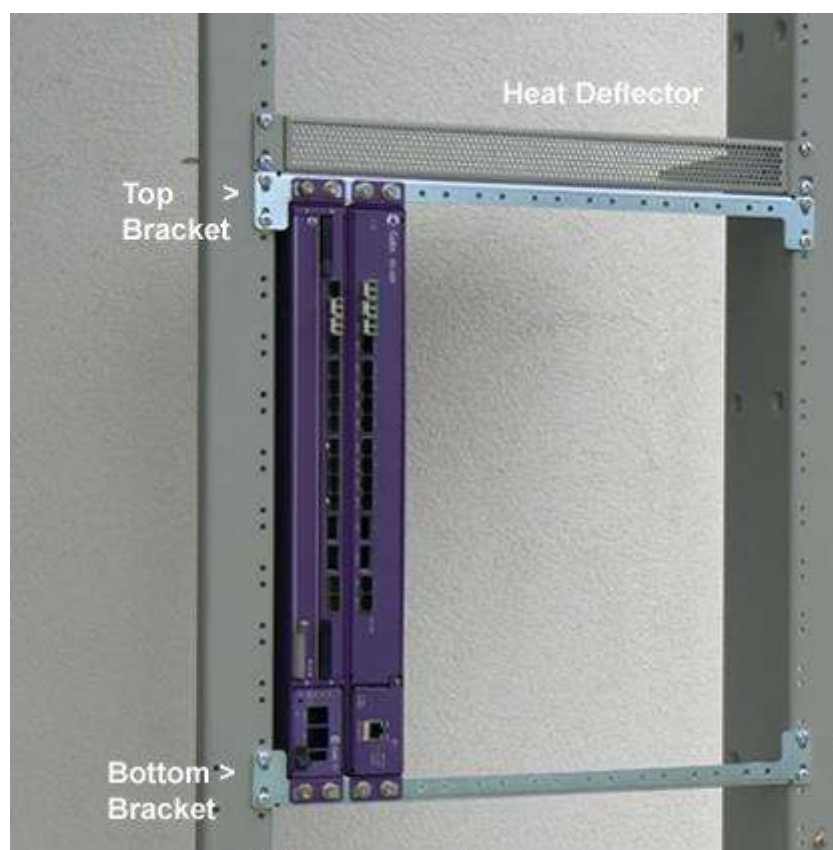
3. Install the mounting frame's bottom bracket as follows:

   a. Orient the bracket with its equipment-mounting flange on the bottom.

   b. Position the bottom bracket against the rack 19 inches (48.26 cm) below the top bracket, aligning the bracket's mounting holes with counterpart holes on the rack.

   c. Attach the bottom bracket to the rack using (4) supplied mounting screws (2 per side).

4. Install the heat deflector above or below the mounting frame (typically above) as follows:

   a. Orient the deflector with the baffle directly above the mounting frame's top bracket.

b. Position the deflector against the rack at the identified location, aligning the deflector's mounting holes with counterpart holes on the rack.

c. Attach the deflector to the rack using (4) supplied mounting screws (2 per side).

After the vertical mounting frame is installed, you can install Calix E7-2 units onto the frame as required. Mount the E7-2 chassis with its right side (fan tray) on the bottom, to direct airflow upward.

To install an E7-2 with the ETSI rack mounting kit

1. Get the pair of ETSI rack mounting ears from the installation kit.

2. Attach each mounting ear to the E7-2 chassis as follows:

a. Position the bracket against the side of the chassis, aligning the bracket's (4) equipment mounting holes with the counterpart holes on the chassis.

b. Attach the mounting ear to the E7-2 chassis using (4) supplied flat head screws.

3. Mount the E7-2 chassis onto the equipment rack:

a. Identify the E7-2 mounting location on the rack.

b. Position the E7-2 chassis against the rack at the identified location, aligning its ear holes with the counterpart holes on the rack.

c. Install (4) mounting screws to secure the unit in place.

Grounding the Chassis

The Calix E7-2 ground system can be connected to a Common Bonding Network (CBN) or Isolated Bonding Network (IBN).

Note: For environments that employ an IBN scheme, the low voltage and frame grounds on the E7-2 shelf are isolated from the input power DC-return.

The installation kit includes a 12-foot (3.66-meter) ground cable, plus hardware to attach it to the E7-2 frame ground.

ESD ALERT! Beware of electrostatic discharge. Follow standard ESD precautions. Always wear a grounded ESD wristband to avoid damaging the electronic equipment.

To ground the E7-2 chassis

1. Get the ground cable and supplied hardware (pair of 10-32 Keps nuts and washers) from the installation kit.

   Note: The Calix-supplied ground cable uses UL-listed ground compression lugs (p/n 615-0001). If you use a ground cable other than the one supplied by Calix, be sure to coat the bare conductor with an appropriate antioxidant compound before making any crimp connections

2. Connect the ground cable to the E7-2 chassis as follows:

   a. Install (2) star washers and then the ground cable's 2-hole lug onto the dual-post Frame Ground terminal (located on the rear of the chassis).

   b. Install (2) 10-32 Keps nuts onto the Frame Ground posts to secure the lug in place. Tighten to 27 in-lbs. of torque.

3. Connect the chassis ground cable to the main ground system (preferred) or to the rack frame as follows:

   a. Route the ground cable to the grounding termination location. If the cable is too long, cut the cable to length and crimp on an appropriate lug. (A spare lug is included in the installation kit.)

   b. Connect the ground cable to the main ground system or rack frame per PANI guidelines.

Note: Grounding surfaces must be brought to a bright finish and coated with antioxidant before being joined. When grounding to a rack frame, ensure that there is no paint or debris between the ground lug and the rack frame. To ensure a reliable ground bond, apply an anti-oxidant and use paint piercing star washers and thread forming screws to secure a metal-to-metal ground contact to the rack frame.

Connecting DC Power

The Calix E7-2 requires -48 VDC input power. The installation kit includes two 12-foot (3.66-meter) DC power cables (A and B leads) bundled together.

⚠	**DANGER!** Risk of electric shock. Only a qualified technician should perform this procedure

To connect DC power to the E7-2

Note: The E7-2 must be installed in an Isolated DC return (DC-I) configuration, where the DC return is not connected to the grounding system.

1. Get the DC power cable from the installation kit.

2. On E7-2 rear panel, loosen the captive thumbscrew securing the clear plastic power terminal cover to the chassis, and then remove the cover.

3. Connect the DC power cable to the E7-2 chassis as follows:

   a. Connect to the A-side power input:

   - Connect the black **(A) RTN** wire to the **(A) + RTN** terminal.

   - Connect the red **(A) BATT** wire to the **(A) - BATT** terminal.

   b. Connect to the B-side power input:

   - Connect the black **(B) RTN** wire to the **(B) + RTN** terminal.

   - Connect the red **(B) BATT** wire to the **(B) - BATT** terminal.

   c. Tighten the power termination screws to 9 in-lbs.

4. Replace the terminal cover and tighten the thumbscrew. Make sure all wires exit cleanly to the left.

5. Route the power cable to the local DC power source and connect it per local practice.

Note: Use 7.5 Amp GMT fuses to protect the E7-2 DC distribution circuits.

Installing the Fan Module

Install the E7-2 fan module into the E7-2 shelf as described below.

Calix offers two fan module types—FTA and FTA2 (as indicated on the fan module faceplate). FTA supports two fan speeds. FTA2 supports four fan speeds with E7 release 2.2 or higher; in releases prior to 2.2, FTA2 supports two fan speeds.

Note: The E7-2 fan module includes an air filter for use in indoor/office environments only. **Do not** use the air filter for outdoor/cabinet deployments, to provide maximum airflow to the E7-2.

To install the E7-2 fan module

1. Unpack the E7-2 fan module from its packaging.

2. **For indoor deployments only**, insert the air filter into the fan module. (The filter resides on the right edge of FTA2 or on left edge of the FTA, against the fans; for the FTA, the filter is green.)

   Note: FTA2 is shown below. For the FTA, proper orientation of the air filter requires the frame side to face the fans, and the rough side to face away from the fans.

   ALERT! For the FTA model, improper orientation of the air filter will interfere with fan operation. Make sure the filter element's rough side faces the left edge of the module, away from the fans.

3. Insert the fan module into the housing on the right side of the E7-2 chassis.

4. Push the fan module all the way back into the slot. The unit seats once the latch clicks into place.

Installing E7-2 Line or Resource Cards

The Calix E7-2 shelf is equipped with two universal line card slots. Install E7-2 line cards as described below.

Note: The E7-2 shelf ships with a 'Blank' card (no circuitry) installed in Slot 2. For applications using only one E7-2 line card, the Blank card must occupy the second slot. Remove the Blank card for applications using two E7-2 line cards.

ESD ALERT! Beware of electrostatic discharge. Follow standard ESD precautions. Always wear a grounded ESD wristband to avoid damaging the electronic equipment.

Note: Some E7 line or resource cards, such as the VDSL2 Overlay card, occupy two slots in the E7-2 shelf. Adjust the card installation procedure below as needed to install a "double wide" card into both E7-2 card slots simultaneously.

To install an E7-2 line card or resource card

1. Unpack the E7-2 card from its packaging.

2. Install the E7-2 card into a vacant universal slot as follows:

   a. On the card faceplate, pull the ejector lever into the open (unlocked) position.

   b. Orient the card horizontally, with the ejector lever on the right side.

   > ⊕ **ALERT!** To avoid damaging the card or shelf, align the card correctly with the guide rails in the slot before inserting the card.

   c. Insert the card into a vacant E7-2 card slot:

      • Slot 1 (bottom)

      • Slot 2 (top)
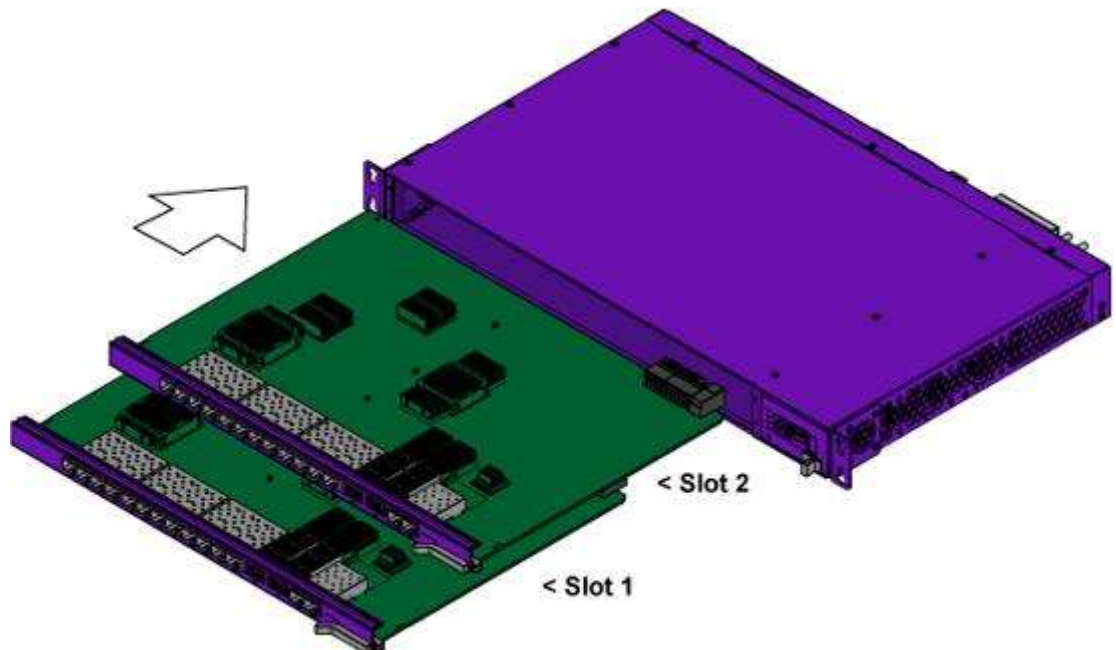
   d. Push the card ejector lever into the closed (locked) position to fully seat the card.

3. Repeat the steps above to install a second line card into the E7-2 shelf, as required. Otherwise, install the Blank card into the vacant slot.

   Note: Due to airflow control considerations, the E7-2 shelf should not be operated with a vacant slot. If you are using only a single E7-2 line card at this time, install the Blank card into the other slot.

To install pluggable transceiver modules and to connect fibers, see *Connecting the E7-2 Line Interfaces* (on page 41).

Installing a Fiber Guide

The E7-2 chassis supports a field installed fiber guide option suitable for all E7-2 deployments, including:

- Flush mounts, horizontal or vertical
- Mid-mounts, horizontal or vertical
- ETSI rack mount kit installations (See *Installing the E7-2 Chassis* (on page 18) for instructions on installing the ETSI rack mount kit.)

The fiber guide installation kit includes mounting brackets for flush and mid-mount deployments, and a 1RU fiber guide assembly.

After installing the E7-2 chassis, install the fiber guide as described below. Alternatively, for flush and mid-mounts you can install the fiber guide while installing the E7-2 chassis.

To install the fiber guide for E7/E5 flush mounts (horizontal or vertical)

Note: This procedure applies to any 19- or 23-inch rack.

1. Unpack the fiber guide kit, and locate the rack mounting bracket.

2. Install the rack mounting bracket as follows:

    a. On the left rack rail or top vertical mounting frame, remove the (2) mounting screws securing the E7/E5 chassis to the rack or frame and hold the chassis in place.

    b. Align the bracket's rack mounting holes with the same holes used to mount the E7/E5 chassis.

    c. Secure the bracket and E7/E5 to the rack or frame using the mounting screws removed in step 2a.

3. Attach the fiber guide assembly to the bracket using the bracket's two captive screws.
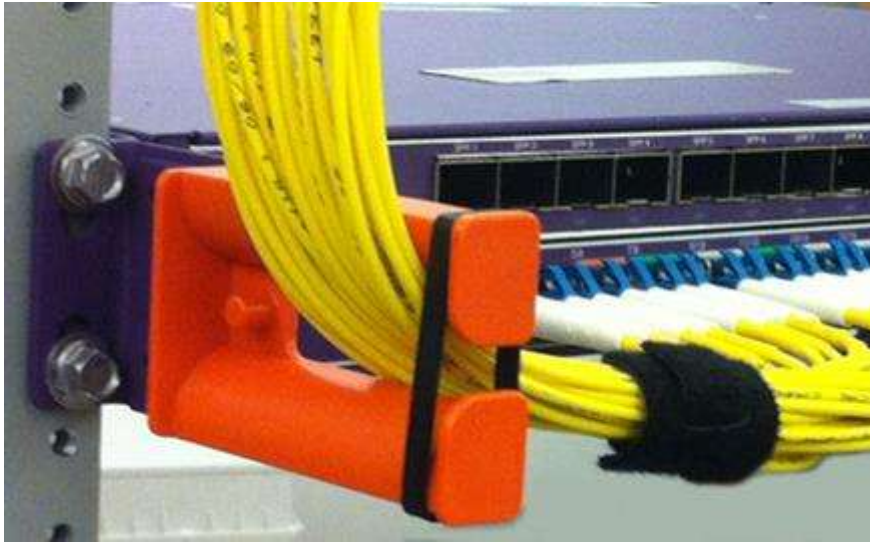
To install the fiber guide for E7/E5 mid-mounts (horizontal or vertical)

Note: This procedure applies to any 19- or 23-inch rack.

1. Unpack the fiber guide kit, and locate the mid-mounting bracket.

2. On the left side of the E7/E5 chassis (oriented horizontally or vertically), align one set of the bracket's captive screws with the forward mounting holes on chassis, and tighten the screws to secure the bracket to the chassis.

3. Attach the fiber guide assembly to the bracket using the bracket's remaining set of captive screws.

To install the fiber guide for an E7-2 mounted with an ETSI rack mount kit

1. Unpack the fiber guide assembly from its packaging.
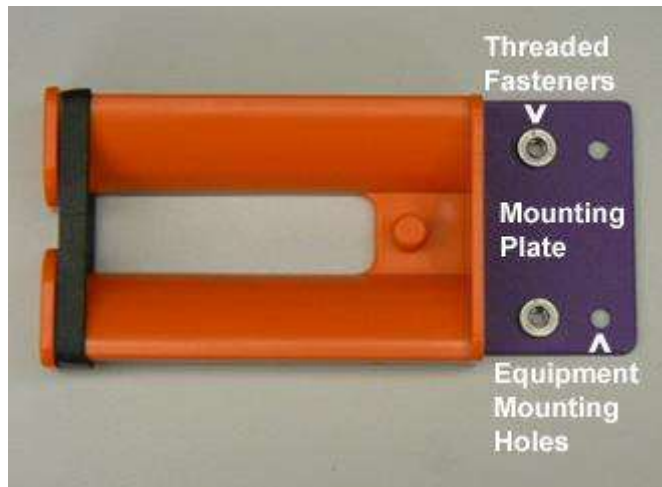
2. Orient the fiber guide with the fiber management on the left outside.

3. Position the fiber guide's flat mounting plate against the right side of the installed ETSI mounting ear, aligning:

   - the threaded fasteners on the fiber guide with the clearance holes on the ETSI mounting ear, *and*

   - the equipment mounting holes on the fiber guide with the counterpart holes on the ETSI mounting ear.

4. Attach the fiber guide assembly to the ETSI mounting ear using the (2) supplied SEMS screws.

Installing an Intake/Exhaust System

The E7-2 chassis supports an optional field installed front cool air intake and rear heat exhaust system. The intake/exhaust system assures adequate airflow by redirecting airflow from the front of the chassis to the rear. Prior to installing the E7-2 chassis, mount the intake/exhaust system on the unit as described below.

Note: The intake/exhaust system converts the E7-2 into a 23-inch shelf.

To install an intake/exhaust system

1. Unpack the intake/exhaust kit from its packaging.

2. Orient the left rear exhaust plenum on the left side of the E7-2 chassis with the vent in the back, aligning the plenum's inner mounting holes with the counterpart holes on the chassis.

   Note: The right and left plenums are not interchangeable.

3. Attach the plenum to the E7-2 chassis as follows:

   a. Route a phillips screw driver through the access hole, and then through the chamber to the captive screw, and tighten the screw.

   b. Repeat step 3a to tighten the (5) remaining captive screws, securing the plenum in place.

4. Orient the right front intake plenum on the right side of the E7-2 chassis with the vent in the front, aligning the plenum's mounting holes with the counterpart holes on the chassis.

5. Repeat steps 3a–3b to attach the right front intake plenum to the E7-2 chassis.

6. Install a rack mounting ear to each plenum as follows:

   a. Position a mounting ear against the plenum, aligning its mounting holes with the counterpart holes on the plenum.

   b. Attach the mounting ear to the plenum using (4) supplied flathead screws.

Mounting Holes

Mounting Ear

Left Rear Exhaust Plenum

Access Holes

Right Front Intake Plenum
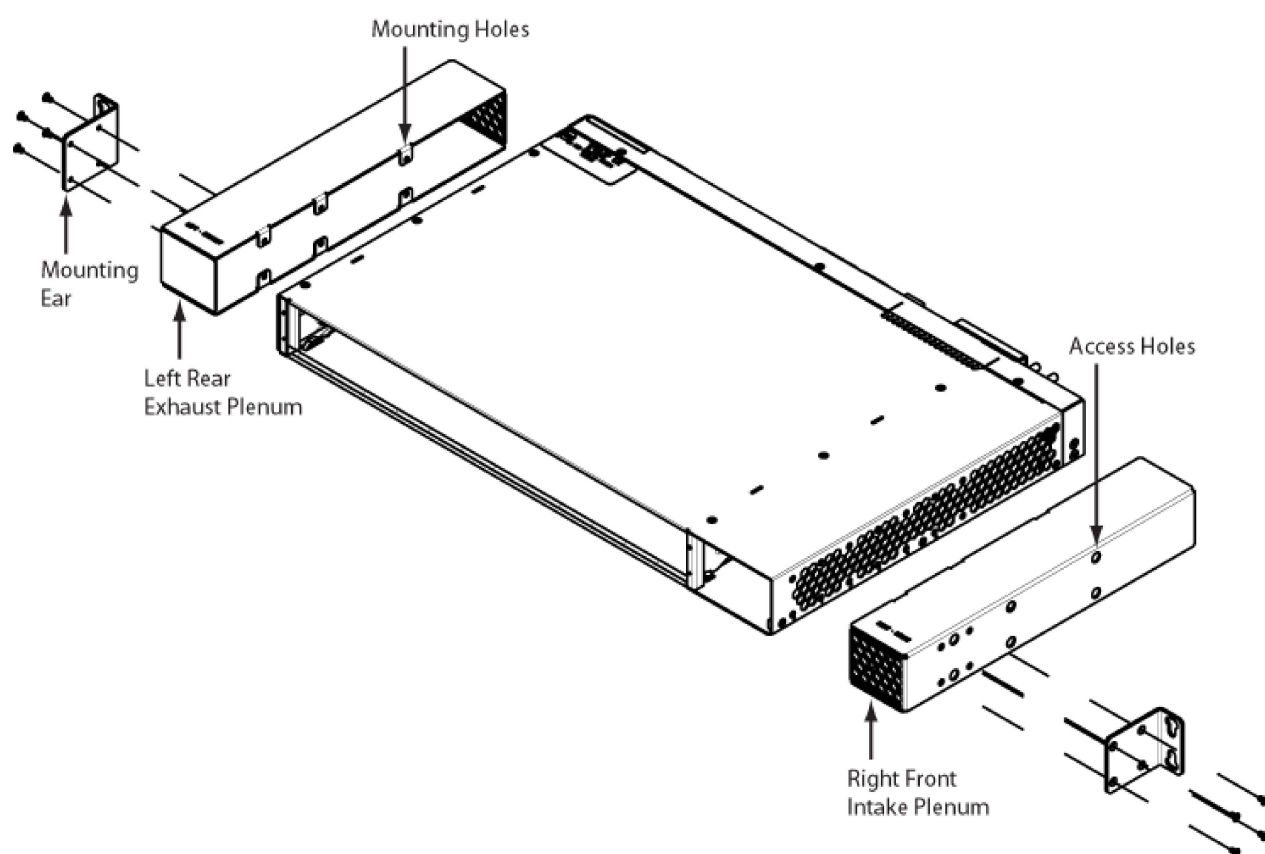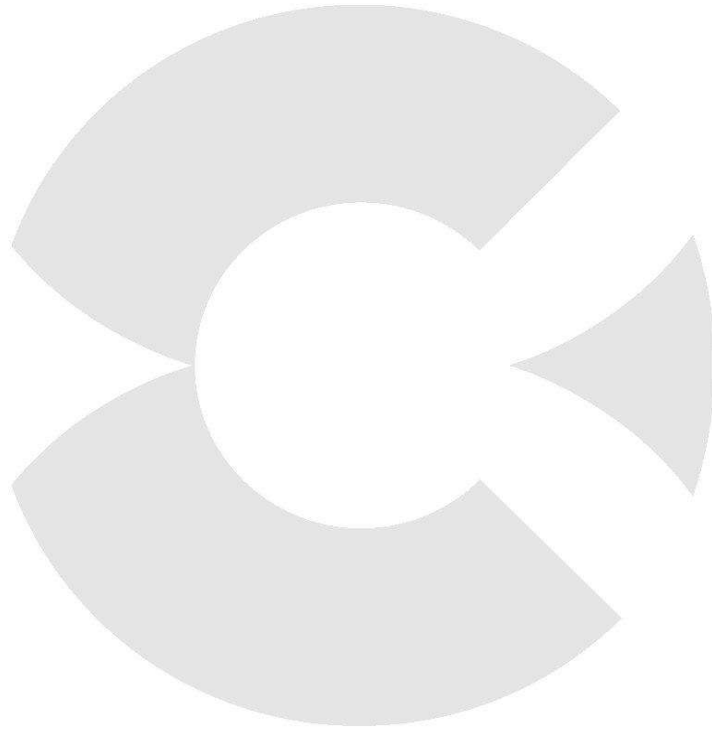
Chapter 4

Wiring the E7-2 Network Interfaces

This section describes how to wire out the Calix E7-2 network interfaces, including management, alarms, and service line interfaces.

Topics Covered

This section covers the following topics:

- Connecting the E7-2 management interfaces
- Wiring the E7-2 alarm and timing interfaces
- Connecting the E7-2 line interfaces

Connecting the E7-2 Management Interfaces

This section describes how to connect to the E7-2 management interface ports, including front and rear Ethernet management ports and RS-232 serial port.

Connecting to the Ethernet Management Ports

The Calix E7-2 is equipped with two out-of-band 10/100 Ethernet management ports (RJ-45 connectors). The front Ethernet management port is located on the E7-2 fan module (labeled **MGT-1**). The rear Ethernet management port is located on the E7-2 rear panel (labeled **MGMT-3**).

Use the front Ethernet port for (temporary) local Craft access to the E7-2. If you require a permanent out-of-band management connection to the E7-2, Calix recommends using the rear Ethernet management port to connect to the LAN.

Note: Use a standard 'straight-through' Ethernet patch cable to connect to the E7-2 Ethernet management ports.

Note: When you connect a disabled MGT port on the E7-2 to an Ethernet switch, the link status lights on the switch light up (yellow, and then green after 30 seconds). A link is established between the E7-2 and the switch, but the Management interface on the E7-2 is not enabled and no traffic will pass over the link.

To connect to the front Ethernet management port

1. Get a 'straight-through' Ethernet patch cable with RJ-45 connectors on both ends.

2. Connect the cable to the E7-2 front Ethernet management port (labeled **MGT-1**, located on the E7-2 fan module).

3. Connect the cable's other end to the Ethernet port on your PC.

For instructions to log in to the E7-2 management interface, refer to the *Calix E-Series (E7 OS) Turnup and Transport Guide.*

Use the rear Ethernet management port to establish a fixed out-of-band management connection to the E7-2.

To connect to the rear Ethernet management port

1. Get an Ethernet patch cable with RJ-45 connectors on both ends.

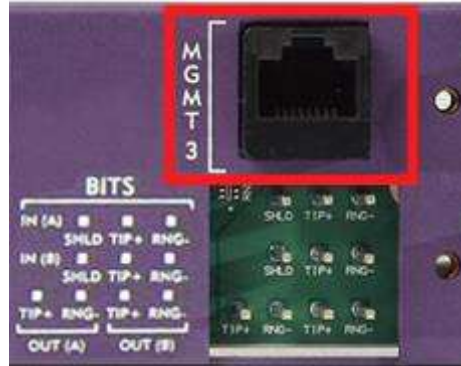2. Connect the cable to the E7-2 rear Ethernet management port (labeled **MGMT-3**, located on the E7-2 rear panel).

3. Connect the cable's other end to a LAN Ethernet hub or switch.

For instructions to log in to the E7-2 management interface, refer to the *Calix E7 User Guide*.

Connecting to the RS-232 Serial Port

The E7-2 has an RS-232 serial port that you can connect to a PC for console management connections. The serial port is located on the E7-2 fan module (RJ-11F connector).

Note: Calix provides an optional RS-232 console cable, or you may supply your own cable with an RJ-11 male connector on one end and a DB-9 female connector on the other end. See *RS-232 Serial Port Pins* (on page) for more information.

To connect to the RS-232 serial port

1. Get an appropriate RS-232 console cable (DB-9F to RJ-11M) to connect to the E7-2.

2. Connect the cable's RJ-11 end to the E7-2 serial port (labeled **MGT-4**, located on the E7-2 fan module).

3. Connect the cable's DB-9 end to your PC.

Use the following settings to establish a console connection from the serial port:

- Baud Rate - 38400
- Parity - None
- Stop Bits - 1
- Data Bits - 8
- Flow Control - None

For instructions to log in to the E7-2 management interface, refer to the *Calix E7 User Guide*.

Wiring the External Alarm and Timing Interfaces

This section describes how to wire external alarms and external (BITS) timing interfaces to the Calix E7-2. The E7-2 terminates its alarm and BITS timing interfaces via wire-wrap pins located on the E7-2 rear panel.

Wiring External Alarms

The E7-2 supports eight external alarm input/output (I/O) positions via wire wrap pins located on the E7-2 rear panel. The eight external alarm positions include seven inputs and one output position.
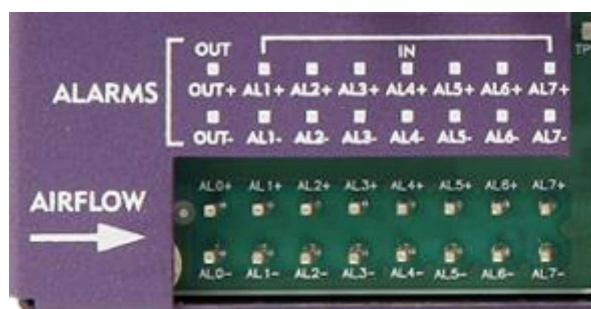
Output	Input						
OUT+	AL1+	AL2+	AL3+	AL4+	AL5+	AL6+	AL7+
OUT-	AL1-	AL2-	AL3-	AL4-	AL5-	AL6-	AL7-

Alarm Inputs (AL1 to AL7): You can configure the E7-2 alarm input positions to interface with up to (7) external input sources, typically for environmental alarm conditions. The input alarm contacts are Normally Open (default), and close when an alarm condition occurs. You can configure the alarm type and severity for each input from the E7-2 user interfaces.

Alarm Output (OUT): You can configure the E7-2 alarm output position to interface with external office alarm systems such as lights or horns. The output alarm contacts are Normally Open (default).

Note: Press the ACO button (located on the fan tray) to turn the external office alarm off; subsequent alarms will trigger the alarm again. Pressing the ACO button does not affect alarms in the system.

Wire the E7-2 external alarm input/output (I/O) positions as described below. Typically, alarm wiring consists of black and white wire pairs.

To wire external alarms

1. Get up to eight 24 AWG wire pairs of sufficient length to reach the far-end contacts from the E7-2.

2. At the E7-2 end, strip approximately one inch (2.54 cm) of insulation from the alarm wire ends.

3. Wire the E7-2 alarm inputs as follows:

   a. Connect a pair of alarm wires to the first input position (**AL1**):

      - Wrap the first wire (typically black) to the **AL1+** pin.

      - Wrap the second wire (typically white) to the **AL1-** pin.

   b. Repeat Step 3a for each additional alarm input to use (**AL2–AL7**), as required.

4. Wire the E7-2 alarm output position (**OUT**) as follows:

   - Wrap the first wire (typically black) to the **OUT+** pin.

   - Wrap the second wire (typically white) to the **OUT-** pin.

5. Route and dress the alarm wires out to the appropriate far-end interfaces and connect per local practice.

Refer to the *Calix E-Series Maintenance and Troubleshooting Guide* for supported environmental alarms and alarm provisioning information.

Wiring the BITS Timing Interface

The E7-2 supports synchronization with an external clock source via timing inputs located on the E7-2 rear panel. The E7-2 accepts a standard DSX-level timing source (DS1/T1 format only, not 64 kbps composite clock format) and should be set to ESF/B8ZS. Wire the E7-2 timing inputs to a Building Integrated Timing System (BITS) clock source using shielded cable.

Calix recommends providing traceable clock synchronization for E7-2 GPON applications.
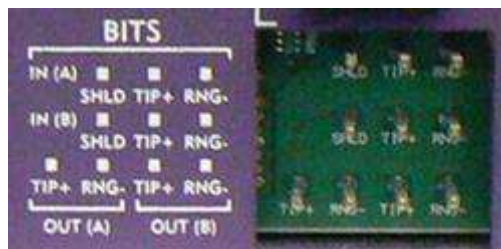
IN (A)	SHLD	TIP+	RNG-
IN (B)	SHLD	TIP+	RNG-
TIP+	RNG-	TIP+	RNG-
OUT (A)		OUT (B)	

You can link up to ten collocated E7-2 shelves to share a BITS timing input. Calix offers a connectorized daisy-chain BITS cable, or you can wire-wrap the individual daisy-chain links between shelves.

To wire the BITS timing input interface

1. Get up to two 24 AWG shielded 2-wire cables of sufficient length to reach the local BITS clock interface from the E7-2. Use one cable to provide a single timing input (A only), or two cables for a redundant input (A + B).

2. Strip approximately one inch (2.54 cm) of insulation from the wire ends.

3. Wire the E7-2 external timing input(s) as follows:

   a. Connect the timing wires to the E7-2 BITS **IN (A)** input position:

      • Wrap the positive (tip) wire to the **TIP+** pin.

      • Wrap the negative (ring) wire to the **RNG-** pin.

      • Wrap the cable shielding to the **SHLD** pin.

   b. To provide a redundant connection to the BITS clock source, repeat Step 3a to wire the E7-2 BITS **IN (B)** input position, as required.

4. Route and dress the timing input cable to the local BITS clock interface and connect per local practice.

To provide timing relays to one or more additional collocated E7-2 units, you can wire the E7-2 external timing output interface as described below.

To wire the BITS timing output interface

1. Get up to two 24 AWG shielded 2-wire cables of sufficient length to reach the next E7-2 shelf. Use one cable to provide a single link (A only), or two cables for a redundant link (A + B).

   Note: You can use the optional Calix-supplied BITS daisy-chain cable instead. See the note after Step 4 for installation instructions.

2. Strip approximately one inch (2.54 cm) of insulation from the wire ends.

3. Wire the E7-2 external timing output as follows:

   a. Connect the timing wires to the E7-2 BITS **OUT (A)** output position:

   - Wrap the positive (tip) wire to the **TIP+** pin.

   - Wrap the negative (ring) wire to the **RNG-** pin.

   b. To provide a redundant timing link to the next E7-2, repeat Step 3a to wire the E7-2 BITS **OUT (B)** position, as required.

4. Route and dress the timing output cable to next E7-2 and connect per the input wiring procedure above.

   Note: If you are using the Calix-supplied BITS daisy-chain cable, connect the **WW Pins Out** end to the BITS **OUT** pins on the upstream E7-2 unit, and connect the **WW Pins In** end to the BITS **IN** pins on downstream unit. Repeat for each additional daisy-chained E7-2 unit.

Connecting the E7-2 Line Interfaces

This section describes how to connect the Calix E7-2 line interfaces to the network.

Equipping the E7-2 interface ports

Calix E7-2 line cards use pluggable transceiver modules to provide interface connections, but the cards do not ship equipped with modules. You must install pluggable modules into the cards to equip the ports.

Calix offers a full suite of optical and copper pluggable modules to support a wide array of applications. The E7-2 10GE and GPON ports require only Calix-supplied modules, but E7-2 GE ports can use SFP modules from Calix or other suppliers, with some restrictions. Refer to the *Calix E7-2 Product Planning Guide* for complete details.

Note: When using SFP modules not supplied by Calix, you must use modules that comply with the SFP Transceiver MultiSource Agreement (MSA). See the Small Form Factor (SFF) committee INF-8074i specification Rev 1.0 for details.

Pluggable modules are available to support different facility types and connectors:

Port Type	Module Type	Interface Options
10GE	XFP	10GE (10 Gbps) optical
	SFP+	10GE (10 Gbps) optical
		10GE (10 Gbps) copper
GE	SFP*	GE (1000 Mbps) dual-fiber and single-fiber modules
		FE (100 Mbps) dual-fiber and single-fiber modules
		1000/100BaseT copper modules
GPON	OIM	2.4/1.2 Gbps PON optical

*All SFPs must be Class 1 laser devices in accordance with FDA regulation 21CFR 1040.10, 1040.11, and IEC 60825-1.

Note: For E7-2 deployments in outdoor/remote environments, be sure to use Industrial-rated (i-temp) modules.

Installing Pluggable Transceiver Modules

Install pluggable transceiver modules into the E7-2 line cards to equip the ports for optical or copper interface connections.

To install pluggable transceiver modules

1. Unpack the pluggable module. Remove the dust cover from the transceiver interface, if present.

2. Orient the module with the exposed PCB side facing down. Insert the module into an appropriate socket on an E7-2 line card as follows:

   - To equip 10GE ports:

     a. Insert XFP modules into sockets labeled **XFP 1** or **XFP 2**, as required.

     b. Insert SFP+ modules into sockets labeled **SFP+ 1** or **SFP+ 2**, as required.

   - To equip GE ports, insert SFP modules into sockets labeled **SFP 1** to **SFP 12**, as required.

   - To equip GPON OLT ports, insert GPON OIM modules into sockets labeled **GPON 1** to **GPON 4**, as required.

3. Press the module firmly into the socket until it clicks into place.

Once the module is installed, you can connect interface cables (fibers) to it. See *Connecting Fibers* (on page 42) for instructions.

Connecting Fibers

Once the E7-2 line card sockets are equipped with pluggable transceiver modules, you can connect fibers/cables to the ports as described below. Be sure the fiber connector type matches the connector type of the module(s).

If the laser at the far end of the fibers is enabled, you can use an optical power meter to test signal strength before connecting fibers to the equipment. Defer to local practice wherever applicable.

> **DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT.** Fiber optic radiation can cause severe eye damage or blindness. Do not look into the open end of an optical fiber.

To connect fibers to the E7-2

1. Route fibers (or copper Ethernet cables) to the E7-2 shelf, approaching from left side.

   Important: Route fibers to the left side of the E7-2 shelf to ensure visibility of system and card status LEDs located on the right side of the E7-2 shelf.

2. Remove the caps or plugs from the fiber connector ends, if present.

3. Connect fibers to transceiver modules on the E7-2 line card.

4. Repeat the steps above to connect additional fiber links, as required.

5. Neatly dress and secure all fibers/cables per local practice.

   Note: To avoid pinching or interference with the equipment, neatly coil or bundle any slack fiber and dress it toward the left side of the E7-2 shelf.

Connecting to the Copper Access Interfaces

To terminate subscriber line interfaces for copper access services (ex: VDSL2/POTS), connect 25-pair twisted pair cables with RJ-21 connectors to the Champ connectors on the rear of the E7-2 unit(s).

Cable assignments

The image below shows the RJ-21 connectors (Champ) identified on the rear of the E7-2.

The table below lists the cable assignments for a single-slot VDSL2 Combo card.

Interface Cable	Card	RJ-21 ID	Service	Protection Block Location	Subscriber Ports
Equipment 1	1	P1	DSL/POTS	1 (ports 1-24)	1-24
Equipment 1	1	P2	DSL/POTS	2 (ports 25-48)	25-48
Equipment 2	2	P3	DSL/POTS	3 (ports 1-24)	1-24
Equipment 2	2	P4	DSL/POTS	4 (ports 25-48)	25-48

The table below lists the cable assignments for a double-slot VDSL2 Overlay card.

Interface Cable	RJ-21 ID	Service	Protection Block Location	Subscriber Ports
Equipment 1	P1	DSL	1 (ports 1-24)	1-24
Equipment 1	P2	DSL	2 (ports 25-48)	25-48
Equipment 2	P3	POTS	3 (ports 1-24)	1-24
Equipment 2	P4	POTS	4 (ports 25-48)	25-48

Note: Calix equipment uses a 'dead pair' scheme, where the 25th pair in each 25-pair cable group is unterminated (dead). Therefore, on each protection block, positions 25 and 50 are not wired. Line identification labels cover the dead pair positions.

Guidelines

• Calix recommends using CAT5 cables to achieve optimal Signal to Noise (SNR) margins and performance.

- Calix recommends using 110-degree right exit Avaya 525e RJ-21 connectors on the CAT5 cables to avoid interference with the cables and adjacent connectors. Using an RJ-21 connector with a 90-degree exit on the back of the E7-2 shelf requires special attention. Only one side of the RJ-21 male connector can be secured with a screw; the other side of the connector must be secured with a cable tie wrap and cable tie mount (provided by Calix in the E7-2 field install kit). The head of the cable tie must align with the bottom edge of the connector to achieve a robust connection.

- Tighten the screws on each side of the RJ-21 connectors to no more than **3-4 inch-lbs of torque** (maximum) to secure subscriber cable RJ-21 connectors to the E7-2 shelf.

  As a best practice, do not over-tighten the screws when securing the RJ-21 connectors to the E7-2 chassis. Ensure that the RJ-21 connector is fully engaged to the connector on the rear of the chassis, and tighten screws only to secure the connector in place without applying excessive force.

To wire out the E7-2 subscriber line interfaces

1. Route the 25-pair equipment interface cables (RJ-21 connectors) to the rear of the E7-2 shelf.

2. On the rear of the E7-2, terminate the interface cable(s) for slot 1 to the RJ-21 connector labeled **P1** or **P2** and the interface cable(s) for slot 2 to the RJ-21 connector labeled **P3** or **P4**, as required for the installed line card(s). See *Cable assignments* above for more information.

   - For an RJ-21 male connector with a 110-degree exit, do the following:

     a. Insert the RJ-21 male connector into the female connector on the back of the E7-2 shelf.

     b. Tighten the screws on each side to 3–4 inch-lbs of torque to secure the connector.

- For an RJ-21 male connector with a 90-degree exit, do the following:

    a. Using a 4-40 screw, attach a cable tie mount to the right side of the shelf RJ-21 female connector as shown.

    b. Insert the RJ-21 male connector into the female connector on the back of the E7-2 shelf.

    c. Secure the connector by tightening the screw at the bottom of the connector to 3–4 inch-lbs of torque and attaching a tie wrap at the top of the connector.

Note: To provide a securely mated connection, be sure to align the head of the cable tie along the bottom edge of the connector as shown. Failure to install the cable tie correctly may result in an inadequate connection.
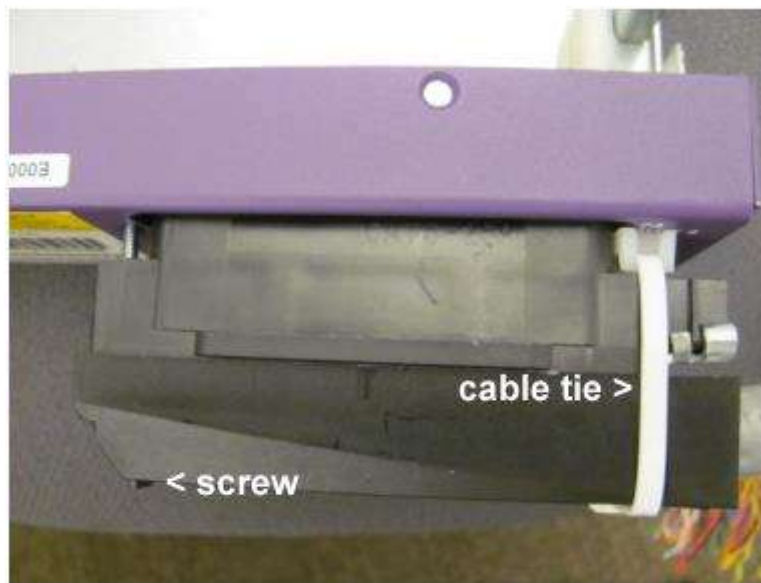
3. Dress the cable and secure them to the equipment rack (and cable tie bars) every 6–8 inches (15.24–20.32 cm) with cable ties or lacing cord.

For pin pair assignments, refer to *RJ-21 Pin Assignments* (on page).

Connecting Vectoring Control Links to a VCP Card

An xDSL System-Level Vectoring (SLV) configuration is supported on E7-2 VDSL2 r2 cards (standalone or modular chassis) with a dedicated external Vector Control Processor (VCP) where all nodes are running the same software version:

- Software version R2.5.20 or later for 192 vectored ports using the VCP-192 card
- Software version R2.6.00 or later for 384 vectored ports using the VCP-384 card

The VCP card (SLV-Host) is installed in an E7-2 chassis and connected to VDLS2 r2 cards (SLV Targets) in another chassis using a Vector Control Y-Cable (VCC).

For the connections on each Vectoring Control Y-cable:

- The VDSL2 r2 overlay cards configured for SLV are located across multiple chassis (modular chassis or standalone shelves).
- The VDSL2 r2 single-slot cards configured for SLV must be located in the same shelf.

To connect the Vector Control Y-Cable between the SLV Host and Targets

1. Connect the single-ended side of the VCC cables to the VCP front panel VC ports.
2. Connect the double-ended side of the cable's ends to the VCC ports on the front of the VDSL2 r2 cards.

Chapter 5

Maintenance

This chapter describes how to perform routine maintenance on worn or failed E7-2 equipment.

Topics Covered

This chapter covers the following topics:

- Replacing pluggable transceiver modules on E7-2 line cards
- Replacing an E7-2 line card
- Replacing the fan module
- Fan filter maintenance

Replacing Pluggable Transceiver Modules

Use the following procedure to replace a damaged or failed pluggable transceiver module.

DANGER! CLASS 1 LASER PRODUCT. INVISIBLE LASER RADIATION MAY BE PRESENT. Fiber optic radiation can cause severe eye damage or blindness. Do not look into the open end of an optical fiber.

To replace a pluggable transceiver module

1. Disconnect the fiber(s) from the module to replace, if present.
2. Remove the pluggable module from the E7-2 line card as follows:
   a. Unlock the latch on the module, if so equipped (latch styles vary).
   b. Gently pull the latch to unseat the module.
   c. Carefully slide the module out of the socket and set it aside.
3. Insert a replacement module into the vacant socket and re-connect fibers. See *Connecting the E7-2 Line Interfaces* (on page 41) for detailed instructions.

Replacing an E7-2 Line Card

Use the following procedure to replace a damaged or failed E7-2 line card.

⚠	**ESD ALERT!** Beware of electrostatic discharge. Follow standard ESD precautions. Always wear a grounded ESD wristband to avoid damaging the electronic equipment.

To replace an E7-2 line card

1. Disconnect all line interface cables (fibers) from the card to replace.

2. If the replacement card will reuse optics modules from the replaced card, remove all pluggable modules from the card.

3. Remove the line card from the E7-2 shelf as follows:

   a. On the card faceplate, pull the ejector lever open into the unlocked position to unseat the card.

   b. Carefully slide the card out of the slot, and place it in protective packaging. Return the faulty unit to Calix.

4. Insert a replacement line card into the vacant slot. See *Installing E7-2 Line Cards* (on page 25) for detailed instructions.

   Note: If you are not installing a replacement card, or no replacement card is available, install a Blank card into the vacant slot.

5. Install pluggable transceiver modules into the card and connect fibers as required. See *Connecting the E7-2 Line Interfaces* (on page 41) for detailed instructions.

Replacing the E7-2 Fan Module

Calix E7-2 fan modules are hot-swappable, so you can remove and install the fan module while the system remains powered.

Calix offers two fan module types—FTA and FTA2 (as indicated on the fan module faceplate). FTA supports two fan speeds. FTA2 supports four fan speeds with E7 release 2.2 or higher; in releases prior to 2.2, FTA2 supports two fan speeds.

Note: Do not leave a powered E7-2 operating for more than a few minutes without a fan module installed, to avoid overheating the system.

Use the following procedure to replace a damaged or failed fan module. Return the faulty unit to Calix.

To replace the fan module

1. Remove the fan module from the E7-2 housing as follows:

   a. Firmly grasp the fan module latch and slide it to the left, and then pull forward to unseat the module.

   b. Pull the fan module forward to remove it from the E7-2 chassis.

2. Insert a new fan module into the vacant slot.

3. Push the fan module back into the slot until the latch clicks into place, completely seating the module.

E7-2 Fan Filter Maintenance

The E7-2 fan module includes an air filter for use in indoor/office environments. The filter resides on the left side of the FTA, and on the right side of the FTA2.

The air filter is made of closed-cell fiber composite material and can be washed and replaced. Calix recommends conducting a visual inspection of the filter every three months. When the filter becomes visibly clogged with dust or dirt, the filter must be cleaned.

Note: Do not leave a powered E7-2 operating for more than a few minutes without a fan module installed, to avoid overheating the system.

To clean the air filter

1. Remove the fan module from the E7-2 housing as follows:

   a. Firmly grasp the fan module latch and slide it to the left, and then pull forward to unseat the module.

   b. Pull the fan module forward to remove it from the E7-2 chassis.

2. Remove the air filter from the fan module (located on the left side of the FTA or on the right side of the FTA2). For the FTA, the filter is green.

   The FTA2 is shown below.

3. Clean the filter as follows:

    a.   Using compressed air, spray the filter to remove loose dust particles from the surface.

    b.   Thoroughly wash the filter in soapy water, removing any trapped dust/dirt particles. Rinse the filter with water.

    c.   Pat dry the filter using an absorbent towel or cloth.

    d.   Spray the filter with compressed air to remove any remaining moisture on the outside of the filter.

Note: If the filter is badly worn, replace it with a new filter (available from Calix).

4. Reinstall the filter into the fan module, and then install the fan module into the E7-2 chassis.

Appendix

This appendix provides general reference information about the Calix E7-2 Ethernet service access platform.

Topics Covered

This appendix covers the following topics:

- E7-2 specifications
- E7-2 LED behavior
- ACO button operation
- RS-232 serial port pin assignments
- Fiber handling techniques

E7-2 Specifications

Specifications for the Calix E7-2 follow:

Dimensions	
Chassis	1.7 (H) x 17.5 (W) x 11.45 (D) inches 4.3 (H) x 44.5 (W) x 29.1 (D) cm

Weight	
E7-2 chassis only	5.9 lbs (2.7 kg)
E7-2 chassis with FTA E7-2 chassis with FTA + 2 line cards	7.4 lbs (3.4 kg) 11.5 lbs (5.2 kg)
E7-2 chassis with FTA2 E7-2 chassis with FTA2 + 2 line cards	7.0 lbs (3.2 kg) 11.1 lbs (5.0 kg)

Mounting	
Width	19-inch (48.26-cm) and 23-inch (58.42-cm) racks
Depth	Front (flush) mounting Center (projection) mounting, 5 depth options
Orientation	Horizontal and vertical mounting supported

Electrical	
Power input	-48 VDC redundant battery feeds (A and B) -42.5 VDC to -72 VDC input range
Fusing	7.5 Amps maximum (A and B)

Environmental	
Operating range	-40° C to +65° C (-40° F to +149° F) Humidity: 10 to 95% (non-condensing) Altitude: up to 10,000 feet (3049 m)
Storage range	-40° C to +85° C (-40° F to +185° F) Humidity: 5 to 95%
Heat dissipation (with 2 line cards)	Up to 185 Watts maximum
Fan module cooling capacity	FTA: 200 Watts, 108 CFM; (2) automatic variable fan speed operations
	FTA2: 200 Watts, 115 CFM; (4) automatic variable fan speed operations
	Note: FTA2 requires E7 release 2.2 or higher to support four fan speeds. In releases prior to 2.2, FTA2 supports two fan speeds.
Alarming	8 user definable alarm inputs (7 inputs, 1 output)

Compliance	
Compatibility, Electrical Safety, and Electromagnetic emissions criteria	UL/cUL 60950 European Union EN 60950 (CE Mark)
	EIA-310D
	FCC Part 15 Class A
	Network Equipment-Building System (NEBS) Level 3: Telcordia GR-63-CORE Telcordia GR-1089-CORE Telcordia GR-3028-CORE
	ETSI EN 300 019, ETSI 300 386

E7-2 LED Behavior

System status indicators

The Calix E7-2 fan module has four LEDs to indicate system alarm and operational status.

LED	Name	Color	Status	Description
CR	Critical	Red	On	A critical alarm is present in the system
			Off	No critical alarms are present in the system
MJ	Major	Red	On	A major alarm is present in the system
			Off	No major alarms are present in the system
MN	Minor	Amber	On	A minor alarm is present in the system
			Off	No minor alarms are present in the system
MGT	System Control	Green	On	An active E7-2 shelf controller (card) is present
			Off	No active E7-2 shelf controller (card) is present

Note: The E7-2 fan module also features a 7-segment LCD display (for future use).

Card status indicators

Each Calix E7-2 line card has three LEDs to indicate the card's operational status.

LED	Name	Color	Status	Description
FAIL	Failure	Red	On	A fault has occurred that should be addressed
			Off	Normal card operation
CTRL	Control	Green	On	This card is the active E7-20 shelf controller
		Amber	On	This card is the standby E7-20 shelf controller
SRVC	Service	Green	On	One or more ports are enabled and may carry services
			Off	No ports on this card are enabled

Note: LED behaviors are shown for the card's primary operational states. The card LEDs exhibit additional behaviors associated with boot up cycles and other activities. Refer to the *Calix E7 User Guide* for full details.

Port status indicators

Each interface port on an E7-2 line card has an LED located below its module socket to indicate port status. (E7-2 cards contain a mix of some or all port types listed below).

LED	Port	Color	Status	Description
XFP **(1, 2)**	10GE	Green	On	Indicates that an Ethernet link has been established
			Blinking	After module insertion, blinks (3) times to indicate the inserted module is recognized and allowed to operate Blinks at variable speeds to indicate the link is transmitting/receiving traffic
SFP+ **(1, 2)**			Off	Socket is vacant or an invalid module is inserted
		Red	On	Indicates a module has been inserted into a 10GE socket that is directed to the backplane for connectivity between two cards (Applies to **XFP 2** and **SFP+ 2** only)
SFP **(1–12)**	GE	Green	On	Indicates that an Ethernet link has been established
			Blinking	After module insertion, blinks (3) times to indicate the inserted module is recognized and allowed to operate Blinks at variable speeds to indicate the link is transmitting/receiving traffic
			Off	Socket is vacant or an invalid module is inserted
GPON **(1–4)**	GPON	Green	On	Indicates that at least one ONT is in service on the PON
			Blinking	After module insertion, blinks (3) times to indicate the inserted module is recognized and allowed to operate Blinks steadily while the first ONT on the port is ranging
			Off	Socket is vacant or an invalid module is inserted

ACO Button Operation

The E7-2 has an Alarm Cut Off (ACO) button located on the fan tray to turn off an external alarm. When the alarm output position (located on the E7-2 rear panel) is configured to interface with an external alarm system and an alarm is raised in the system, the environmental output pins short (close) and cause the external alarm (such as horns or lights) to start.

By default, major alarms and higher short the output pins, however you may provision the alarm severity via the user interface.

To turn the external alarm off, press the Alarm Cut-Off (ACO) button located on the fan tray; alarms raised in the system before the ACO button was last pressed are no longer considered, however a new alarm in the system will cause the external alarm to start again. The ACO button does not affect alarms in the system. The output pins affect the ACO button by default, and can be disabled via the user interface.

See *Wiring External Alarms* (on page 37) for more information.

RS-232 Serial Port Pins

The E7-2 RS-232 serial port enables console connections to the E7-2 CLI, accessible via an RJ-11 connector located on the E7-2 fan module (labeled **MGT-4**).

E7-2 Serial Port

RJ-11F Connector

RS-232 Signal (From E7-2)	Serial Port RJ-11F
TX	Pin 3
RX	Pin 4
GND	Pin 5

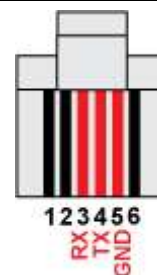Calix offers an RS-232 console cable (DB-9F to RJ-11M) to connect a PC to the E7-2 serial port. Alternatively, you may use the pin assignments below to make your own console cable, as required.

Console Cable

| RS-232 Signal (From PC)	PC End: DB-9F	E7-2 End: RJ-11M
RX	Pin 2	Pin 3
TX	Pin 3	Pin 4
GND	Pin 5	Pin 5
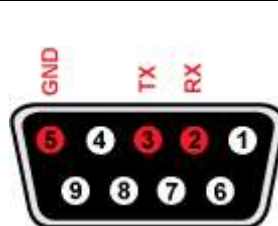
DB-9F Connector

RJ-11M Connector

RJ-21 Pin Assignments

This topic provides the RJ-21 connector pin assignments. To wire the Calix E7-2 for DSx services (e.g., VDSL2/POTS), use 25-pair cables with an RJ-21 male connector. Calix recommends that the RJ-21 connector on the 25-pair cables use a 110 degree exit or 90 degree exit (at pins 1 and 26).
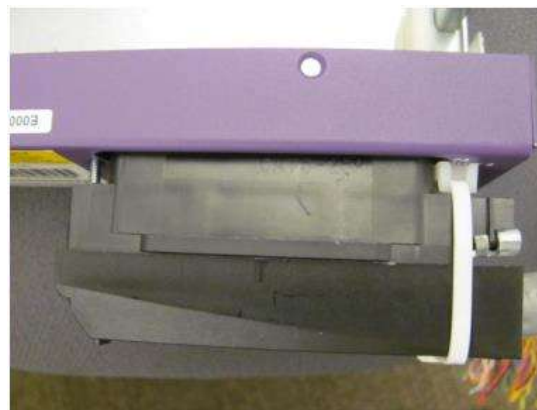
110-degree exit   90-degree exit

For instructions on installing an RJ-21 connector, see *Connecting to the Subscriber Interfaces* (on page 43).

Pin assignments

The E7-2 standard RJ-21 pinout assignments follow:

Pin	Color	Tip/Ring	Circuit		Pin	Color	Tip/Ring	Circuit
1	BL/WH	Ring	1		26	WH/BL	Tip	1
2	OR/WH	Ring	2		27	WH/OR	Tip	2
3	GN/WH	Ring	3		28	WH/GN	Tip	3
4	BR/WH	Ring	4		29	WH/BR	Tip	4
5	SL/WH	Ring	5		30	WH/SL	Tip	5
6	BL/RD	Ring	6		31	RD/BL	Tip	6
7	OR/RD	Ring	7		32	RD/OR	Tip	7
8	GN/RD	Ring	8		33	RD/GN	Tip	8
9	BR/RD	Ring	9		34	RD/BR	Tip	9

Pin	Color	Tip/Ring	Circuit		Pin	Color	Tip/Ring	Circuit
10	SL/RD	Ring	10		35	RD/SL	Tip	10
11	BL/BK	Ring	11		36	BK/BL	Tip	11
12	OR/BK	Ring	12		37	BK/OR	Tip	12
13	GN/BK	Ring	13		38	BK/GN	Tip	13
14	BR/BK	Ring	14		39	BK/BR	Tip	14
15	SL/BK	Ring	15		40	BK/SL	Tip	15
16	BL/YL	Ring	16		41	YL/BL	Tip	16
17	OR/YL	Ring	17		42	YL/OR	Tip	17
18	GN/YL	Ring	18		43	YL/GN	Tip	18
19	BR/YL	Ring	19		44	YL/BR	Tip	19
20	SL/YL	Ring	20		45	YL/SL	Tip	20
21	BL/VI	Ring	21		46	VI/BL	Tip	21
22	OR/VI	Ring	22		47	VI/OR	Tip	22
23	GN/VI	Ring	23		48	VI/GN	Tip	23
24	BR/VI	Ring	24		49	VI/BR	Tip	24
25	SL/VI		Not used		50	VI/SL		Not used

Fiber Handling Techniques

Fiber splices must be created with utmost care to minimize optical link budget losses. To ensure fiber splices are within optical link budget loss specifications, follow the suggestions below.

Important: Calix strongly recommends using the fusion splice method for all fiber splices.

Jacket preparation (OSP fiber)

Remove the jacket, buffer tubes and strength member using a wire stripper or cutting pliers. The plastic buffer coating should be removed with a high-quality wire stripper.

Fiber preparation

Proper preparation of the fiber end face is critical to any fiber optic connection. Perpendicularity and end finish must be within allowable tolerances in order to minimize signal loss at these connections. A divergence of as little as 2° from perpendicular should be considered unacceptable. The end finish should have a smooth, mirror-like finish free of blemishes, hackles, lips, and burrs.

Ends should be prepared using the scribe and break method. While holding the fiber under slight pressure, run the cutting tool across the stationary fiber at a perpendicular angle. Properly done, the cleave produces a perpendicular, mirror-like finish without hackles or lips. If major flaws are noticed, the process must be repeated. Inspect the fiber end under a microscope to ensure proper finish.

Small scratches on the face or small pits on the outside rim of the cladding are common and should be considered acceptable. Fusion splicer readings and experience more than anything determines the definition of "small."

Prior to putting the fiber ends into the fusion splicer, clean each end with pure optical grade isopropyl alcohol and a lint free pad such as Texwipe™ Alco Pad or Texwipe™ Cloth.

Cleaning fiber optic connectors

The process described here should not be applied routinely. This procedure should only be performed in cases where degraded performance of the assembly is noted or there is evidence of contamination. Excessive cleaning may increase the likelihood of fiber contamination.

Materials used for cleaning fiber-optic devices should be consistent with the function. Wiping cloths should be made of lint free, non-abrasive materials. Cotton swabs should have a tightly wrapped tip and be talcum-free. Pure optical grade isopropyl alcohol is the recommended solvent for cleaning connector tips. For removing dust from receptacles, a canned compressed gas is recommended.

Cleaning procedures

- Remove any accumulated dust or debris from the connector by blowing off the cylindrical and end-face surfaces of the connector using the compressed gas.
- Use a pad or a wipe saturated with optical-grade isopropyl alcohol to gently wipe the cylindrical and end-face surfaces.
- Use compressed gas to blow dry the connector surfaces or allow them to air dry.
- Avoid touching the connector surfaces after cleaning. If the connector is not going to be used, it should be covered with a dust cap to prevent contamination.

Handling of connectors

Although ruggedly constructed, fiber connectors should be handled with care during insertion. Follow these tips to make secure, long lasting connections:

- After removing the protective cap, make sure the fiber end remains clean and moisture free.
- Insert the connector into the fitting by grasping the rigid plastic fitting directly behind the fiber output shroud. The connection is fully seated when you hear it snap (click) into place.
- Never attempt to insert the connector by gripping the white or green flexible shroud. This may cause the fiber to kink in the jacket, introducing unwanted noise to the line.