Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

Product Number: 15454-FAP-4=

This document explains how to install, test, operate, and maintain the Cisco ONS 15454-FAP-4 fuse alarm panel.

This document includes the following sections:

- Safety Information
- Product Description
- Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel
- Testing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel
- Operating the Cisco ONS 15454-FAP-4 Fuse Alarm Panel
- Maintaining the Cisco ONS 15454-FAP-4 Fuse Alarm Panel
- Allowable Ampacities of Insulated Conductors
- Related Documentation
- Obtaining Documentation and Submitting a Service Request

Safety Information

Before you install, test, operate, and maintain the Cisco ONS 15454-FAP-4 fuse alarm panel, you must read the *Regulatory Compliance and Safety Information for Cisco Optical Transport Products* document for important safety information and warning translations.

The Cisco ONS 15454-FAP-4 fuse alarm panel is compliant with these warning statements:

Warning **Suitable for mounting on concrete or other non-combustible surface only.** Statement 345

Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than 150 A per module.** Statement 1005

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning **Take care when connecting units to the supply circuit so that wiring is not overloaded.** Statement 1018

Warning **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 131° F (55° C).** Statement 1047

Warning **This equipment is intended to be grounded to comply with emission and immunity requirements. Ensure that the switch functional ground lug is connected to earth ground during normal use.** Statement 1064

Caution Care should be given to allow sufficient air circulation or space between units when the fuse alarm panel is installed in a closed or multiunit rack assembly because the operating ambient temperature of the rack environment might be greater than room ambient.

Note The DC mains positive terminal must be connected to the ground at the source.

Product Description

The Cisco ONS 15454-FAP-4 fuse alarm panel supplies low-voltage DC power to the –48 VDC powered equipment installed in a central office, multimedia headend, remote site, or other restricted access locations. The fuse alarm panel provides the following basic functions and features:

- The line voltage regulation (LVR) function monitors the input voltage on each power bus and activates an alarm if the bus voltage drops below a threshold setting and deactivates the alarm if the bus voltage rises to a LVR alarm deactivation setting. For more information, see the "I/O Voltage and LVR" section on page 9.

- The alarm activation and deactivation voltage settings are field-adjustable. For more information, see the "Adjusting the Low Voltage Alarm Settings" section on page 27
- Two side-by-side independent power modules, designated A and B. Each power module provides two power buses with two power outputs per bus. The four buses are labeled A1, A2, B1, and B2. For more information, see the "Power Buses" section on page 8.
- Eight Transmit Power Amplifier (TPA) fuse holder receptacles (two per bus) providing mounting positions for eight fuses. For more information, see the "TPA Fuses" section on page 9.
- Maximum input rating of 75 A per bus and 50 A per fuse. This corresponds to a maximum input rating of 150 A for each dual-bus module and 300 A for the four-bus panel.
- OR-ing diodes provide isolation of the return paths for all bus circuits. For more information, see the "OR-ing Diodes" section on page 9.
- Mounting brackets provide the ability to mount the fuse alarm panel in a 23–inch (584.2 mm) WECO equipment rack. The fuse alarm panel occupies one rack space (2–inches, 50.8 mm).
- Wire-wrap pin terminals on each power module for alarm connections. For more information, see the "Alarm Operation and Connections" section on page 10.
- Set of power, LVR alarm, and fuse indicators for each power bus. For more information, see the "LED Indicators" section on page 7.
- Individual Fuse Alarm (red) indicators on each TPA fuse holder. These alarms indicate when the corresponding fuse has failed.
- Two chassis ground studs for reliable grounding of the fuse alarm panel. For more information, see the "Ground Connections" section on page 10.
- Easy to remove or replace plastic protective covers. These covers mount over the input and output terminal connections to prevent inadvertent contact with power.

Specifications

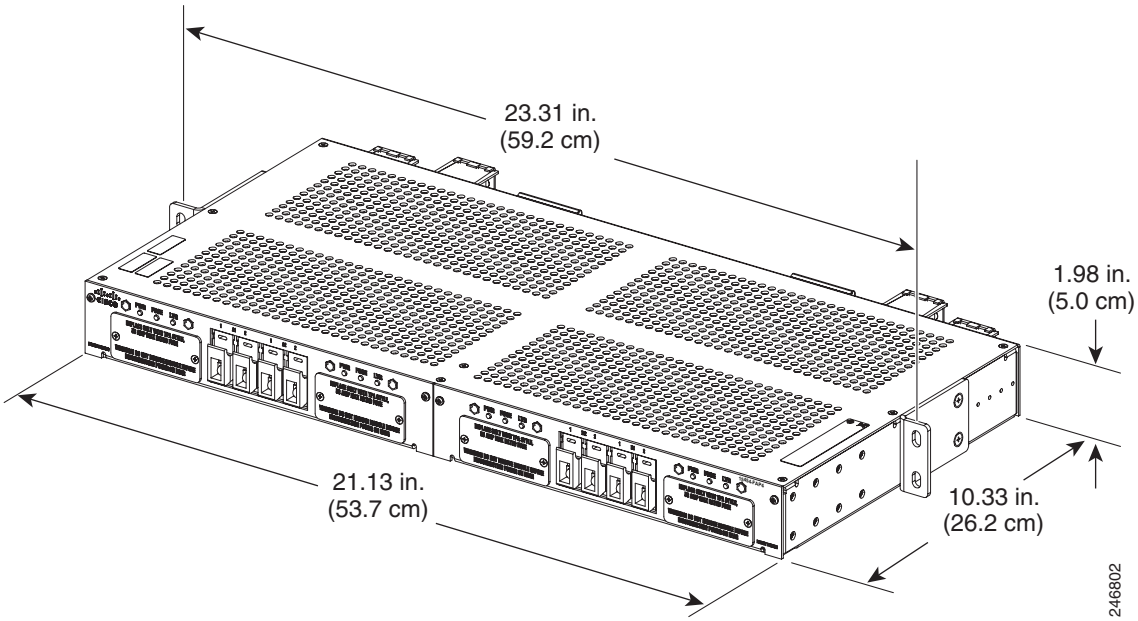
The Cisco ONS 15454-FAP-4 fuse alarm panel has the following specifications:

- Physical
  - Weight: 23.62 lbs. (10.71 kg)
  - Dimensions (HxWxD): 1.98 x 21.1 x 10.3 inches (50.3 x 536 x 262 mm)
  - Color: blue
  - Rack mounting: 23–inch (EIA or WECO hole spacing)
- Electrical
  - Operating voltage: –48 VDC nominal (input range: –30 VDC to –60 VDC)
  - LVR alarm activation setting (trigger): –39 VDC (adjustable)
  - LVR alarm deactivation setting (trigger): –43.5 VDC (adjustable)
  - Input current: 75 A per bus maximum (150 A for each dual-bus module)
  - Fuse type: TPA
  - Fuse mounting positions: Two per bus (total eight)
  - Maximum fuse size: 50 A rating
  - Input terminal type: Two hole compression lug (0.25–inch holes on 0.625–inch centers); maximum lug width 0.620–inches

  - Output terminal type: screw–down barrier terminal strip; 8–32, maximum lug width 0.378–inches
  - Alarm contact voltage: 110 VAC, 125 VDC maximum
  - Alarm contact current: 1 A maximum
  - Grounding connection: Two #10 grounding studs on 0.625–inch centers (ground wires are terminated at the ground studs using #10 ring terminals or 2-hole compression lug)
- Environmental
  - Operating temperature: –5º C to +55º C ((23º F to 131º F)
  - Storage temperature: –45º C to +85º C (–49º F to 185º F)
  - Humidity range: 0% to 95% humidity (no condensation)
  - Altitude range: up to 13,000 ft. (3.96 km)
  - Fire rating: all components UL94 V–0 or better
  - Acoustic noise: 0 dBA above ambient
- Torque
  - Mounting bracket chassis screws: 15 pound force–inches (1.7 Newton meters)
  - Mounting bracket rack screws: 27 pound force–inches (3.0 Newton meters)
  - Input power terminal nuts: 42 pound force–inches (4.75 Newton meters)
  - Output power terminal nuts: 15 pound force–inches (1.7 Newton meters)
  - Grounding stud nuts: 20 pound force–inches (2.3 Newton meters)
- Compliance
  - UL, NEC 2002, NEBS Level 3, IEC, and CE

Figure 1 shows the Cisco ONS 15454-FAP-4 fuse alarm panel dimensions.

Figure 1 Cisco ONS 15454-FAP-4 Fuse Alarm Panel Dimensions

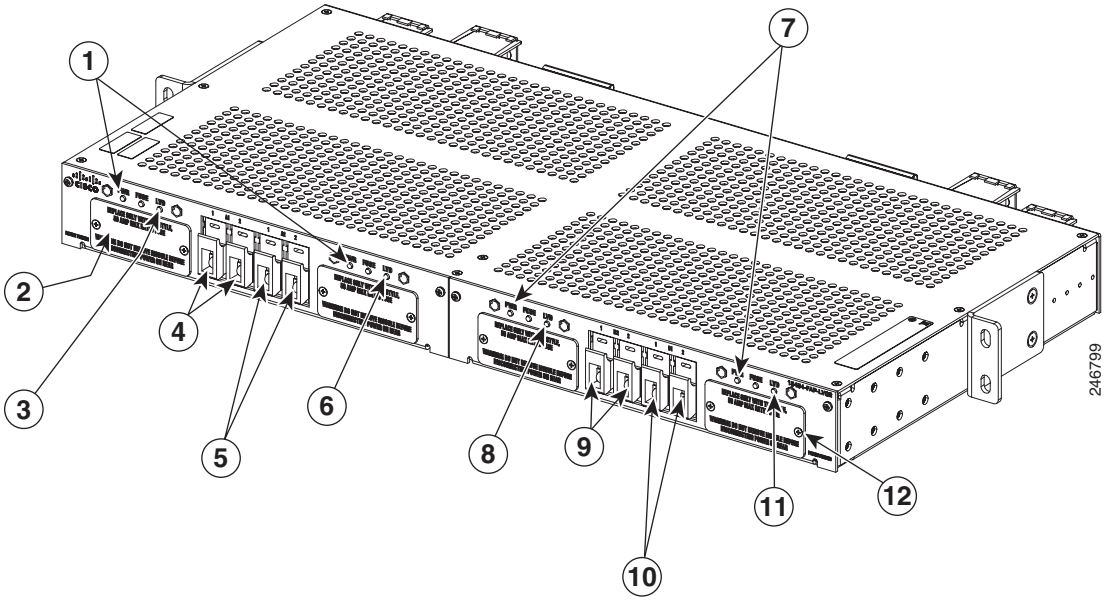


Cisco ONS 15454-FAP-4 Fuse Alarm Panel Components

The Cisco ONS 15454-FAP-4 fuse alarm panel consists of two side-by-side power modules, designated A and B. The two modules are mirror images of one another. Each module provides two power buses and holds four TPA fuses. In total, the fuse alarm panel provides four power buses with eight TPA fuses per panel. (See Figure 2.)

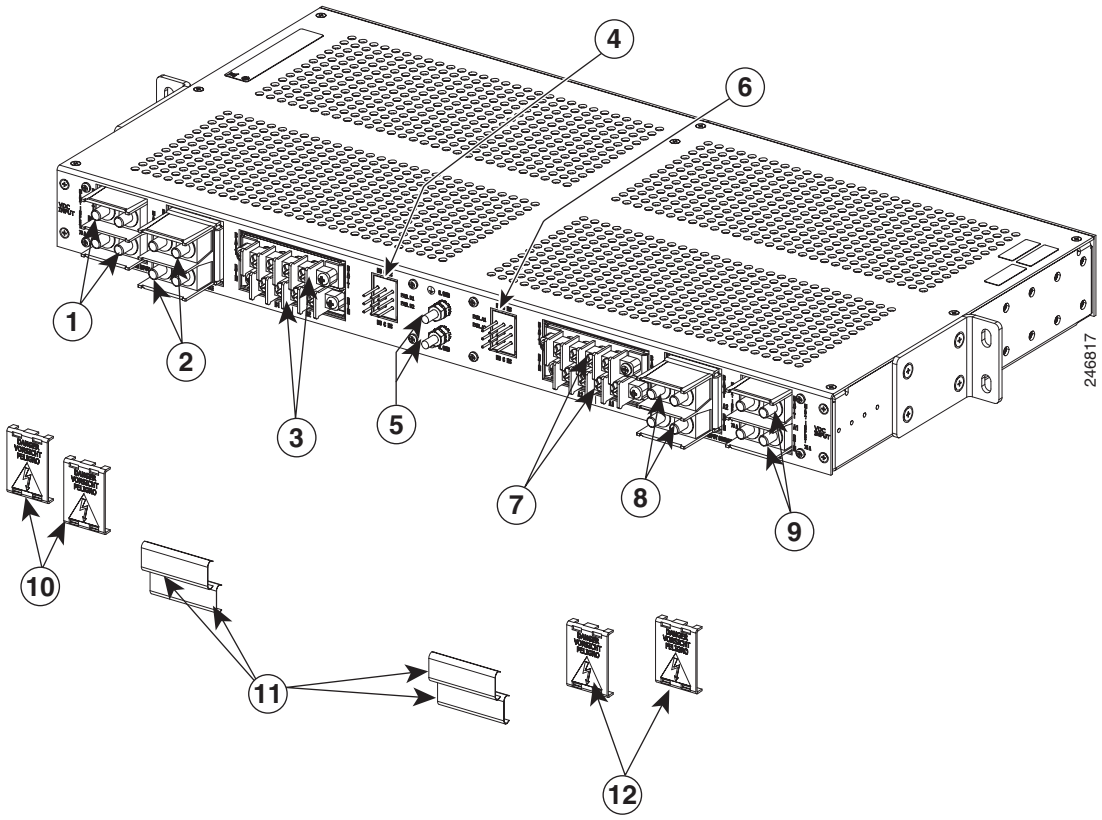
The fuse alarm panel components are either mounted on or housed within a powder-painted, sheet metal (cold rolled steel) enclosure, as shown in Figure 2 and Figure 3.

Figure 2 Cisco ONS 15454-FAP-4 Fuse Alarm Panel Components (Front View)



1	Circuits A1 and A2 power indicators	**2**	Circuits A1 and A2 designation card
3	Circuit A1 LVR alarm indicator	**4**	Circuit A1 fuse holder
5	Circuit A2 fuse holder	**6**	Circuit A2 LVR alarm indicator
7	Circuits B1 and B2 power indicators	**8**	Circuit B2 LVR alarm indicator
9	Circuit B2 fuse holder	**10**	Circuit B1 fuse holder
11	Circuit B1 LVR alarm indicator	**12**	Circuits B1 and B2 designation card

Figure 3 Cisco ONS 15454-FAP-4Fuse Alarm Panel Components (Rear View)



1	Circuit B1 power input terminals	**2**	Circuit B2 power input terminals
3	Circuit B1 and B2 power output terminals	**4**	Circuit B1 and B2 alarm terminals
5	Chassis ground studs	**6**	Circuit A1 and A2 alarm terminals
7	Circuit A1 and A2 power output terminals	**8**	Circuit A2 power input terminals
9	Circuit A1 power input terminals	**10**	Covers for B1 and B2 power input terminals
11	Covers for B1, B2, A1, and A2 power output terminals	**12**	Covers for A1 and A2 power input terminals

TPA fuse holders, TPA fuses, power indicators, and LVR alarm indicators are mounted on the front side of the fuse alarm panel. Each fuse holder also has an individual fuse alarm indicator to indicate if the fuse in that fuse holder has failed.

Power input and output terminals, alarm terminals, and ground studs are mounted on the rear side of the fuse alarm panel.

The plastic protective covers install over the input and output power terminals. The covers prevent accidental contact with the terminals when power is present in the fuse alarm panel.

The internal bus wiring, alarm relay circuit boards, LVR devices, and OR-ing diodes are mounted within the enclosure and are not user-accessible.

Packaged Hardware

The shipped product includes hardware components that are packaged separately and shipped with the Cisco ONS 15454-FAP-4 fuse alarm panel. These packaged hardware components and their quantity are:

- 5/16–inch long, Phillips drive, 8–32 flat-head screws (10 which includes 2 spares)—Used to secure the mounting brackets to the fuse alarm panel.
- 3/8–inch long, combination drive, 12–24 pan-head screws (4) and #12 flat washers (4)—Used to secure the panel mounting brackets to the equipment rack.
- #10 ring terminals (2) for 10–12 AWG wire—Used to connect the grounding cables to the grounding studs.
- Rear protective input terminal covers (4) and output terminal covers (4)—Used to prevent accidental contact with the power input and output terminals.
- Designation card and card holder (2)—Used to record information about the fused equipment. Cards and clear cover insert into the card holder.
- Designation window and designation strips—Used to record information about the input and output cable connections. These are stuck onto their holder on rear side of the fuse alarm panel.

Mounting Brackets

The Cisco ONS 15454-FAP-4 fuse alarm panel is shipped with mounting brackets configured for flush mounting in a 23–inch (584.2 mm) rack.

If required, the mounting brackets can be removed and reinstalled for flush mounting or for a recess of 1–inch (25.4 mm) or 5–inches (127 mm).

LED Indicators

Each power bus (A1, A2, B1, and B2) has a set of LED indicators, and are provided on the front side of the fuse alarm panel. The LED indicators are listed in Table 1.

Table 1 Cisco ONS 15454-FAP-4 Fuse Alarm Panel LED Indicators

Indicator Label	Color	Description
PWR	Green[1]	This indicator stays on (green) as long as electrical power is present in the corresponding power bus and turns off if the power is interrupted.
FUSE[2]	Red	This indicator turns on when the corresponding fuse fails. Replacement of the failed fuse with a good fuse will turn it off.
LVR	Red	This indicator turns on when the LVR device for the corresponding power bus activates the alarm due to a low voltage condition, which occurs when the input voltage is equal to or less than the LVR alarm activation setting. When the voltage level returns to the LVR alarm deactivation setting or greater, the indicator turns off.

1. This LED is lit in amber color if the unit is working in the –24VDC mode.
2. Separate fuse alarm (red) indicators are provided on each fuse holder.

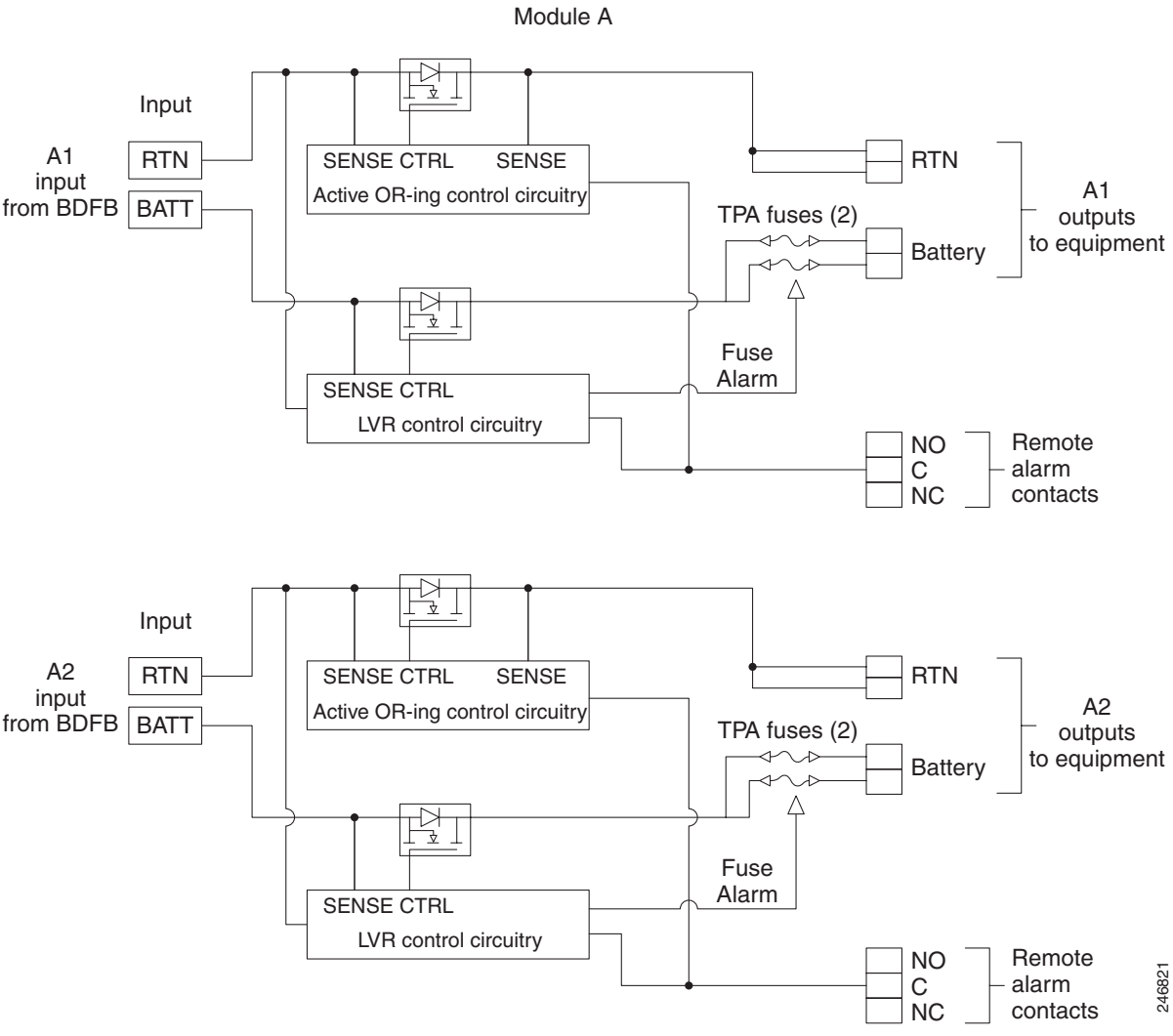
Power Buses

The fuse alarm panel has four power bus (power feed) circuits: A1 and A2 within the A module; B1 and B2 within the B module. The circuit block diagram is as shown in Figure 4. (Module A is shown; module B is analogous.) It displays, in each bus circuit, current flows from the input power terminals through the corresponding TPA fuses to the output power terminals (labeled A1, A2, B1, or B2).

The maximum current capacity of each power bus circuit is 75 A. The total output current capacity of any TPA on any of the power buses must not exceed a 50 A rated fuse. The maximum current rating is marked on the fuse alarm panel rear side.

When a TPA fuse on the power bus fails, the input power bus is disconnected from the corresponding output circuit. A fuse failure also causes the fuse alarm indicator on the front of the corresponding fuse holder to light up (red) and opens or closes a set of alarm relay contacts.

Figure 4 Module Schematic (Module A Shown)



TPA Fuses

The fuse alarm panel uses TPA fuses, which can range in rating from 3 A to 50 A. However, two fuses on the same bus cannot together total more than 75 A. The fuses install in fuse holders that insert into any one of the eight receptacles located on the front side of the fuse alarm panel. Each receptacle provides one fuse holder mounting position. Each power bus is fed through two fuse positions.

I/O Voltage and LVR

The Cisco ONS 15454-FAP-4 fuse alarm panel accepts an input voltage of –48 VDC nominal, within an input range from –30 VDC to –60 VDC.

The LVR function activates an alarm if the voltage on any bus drops below the set level called the LVR alarm activation setting. The setting for all buses is set at a default of –39 VDC (+/– 0.5 VDC) and is field-adjustable.

The LVR function also provides a separate alarm deactivation setting for each bus. This is the trigger point at which the LVR deactivates the alarm when the supply voltage on the bus has returned to a safe level. The setting for all buses is set at a default of –43.5 VDC (+/– 0.5 VDC) and is field-adjustable.

LVR adjustments are made using DIP switches. For information of LVR adjustment, see the "Adjusting the Low Voltage Alarm Settings" procedure on page 27.

Input Power Connections

Input power is supplied to the fuse alarm panel through the A1, A2, B1, and B2 input power terminal blocks, located on the rear side of the fuse alarm panel. Each input terminal block includes two pairs of 0.25–inch ground studs that are used to connect the BATT negative (–) and RTN positive (+) input power cables. Each pair of ground studs is mounted on 0.625–inch centers and accepts various sizes of 2-hole compression lugs and AWG wires. The maximum lug width is 0.62–inches. In selecting the copper wire size to be used for power input, consider the allowable ampacity as defined by local practice and the National Electrical Code (see Table 3).

Output Power Connections

Output power is supplied to the site equipment through the A1, A2, B1, and B2 output power terminal blocks, located on the rear side of the fuse alarm panel. The screw-down terminals are used to connect the BATT negative (–) and RTN positive (+) output power wiring to the equipment.

Each terminal block consists of four pairs of screw-down terminals equipped with 8–32 screws. The output power wires can be terminated with spade-type compression lugs (maximum width, 0.378–inches), or the insulation can be stripped back and the bare wire looped under the screw head. In selecting the copper wire size to be used for power output, consider the allowable ampacity as defined by local practice and the National Electrical Code (see Table 3).

OR-ing Diodes

The Cisco ONS 15454-FAP-4 fuse alarm panel is equipped with OR-ing diodes that are installed on the RTN positive (+) inputs to the four buses. The purpose of these OR-ing diodes is to provide isolation of the return paths of the bus circuits. In a situation where two of the bus circuits are combined together at

the equipment, this prevents both batteries from being drained if one battery short circuits. The isolated good battery continues to function, providing uninterrupted power. For a circuit diagram, see Figure 4. The operation of OR-ing diodes is fully automatic and no user adjustments are required.

Ground Connections

Two #10 studs are provided on the rear side of the Cisco ONS 15454-FAP-4 fuse alarm panel for attaching a grounding cable to the fuse alarm panel chassis. The grounding studs are mounted on 0.625–inch centers. A minimum #6 AWG copper wire terminated with a 2-hole compression lug is recommended for use as the grounding cable and is provided with the fuse alarm panel.

Alarm Operation and Connections

The Cisco ONS 15454-FAP-4 fuse alarm panel has a circuitry that opens and closes form C relay contacts when a fuse fails or when power to any one of the four power buses is lost. These relay contacts can be used to open or close a loop circuit connected to an external alarm system.

The physical interface to the relays is through two blocks of wire–wrapped pins (one for each module) located on the rear side of the fuse alarm panel. Each block has three rows of three pins labeled NO, C, and NC. The top row is used for Bus 1 failure, the middle row is used for Bus 2 failure, and the bottom row is not used.

During normal operation (when power is present), the normally open (NO) contacts remain open and the normally closed (NC) contacts remain closed. When a fuse fails, or when source power to a power bus is lost, the NO contacts close and the NC contacts open, creating a connection between the NO and common (C) terminals, and an open circuit between the NC and C terminals.

The wire–wrapped pins accept #22 to #24 AWG copper wire. The rating for the alarm relay contacts is 110 VDC (125 VAC maximum voltage) with 1.0 A maximum switching current.

Cooling

For cooling, the Cisco ONS 15454-FAP-4 fuse alarm panel relies on convection air flow. Holes are provided on the top and bottom of the fuse alarm panel to allow heated air to escape and cool air to enter. At least one rack unit of space or equivalent spacing must be provided above and below the fuse alarm panel to allow for air circulation.

Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This section describes how to install the Cisco ONS 15454-FAP-4 fuse alarm panel. The following topics are included in this section:

- General Installation Recommendations, page 11
- Unpacking and Verifying the Equipment, page 11
- Tools and Materials Required for Installation, page 11
- Testing Circuitry of the Cisco ONS 15454-FAP-4 Fuse Alarm Panel, page 12
- Mounting the Cisco ONS 15454-FAP-4 Fuse Alarm Panel on the Rack, page 13
- Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring, page 15

General Installation Recommendations

Follow these recommendations while installing the Cisco ONS 15454-FAP-4 fuse alarm panel.

- Install the fuse alarm panel in a central office, equipment cabinet, or other restricted access location.
- Mount the fuse alarm panel in the uppermost area of the rack to reduce the exposure of the power wiring.
- Provide at least one rack unit of space above and below the fuse alarm panel to allow for air circulation.
- Route all the cables to the fuse alarm panel according to local practice and procedures.
- Secure the routed cables to the equipment rack or to any cable management devices that are in use.
- Install the protective covers on the rear side of the fuse alarm panel after all wiring connections are made and all tests are completed.
- Do not apply power to the fuse alarm panel until all wiring and tests are completed.

For safety information, see the "Safety Information" section on page 1.

Unpacking and Verifying the Equipment

Before starting the installation, always open the shipping boxes and verify that all parts have been received and that no shipping damage has occurred. Check the Cisco ONS 15454-FAP-4 fuse alarm panel for broken or missing parts. If there is any damage, contact the Cisco Technical Assistance Center (TAC). You can submit a service request at http://tools.cisco.com/ServiceRequestTool/create/launch.do.

Tools and Materials Required for Installation

The following tools are required to install the fuse alarm panel:

- Phillips screwdrivers (#1 and #2)
- Flat-blade screwdrivers (medium and large)
- Torque wrench calibrated in pound force–inches or Newton meters
- 3/8–inch and 7/16–inch sockets (for torque wrench)
- Wire cutter
- Wire stripper
- Compression lug crimper
- Wire-wrap tool
- Multimeter
- Heat gun

The following materials are required to install the fuse alarm panel:

- Insulated copper wire for input and output power wires
- Two-hole compression lugs for terminating #6 AWG input wires or #6 AWG grounding wires (0.625–inches between centers)
- #6 copper wire for ground connections
- #22 to #24 AWG insulated copper wire for the wire-wrap pin terminal alarm wires.
- Heat-shrink tubing

Testing Circuitry of the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This procedure describes how to verify that the internal circuitry of the fuse alarm panel has not been damaged during shipping and handling.

Step 1 Complete the "Testing Input BATT to Input RTN" task on page 12.

Step 2 Complete the "Testing Alarm Terminals" task on page 13.

Step 3 Continue with the "Mounting the Cisco ONS 15454-FAP-4 Fuse Alarm Panel on the Rack" procedure on page 13.

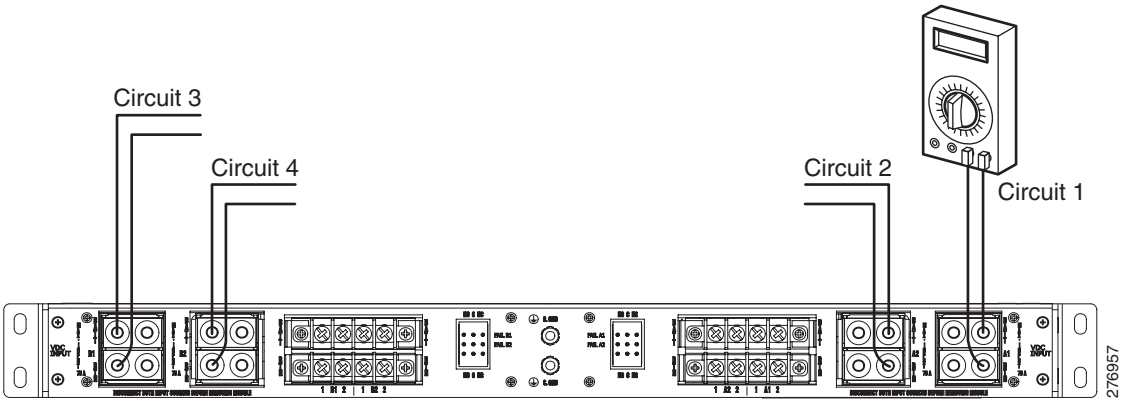
Stop. You have completed this procedure.

Testing Input BATT to Input RTN

This task describes how to check that there is no short between the input negative terminal and the input positive terminal on each bus circuit.

Step 1 Beginning at Bus A1, connect one test probe to the BATT input power terminal and the other test probe to the RTN input power terminal as shown in Figure 5.

Figure 5 Testing Input BATT to Input RTN



Step 2 Verify that no continuity exists between the input power BATT and RTN terminals. Reverse the test probe connections and verify that no continuity exists between the input power RTN and BATT terminals.

Step 3 Repeat the previous steps for each remaining bus (A2, B1, and B2).

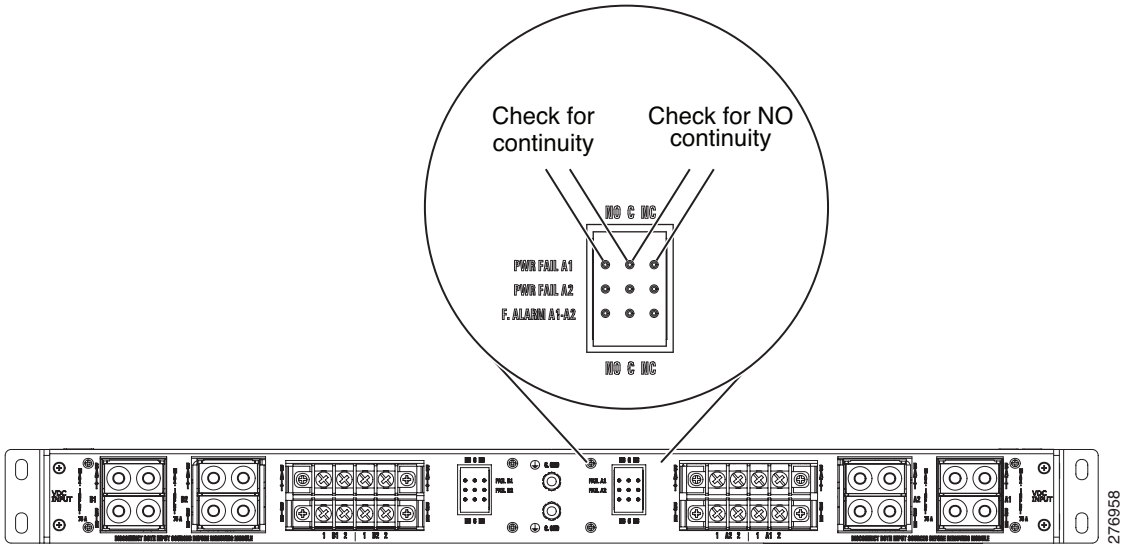
Step 4 Return to the "Testing Circuitry of the Cisco ONS 15454-FAP-4 Fuse Alarm Panel" procedure on page 12.

Testing Alarm Terminals

This task describes how to check the alarm relays to ensure that they are functioning correctly for each of the bus modules (A and B). In this task you will verify the status of the alarm indicator contacts. When no power is being supplied to the fuse alarm panel, the Normally Open (NO) contacts should be closed and the Normally Closed (NC) contacts should be open. When power is supplied to the fuse alarm panel, the states of the contacts will be as marked on the fuse alarm panel (NO will be open, NC will be closed).

Step 1 Starting at the power module A alarm terminals on the right rear side of the fuse alarm panel, connect the test probes between the C and NC terminals on the first set of alarm terminals, labeled FAIL A1 (Figure 6).

Figure 6 Testing Alarm Terminals



Step 2 Verify that no continuity exists between the C and NC terminals.

Step 3 Connect the test probes between the C and NO terminals on the first set of alarm terminals.

Step 4 Verify that continuity exists between the C and NO terminals.

Step 5 Repeat the previous steps for each set of alarm terminals (FAIL A2).

Step 6 Repeat the same test for power module B alarm terminals (FAIL B1, FAIL B2) on the left rear side of the chassis.

Step 7 Return to the "Testing Circuitry of the Cisco ONS 15454-FAP-4 Fuse Alarm Panel" procedure on page 12.

Mounting the Cisco ONS 15454-FAP-4 Fuse Alarm Panel on the Rack

This procedure describes how to install the Cisco ONS 15454-FAP-4 fuse alarm panel on the rack and perform related tasks such as installing the cable management bar.

Step 1 Complete the "Checking and Adjusting the Mounting Brackets" task on page 14.

Step 2 Complete the "Fastening the Cisco ONS 15454-FAP-4 Fuse Alarm Panel to the Rack" task on page 15.

Step 3 Continue with the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Stop. You have completed this procedure.

Checking and Adjusting the Mounting Brackets

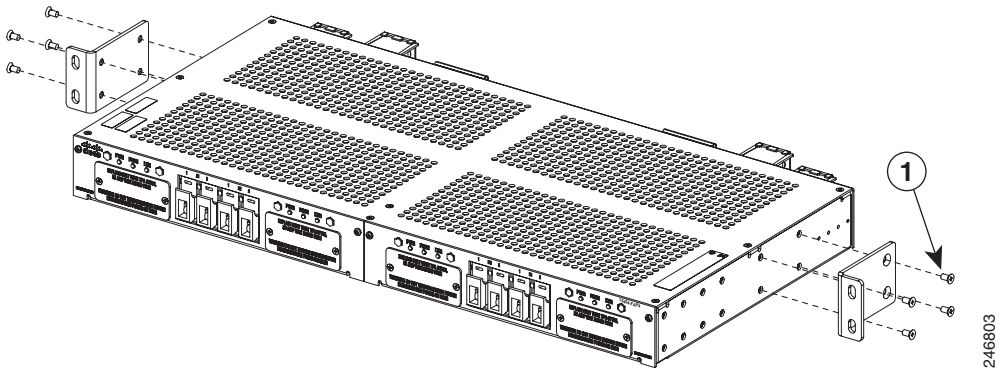
This task describes how to check the mounting brackets on the Cisco ONS 15454-FAP-4 fuse alarm panel to determine whether the default configuration is correct for the planned application. If not, reinstall the mounting brackets in the correct configuration.

Caution When attaching the mounting brackets to the fuse alarm panel, use only the 5/16–inch (7.94 mm) long flathead screws provided with the fuse alarm panel. Use of any other hardware could cause contact with internal parts of the fuse alarm panel.

Step 1 Determine whether the fuse alarm panel will be mounted as shipped in the flush position.

Step 2 If a flush mounting or recess of 1–inch or 5–inches is desired, remove the mounting brackets and install them in the desired position (Figure 7).

Figure 7 Installing Mounting Brackets on the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Chassis



1	5/16–inch (7.94 mm) 8-32 flat-head screws

Step 3 Attach the brackets to the side of the fuse alarm panel chassis using the eight 5/16–inch (7.94 mm) long Phillips–driven, 8-32 flathead screws provided with the fuse alarm panel.

Step 4 Tighten the screws to 15 pound force–inches (1.7 Newton meters) of torque to insure grounding.

Step 5 Return to the "Mounting the Cisco ONS 15454-FAP-4 Fuse Alarm Panel on the Rack" procedure on page 13.

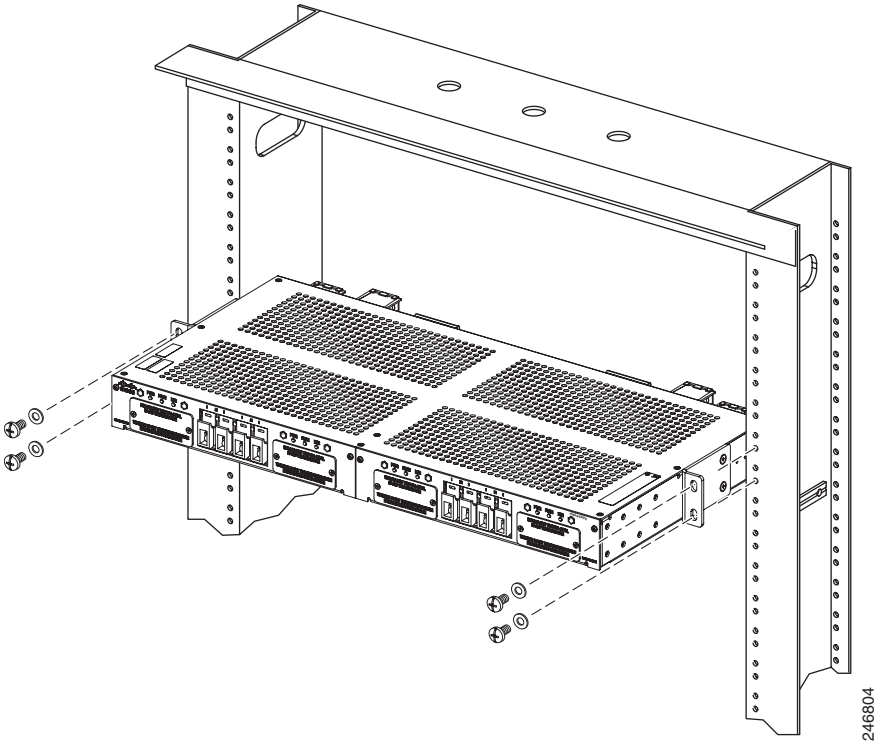
Fastening the Cisco ONS 15454-FAP-4 Fuse Alarm Panel to the Rack

This task describes how to install the Cisco ONS 15454-FAP-4 fuse alarm panel on the rack.

Step 1 Align the Cisco ONS 15454-FAP-4 fuse alarm panel with the rack (Figure 8).

Note Provide one rack unit of space or equivalent spacing above and below the fuse alarm panel for air circulation.

Figure 8 Fastening the Cisco ONS 15454-FAP-4 Fuse Alarm Panel to the Rack



Step 2 Fasten the fuse alarm panel to the rack using the four 3/8–inch (9.53 mm) long, Phillips-drive, 12-24 pan–head screws and four #12 flat washers provided with the fuse alarm panel.

Step 3 Tighten the screws to 27 pound force–inches (3.1 Newton meters) of torque to insure grounding.

Step 4 Return to the "Mounting the Cisco ONS 15454-FAP-4 Fuse Alarm Panel on the Rack" procedure on page 13.

Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring

This procedure describes how to wire the Cisco ONS 15454-FAP-4 fuse alarm panel for operation.

Caution All DC input wiring shall be routed away from any sharp edges and properly secured in place to prevent chaffing and to provide strain relief. This may be achieved by tie-wrapping the wires to the rack frame, or by equivalent means.

Step 1 Complete the "Installing Ground Wires" task on page 16.

Step 2 Complete the "Connecting Alarms" task on page 17.

Step 3 Complete the "Connecting the Output" task on page 18.

Step 4 Complete the "Connecting Input" task on page 20.

Step 5 Complete the "Installing the Protective Covers to the Cisco ONS 15454-FAP-4 Fuse Alarm Panel" task on page 21.

Step 6 Continue with the "Testing Power Indicators and Connection Polarity" procedure on page 22.

Stop. You have completed this procedure.

Installing Ground Wires

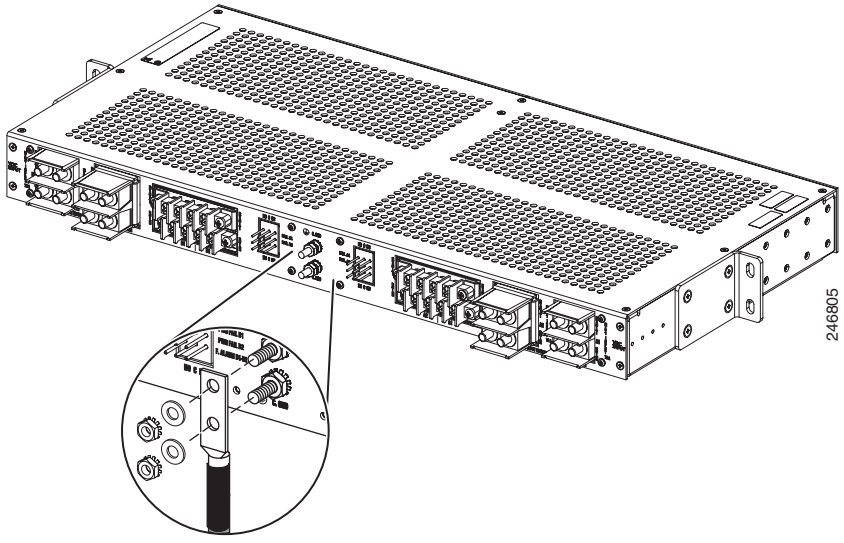
This task describes how to ground the Cisco ONS 15454-FAP-4 fuse alarm panel chassis to the office ground.

Step 1 Obtain a length of minimum # 6 AWG wire for use as the chassis grounding wire.

Step 2 Terminate one end of the wire with a 2-hole compression lug.

Step 3 Locate the C. GND (chassis ground) studs at the rear of the fuse alarm panel (Figure 9).

Figure 9 Installing Ground Wires



Step 4 Place the lug over the studs and secure using the kep nuts and washers provided (requires 3/8–inch socket). Tighten each stud nut to 20 pound force–inches (2.3 Newton meters) of torque.

Step 5 Route the free end of the chassis grounding wire to an approved office ground source. Terminate the wire at the ground source.

Step 6 Return to the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Connecting Alarms

This task describes how to connect an external alarm system to the alarm terminals on the Cisco ONS 15454-FAP-4 fuse alarm panel chassis.

Caution All DC input wiring shall be routed away from any sharp edges and properly secured in place to prevent chaffing and to provide strain relief. This may be achieved by tie-wrapping the wires to the rack frame, or by equivalent means.

Step 1 Obtain #22 to #24 AWG wire.

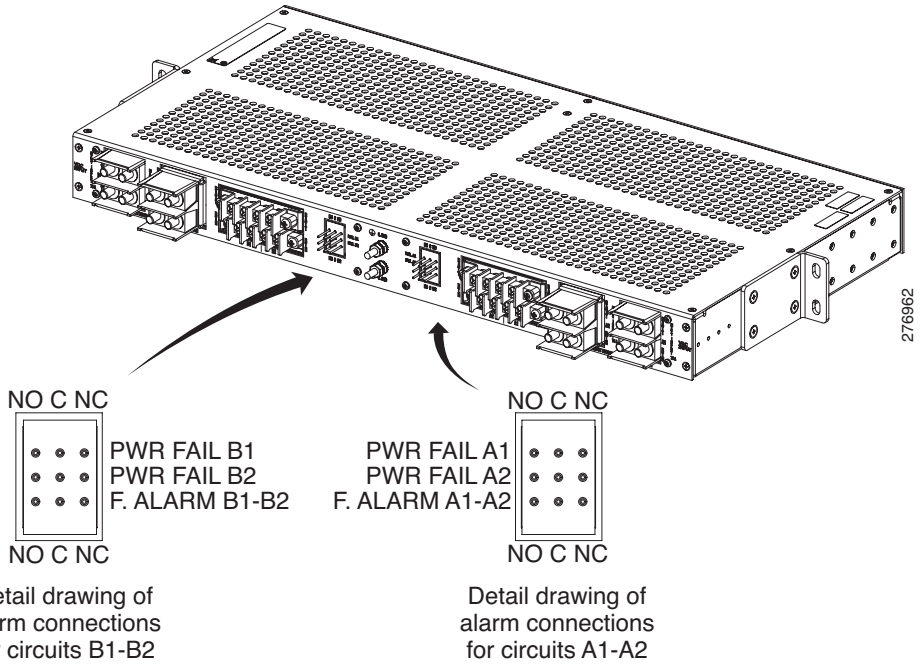
Step 2 Cut the wire into the number of pieces required, each of a length based on the distance from the Cisco ONS 15454-FAP-4 fuse alarm panel to the external alarm system.

Step 3 Strip back the insulation approximately 1.5–inches (38.1 mm) on each piece of wire.

Step 4 Using the wire–wrap tool, connect the individual pieces to the respective terminals.

Note Normally open (NO) and normally closed (NC) alarm contacts are provided for connecting the fuse alarm panel to an external alarm system. Alarm connections are provided through wire-wrap pins located on the rear side of the fuse alarm panel (Figure 10). Two blocks of terminals (one per module) are provided for reporting low voltage alarm and fuse fail alarms combined. The wire-wrap terminals can accept #22 to #24 AWG solid copper wire. The rating for the alarm relay contacts is 110 VDC (125 VAC maximum voltage) with 1.0 A maximum switching current

Figure 10 Connecting Alarms to the Cisco ONS 15454-FAP-4 Fuse Alarm Panel



Step 5 Route the wires to the external alarm system.

Step 6 Terminate the wires at the appropriate terminals in the external alarm system.

Step 7 Return to the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Connecting the Output

This task describes how to connect the Cisco ONS 15454-FAP-4 fuse alarm panel to the protected equipment.

Caution All DC input wiring shall be routed away from any sharp edges and properly secured in place to prevent chaffing and to provide strain relief. This may be achieved by tie-wrapping the wires to the rack frame, or by equivalent means.

Caution Connecting the equipment to the wrong circuit may cause damage to the equipment or the fuse alarm panel. Make sure the fuse is the correct type and current rating as specified by the equipment manufacturer.

Note The continuous output load of the equipment during normal operation should not exceed 80% of the rated value of the fuse. This allows some room for manufacturing tolerances and voltage fluctuations in the plant power mains.

Step 1 Obtain the required lengths of wire for use as the output power cables.

Output power is supplied to the fused equipment through the output power terminal blocks, equipped with 8-32 screws. The output power wires may be terminated with spade-type compression lugs (maximum width 0.378–inches), or the insulation may be stripped back and the bare wire looped under the screw head. In selecting the copper wire size to be used for power output, consider the allowable ampacity as defined by local practice and the National Electrical Code (Table 3).

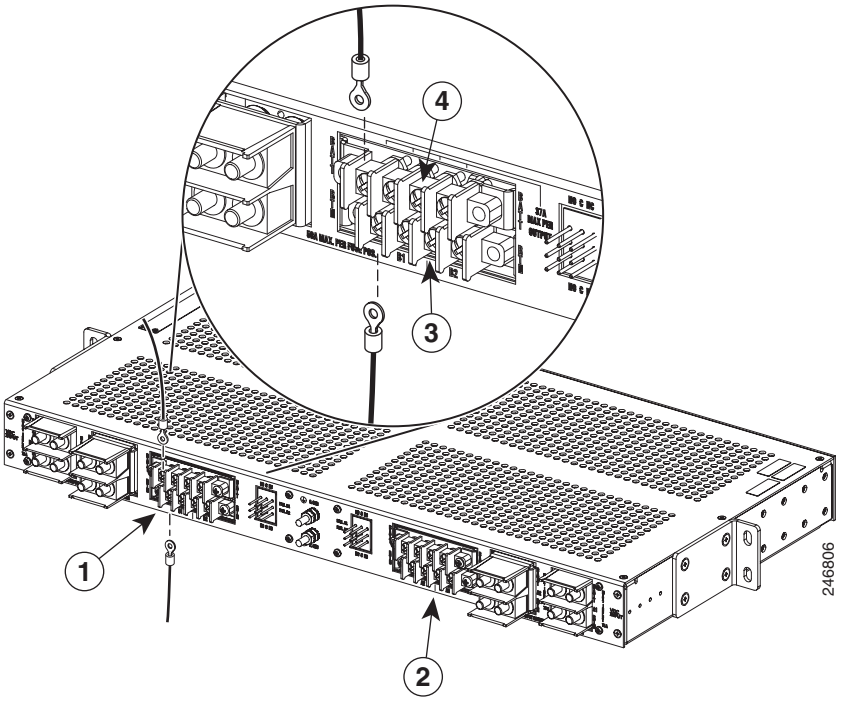
Step 2 Equip wire leads with ring-type compression lugs (maximum width 0.378–inches) or prepare a bare wire contact.

Step 3 Terminate the wires at the screw-down barrier strip as follows:

- **Negative wires (Battery –)**: Connect to the BATT output power terminals.
- **Positive wires (Return +)**: Connect to the RTN output power terminals.

Figure 11 shows a connection using ring-type compression lugs.

Figure 11 Connecting Output Power to the Cisco ONS 15454-FAP-4 Fuse Alarm Panel



1	Circuit B1 and B2 power output terminals	**2**	Circuit A1 and A2 power output terminals
3	Power return terminals	**4**	Power feed terminals

Step 4 Tighten the output power terminal block nuts to 15 pound force–inches (1.7 Newton-meters) of torque.

Step 5 Route the free end of each output power cable to the equipment for connection.

Step 6 Return to the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Connecting Input

This task describes how to connect the Cisco ONS 15454-FAP-4 fuse alarm panel to the input power source.

Caution All DC input wiring shall be routed away from any sharp edges and properly secured in place to prevent chaffing and to provide strain relief. This may be achieved by tie-wrapping the wires to the rack frame, or by equivalent means.

Caution Connect only the input voltage wire (the wire labeled BATTERY or BATT, or labeled with the negative [–] voltage polarity or the voltage value or both) to the connector on the fuse alarm panel labeled BATT. Connect only the input return wire (the wire labeled RTN, RETURN, or BATTERY GROUND, or labeled with the positive [+] voltage polarity) to the connector on the fuse alarm panel labeled RTN.

Caution Caution should be taken not to reverse the input wires to the fuse alarm panel. Within the fuse alarm panel, the internal return wiring is not protected by fuses. If the wires are reversed, current flows through the unprotected return wiring in the fuse alarm panel to the equipment. This condition can cause damage to the equipment in the frame in which the fuse alarm panel is installed and to the equipment in adjacent frames.

Step 1 Obtain eight lengths of copper wire for use as the input power cables.

Input power is supplied to the fuse alarm panel through the A1, A2, B1, and B2 input power terminal blocks located on the rear side of the fuse alarm panel. Each input terminal block consists of two pairs of 0.25–inch studs that are used for connecting the negative (BATT) and positive (RTN) input power cables. The stud pairs are mounted on 0.625–inch centers and accept 2-hole compression lugs. The maximum lug width is 0.625–inches. Kep nuts are provided to secure the compression lugs to the terminal block.

In selecting the copper wire size to be used for power output, consider the allowable ampacity as defined by local practice and the National Electrical Code (Table 3).

Step 2 Strip back 7/8–inches of insulation from one end of each wire.

Step 3 Slide a 2–inch length of heat shrink insulation over the end of each wire.

Step 4 Terminate one end of each wire with the 2-hole lug terminals provided (requires crimper).

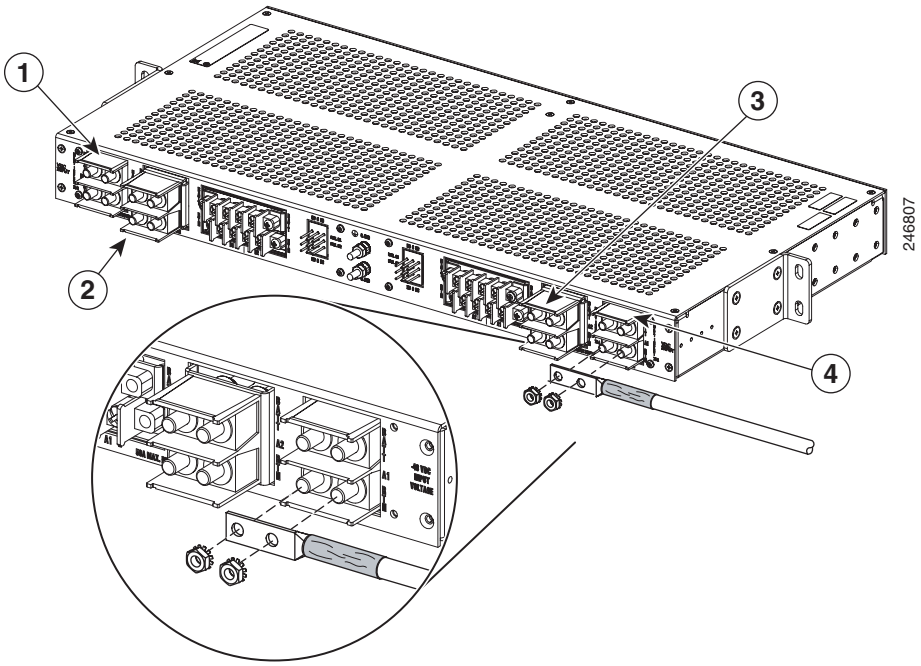
Step 5 Slide the heat shrink insulation down to the lug terminal so that the barrel end of the terminal is covered.

Step 6 Use a heat gun to apply heat to the heat shrink insulation until it tightens around the wire and barrel end of the terminal.

Step 7 Form each input cable into the shape required for connection to the input terminals and secure to side of rack.

Step 8 Use the kep nuts provided to secure the input power wires to the specified terminals (Figure 12).

Figure 12 Connecting Input Power to the Cisco ONS 15454-FAP-4 Fuse Alarm Panel



1	Circuit B1 power input terminals	**2**	Circuit B2 power input terminals
3	Circuit A1 power input terminals	**4**	Circuit A2 power input terminals

Step 9 Connect the negative inputs to the negative (BATT) terminals on the A1, A2, B1, and B2 input power terminal blocks.

Step 10 Connect the positive inputs to the positive (RTN) terminals on the A1, A2, B1, and B2 input power terminal blocks.

Step 11 Use a torque wrench (with a 7/16–inch socket) to tighten the input power terminal block nuts to 42 pound force–inches (4.75 Newton meters) of torque.

Step 12 Route the free ends of the input power cables to the office battery source.

Step 13 Connect the input power cables to the office battery power source in accordance with applicable local electrical codes and National Electrical Codes. Do not apply power to the fuse alarm panel until instructed to do so for testing (see the "Testing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel" section on page 22).

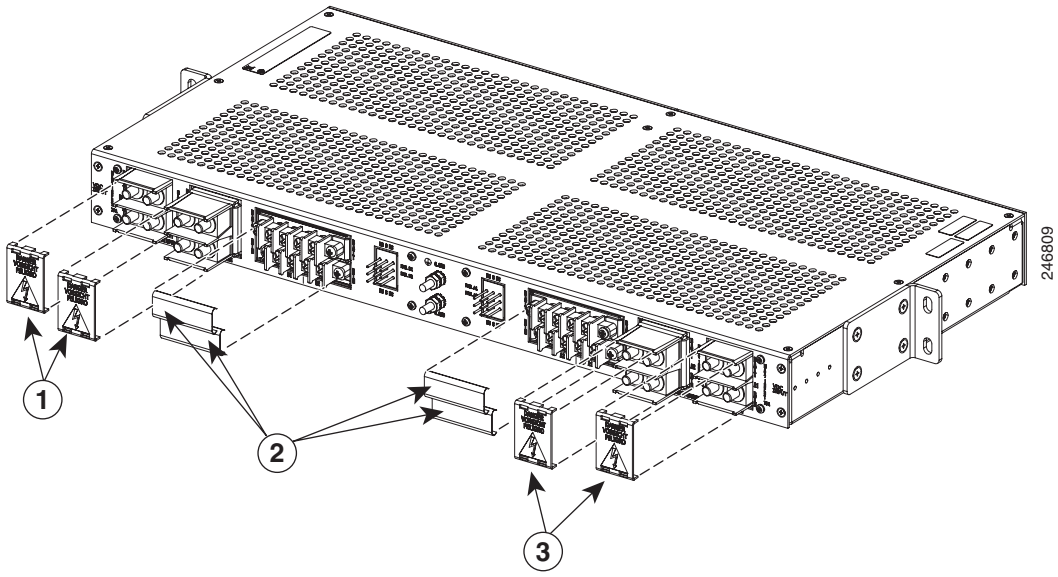
Step 14 Return to the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Installing the Protective Covers to the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This task describes how to install the protective covers on the input and output power terminals.

Step 1 Align the protective covers with the input and output terminals (Figure 13).

Figure 13 Installing Protective Covers on the Input and Output Power Terminals



1	Covers for B1 and B2 power input terminals	**2**	Covers for B1, B2, A1, and A2 power output terminals
3	Covers for A1 and A2 power input terminals		—

Step 2 Snap the covers into position.

Step 3 Return to the "Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel Wiring" procedure on page 15.

Testing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This section describes how to test the Cisco ONS 15454-FAP-4 fuse alarm panel after installation.

The following topics are included:

- Testing Power Indicators and Connection Polarity, page 22
- Testing Alarm Contacts in Normal State, page 23
- Test Failed Fuse Alarm, page 23

Testing Power Indicators and Connection Polarity

Perform the following procedure to verify that the power LEDs indicate receipt of power and that the input power cables are connected for correct polarity.

Step 1 Verify that any fuses installed during preinstallation testing have been removed,

Step 2 Verify that the input power cables are connected to the correct terminals.

Step 3 Turn on the power supply (all four sources) to the fuse alarm panel.

Step 4 Verify that the power indicators for all circuits are switched on.

Step 5 Use a multimeter (set to measure DC voltage) to measure the voltage between each input power RTN terminal and chassis ground. The voltage level should be less than 2.0 VDC.

Step 6 If the voltage is more than 2.0 VDC, perform the following to verify and reduce the voltage level to less than 2.0 VDC:

a. Check the voltage between the power terminal and chassis ground.

b. Turn off the power supply from the panel and reverse the input power wires. Turn on the power supply and again measure the voltage between each RTN input power terminal and the chassis ground.

Stop. You have completed this procedure.

Testing Alarm Contacts in Normal State

The following procedure describes how to test the alarm connections for correct functioning of the NO and NC terminals.

Step 1 Verify that the alarm contacts remain in the normal state when power is applied and no fuse alarms are present.

Step 2 Using a multimeter that is set to test for continuity, connect the probes alternately between the C and NC terminals and the C and NO terminals for all sets of alarm terminals.

Step 3 Verify that continuity exists between the C and NC terminals and that no continuity exists between the C and NO terminals.

Stop. You have completed this procedure.

Test Failed Fuse Alarm

The following procedure describes how to test correct functioning of the failed fuse alarms.

Step 1 Remove the TPA fuse holder from Bus A1.

Step 2 Install a failed TPA fuse into the fuse holder.

Step 3 Reinstall the fuse holder (with the failed TPA fuse) in the fuse alarm panel.

Step 4 Verify that the red fuse alarm indicator on the fuse holder is switched on (is lit red).

Step 5 Locate the alarm terminals labeled A1 FAIL at the rear side of the fuse alarm panel.

Step 6 Connect the probes alternately between the C and NC terminals and the C and NO terminals.

Step 7 Use a multimeter (set to test continuity) between the C and NO terminals and that no continuity exists between the C and NC terminals.

Step 8 Remove the TPA fuse holder (with the failed TPA fuse) from bus A1 and reinstall a good fuse.

Step 9 Repeat steps 1 through 8 for the remaining buses (A2, B1, and B2). Verify that the red fuse alarm indicator on the fuse holder lights up as the failed fuse is installed in the fuse alarm panel. In addition, locate the appropriate FAIL (A1, B1, B2) terminals on the rear side of the fuse alarm panel. Use a multimeter (set to test continuity) to verify that continuity exists between the C and NO terminals and that no continuity exists between the C and NC terminals.

Step 10 When testing is complete, make sure the failed fuse used for testing is removed and replaced with good fuses in all the tested positions.

Stop. You have completed this procedure.

Operating the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This section describes how to operate the Cisco ONS 15454-FAP-4 fuse alarm panel.

The following topics are included:

- Install TPA Fuse, page 24
- Connecting New Equipment, page 26
- Adjusting the Low Voltage Alarm Settings, page 27

Install TPA Fuse

This procedure describes how to install a TPA fuse.

Caution Using the wrong fuse can cause damage to the protected equipment or the power distribution panel. When replacing a blown fuse, make sure the fuse-type and current rating of the replacement fuse complies with any recommendations provided by the manufacturer of the protected equipment and does not exceed 50 A**.** Also, make sure that the two fuses installed for any bus do not total more than 75 A. The fuse rating must be chosen according to the protected equipment requirements.

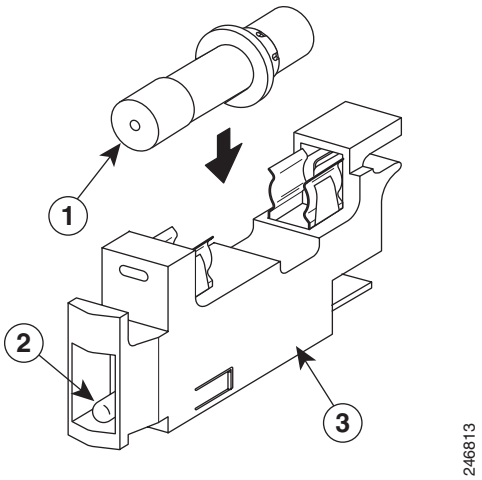
Note The continuous output load of the equipment during normal operation should not exceed 80% of the rated value of the fuse. This allows some room for manufacturing tolerances and voltage fluctuations in the plant power mains.

Step 1 Obtain a TPA fuse of the recommended size and type (as specified by the equipment manufacturer) in each fuse position as needed. The current rating of the fuse (in amps) is indicated on the fuse.

Step 2 Remove the fuse holder from the fuse alarm panel by pulling outward on the fuse holder handle until it comes free of the fuse alarm panel.

Step 3 Insert the TPA fuse into the two clips on the top side of the fuse holder as shown in Figure 14. Note that the plastic ring around the center part of the fuse fits into a recess provided in the top of the fuse holder.

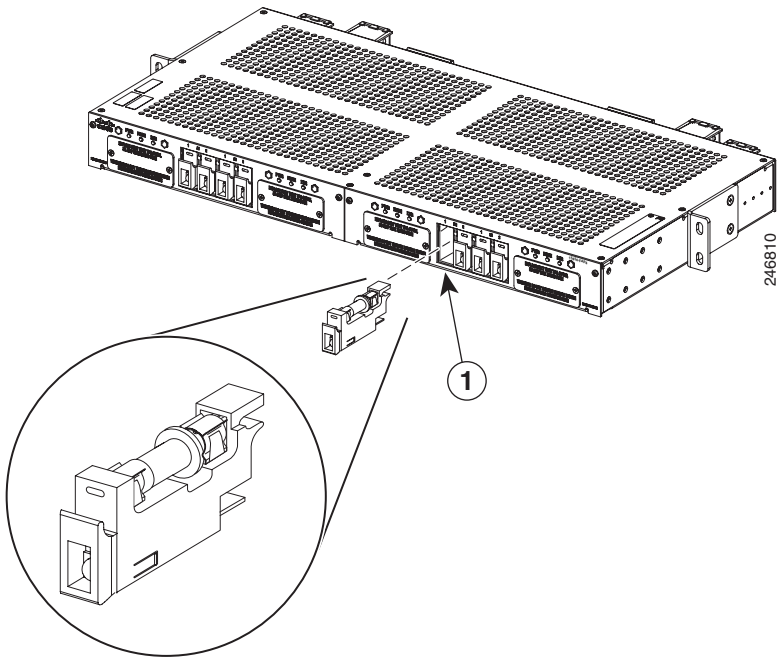
Figure 14 Inserting the Fuse Into the TPA Fuse Holder



1	TPA fuse	**2**	TPA fuse holder
3	Open fuse LED indicator		—

Step 4 Insert the fuse holder (with installed TPA fuse) into the fuse alarm panel (Figure 15). Press firmly to make sure the fuse holder is fully seated.

Figure 15 Inserting Fuse Holder Into Cisco ONS 15454-FAP-4 Fuse Alarm Panel



1	Fuse holder receptacle

Step 5 Verify that the fuse alarm indicator on the front of the fuse holder stays off.

Step 6 Use a multimeter (set to measure DC voltage) to verify that the output voltage at the equipment is a nominal –48 VDC and that the polarity of the negative and positive wires is correct.

Stop. You have completed this procedure.

Connecting New Equipment

This procedure describes how to connect new equipment to the Cisco ONS 15454-FAP-4 fuse alarm panel.

Note The continuous output load of the equipment during normal operation should not exceed 80% of the rated value of the fuse. This allows some room for manufacturing tolerances and voltage fluctuations in the plant power mains.

Step 1 Remove the plastic protective cover from the rear side of the output power terminal block.

Step 2 Locate the output power terminals and verify that a fuse is not installed in the corresponding fuse mounting position.

Connect the output power wiring to the power output terminals. In selecting the copper wire size to be used for power output, consider the allowable ampacity as defined by local practice and the National Electrical Code (Table 3).

Step 3 Take care to avoid shorting out adjacent terminals when connecting new output power wiring to a powered fuse alarm panel. Shorting can cause injury and damage the fuse alarm panel or the connected equipment.

Step 4 Reinstall the plastic protective covers over the output power terminal block.

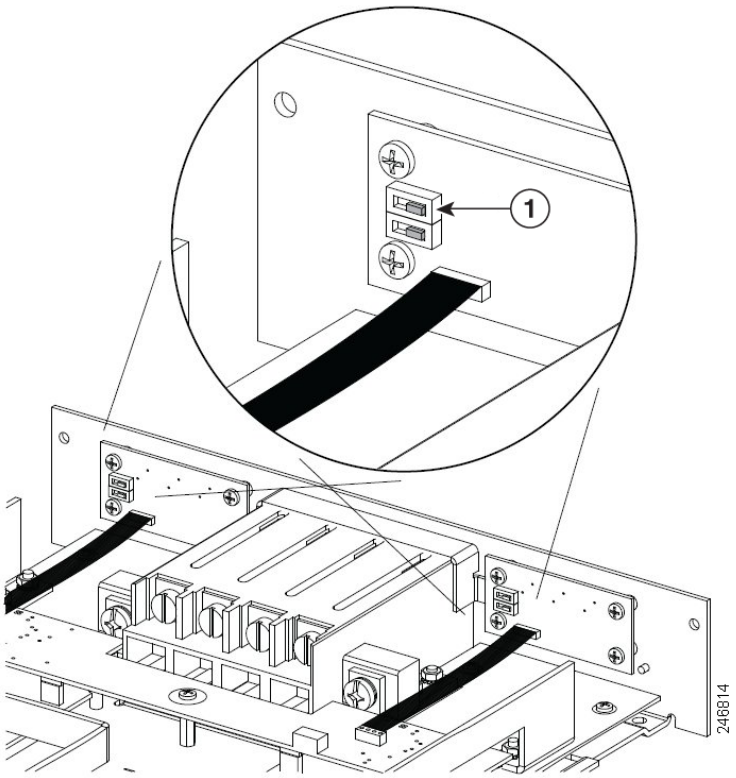
Step 5 Install a fuse of the recommended size (as specified by the equipment manufacturer) in the appropriate fuse position.

Stop. You have completed this procedure.

24 VDC Operation

The LVR unit can be set to operate at 24 VDC. To switch the power module operating voltage from –48 VDC to –24 VDC nominal input, remove the power module from the chassis, as shown in Figure 19. Move the DIP switch, as shown in Figure 16. The power LED turns to amber during normal operation.

Figure 16 Setting 24 VDC Operation



1	Slide the top switch to right

Adjusting the Low Voltage Alarm Settings

The LVR function activates alarm when the input voltage drops below a specific level and deactivates the alarm when the voltage returns to a specific level. Both the alarm activation and deactivation voltages are adjustable. The Cisco ONS 15454-FAP-4 fuse alarm panel ships with the following LVR default voltage settings:

- Normal operational voltage: –48 VDC
- Alarm activation voltage: –39 VDC
- Alarm deactivation voltage: –43.5 VDC

To change the default voltage settings:

Step 1 On the module that you want to adjust the voltage settings, remove the LVR cover. Remove the two screws, as shown in Figure 17. This allows access to the LVR adjustment switches.

Step 2 Set switches to the required positions as shown in Table 2.

Note If the LVR deactivation voltage is set equal to or less than the LVR activation value, the power LED flashes and the system overrides the deactivation setting and sets the deactivation setting to 1 VDC greater than the activation value. The power LED continues to flash as long as the switch setting is not corrected.

Figure 17 Removing the LVR Cover from the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

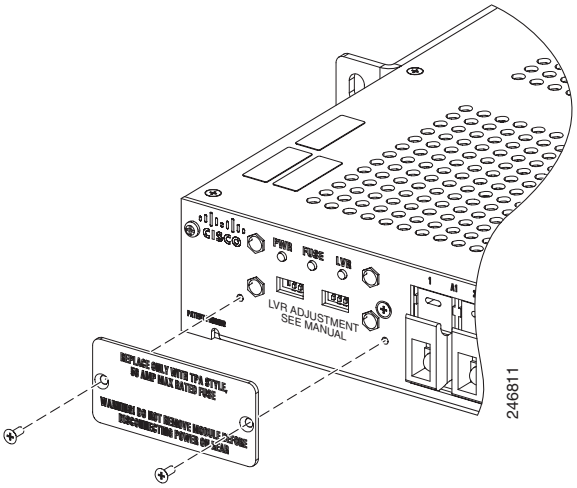


Figure 18 LVR Adjustment Area

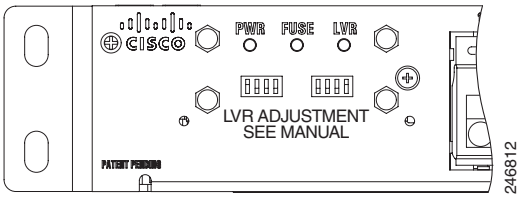


Table 2 LVR Alarm Activation and Deactivation Settings

Alarm Deactivate						Alarm Activate					
Left DIP Switch Settings				–48 VDC (NOM.)	–24 VDC[1] (NOM.)	Right DIP Switch Settings				–48 VDC (NOM.)	–24 VDC[1] (NOM.)
1	2	3	4			1	2	3	4		
0	0	0	0	–39.5	–16.0	0	0	0	0	–38.0	–15.5
0	0	0	1	–40.0	–16.5	0	0	0	1	–38.5	–16.0
0	0	1	0	–40.5	–17.0	0	0	1	0	–39.5	–16.5
0	0	1	1	–41.0	–17.5	0	0	1	1	–40.0	–17.0
0	1	0	0	–41.5	–18.0	0	1	0	0	–40.5	–17.5
0	1	0	1	–42.0	–18.5	0	1	0	1	–41.0	–18.0

Table 2 LVR Alarm Activation and Deactivation Settings

Alarm Deactivate						Alarm Activate					
Left DIP Switch Settings				–48 VDC (NOM.)	–24 VDC[1] (NOM.)	Right DIP Switch Settings				–48 VDC (NOM.)	–24 VDC[1] (NOM.)
1	2	3	4			1	2	3	4		
0	1	1	0	–42.5	–19.0	0	1	1	0	–41.5	–18.5
0	1	1	1	–43.0	–19.5	0	1	1	1	–42.0	–19.0
1	0	0	0	–43.5	–20.0	1	0	0	0	–42.5	–19.5
1	0	0	1	–44.0	–20.5	1	0	0	1	–43.0	–20.0
1	0	1	0	–44.5	–21.0	1	0	1	0	–43.5	–20.5
1	0	1	1	–45.0	–21.5	1	0	1	1	–44.0	–21.0
1	1	0	0	–45.5	–22.0	1	1	0	0	–44.5	–21.5
1	1	0	1	–46.0	–22.5	1	1	0	1	–45.0	–22.0
1	1	1	0	–46.5	–23.0	1	1	1	0	–45.5	–22.5
1	1	1	1	–47.0	–23.5	1	1	1	1	–46.0	–23.0

1. For information VDC operations, see the "24 VDC Operation" section on page 26.

Step 3 When complete, reinstall the LVR cover.

Stop. You have completed this procedure.

Maintaining the Cisco ONS 15454-FAP-4 Fuse Alarm Panel

This section provides routine maintenance procedures for the Cisco ONS 15454-FAP-4 fuse alarm panel.

The following topics are included:

- Performing a Routine Inspection, page 29
- Replacing Failed TPA Fuse, page 30
- Replacing the Power Bus Module, page 30

Performing a Routine Inspection

This procedure describes how to perform a routine inspection.

Caution Take care to avoid damaging the fuses or wiring.

Step 1 Inspect the Cisco ONS 15454-FAP-4 fuse alarm panel for damage to the fuse holders and for damaged or broken wires at the power and external alarm connections.

Step 2 If excessive dirt is found during the inspection, brush or wipe dust and dirt from the fuse alarm panel with a soft bristle brush or soft cloth.

Step 3 If any fuse holder is broken or damaged, replace the fuse holder. See the "Install TPA Fuse" section on page 24.

Stop. You have completed this procedure.

Replacing Failed TPA Fuse

This procedure describes how to replace a failed TPA fuse on the Cisco ONS 15454-FAP-4 fuse alarm panel.

Note When a TPA fuse fails, the fuse alarm indicator on the corresponding fuse holder lights (red) and the fuse alarm contacts for the corresponding power bus switch to the alarm state.

Step 1 Remove the fuse holder from the Cisco ONS 15454-FAP-4 fuse alarm panel. See the "Install TPA Fuse" section on page 24.

Note The fuse alarm contacts should return to the normal state. Determine the problem that caused the fuse to fail and take the appropriate corrective action. When the problem has been corrected, install a replacement TPA fuse in the fuse holder.

Step 2 Using a medium size screwdriver, carefully pull the failed fuse out of the fuse holder.

Step 3 Install the replacement fuse in the fuse holder and insert the fuse holder into the fuse alarm panel (see Figure 14).

Caution Make sure the fuse-type and current rating of the replacement fuse comply with the recommendations of the equipment manufacturer and do not exceed 50 A. For any bus, both fuses together cannot exceed 75 A.

Note The continuous output load of the equipment during normal operation should not exceed 80% of the rated value of the fuse.

Stop. You have completed this procedure.

Replacing the Power Bus Module

This procedure describes how to replace a power bus module on the Cisco ONS 15454-FAP-4 fuse alarm panel.

Note When replacing a power bus module, all wires must be disconnected.

Step 1 Turn off the power supply to the module.

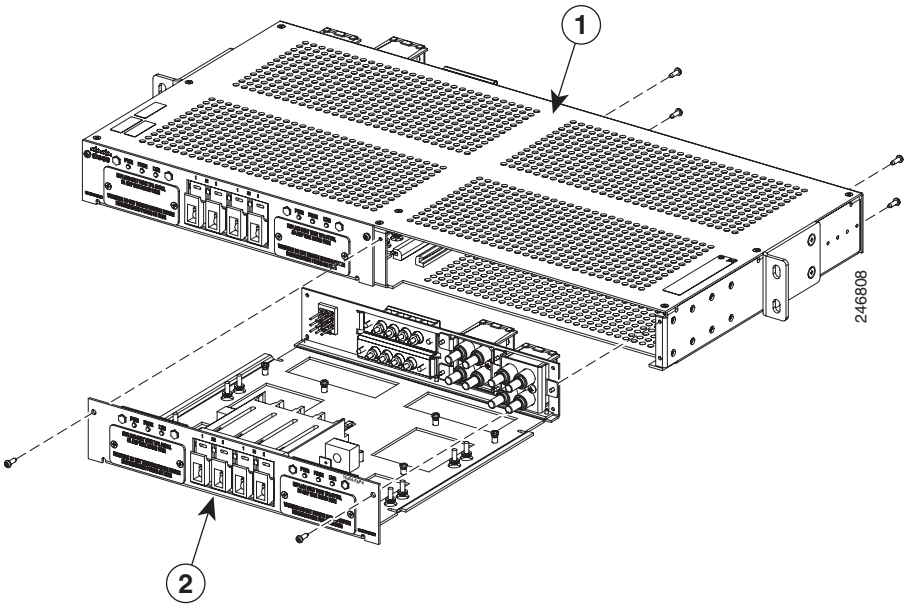
Warning **This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.** Statement 1028

Step 2 Disconnect the alarm wires for the power bus module being replaced.

Step 3 Disconnect all wires from the input and output terminals.

Step 4 Remove the four screws on the front and four screws on the back (shown exploded from the bus module in Figure 19).

Figure 19 Removing the Power Bus Module That is Being Replaced



1	Cisco ONS 15454-FAP-4 fuse alarm panel chassis	**2**	Power bus module

Step 5 Slide out the power bus module from the fuse alarm panel chassis, as shown in Figure 19.

Step 6 Slide in the new module and fasten it in the chassis using the same eight screws.

Step 7 Connect the output power wires first, and then the input power wires.

Step 8 Turn on the power supply to the new module.

Stop. You have completed this procedure.

Allowable Ampacities of Insulated Conductors

This section provides guidelines for selecting AWG wire size based on the temperature rating of the conductor and the anticipated load. The information contained is from Table 3 of the National Electrical Code document, ANSI/NPFA 70 (1978).

Note Information for aluminum conductors has been omitted from the table because copper conductors only are recommended for use with the Cisco ONS 15454-FAP-4 fuse alarm panel.

Table 3 Allowable Ampacities of Insulated Conductors, Rated O Through 2000 Volts, 60° C to 90° C (140° F to 194° F), not More Than Three Current-Carrying Conductors in Raceway or Cable or Earth (Directly Buried), Based on Ambient Temperature of 30° C (86° F)

Size	Temperature Rating of Conductor		
AWG kcmil	60° C (114° F)	75° C (167° F)	90° C (194° F)
	TYPES TW*, UF*	TYPES FEPW*, RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*, ZW*	TYPES TBS, SA, SIS, FEP*, FEPB*, MI, RHH*, RHW-2, THHN*, THHW*, THW-2*, THWN-2*, USE-2, XHH, XHHW* XHHW-2 ZW-2
18	—	—	14
16	—	—	18
14	20*	20*	25*
12	25*	25*	30*
10	30	35*	40*
8	40	50	55
6	55	65	75
4	70	85	95
3	85	100	110
2	95	115	130
1	110	130	150
1/0	125	150	170
2/0	145	175	195
3/0	165	200	225

Table 3 Allowable Ampacities of Insulated Conductors, Rated O Through 2000 Volts, 60° C to 90° C (140° F to 194° F), not More Than Three Current-Carrying Conductors in Raceway or Cable or Earth (Directly Buried), Based on Ambient Temperature of 30° C (86° F) (continued)

Size	Temperature Rating of Conductor		
AWG kcmil	60° C (114° F)	75° C (167° F)	90° C (194° F)
	TYPES TW*, UF*	TYPES FEPW*, RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*, ZW*	TYPES TBS, SA, SIS, FEP*, FEPB*, MI, RHH*, RHW-2, THHN*, THHW*, THW-2*, THWN-2*, USE-2, XHH, XHHW* XHHW-2 ZW-2
4/0	195	230	260
250	215	255	290
300	240	285	320
350	260	310	350
400	280	335	380
500	320	380	430
600	355	420	475
700	385	460	520
750	400	335	380

Table 3 Allowable Ampacities of Insulated Conductors, Rated O Through 2000 Volts, 60° C to 90° C (140° F to 194° F), not More Than Three Current-Carrying Conductors in Raceway or Cable or Earth (Directly Buried), Based on Ambient Temperature of 30° C (86° F) (continued)

Size	Temperature Rating of Conductor		
AWG kcmil	60° C (114° F)	75° C (167° F)	90° C (194° F)
	TYPES TW*, UF*	TYPES FEPW*, RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*, ZW*	TYPES TBS, SA, SIS, FEP*, FEPB*, MI, RHH*, RHW-2, THHN*, THHW*, THW-2*, THWN-2*, USE-2, XHH, XHHW* XHHW-2 ZW-2
800	410	490	555
900	435	520	585
1000	455	545	615
1250	495	590	665
1500	520	625	705
1750	545	650	735
2000	560	665	750
CORRECTION FACTORS For ambient temperatures other than 30° C (86° F), multiply the allowable ampacities by the appropriate factor shown below.			
21-25	1.08	1.05	1.04
26-30	1.00	1.00	1.00
31-35	.91	.94	.96
36-40	.82	.88	.91
41-45	.71	.82	.87
46-50	.58	.75	.82
51-55	.41	.67	.76
56-60	—	.58	.71
61-70	—	.33	.58
71-80	—	—	.41

* Unless otherwise specifically permitted in the code, as defined in the NEC document cited (ANSI/NEC 70), the overcurrent protection for conductor types marked with an asterisk (*) shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10 copper, after any correction factors for ambient temperature (see and number of conductors have been applied.

Related Documentation

Use the Installing the Cisco ONS 15454-FAP-4 Fuse Alarm Panel document in conjunction with the following referenced publications as needed:

- *Unpacking and Installing the Cisco ONS 15216 Five-Component Bay Assembly*
- *Cisco ONS 15454 Procedure Guide*
- *Cisco ONS 15454 Reference Manual*
- *Cisco ONS 15454 Troubleshooting Guide*

Obtaining Documentation and Submitting a Service Request

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