This chapter provides a description of Cisco ONS 15454 SDH shelf and backplane hardware. Card and cable descriptions are provided in Common Control Cards, Electrical Cards, Optical Cards, Ethernet Cards, and Storage Access Networking Cards. To install equipment, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- Overview
- Front Door
- Front Mount Electrical Connection
- E1-75/120 Conversion Panel
- Coaxial Cable
- Twisted-Pair Balanced Cable
- Cable Routing and Management
- Fan-Tray Assembly
- Power and Ground Description
- Alarm, Timing, LAN, and Craft Pin Connections
- Cards and Slots
- Software and Hardware Compatibility

Note: The Cisco ONS 15454 SDH assembly is intended for use with telecommunications equipment only.

Caution! Unused multiservice card slots should be filled with a filler card (Cisco P/N 15454-BLANK) and unused FMEC slots should be covered with a blank faceplate (Cisco P/N 15454E-BLANK-FMEC). The filler cards and blank faceplates ensure proper airflow when operating the ONS 15454 SDH without the front door attached, although Cisco recommends that the front door remain attached.

Contents

Overview

When installed in an equipment rack, the ONS 15454 SDH assembly is typically connected to a fuse and alarm panel to provide centralized alarm connection points and distributed power for the ONS 15454 SDH. Fuse and alarm panels are third-party equipment and are not described in this documentation. If you are unsure about the requirements or specifications for a fuse and alarm panel, consult the user documentation for the related equipment. The front door of the ONS 15454 SDH allows access to the shelf assembly, fan-tray assembly, and cable-management area. The FMEC cover at the top of the shelf allows access to power connectors, external alarms and controls, timing input and output, and craft interface terminals.

You can mount the ONS 15454 SDH in an ETSI rack. The shelf assembly weighs approximately 26 kg (57 pounds) with no cards installed. The shelf assembly includes a front door and a Front Mount Electrical Connection (FMEC) cover for added security, a fan tray module for cooling, and extensive cable-management space.

All ONS 15454 SDH optical cards have SC connectors on the card faceplate, except the STM-1SH 1310-8 card, which has LC connectors. Fiber-optic cables are routed into the front of the optical and Ethernet cards. Electrical cards (E-1, E-3, DS3i, STM-1E) require FMEC cards to provide the cable connection points for the shelf assembly.

The ONS 15454 ETSI is powered using - 48 VDC power. Negative and return power terminals are connected via the MIC-A/P and the MIC-C/T/P FMECs. The ground terminal is connected via the 2-hole grounding lug.

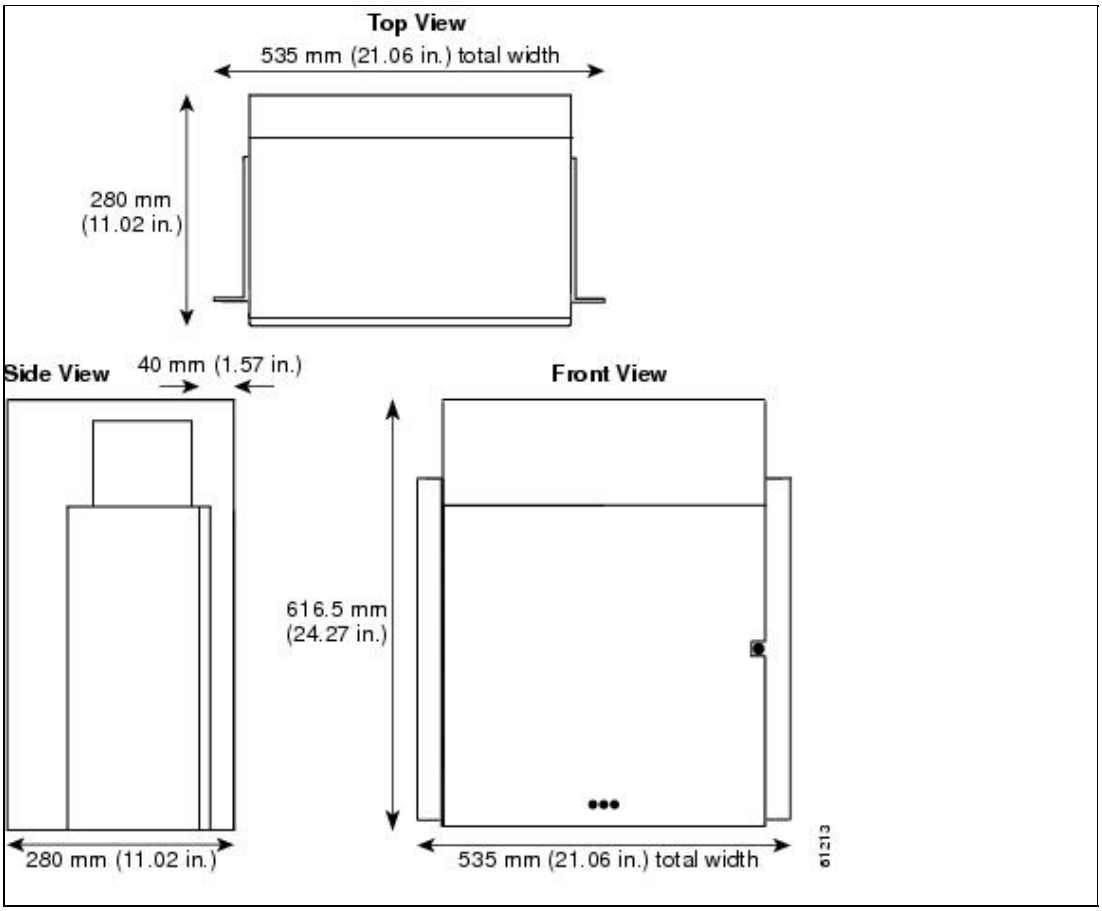
Note: In this chapter, the terms "ONS 15454 SDH" and "shelf assembly" are used interchangeably. In the installation context, these terms have the same meaning. Otherwise, shelf assembly refers to the physical steel enclosure that holds cards and connects power, and ONS 15454 SDH refers to the entire system, both hardware and software.

Install the ONS 15454 SDH in compliance with your local and national electrical codes:

- United States: National Fire Protection Association (NFPA) 70; United States National Electrical Code
- Canada: Canadian Electrical Code, Part I, CSA C22.1
- Other countries: If local and national electrical codes, are not available, refer to IEC 364, Part 1 through Part 7.

Figure 1-1 provides the dimensions of the ONS 15454 SDH.

Figure 1-1: ONS 15454 SDH Dimensions

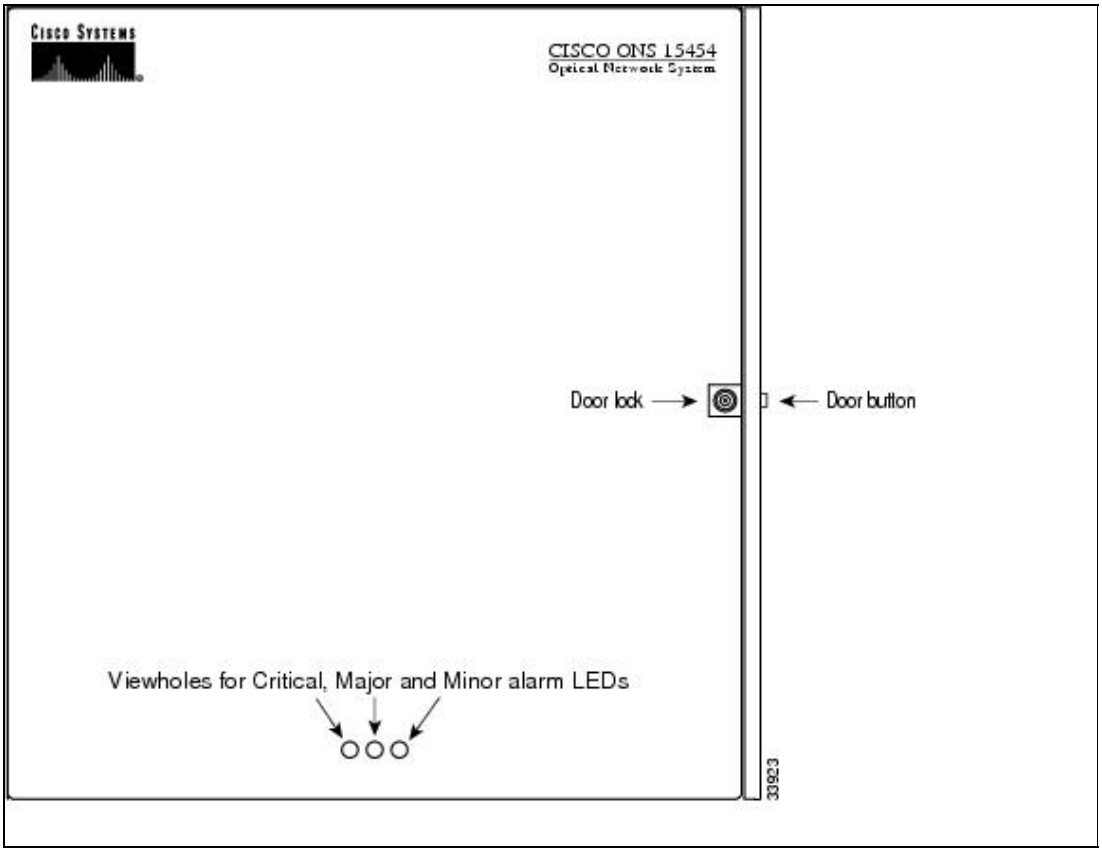


Front Door

The Critical, Major, and Minor alarm LEDs visible through the front door indicate whether a critical, major, or minor alarm is present anywhere on the ONS 15454 SDH. These LEDs must be visible so technicians can quickly determine if any alarms are present. You can use the LCD to further isolate alarms.

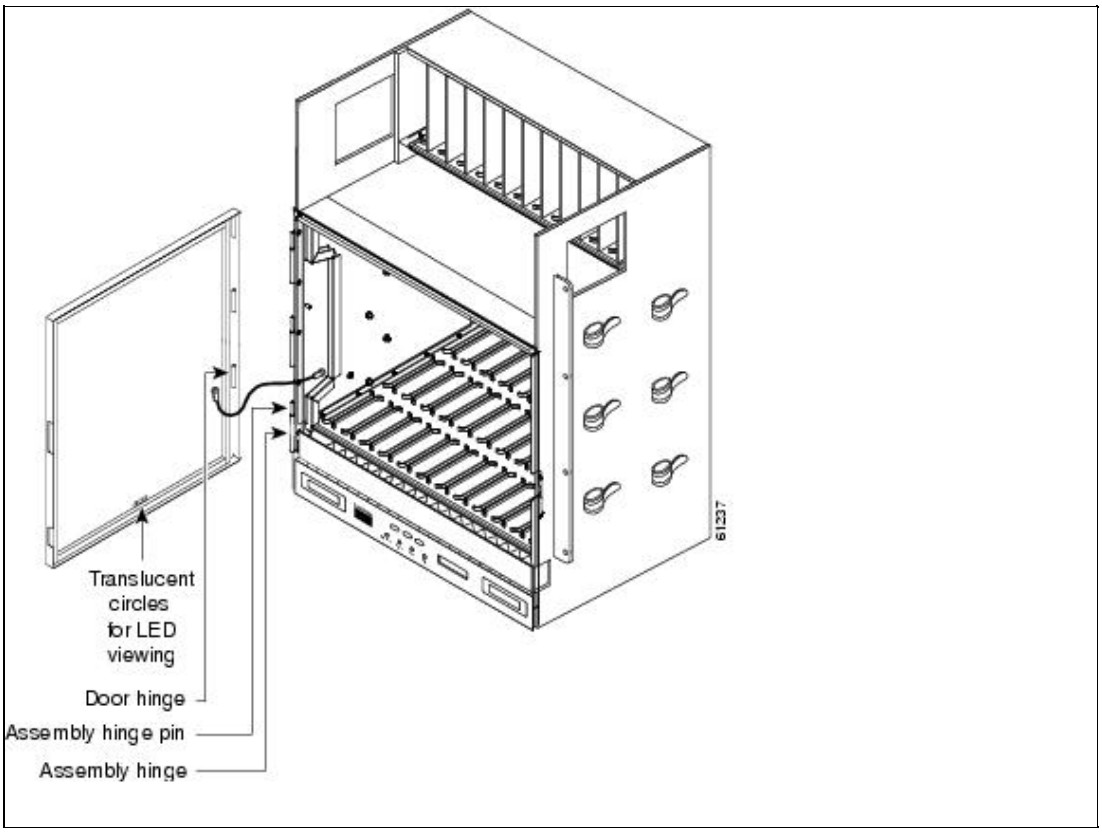
The ONS 15454 SDH features a locked door to the front compartment. A pinned hex key that unlocks the front door ships with the ONS 15454 SDH. A button on the right side of the shelf assembly releases the door. The front door provides access to the shelf assembly, cable-management tray, fan-tray assembly, and LCD screen (Figure 1-2).

Figure 1-2: The ONS 15454 SDH Front Door



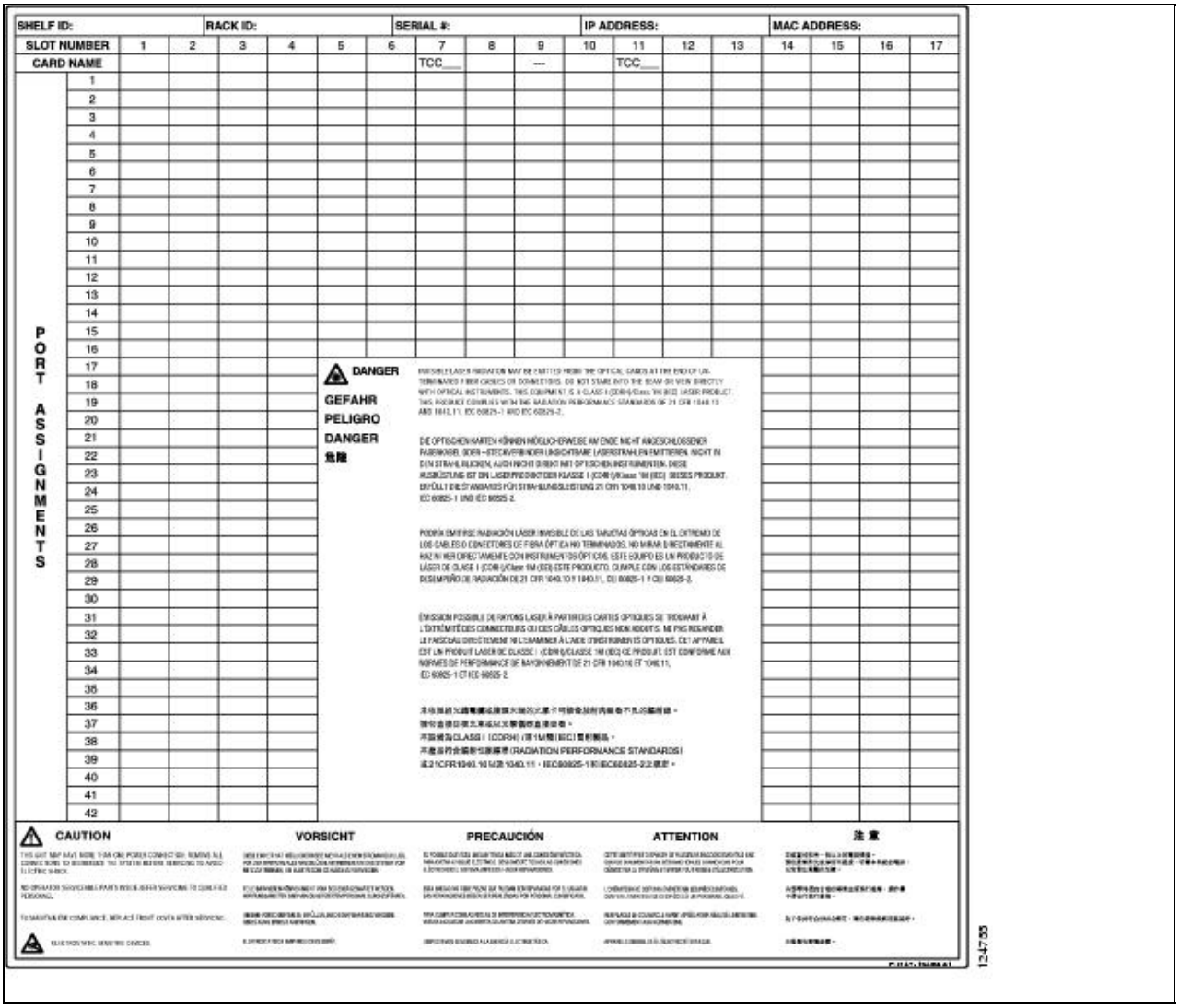
You can remove the front door of the ONS 15454 SDH to provide unrestricted access to the front of the shelf assembly (Figure 1-3).

Figure 1-3: Removing the ONS 15454 SDH Front Door



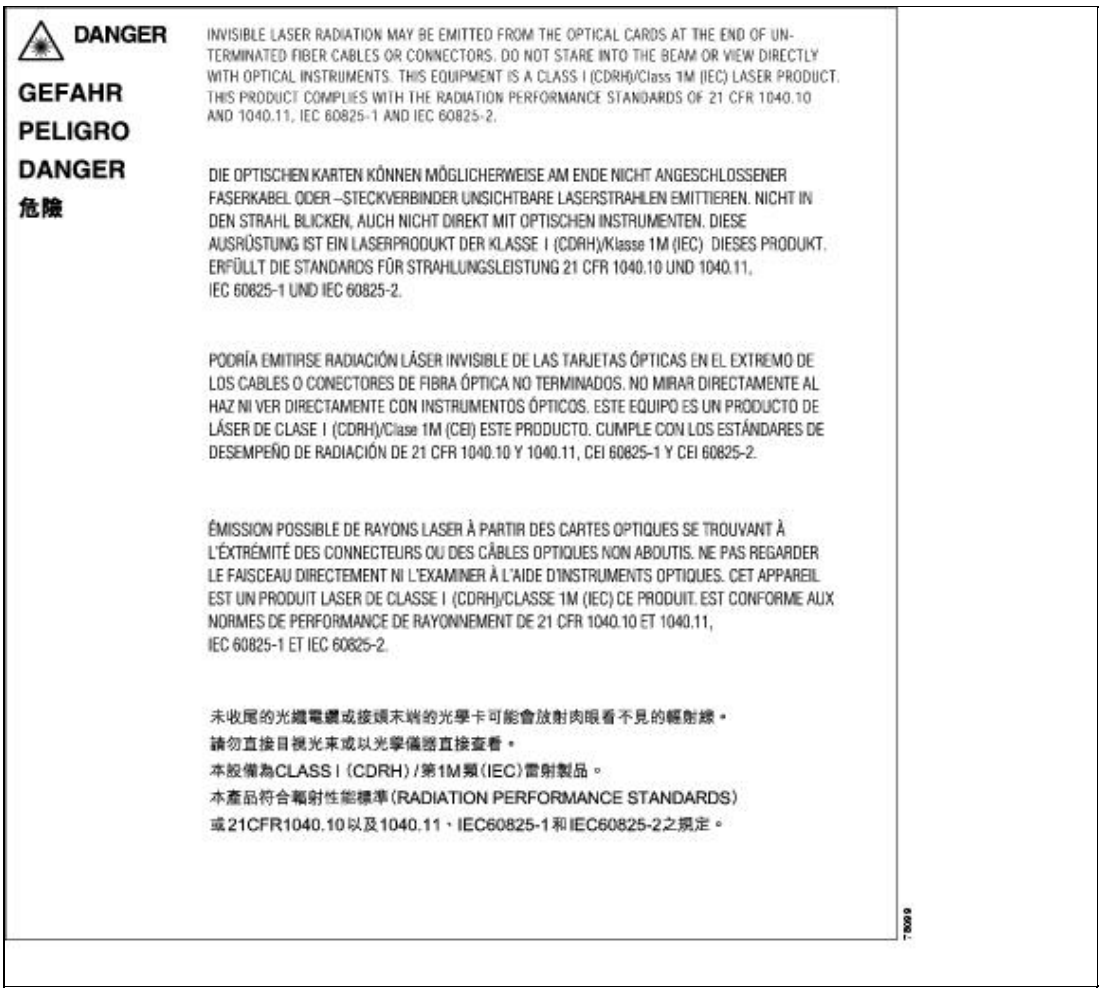
An erasable label is pasted on the inside of the front door (Figure 1-4). You can use the label to record slot assignments, port assignments, card types, node ID, rack ID, and serial number for the ONS 15454 SDH.

Figure 1-4: Front-Door Erasable Label



The front door label also includes the Class I and Class 1M laser warning (Figure 1-5).

Figure 1-5: Laser Warning on the Front-Door Label



Front Mount Electrical Connection

The positive and negative power terminals are located on FMEC cards in the Electrical Facility Connection Assembly (EFCA). The ground connection is the grounding receptacle on the side panel of the shelf.

The ONS 15454 SDH EFCA at the top of the shelf has 12 FMEC slots numbered sequentially from left to right (18 to 29). Slots 18 to 22 and 25 to 29 provide electrical connections. Slots 23 and 24 host the MIC-A/P and MIC-C/T/P cards, respectively.

Caution! The faceplate screws of the MIC-A/P and MIC-C/T/P cards must be tighten with 1.0Nm torque.

FMEC-E1, FMEC-DS1/E1, FMEC E1-120NP, and FMEC E1-120PROA cards can be installed in Slots 18 to 21; the FMEC E1-120PROB card can be installed in Slots 26 to 29; the FMEC-E3/DS3 and FMEC STM1E 1:1 cards can be installed in Slots 18 to 21 or Slots 26 to 29. FMEC electrical card assignment is as follows:

- FMEC Slot 18 supports an electrical card in Slot 1.
- FMEC Slot 19 supports an electrical card in Slot 2.
- FMEC Slot 20 supports an electrical card in Slot 3.
- FMEC Slot 21 supports an electrical card in Slot 4.
- FMEC Slot 22 supports an electrical card in Slot 5.
- FMEC Slot 23 hosts the MIC-A/P alarm and power FMEC.
- FMEC Slot 24 supports the MIC-C/T/P timing, craft, and power FMEC.
- FMEC Slot 25 supports an electrical card in Slot 13.
- FMEC Slot 26 supports an electrical card in Slot 14.

Figure 1-5: Laser Warning on the Front-Door Label

- FMEC Slot 27 supports an electrical card in Slot 15.
- FMEC Slot 28 supports an electrical card in Slot 16.
- FMEC Slot 29 supports an electrical card in Slot 17.

FMEC slots have symbols indicating the type of cards that you can install in the slots. Each ONS 15454 SDH FMEC has a corresponding symbol. The symbol on the FMEC must match the symbol on the slot. Table 1-1 shows the slot-FMEC symbol definitions.

Table 1-1: Slot and FMEC Symbols

Color/Shape	Definition
Orange/Circle	Electrical 75-ohm E-1 connection via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
	Electrical 120-ohm E-1 connection via DB-37 connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
	Electrical 75-ohm E3/DS3 connection via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
Green/Star	Electrical 75-ohm E1-42 and STM-1e connections via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a star symbol on the faceplate.
Red/Vertical ellipse	Node power and interface for environmental alarms. Only install ONS 15454 SDH FMECs with a vertical ellipse symbol on the faceplate.
Red/Horizontal ellipse	Node power and LAN timing. Only install ONS 15454 SDH FMECs with a horizontal ellipse symbol on the faceplate.

Table 1-2 lists the number of ports, line rates, connector options, and connector locations for ONS 15454 SDH electrical FMECs.

Table 1-2: FMEC, Ports, Line Rates, and Connectors

FMEC	Ports	Line Rate per Port	Connector Type	Connector Location
FMEC-E1	14	2.048 Mbps	1.0/2.3 miniature coax connector	EFCA
FMEC-DS1/E1	14	2.048 Mbps	DB-37	EFCA
FMEC E1-120NP	42	2.048 Mbps	Molex 96-pin LFH connector	EFCA
FMEC E1-120PROA	3 to 42	2.048 Mbps	Molex 96-pin LFH connector	EFCA, Slots 18 to 21
FMEC E1-120PROB	3 to 42	2.048 Mbps	Molex 96-pin LFH connector	EFCA, Slots 26 to 29
FMEC-E3/DS3	12	34.368 Mbps 44.736 Mbps	1.0/2.3 miniature coax connector	EFCA
FMEC STM1E 1:1	12 (protected) or 24 (nonprotected)	155.52 Mbps	1.0/2.3 miniature coax connector	EFCA

Note: The E1-120NP FMEC can only be used in Slots 18-21 and Slots 26-29. The STM1E 1:1 FMEC can only be used in Slots 18 and 19, 20 and 21, 26 and 27, or 28 and 29.

Table 1-3 provides color coding details for the cable assembly used with the Cisco ONS 15454 SDH E1-42 FMEC modules.

Note: For each colored code, the first color is solid and the second color is a stripe (tracer). A white-blue wire is solid white with a blue tracer, the blue-white wire is solid blue with a white tracer.

Table 1-3: Color Coding for Cisco ONS 15454 SDH E1-42 FMEC Modules

Bundle	Pair	1st Conductor	2nd Conductor
Group 1 white-blue	1	white-blue	blue-white
	2	white-orange	orange-white
	3	white-green	green-white
	4	white-brown	brown-white
	5	white-slate	slate-white
	6	red-blue	blue-red
	7	red-orange	orange-red
	8	red-green	green-red
	9	red-brown	brown-red
	10	red-slate	slate-red
	11	black-blue	blue-black
Group 2 white-blue	12	black-orange	orange-black
	13	black-green	green-black
	14	black-brown	brown-black
	15	black-slate	slate-black
	16	yellow-blue	blue-yellow
	17	yellow-orange	orange-yellow
	18	yellow-green	green-yellow
	19	yellow-brown	brown-yellow
	20	yellow-slate	slate-yellow
	21	violet-blue	blue-violet
Group 3 white-orange	22	white-blue	blue-white
	23	white-orange	orange-white
	24	white-green	green-white
	25	white-brown	brown-white
	26	white-slate	slate-white
	27	red-blue	blue-red
	28	red-orange	orange-red
	29	red-green	green-red
	30	red-brown	brown-red
	31	red-slate	slate-red
	32	black-blue	blue-black
Group 4 white-orange	33	black-orange	orange-black
	34	black-green	green-black
	35	black-brown	brown-black
	36	black-slate	slate-black

37	yellow-blue	blue-yellow
38	yellow-orange	orange-yellow
39	yellow-green	green-yellow
40	yellow-brown	brown-yellow
41	yellow-slate	slate-yellow
42	violet-blue	blue-violet

Table 1-4 details cable signal and pin matrix for the cable assembly used with the Cisco ONS 15454 SDH E1-42 FMEC modules.

Table 1-4: Cable Signal and Pin Matrix for Cisco ONS 15454 SDH E1-42 FMEC Modules

Pin	Signal Connection	Bundle	Conductor Color
1	TX11-/TX32-	white-blue	white-blue
2	TX11+/TX32+		blue-white
3	TX10-/TX31-		white-orange
4	TX10+/TX31+		orange-white
5	TX9-/TX30-		white-green
6	TX9+/TX30+		green-white
7	TX8-/TX29-		white-brown
8	TX8+/TX29+		brown-white
9	TX7-/TX28-		white-slate
10	TX7+/TX28+		slate-white
11	TX6-/TX27-		red-blue
12	TX6+/TX27+		blue-red
13	TX5-/TX26-		red-orange
14	TX5+/TX26+		orange-red
15	TX4-/TX25-		red-green
16	TX4+/TX25+		green-red
17	TX3-/TX24-		red-brown
18	TX3+/TX24+		brown-red
19	TX2-/TX23-		red-slate
20	TX2+/TX23+		slate-red
21	TX1-/TX22-		black-blue
22	TX1+/TX22+		blue-black
23	unused	-	-
24	unused	-	-
25	RX11-/RX32-	white-orange	white-blue
26	RX11+/RX32+		blue-white
27	RX10-/RX31-		white-orange
28	RX10+/RX31+		orange-white
29	RX9-/RX30-		white-green
30	RX9+/RX30+		green-white
31	RX8-/RX29-		white-brown
32	RX8+/RX29+		brown-white
33	RX7-/RX28-		white-slate

34	RX7+/RX28+		slate-white
35	RX6-/RX27-		red-blue
36	RX6+/RX27+		blue-red
37	RX5-/RX26-		red-orange
38	RX5+/RX26+		orange-red
39	RX4-/RX25-		red-green
40	RX4+/RX25+		green-red
41	RX3-/RX24-		red-brown
42	RX3+/RX24+		brown-red
43	RX2-/RX23-		red-slate
44	RX2+/RX23+		slate-red
45	RX1-/RX22-		black-blue
46	RX1+/RX22+		blue-black
47	unused	-	-
48	unused	-	-
49	TX21-/TX42-	white-blue	black-orange
50	TX21+/TX42+		orange-black
51	TX20-/TX41-		black-green
52	TX20+/TX41+		green-black
53	TX19-/TX40-		black-brown
54	TX19+/TX40+		brown-black
55	TX18-/TX39-		black-slate
56	TX18+/TX39+		slate-black
57	TX17-/TX38-		yellow-blue
58	TX17+/TX38+		blue-yellow
59	TX16-/TX37-		yellow-orange
60	TX16+/TX37+		orange-yellow
61	TX15-/TX36-		yellow-green
62	TX15+/TX36+		green-yellow
63	TX14-/TX35-		yellow-brown
64	TX14+/TX35+		brown-yellow
65	TX13-/TX34-		yellow-slate
66	TX13+/TX34+		slate-yellow
67	TX12-/TX33-		violet-blue
68	TX12+/TX33+		blue-violet
69	unused	-	-
70	unused	-	-
71	unused	-	-
72	unused	-	-
73	RX21-/RX42-	white-orange	black-orange
74	RX21+/RX42+		orange-black
75	RX20-/RX41-		black-green
76	RX20+/RX41+		green-black
77	RX19-/RX40-		black-brown

Table 1-4: Cable Signal and Pin Matrix for Cisco ONS 15454 SDH E1-42 FMEC Modules

78	RX19+/RX40+		brown-black
79	RX18-/RX39-		black-slate
80	RX18+/RX39+		slate-black
81	RX17-/RX38-		yellow-blue
82	RX17+/RX38+		blue-yellow
83	RX16-/RX37-		yellow-orange
84	RX16+/RX37+		orange-yellow
85	RX15-/RX36-		yellow-green
86	RX15+/RX36+		green-yellow
87	RX14-/RX35-		yellow-brown
88	RX14+/RX35+		brown-yellow
89	RX13-/RX34-		yellow-slate
90	RX13+/RX34+		slate-yellow
91	RX12-/RX33-		violet-blue
92	RX12+/RX33+		blue-violet
93	unused	-	-
94	unused	-	-
95	unused	-	-
96	unused	-	-

E1-75/120 Conversion Panel

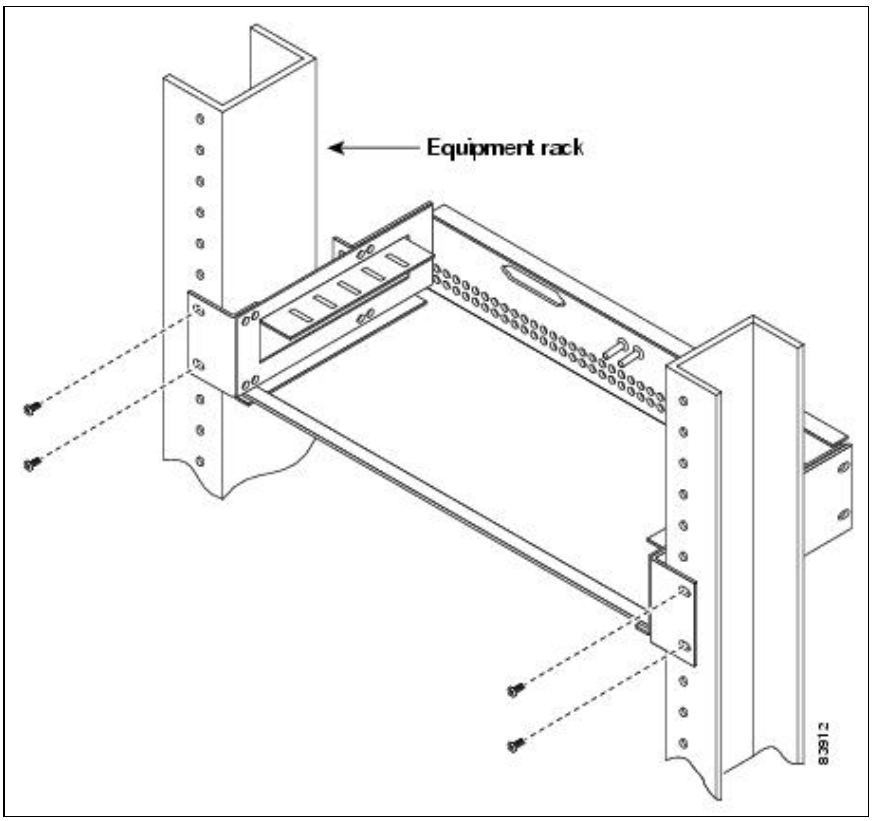
You need an E1-75/120 conversion panel if you want to convert the balanced 120-ohm interfaces of the E1-42 card and the corresponding FMECs to unbalanced 75-ohm interfaces.

The E1-75/120 contains eighty-four 1.0/2.3 miniature coax connectors (42 for transmit, 42 for receive) to the customer side and two Molex 96-pin LFH connectors to the E1-42 FMEC 120-ohm side. Each of the Molex 96-pin LFH connectors connects 21 inputs and 21 outputs. The E1-75/120 conversion panel is intended to be used in digital distribution frames (DDFs), ETSI racks, and ANSI racks.

You can install the E1-75/120 conversion panel in the rack of your ONS 15454 SDH or in a nearby rack. If you install the E1-75/120 conversion panel in a place where a longer cable is required, make sure that the total cable loss of the balanced 120-ohm cable and the unbalanced 75-ohm cable does not exceed the maximum allowed value. To ensure that the E1-75/120 conversion panel is secure, use one or two M6 mounting screws for each side of the shelf assembly. Figure 1-6 shows the rack-mounting for the E1-75/120 conversion panel.

Note: If required, the mounting brackets of the E1-75/120 conversion panel can be uninstalled, rotated 90 degrees, and reinstalled to enable 19-inch (482.6 mm) rack mounting.

Figure 1-6: Mounting the E1-75/120 Conversion Panel in a Rack



Coaxial Cable

Caution! Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.

All interfaces that are listed in Table 1-2 with 1.0/2.3 miniature coax connectors (E-1, E-3, DS-3, and STM-1E) must be connected using a 75-ohm coaxial cable.

The electromagnetic compatibility (EMC) performance of the node depends on good-quality coaxial cables, such as Shuner Type G 03233 D or the equivalent.

Twisted-Pair Balanced Cable

Caution! Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.

All E-1 interfaces that are listed in Table 1-2 with DB-37 or with Molex 96-pin LFH connectors must be connected using a 120-ohm twisted-pair balanced cable. For the interfaces that use Molex 96-pin LFH connectors Cisco offers ready-made cables.

Ethernet Cables

Ethernet cables use RJ-45 connectors, and are straight-through or crossover, depending on what is connected to them.

Table 1-5 shows 100Base-TX connector pin assignments, used with E100 Ethernet cards in the ONS 15454.

Figure 1-6: Mounting the E1-75/120 Conversion Panel in a Rack

Table 1-5: E100-TX Connector Pinout

Pin	Cable Port
1	RD+
2	RD-
3	TD+
4	NC
5	NC
6	TD-
7	NC
8	NC

Figure 1-7 shows the pin locations on 100BaseT connector.

Figure 1-7: 100BaseT Connector Pins

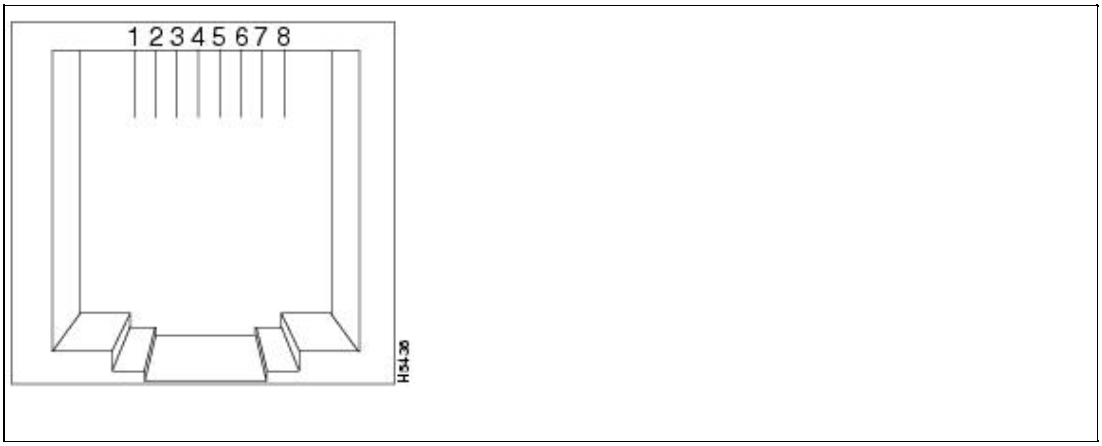


Figure 1-8 shows the straight-through Ethernet cable schematic. Use a straight-through cable when connecting to a router or a PC.

Figure 1-8: Straight-Through Cable

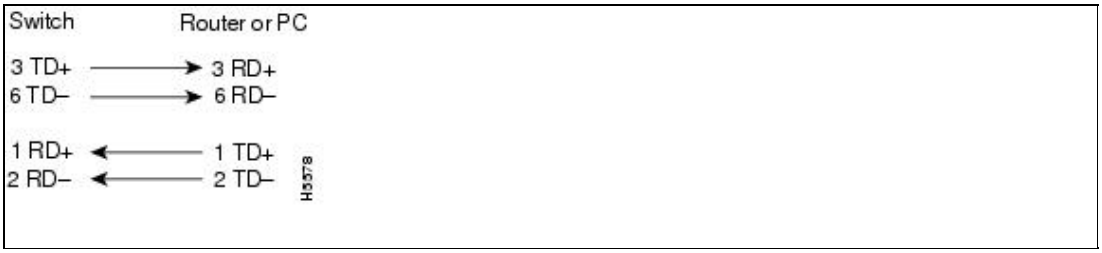
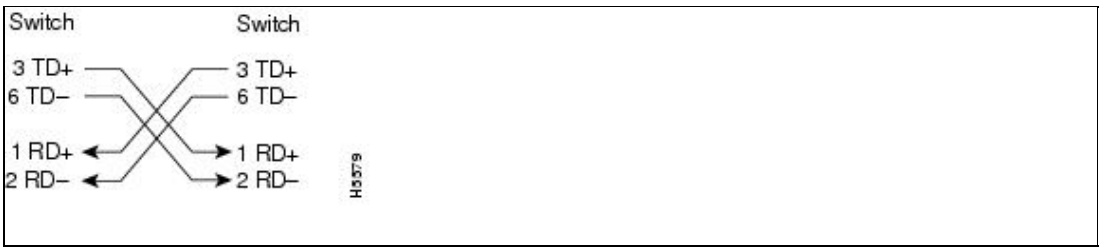


Figure 1-9 shows the crossover Ethernet cable schematic. Use a crossover cable when connecting to a switch or hub.

Figure 1-9: Crossover Cable



Cable Routing and Management

The ONS 15454 SDH cable management facilities include the following:

- A cable-routing channel (behind the fold-down door) that runs the width of the shelf assembly, Figure 1-10
- Plastic horseshoe-shaped fiber guides at each side opening of the cable-routing channel that ensure the proper bend radius is maintained in the fibers, Figure 1-11

  Note: You can remove the fiber guide if necessary to create a larger opening (if you need to route CAT-5 Ethernet cables out the side, for example). To remove the fiber guide, take out the three screws that anchor it to the side of the shelf assembly.

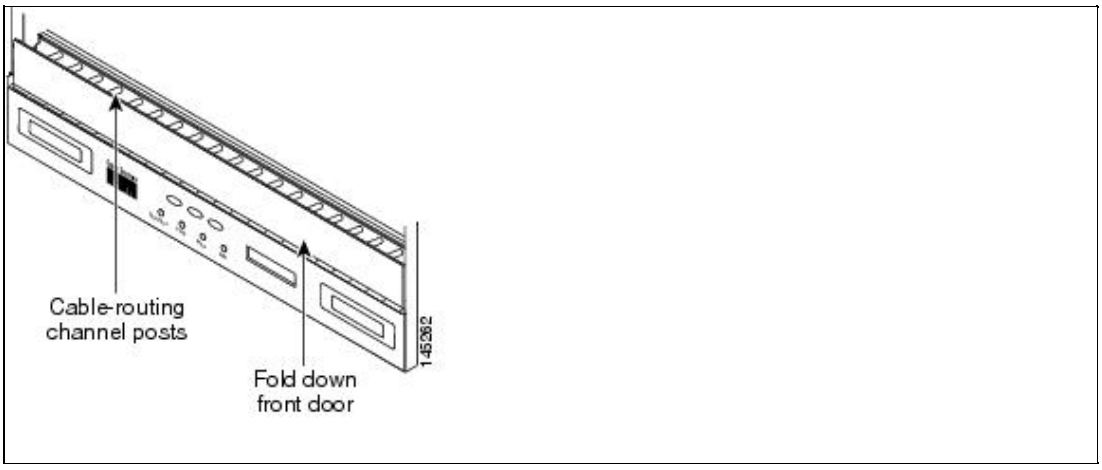
- A fold-down door that provides access to the cable-management tray
- Cable routing channel that enables you to route cables out either side

  Note: To remove the jumper slack storage reels, take out the screw in the center of each reel.

- Optional fiber management tray (recommended for DWDM nodes)

Figure 1-10 shows the cable management facilities that you can access through the fold-down front door, including the cable-routing channel and cable-routing channel posts.

Figure 1-10: Managing Cables on the Front Panel



Fiber Management

The jumper routing fins are designed to route fiber jumpers out of both sides of the shelf. Slots 1 to 6 exit to the left, and Slots 12 to 17 exit to the right. Figure 1-11 shows fibers routed from cards in the left slots, down through the fins, then exiting out the fiber channel to the left. The maximum capacity of the fiber routing

Figure 1-9: Crossover Cable

channel depends on the size of the fiber jumpers.

Figure 1-11: Fiber Capacity

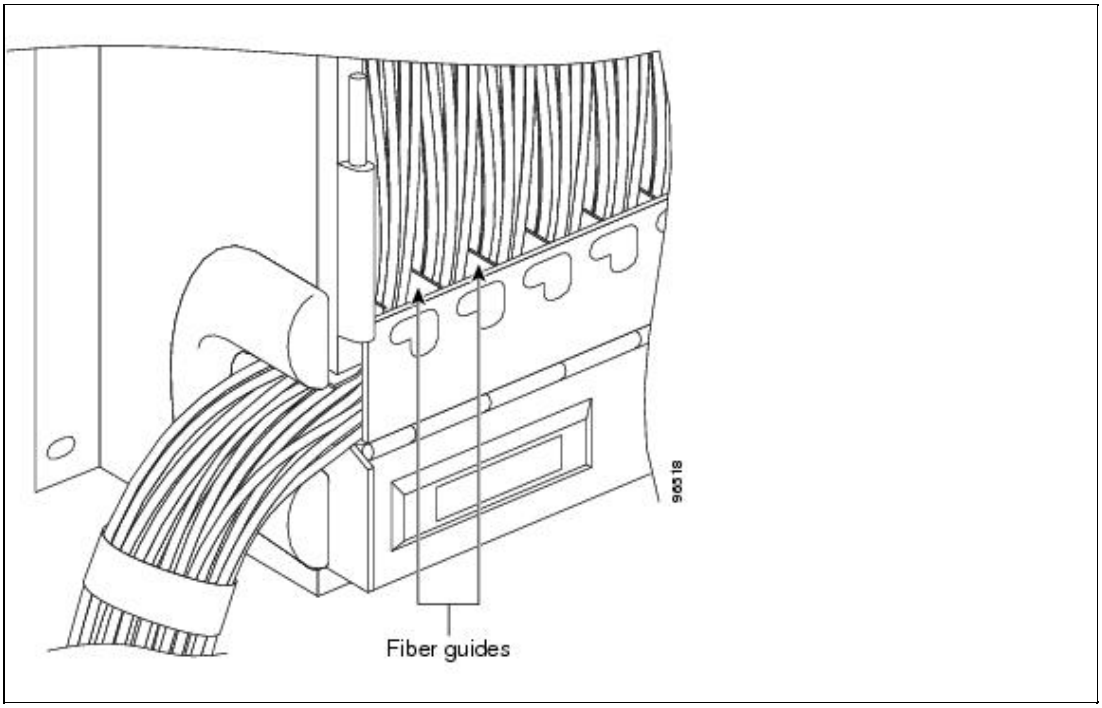


Table 1-6 provides the maximum capacity of the fiber channel for one side of a shelf, depending on fiber size and number of Ethernet cables running through that fiber channel.

Table 1-6: Fiber Channel Capacity (One Side of the Shelf)

!Fiber Diameter	!Maximum Number of Fibers Exiting Each Side			
	1.6 mm (0.6 inch)	126	110	94
2 mm (0.7 inch)	80	70	60	
3 mm (0.11 inch)	36	31	26	

Plan your fiber size according to the number of cards/ports installed in each side of the shelf. For example, if your port combination requires 36 fibers, 3 mm (0.11 inch) fiber is adequate. If your port combination requires 68 fibers, you must use 2 mm (0.07 inch) or smaller fibers.

Fan-Tray Assembly

The fan-tray assembly is located at the bottom of the ONS 15454 SDH. After you install the fan-tray assembly, you only need to open the drawer if a fan fails, or if you need to replace or clean the fan-tray air filter. Do not operate an ONS 15454 SDH without a fan-tray air filter. Refer to the "Maintain the Node" chapter in the *Cisco ONS 15454 SDH Procedure Guide* for information about cleaning and maintaining the fan-tray air filter.

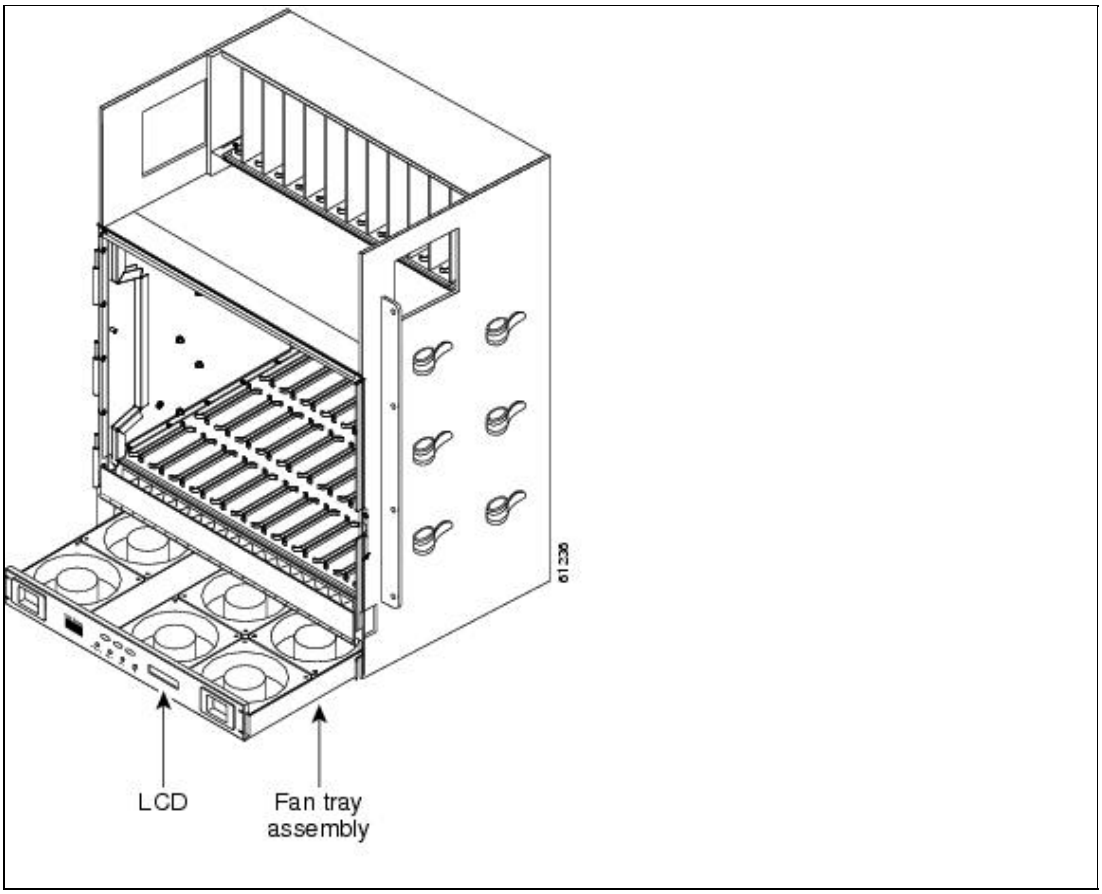
The fan-tray assembly is a removable drawer that holds fans and fan-control circuitry for the ONS 15454 SDH. Cisco recommends removing the front door of the chassis when removing or installing the fan-tray assembly. The front of the fan-tray assembly has an LCD screen that provides slot and port-level information for all ONS 15454 SDH card slots, including the number of critical, major, and minor alarms. For STM-N cards, you can use the LCD to determine if a port is in working or protect mode and is active or standby. It

also displays whether the software load is SONET or SDH and the software version number.

The temperature measured by the TCC2/TCC2P sensors is displayed on the LCD screen.

See Figure 1-12 for the position of the fan-tray assembly.

Figure 1-12: Position of the Fan-Tray Assembly



Note: 15454E-CC-FTA is compatible with Software Release 4.0 and greater and shelf assembly 15454-SA-ETSI.

Fan Speed

If one or more fans fail on the fan-tray assembly, replace the entire assembly. You cannot replace individual fans. The red Fan Fail LED on the front of the fan tray illuminates when one or more fans fail. For fan tray replacement instructions, refer to the *Cisco ONS 15454 SDH Troubleshooting Guide*. The red Fan Fail LED clears after you install a working fan-tray assembly.

Fan speed is controlled by TCC2/TCC2P card temperature sensors. The sensors measure the input air temperature at the fan-tray assembly. Fan speed options are low, medium, and high. If the TCC2 card fails, the fans automatically shift to high speed. The temperature measured by the TCC2 sensors is displayed on the LCD screen.

Caution! As with the older fan-tray assemblies, the 15454E-CC-FTA Fan Fail LED on the front of the fan-tray assembly illuminates when one or more fans fail to indicate that a fan-tray assembly or AIP replacement is required. But the Fan Fail LED on the 15454E-CC-FTA will also illuminate when only one power source is connected to the chassis, and or any fuse blows. In such conditions, the Fan Alarm is

triggered and the fans run at maximum speed.

Air Filter

The ONS 15454 SDH contains a reusable air filter that is installed beneath the fan-tray assembly.

The reusable filter is made of a gray, open-cell, polyurethane foam that is specially coated to provide fire and fungi resistance. Spare filters should be kept in stock. Clean the filter every three to six months. Replace the air filter every two to three years. Avoid cleaning the air filter with harsh cleaning agents or solvents.

Caution! Do not operate an ONS 15454 SDH without a fan-tray air filter. A fan-tray air filter is mandatory.

Pilot Fuse

The Pilot Fuse in the Fan tray assembly allows you to blow a low rate fuse when the main fuse of the lower power battery is not installed in the equipment.

CC-FTAs 15454-CC-FTA 800-27558-01 and 15454-CC-FTA 800-27561-01 can automatically generate an electrical pulse (without external commands) at power on and about every 25-35 minutes in order to drain extra current from both the batteries. The amount of current and the duration of the pulse that the CC-FTA can generate, is suitable to blow the fuses listed in the Table 1-7. Similar to CC-FTA, 15454-FTA3-T 800-23907-01 and 800-23907-05 can also operate the pilot fuses mentioned in Table 1-7 when the main fuse is missing. Unlike CC-FTA, FTA3-T alternatively drains the current from the two batteries every 50-100 msec to feed the fans.

Table 1-7: Pilot Fuse Ratings

Type of Fuse	Current rating
Bussmann GMT-18/100A	18/100A
Bussmann GMT-1/4A	1/4A
Bussmann 70E	18/100A
Bussmann 70F	1/4A

This is accomplished in the I-temp range (-40°C to +65°C) in either of these conditions:

- When the lower power battery is in the 43.0V to 60.0V range and the higher power battery is more than 1V greater than the lower power battery (or)
- When the lower power battery is in the 40.0V to 60.0V range and the difference between the two batteries does not exceed 0.5V.

Power and Ground Description

Ground the equipment according to standards or local practices.

The ONS 15454 SDH has redundant -48 VDC power connectors on the MIC-A/P and MIC-C/T/P faceplates. To install redundant power feeds, use the two power cables shipped with the ONS 15454 SDH and one ground cable. For details, see the MIC-A/P FMEC and the MIC-C/T/P FMEC.

Caution! Only use the power cables shipped with the ONS 15454 SDH.

Alarm, Timing, LAN, and Craft Pin Connections

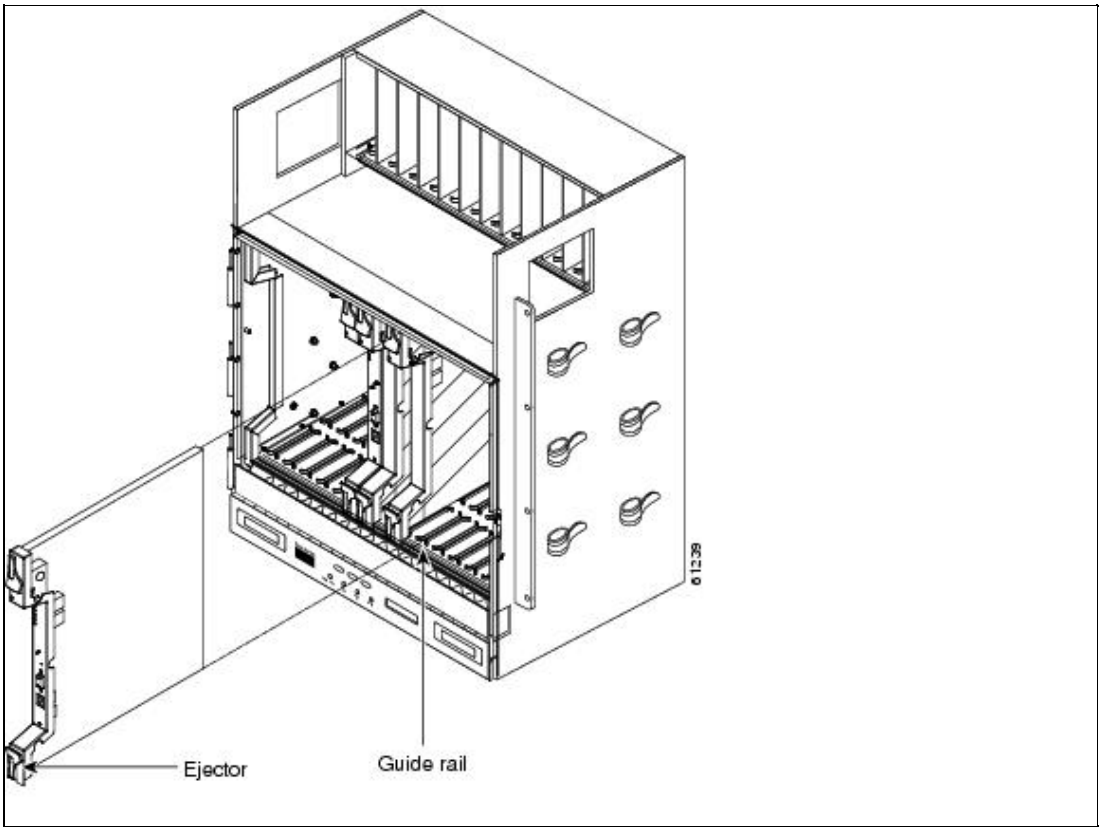
Caution! Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.

The MIC-A/P and the MIC-C/T/P FMECs in the EFCA area at the top of the ONS 15454 SDH shelf are used for enabling external alarms, timing input and output, and craft interface terminals to the ONS 15454 SDH. For details, see the MIC-A/P FMEC and the MIC-C/T/P FMEC.

Cards and Slots

ONS 15454 SDH cards have electrical plugs at the back that plug into electrical connectors on the shelf assembly backplane. When the ejectors are fully closed, the card plugs into the assembly backplane Figure 1-13 shows card installation.

Figure 1-13: Installing Cards in the ONS 15454 SDH



Card Slot Requirements

The ONS 15454 SDH shelf assembly has 17 card slots numbered sequentially from left to right. Slots 1 through 6 and 12 through 17 are for traffic-bearing cards.

Slots 7 and 11 are dedicated to TCC2/TCC2P cards. Slots 8 and 10 are dedicated to cross-connect (XC-VXL-2.5G, XC-VXL-10G, XC-VXC-10G) cards. Slot 9 is reserved for the optional AIC-I card. Slots 3 and 15 can also host electrical protect cards that are used in 1:N protection.

Caution! Do not operate the ONS 15454 SDH with a single TCC2/TCC2P card or a single XC-VXL-2.5G/XC-VXL-10G/XC-VXC-10G card installed. Always operate the shelf assembly with one

working and one protect card of the same type.

Shelf assembly slots have symbols indicating the type of cards that you can install in them. Each ONS 15454 SDH card has a corresponding symbol. The symbol on the card must match the symbol on the slot.

Table 1-8 shows the slot and card symbol definitions.

Table 1-8: Slot and Card Symbols

Symbol Color/Shape	Definition
Orange/Circle	Slots 1 to 6 and 12 to 17. Only install ONS 15454 SDH cards with a circle symbol on the faceplate.
Blue/Triangle	Slots 5, 6, 12, and 13. Only install ONS 15454 SDH cards with circle or a triangle symbol on the faceplate.
Purple/Square	TCC2/TCC2P slot, Slots 7 and 11. Only install ONS 15454 SDH cards with a square symbol on the faceplate.
Green/Cross	Cross-connect (XC-VXL-2.5G/XC-VXL-10G) slot, that is, Slots 8 and 10. Only install ONS 15454 SDH cards with a cross symbol on the faceplate.
Red/P	Protection slot in 1:N protection schemes.
Red/Diamond	AIC-I slot, that is, Slot 9. Only install ONS 15454 SDH cards with a diamond symbol on the faceplate.
Gold/Star	Slots 1 to 4 and 14 to 17. Only install ONS 15454 SDH cards with a star symbol on the faceplate.

Table 1-9 lists the number of ports, line rates, connector options, and connector locations for ONS 15454 SDH optical and electrical cards.

Table 1-9: Card Ports, Line Rates, and Connectors

Card	Ports	Line Rate per Port	Connector Types	Connector Location
CE-100T-8	8	100 Mbps	RJ-45	Faceplate
E1-N-14	14	2.048 Mbps	1.0/2.3 miniature coax connector or DB-37	EFCA
E1-42	14	2.048 Mbps	1.0/2.3 miniature coax connector or Molex 96-pin LFH connector	EFCA
E3-12	12	34.386 Mbps	1.0/2.3 miniature coax connector	EFCA
DS3i-N-12	12	44.736 Mbps	1.0/2.3 miniature coax connector	EFCA
STM1E-12	12	Configurable 155.52 Mbps or 139.264 Mbps	1.0/2.3 miniature coax connector	EFCA
E100T-G	12	100 Mbps	RJ-45	Faceplate
E1000-2-G	2	1 Gbps	SC (GBIC)	Faceplate
G1K-4	4	1 Gbps	SC (GBIC)	Faceplate
ML100T-12	12	100 Mbps	RJ-45	Faceplate
ML100X-8	8	100 Mbps	SC (SFP)	Faceplate
ML1000-2	2	1 Gbps	LC (SFP)	Faceplate

OC3 IR 4/STM1 SH 1310	4	155.52 Mbps (STM-1)	SC	Faceplate
OC3IR/STM1SH 1310-8	8	155.52 Mbps (STM-1)	LC	Faceplate
OC12 IR/STM4 SH 1310	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 LR/STM4 LH 1310	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 LR/STM4 LH 1550	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 IR/STM4 SH 1310-4	4	622.08 Mbps (STM-4)	SC	Faceplate
OC48 IR/STM16 SH AS 1310	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC48 LR/STM16 LH AS 1550	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC48 ELR/STM16 EH 100 GHz	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC192 SR/STM64 IO 1310	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 IR/STM64 SH 1550	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 LR/STM64 LH 1550	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 LR/STM64 LH ITU 15xx.xx	1	9.95 Gbps (STM-64)	SC	Faceplate
FC_MR-4	4	1.0625 Gbps	SC	Faceplate
15454_MRC-12	12	Up to 2488.32 Mbps (STM-16), depending on SFP	LC	Faceplate
MRC-2.5G-12	12	Up to 2488.32 Mbps (STM-16), depending on SFP	LC	Faceplate
OC192SR1/STM64IO Short Reach, OC192/STM64 Any Reach[1]	1	9.95 Gbps (STM-64)	LC	Faceplate

1. These cards are designated as STM64-XFP in CTC.

Card Replacement

To replace an ONS 15454 SDH card with another card of the same type, you do not need to make any changes to the database; remove the old card and replace it with a new card. To replace a card with a card of a different type, physically remove the card and replace it with the new card, then delete the original card from CTC. For specifics, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Caution! Removing any active card from the ONS 15454 SDH can result in traffic interruption. Use caution when replacing cards and verify that only inactive or standby cards are being replaced. If the active card needs to be replaced, switch it to standby prior to removing the card from the node. For traffic switching procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Note: An improper removal (IMPROPRMVL) alarm is raised whenever a card pull (reseat) is performed, unless the card is deleted in CTC first. The alarm clears after the card replacement is complete.

Note: In a subnetwork connection protection (SNCP), pulling the active cross-connect card without a lockout causes SNCP circuits to switch.

Software and Hardware Compatibility

Table 1-10 shows ONS 15454 SDH software and hardware compatibility for systems configured with XC-VXL-2.5G cards for Releases 4.6, 5.0, 6.0, 7.0, 7.2, 8.0, and 8.5.

Table 1-10: ONS 15454 SDH Software Release/Hardware Compatibility-XC-VXL-2.5G Configurations

Hardware	4.6.0x (4.6)	5.0.0x (5.0)	6.0.0x (6.0)	7.0.0x (7.0)	7.2.0 (7.0)	8.0.0x(8.0)	8.5.0x(8.5)
XC-VXL-2.5G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
TCC2	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
TCC2P	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
AIC-I	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E1N-14	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E1-42	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E3-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
DS3i-N-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
STM1E-12	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E100T-G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E1000-2-G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
G1000-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
G1K-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML100T-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML-100X-8	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML1000-2	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML-MR-10	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible
CE-MR-10	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible
CE-100T-8	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
CE-1000-4	Not supported	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible

OC3 IR 4/STM1 SH 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC3IR/STM1SH 1310-8	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 IR/STM4 SH 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 LR/STM4 LH 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 LR/STM4 LH 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 IR/STM4 SH 1310-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 IR/STM16 SH AS 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 LR/STM16 LH AS 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 ELR/STM16 EH 100 GHz	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192 SR/STM64 IO 1310	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
OC192 IR/STM64 SH 1550	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
OC192 LR/STM64 LH 1550	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
OC192 LR/STM64 LH ITU 15xx.xx	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
OC192SR1/STM64IO Short Reach, OC192/STM64 Any Reach[1]	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
MRC-12[2]	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
MRC-2.5G-12	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible	Fully compatible
FC_MR-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible

1. These cards are designated as STM64-XFP in CTC.

2. Slots 1 to 4 and 14 to 17 give a total bandwidth of up to 622 Mb/s. Slots 5, 6, 12, and 13 give a total bandwidth of up to 2.5 Gb/s

Table 1-11 shows ONS 15454 SDH software and hardware compatibility for systems configured with the XC10G, XC-VXC-10G, and XC-VXL-10G cards for Releases 4.6, 5.0, 6.0, 7.0, 7.2, 8.0, and 8.5. Release 4.5 is not supported on the XC10G and XC-VXL-10G cards. XC-VXC-10G is only supported from Release 6.0.

Note: XC-10G is not supported in Lower Order circuits.

Table 1-11: ONS 15454 SDH Software Release/Hardware Compatibility-XC10G, XC-VXC-10G, and XC-VXL-10G Configuration

Hardware	4.6.0x (4.6)	5.0.0x (5.0)	6.0.0x (6.0)	7.0.0x (7.0)	7.2.0x (7.2)	8.0.0x (8.0)	8.5.0x(8.5)
TCC2/TCC2P	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
AIC-I	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E1N-14	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E1-42	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
E3-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
DS3i-N-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
STM1E-12	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
RAN-SVC	Not supported	Not supported	Not supported	Not supported	Fully compatible	Not supported	Not supported
E100T-G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Not supported
E1000-2-G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
G1000-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
G1K-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML100T-12	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML-100X-8	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML1000-2	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
ML-MR-10	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible
CE-MR-10	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible
CE-100T-8	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
CE-1000-4	Not supported	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC3 IR 4/STM1 SH 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC3IR/STM1SH 1310-8	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 IR/STM4 SH	Fully	Fully	Fully	Fully	Fully	Fully	Fully

1310	compatible	compatible	compatible	compatible	compatible	compatible	compatible
OC12 LR/STM4 LH 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 LR/STM4 LH 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC12 IR/STM4 SH 1310-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 IR/STM16 SH AS 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 LR/STM16 LH AS 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC48 ELR/STM16 EH 100 GHz	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192 SR/STM64 IO 1310	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192 IR/STM64 SH 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192 LR/ STM64 LH 1550	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192 LR/ STM64 LH ITU 15xx.xx	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
OC192SR1/STM64IO Short Reach, OC192/STM64 Any Reach[1]	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
MRC-12[2]	Not supported	Not supported	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
MRC-2.5G-12	Not supported	Not supported	Not supported	Not supported	Not supported	Fully compatible	Fully compatible
TXP_MR_10G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
MXP_2.5G_10G	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible
FC_MR-4	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible	Fully compatible

1. These cards are designated as STM64-XFP in CTC.

2. Slots 1 to 4 and 14 to 17 give a total bandwidth of up to 2.5Gb/s. Slots 5, 6 , 12 , and 13 give a total bandwidth of up to 10Gb/s

Note: For compatibility information of DWDM cards, see the Cisco ONS 15454 DWDM Reference Manual.

If an upgrade is required for compatibility, go to the Cisco Technical Assistance Center (Cisco TAC) website at http://www.cisco.com/tac.

Table 1-11: ONS 15454 SDH Software Release/Hardware Compatibility-XC10G, XC-VXC-10G, and XC-VXL-1