



# **ADTRAN 1748F Switch Hardware Installation Guide**

1700558F1

ADTRAN 1748F

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## Conventions

**NOTE**

*Notes provide additional useful information.*

**CAUTION**

*Cautions signify information that could prevent service interruption or damage to the equipment.*

**WARNING**

*Warnings provide information that could prevent injury or endangerment to human life.*

## Safety Instructions

When using your networking equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as a utility sink, water heater, or in a wet basement.
2. Use only the power cord, power supply, and batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.
3. The socket-outlet shall be installed near the equipment and shall be easily accessible.

If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your qualified service personnel:

1. The power cable, extension cable, or plug is damaged.
2. An object has fallen into the product.
3. The product has been exposed to water.
4. The product has been dropped or damaged.
5. The product does not operate correctly when you follow the operating instructions.



*This equipment incorporates double pole/neutral fusing. If the neutral fuse opens and the line fuse does not open, voltage could still be present in the unit.*



*These units contain no user-serviceable parts. They should only be serviced by qualified service personnel.*



*Additional safety guidelines, such as Waste Electrical and Electronic Equipment (WEEE), are given in the document [NetVanta Safety and Regulatory Information](https://supportforums.adtran.com) available at <https://supportforums.adtran.com>.*

**Save These Important Safety Instructions**

## **FCC Radio Frequency Interference Statement**

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

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) for RJ-45 connections, Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections, Category 5, 5e, or 6 for 1000 Mbps connections. For fiber optic connections, you may use 50/125 or 62.5/125 micron multi-mode fiber or 9/125 micron single-mode fiber.

## **Laser Safety**

### **Warning: Fiber Optic Port Safety: Class A Laser Device**

When using a fiber optic port, never look at the transmit laser while it is powered on. Also, never look directly at the fiber TX port and fiber cable ends when they are powered on.

## **Canadian Emissions Requirements**

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

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

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## **Service and Warranty**

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# 1. INTRODUCTION

This guide includes detailed information on the switch hardware, including network ports, power, cabling requirements, as well as plug-in modules and transceivers. This guide also provides general installation guidelines and recommended procedures. To deploy this switch effectively and ensure trouble free operation, you should first read the relevant sections in this guide so that you are familiar with all its hardware components. This guide includes the following chapters:

- [Introduction on page 13](#)
- [Unit Installation on page 18](#)
- [Port Connections on page 26](#)
- [Switch Management on page 36](#)
- [Troubleshooting on page 41](#)

For a detailed description of connecting to the ADTRAN 1748F Switch, refer to the *DCSS Administrator's Guide* available online at <https://supportforums.adtran.com>. For more detailed information about using the switch's command line interface (CLI), refer to the *DCSS Command Reference Guide* available online at <https://supportforums.adtran.com>.

## Switch Overview

The ADTRAN 1748F switch is a high-performance top-of-rack switch, designed for campus local area network (LAN) and data center operating environments. The switch provides 48 10G Ethernet Small Form Factor Pluggable Plus (SFP+) transceiver slots, four 40G Quad-SFP+ (QSFP+) ports, and two 1G RJ-45 ports. The switch also includes replaceable dual power supply units and a fan tray module.

The switch supports a full set of Layer 2 switching, data center bridging, and Layer 3 routing features. The switch can be deployed as a top-of-rack (TOR).

The switch also offers an option of front-to-back (F2B) or back-to-front (B2F) airflow cooling for rack deployment with either blade servers or other switches, allowing cool aisles to be maintained without creating *hot loops*. However, the default option from unit will be B2F cooling.

## Key Hardware Components

The ADTRAN 1748F switch consists of several key hardware components. This manual describes each specific component, or related components, together with their installation requirements and procedures in each chapter. To understand each component in detail, refer to the relevant section.

## ADTRAN 1748F Front Panel Design

The ADTRAN 1748F front panel is shown below.



Figure 1. ADTRAN 1748F Front Panel Layout

## Front Panel Features

### 10G SFP+ Slots

The switch contains 48 SFP+ (labeled **1** through **48**) transceiver slots that support 10G Ethernet SFP+ transceivers or 1G Ethernet SFP transceivers. Status LEDs for each stacked pair are located between the slots. For more information, refer to [Connecting to SFP/SFP+ Fiber Optic Ports on page 31](#).

### 40G QSFP+ Slots

The switch contains four QSFP+ transceiver slots (labeled **49** through **52**) that operate up to 40 Gbps full duplex. For more information, refer to [Connecting to QSFP+ Fiber Optic Ports on page 32](#).

### Console Port

The RJ-45 port labeled **Console** provides an out-of-band serial connection to a terminal or a PC running terminal emulation software. The port can be used for performing switch monitoring and configuration. For more information, refer to [Connecting to the Console Port on page 38](#).

### Management Port

The RJ-45 port labeled **Management** provides a dedicated 1000BASE-T management interface. For more information, refer to [Connecting to the Management Port on page 37](#).

### USB Port

A USB port is provided on the switch front panel. This port is for transferring configuration files from a USB storage device to the switch's flash memory. For more information, refer to [Connecting to the USB Port on page 40](#).

### Reset Button

The reset button is located below the **Management** port. Pressing the reset button on the front panel causes the switch to perform a hard reset. For more information, refer to [Resetting the Switch on page 40](#).

### System LEDs

For more information on system status LED indicators, refer to [Understanding the System Status LEDs on page 36](#).

### Port LEDs

For more information on port status LED indicators, refer to [Understanding the Port Status LEDs on page 27](#).

## ADTRAN 1748F Rear Panel Design

The ADTRAN 1748F rear panel is shown below.



Figure 2. ADTRAN 1748F Rear Panel Layout

## Rear Panel Features

### Grounding Terminal

The grounding terminal must be connected to a ground source that provides local earth potential. Refer to [Grounding the Chassis on page 23](#) for grounding instructions.

### Fan Tray Module

The fan tray module provides air cooling for the switch system. For more information on the fan tray module, refer to [Fan Tray Module on page 21](#).

### Power Supply Module Slots

The switch supports dual hot-swappable AC power supply units (PSUs). You can install up to two PSUs with matching airflow direction in the switch. For more information on the switch power supplies, how to install them, and how to power the switch, refer to [Power Supply Modules on page 22](#).

## Product Specifications

### Ports

- 48 10 Gbps SFP+ transceiver slots
- 4 40 Gbps QSFP+ transceiver slots
- 1 10/100/1000 Mbps RJ-45 management port

#### Ports 1 through 48: SFP+

- 10 Gbps SFP+ transceivers: 10GBASE-LR, 10GBASE-SR
- 1 Gbps SFP transceivers: 1000BASE-SX, 1000BASE-LX

#### Ports 49 through 52: QSFP+

- 40 Gbps QSFP+ transceivers

### Management Port

- 10/100/1000BASE-T, RJ-45 connector

### Buffer Architecture

- 32 Mbit packet buffer

### Aggregate Bandwidth

- 1280 Gbps

### Switching Database

- 128K MAC address entries

### Power Supply Module

- 100 to 240 VAC, 50 to 60 Hz, auto-sensing; hot pluggable
- 400 Watts at 240 V/100 V per module

### Power Consumption

- 165 Watts maximum

### Out-of-Band Management

- RS-232 RJ-45 console port

### In-Band Management

- SSH, Telnet, or SNMP

### Software Loading

- FTP/TFTP in-band

**Forwarding Mode**

- Store-and-forward

**Throughput**

- Wire speed

**Flow Control**

- Full Duplex: IEEE 802.3x
- Half Duplex: Back pressure

**Environment**

- Operating Temperature: 0°C to 40°C (32°F to 140°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Relative Humidity: Up to 95 percent, noncondensing

**Physical**

- Dimensions: 438.4 mm W x 473 mm D x 43.4 mm H (17.26 inch W x 18.62 inch H x 1.71 inch D)
- Weight: 8.395 kg (18.51 lb), with two installed power supply modules

**Compliance**

- FCC Part 15 Class A
- EN 55022:2010 Class A
- EN 61000-3-2:2009 Class A
- EN 61000-3-3:2008
- FCC Class A
- VCCI Class A
- CE Mark
- EN 55024:2010
- ICE 61000-4-2/3/4/5/6/8/11
- UL (CSA 22.2 No 60950-1 and UL 60950-1)
- CB (IEC/EN 60950-1)

**Deployment**

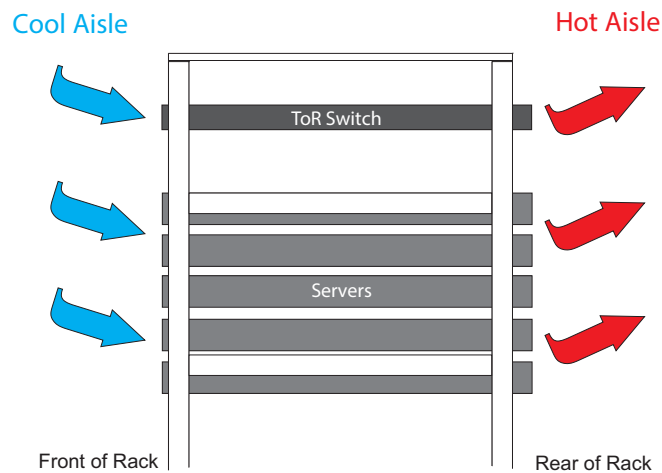
The switch is designed for high-availability environments with a high port density. The switch includes redundant, hot-swappable, load-sharing AC PSUs, a hot-swappable fan tray, and port-to-power and power-to-port airflow direction options. Meeting the network scaling requirements of enterprise and cloud data centers, the switch can be deployed as a top-of-rack switch providing full line-rate switching at Layer 2 or Layer 3 across all ports.

**Rack Cooling**

The top-of-rack switch is a high-performance, high-density unit that generates a substantial amount of heat. When mounted in a rack with other equipment, it is important that the switch has the same airflow direction to avoid *hot loops* in the data center aisles. Hot loops increase cooling requirements since warm air is drawn into rack devices instead of cool air.

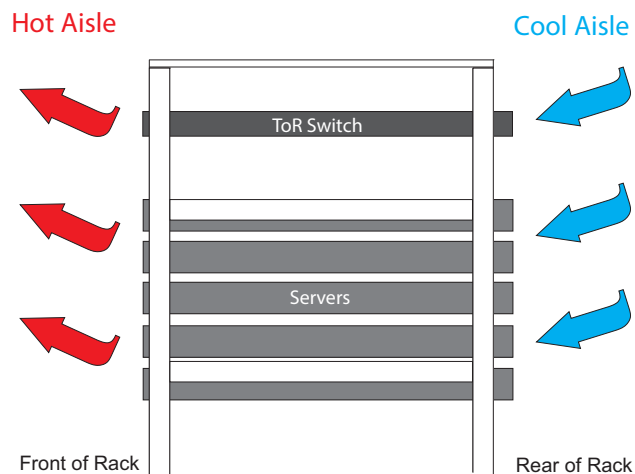
Most rack-mounted blade servers draw cool air from the front and expel hot air at the rear. The top-of-rack switch includes power supply units and a fan tray module that have a front-to-back (F2B) airflow direction that maintains cool aisles in the data center.





**Figure 3. F2B Airflow Cooling**

When mounted in a rack with other network equipment that may have a back-to-front (B2F) airflow direction, the top-of-rack switch includes power supply and fan tray modules that reverse the airflow direction through the switch. This enables various deployment options for the switch in the data center.



**Figure 4. B2F Airflow Cooling**

## 2. UNIT INSTALLATION

The instructions and guidelines provided in this section cover hardware installation topics, such as mounting options and supplying power to the unit. These instructions are presented as follows:

- *Shipping Contents on page 18*
- *Rack Mounting on page 18*
- *Switch Cooling Requirements on page 20*
- *Replacing the Fan Tray on page 21*
- *Supplying Power to the Unit on page 22*

### Shipping Contents

Each ADTRAN 1748F Switch unit is shipped in its own cardboard shipping carton. Open each carton carefully, and avoid deep penetration into the carton with sharp objects.

After unpacking the unit, inspect it for possible shipping damage. If the equipment has been damaged in transit, immediately file a claim with the carrier and contact ADTRAN Customer Service (refer to the *Support* page on the ADTRAN website at <http://www.adtran.com/support>).

Shipments of the ADTRAN 1748F Switch includes the following items:

- ADTRAN 1748F base unit
- Rack mounting kit containing two brackets and eight screws for attaching the brackets to the switch
- Grounding wire
- U.S. power cord
- Console cable (RJ-45 to DB-9)
- Quick Start Guide

### Rack Mounting

The ADTRAN 1748F Switch is a 1U-high, rack-mountable unit that can be installed into a 19-inch equipment rack. The following steps guide you in mounting the ADTRAN into a rack.

#### Tools Required

Before you start to rack-mount the switch, be sure to have the following items available:

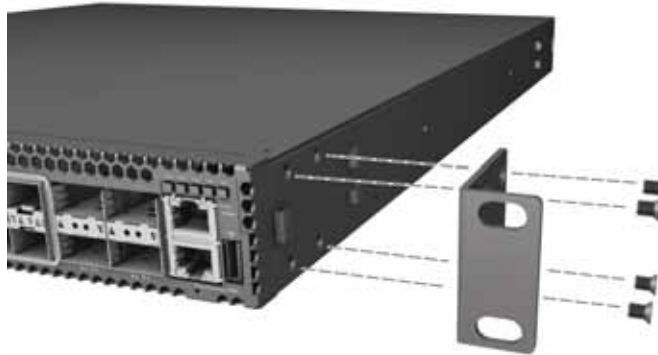
- Four mounting screws for each device you plan to install in a rack—these are not included in the shipment. Be sure to use the rack mounting screws that are supplied with the rack.
- A screwdriver (Phillips or flathead, depending on the type of screws used).

#### **WARNING**

- *To prevent electrical shock, do not install equipment in a wet location or during a lightning storm.*
- *Ethernet cables are intended for intrabuilding use only. Connecting an ADTRAN unit directly to Ethernet cables that run outside the building in which the unit is housed will void the user's warranty and could create a fire or shock hazard.*



- *Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.*
- *The ADTRAN 1748F is intended to be installed, maintained, and serviced by qualified service personnel only and should be installed in a restricted access location as described in UL/IEC 60950-1.*
- *If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature specified by the manufacturer.*
- *Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.*
- *Be careful not to compromise the stability of the equipment mounting rack when installing this product.*
- *Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading the circuit might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.*
- *Reliable grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).*



**Figure 5. Attach Mounting Brackets**



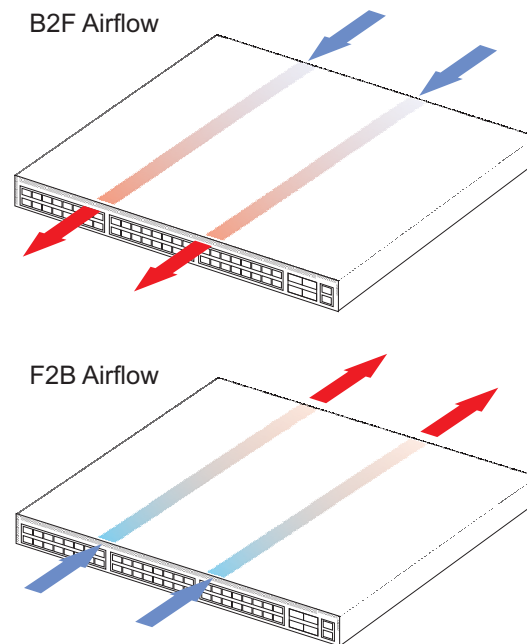
**Figure 6. Install Unit in Rack**

Rack Mounting the Unit Using the Rack Mounting Brackets	
Step	Action
1	Install the rack mounting brackets on the unit. To avoid damaging the unit, use only the screws shipped with the mounting brackets when attaching them to the chassis (see <a href="#">Figure 5</a> ).
2	To allow proper grounding, scrape the paint from the rack around the mounting holes where the unit will be positioned.
3	Position the unit in a stationary equipment rack. This unit occupies 1U of space.
4	Have an assistant hold the unit in position as you install two mounting bolts (not provided) through the unit's brackets and into the equipment rack using a #2 Phillips-head screwdriver (see <a href="#">Figure 6</a> ).
5	If installing a single switch only proceed to <a href="#">Supplying Power to the Unit on page 22</a> . If installing multiple switched repeat steps 1 through 4 and refer to

### Switch Cooling Requirements

Wherever the switch is located, be sure to pay close attention to switch cooling requirements. The location should be well ventilated and provide unrestricted air flow at the front, back, and sides of the switch. If the air flow is insufficient, it may cause the switch to overheat and possibly fail.

The switch includes a removable fan tray module located in the rear of the switch. The module options may have either a front-to-back (F2B) airflow direction or a back-to-front (B2F) airflow direction. The switch's plug-in power supply modules also include a fan, which can be either F2B or B2F airflow direction. For proper switch cooling, all installed modules must have a matching airflow direction. The following figure shows the airflow through the switch.

**Figure 7. Switch Cooling**

## Rack Cooling

When mounting the switch in an enclosed rack or cabinet, be sure to check the following guidelines to prevent overheating:

- Make sure that enough cool air can flow into the enclosure for the equipment it contains.
- Check that the rack or cabinet allows the hot air to exit the enclosure (normally from the top) without circulating back into equipment.
- If the enclosure has sides or doors with ventilation holes, make sure they are not blocked by cables or other obstructions.
- Route cables within the rack or cabinet to maximize the airflow.
- When possible, do not completely fill the rack or cabinet with equipment, allow some unused space within the enclosure for better airflow.

## Fan Tray Module

The fan tray module is an important part of the switch air cooling system. A fan tray module must be installed in the switch at all times. If a fan should fail, the whole fan tray module must be replaced as soon as possible.

You must install the fan tray module in the switch that matches the airflow direction of the installed power supply units.



*The switch includes plug-in power supply and fan tray modules that are installed into its chassis. All installed modules must have a matching airflow direction. That is, all modules must have a front-to-back (F2B) airflow direction, or all modules must have a back-to-front (B2F) airflow direction. The airflow direction of PSUs and fan trays is indicated by labels on the modules.*

## Replacing the Fan Tray

The switch system is shipped with a fan tray module installed. The removable fan tray, located in the rear of the switch, includes four fixed fans and supports fan speed control. The fan speed is dynamically controlled as a function of temperature: the higher the internal temperature, the faster the speed of the fans. The fan tray module does not include LED indicators.



**Figure 8. Fan Tray**

**Table 1. Fan Tray Specifications**

Item	Description
Power Consumption	12 VDC @ 2.8 A, 37 Watts maximum
Airflow	76.4 CFM minimum 90.4 CFM maximum
Dimensions	207mm W x 94.25 mm D x 40.4 mm H (8.15 inch W x 3.71 inch D x 1.59 inch H)

To replace the fan tray, follow these steps:

Replacing the Fan Tray	
Step	Action
1	Loosen the two retaining screws on the front panel of the fan tray (see <a href="#">Figure 8</a> ).
2	Pull firmly on the screws until the fan tray is free.
3	Slide the fan tray out of the switch.
4	Insert the replacement fan tray into the slot and slide it slowly into the chassis.
5	Push firmly until the fan tray clicks into place. The fans should immediately start to operate.
6	Tighten the retaining screws to secure the fan tray in the chassis.

## Supplying Power to the Unit

This chapter focuses on the switch power supplies, how to install them, and how to power-on the switch. Connecting the switch to ground is also covered.

This section includes these sections:

- [Power Supply Modules on page 22](#)
- [Grounding the Chassis on page 23](#)
- [Connecting to AC Power on page 24](#)

### Power Supply Modules

The switch supports hot-swappable power supply units (PSUs). You can install up to two PSUs with matching airflow direction in the switch. The PSUs operate in a load-sharing mode and provide 1+1 redundancy.



*1+1 redundancy is a system where a switch power supply is backed up by another switch power supply in a load-sharing mode. If one power supply fails, the other power supply takes over the full load of the switch.*



*The switch includes plug-in power supply and fan tray modules that are installed into its chassis. All installed modules must have a matching airflow direction. That is, all modules must have a front-to-back (F2B) airflow direction, or all modules must have a back-to-front (B2F) airflow direction. The airflow direction of PSUs and fan trays is indicated by labels on the modules.*

The AC Power Supply Modules require power from an external AC power supply that can provide 100 to 240 VAC, 50-60 Hz. A standard AC power socket is located on the rear panel of the PSU. The power socket is for the AC power cord.



**Figure 9. AC Power Supply Module**

**Table 2. AC Power Supply Module Specifications**

Item	Description
AC Input	100 to 240 VAC, 50 to 60 Hz, 4-2 A
DC Output	5 VDC @ 3 A 12 VDC @ 33 A
Power Supply	100 to 240 VAC, 50 to 60 Hz, auto-sensing; hot pluggable 400 W @ 220 V/110 V per module
Power Consumption	165 W maximum
Maximum Current	4 A @ 100 VAC 2 A @ 240 VAC
Dimensions	54.5 mm W x 220 mm D x 40.25 mm H (2.15 inch W x 8.66 inch D x 1.58 inch H)

The PSU also includes an AC power status LED. This LED is described in the following table.

LED	Color	Indication
<b>AC</b>	Off	External power is not connected or has failed.
	Green (solid)	External AC power is connected to the module.

### ***Grounding the Chassis***

The switch chassis must be connected to ground to ensure proper operation and to meet electromagnetic interference (EMI) and safety requirements.

The rear panel of the switch chassis includes a single-screw grounding terminal. The surface area around this terminal is not painted in order to provide for a good connection. It must be connected to ground to ensure proper operation and to meet electromagnetic interference (EMI) and safety requirements. Before powering on the switch, ground the switch to earth as described below.



- *The earth connection must not be removed unless all supply connections have been disconnected.*
- *Ensure that the rack on which the switch is to be mounted is properly grounded and in compliance with ETSI ETS 300 253.*
- *Ensure that there is a good electrical connection to the grounding point on the rack (no paint or isolating surface treatment).*
- *The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.*



**Figure 10. Grounding Terminal**

Instructions for Grounding the Chassis	
Step	Action
1	Disconnect all power cables to the switch.
2	Attach a 6 AWG stranded copper wire to the grounding terminal on the switch.
3	Then attach the grounding wire to the ground point on the rack.

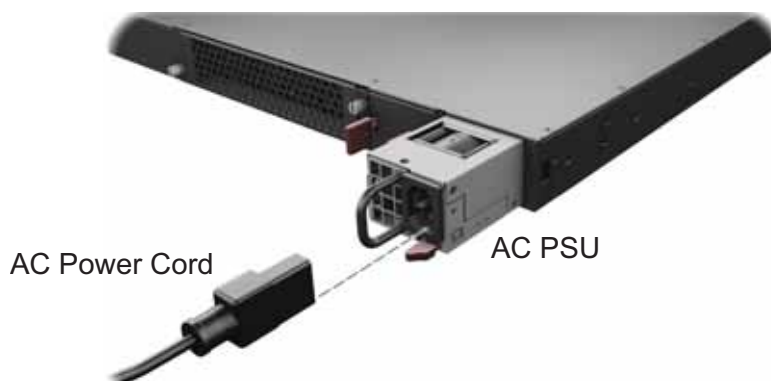
### **Connecting to AC Power**

To supply AC power to the switch, first verify that the external AC power supply can provide 100 to 240 VAC, 50-60 Hz, 3 A minimum.



**WARNING**

- *Installation and removal of the unit must be carried out by qualified personnel only.*
- *The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.*
- *Do not connect the unit to an AC outlet (power supply) without an earth (ground) connection.*
- *The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.*
- *The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.*
- *When connecting this device to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.*
- *This unit operates under SELV (Safety Extra Low Voltage) conditions according to UL 60950-1. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.*



**Figure 11. AC PSU and Power Socket**

To connect the switch to a power source follow these steps.

<b>Instructions for Connecting to AC Power</b>	
<b>Step</b>	<b>Action</b>
1	Install one or two AC PSU modules. Slide them into the PSU slots at the rear of the switch until they click into place. (Push the red release lever to remove a module from the switch.)
2	Plug the appropriate power cord into a grounded, 3-pin, AC power source.
3	Insert the plug on the other end of the power cord directly into the socket on the AC PSU.
4	Check the LED indicators on the PSU and switch front panel as the unit is powered on to verify that power is being received. If not, recheck the PSU and power cord connections at the AC supply source and PSU.
5	If you have installed a second PSU, repeat steps 2 to 4.

### 3. PORT CONNECTIONS

This chapter focuses on making connections to switch network interfaces, including how to install optional transceivers, and details on network cable specifications.

The switch features 48 SFP+ transceiver slots and four 40 Gigabit QSFP+ transceiver slots. The sections that follow describe these interfaces.



*The switch also has one 10/100/1000BASE-T port for dedicated management access. This port is described in [Connecting to the Management Port on page 37](#).*

This chapter includes these sections:

- [Cable Labeling and Connection Records on page 26](#)
- [Understanding the Port Status LEDs on page 27](#)
- [Installing an SFP/SFP+/QSFP+ Transceiver on page 27](#)
- [Connecting to Twisted-Pair Copper Ports on page 28](#)
- [Connecting to SFP/SFP+ Fiber Optic Ports on page 31](#)
- [Connecting to QSFP+ Fiber Optic Ports on page 32](#)
- [DAC Connections on page 34](#)

#### Cable Labeling and Connection Records

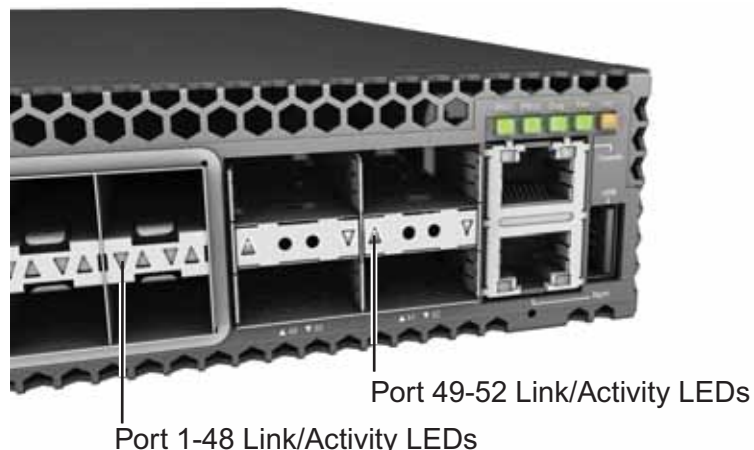
When planning a network installation, it is essential to label the opposing ends of cables and to record where each cable is connected. Doing so will enable you to easily locate inter-connected devices, isolate faults and change your topology without need for unnecessary time consumption.

To best manage the physical implementations of your network, follow these guidelines:

- Clearly label the opposing ends of each cable.
- Using your building's floor plans, draw a map of the location of all network connected equipment. For each piece of equipment, identify the devices to which it is connected.
- Note the length of each cable and the maximum cable length supported by the switch ports.
- For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.
- Use sequential numbers for cables that originate from the same equipment.
- Differentiate between racks by naming accordingly.
- Label each separate piece of equipment.
- Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

## Understanding the Port Status LEDs

The switch includes LED indicators for each port to indicate link status and network activity. The port LEDs are shown below and described in the following table.



**Figure 12. Port Status LEDs**

**Table 3. Port Status LEDs**

LED	Color	Indication
<b>10G SFP+ Ports</b> (1 through 48)	Off	The link is down.
	Green (solid)	Port has a valid 1G or 10G link.
	Green (flashing)	There is activity on the port.
<b>40G QSFP+ Ports</b> (49 through 52)	Off	The link is down.
	Green (solid)	Port has a valid 40G link.
	Green (flashing)	There is activity on the port.

## Installing an SFP/SFP+/QSFP+ Transceiver

The switch provides slots for optional SFP, SFP+, and QSFP+ transceivers. The supported transceiver types are listed below:

- 40 Gbps Ethernet QSFP+ transceivers
- 10 Gbps Ethernet SFP+ transceivers
- 1000 Mbps Ethernet SFP transceivers



- *SFP/SFP+/QSFP+ transceivers are hot-swappable. The switch does not need to be powered off before installing or removing a transceiver.*
- *SFP/SFP+/QSFP+ transceivers are not provided in the switch package.*

**WARNING**

- When selecting a fiber SFP/SFP+/QSFP+ device, considering safety, make sure that it can function at a temperature that is not more than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP/SFP+/QSFP+ transceiver.
- This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.



**Figure 13. Inserting an SFP/SFP+/QSFP+ Transceiver into a Slot**

To install an SFP/SFP+/QSFP+ transceiver, do the following:

Instructions for Installing SFP/SFP+/QSFP+ Transceivers	
Step	Action
1	Consider network and cabling requirements to select an appropriate transceiver type that is also compatible with the switch transceiver support.
2	If the SFP/SFP+/QSFP+ slot is covered with a rubber protective cap, remove the cap and keep it for later replacement.
3	Insert the transceiver with the optical connector facing outward and the slot connector facing down. Note that SFP/SFP+/QSFP+ transceivers are keyed so they can only be installed in the correct orientation (see <a href="#">Figure 13 on page 28</a> ).
4	Slide the transceiver into the slot until it clicks into place. If you do not immediately connect a cable to the port, use a rubber protective cap to keep the transceiver optics clean.

**NOTE** *To remove a transceiver: First disconnect the network cable, then release and pull the wire bail to remove the transceiver from the slot.*

### Connecting to Twisted-Pair Copper Ports

The RJ-45 management port on the switch supports automatic MDI/MDI-X pinout configuration, so you can use standard straight-through twisted-pair cables to connect to any other network device (PCs, servers, switches, routers, or hubs).

The connection requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5, 5e or 6 cable for 1000BASE-T connections, Category 5 or better for 100BASE-TX connections, and Category 3 or better for 10BASE-T connections.

**Table 4. Maximum Twisted-Pair Copper Cable Lengths**

Cable Type	Maximum Cable Length	Connector
<b>1000BASE-T</b> Category 5, 5e, or 6 100-ohm UTP or STP	100 m (328 ft)	RJ-45
<b>100BASE-TX</b> Category 5 or better 100-ohm UTP or STP	100 m (328 ft)	RJ-45
<b>10BASE-T</b> Category 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45

### Copper Cabling Guidelines

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 10BASE-T, 100BASE-TX or 1000BASE-T operation. Check the following criteria against the current installation of your network:

- Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T, Category 5 or better for 100BASE-TX, and Category 5, 5e or 6 for 1000BASE-T.
- Protection from radio frequency interference emissions
- Electrical surge suppression
- Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring
- Safe connections with no damaged cables, connectors or shields



- Do not plug a phone jack connector in the RJ-45 port. This may damage this device.
- Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

### 10/100BASE-TX Pin Assignments

All 100BASE-TX RJ-45 ports support automatic MDI/MDI-X operation, so you can use straight-through or crossover cables for all network connections to PCs, switches, or hubs. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable.



RJ-45 Pin Numbers

**Figure 14. RJ-45 Connector****Table 5. 10/100BASE-TX MDI and MDI-X Port Pinouts**

Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4, 5, 7, 8	Not used	Not used

### 1000BASE-T Pin Assignments

All 1000BASE-T ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs, servers, or switches.

The table below shows the 1000BASE-T MDI and MDI-X port pinouts. These ports require that all four pairs of wires be connected. Note that for 1000BASE-T operation, all four pairs of wires are used for both transmit and receive.

**Table 6. 1000BASE-T MDI and MDI-X Port Pinouts**

Pin	MDI Signal Name	MDI-X Signal Name
1	Bi-directional Pair A Plus (BI_DA+)	Bi-directional Pair B Plus (BI_DB+)
2	Bi-directional Pair A Minus (BI_DA-)	Bi-directional Pair B Minus (BI_DB-)
3	Bi-directional Pair B Plus (BI_DB+)	Bi-directional Pair A Plus (BI_DA+)
4	Bi-directional Pair C Plus (BI_DC+)	Bi-directional Pair D Plus (BI_DD+)
5	Bi-directional Pair C Minus (BI_DC-)	Bi-directional Pair D Minus (BI_DD-)
6	Bi-directional Pair B Minus (BI_DB-)	Bi-directional Pair A Minus (BI_DA-)
7	Bi-directional Pair D Plus (BI_DD+)	Bi-directional Pair C Plus (BI_DC+)
8	Bi-directional Pair D Minus (BI_DD-)	Bi-directional Pair C Minus (BI_DC-)

### 1000BASE-T Cable Requirements

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, providing that all four wire pairs are connected. However, it is recommended that for all critical connections, or any new cable installations, Category 5e (enhanced Category 5) or Category 6 cable should be used. The Category 5e and 6 specifications include test parameters that are only recommendations for Category 5. Therefore, the first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3-2008 standards.

### Connection Procedure

The switch has one 10/100/1000BASE-T port for dedicated management access. Making a connection to this port is described in [Connecting to the Management Port on page 37](#).

## Connecting to SFP/SFP+ Fiber Optic Ports

The switch provides 48 slots for SFP/SFP+ fiber-optic transceivers. Note that all 10G SFP+ fiber optic ports operate at 10 Gbps full duplex. All 1000 Mbps SFP fiber optic ports operate at 1 Gbps full duplex.

**Table 7. Maximum 10 Gigabit Ethernet Fiber Cable Lengths**

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
<b>10GBASE-SR</b>			
62.5/125 micron multimode	160 MHz/km	2-26 m (7-85 ft.)	LC
62.5/125 micron multimode	200 MHz/km	2-33 m (7-108 ft.)	LC
50/125 micron multimode	400 MHz/km	2-66 m (7-216 ft.)	LC
50/125 micron multimode	500 MHz/km	2-82 m (7-269 ft.)	LC
50/125 micron multimode	2000 MHz/km	2-300 m (7-984 ft.)	LC

**Table 8. Maximum Gigabit Ethernet Fiber Cable Lengths**

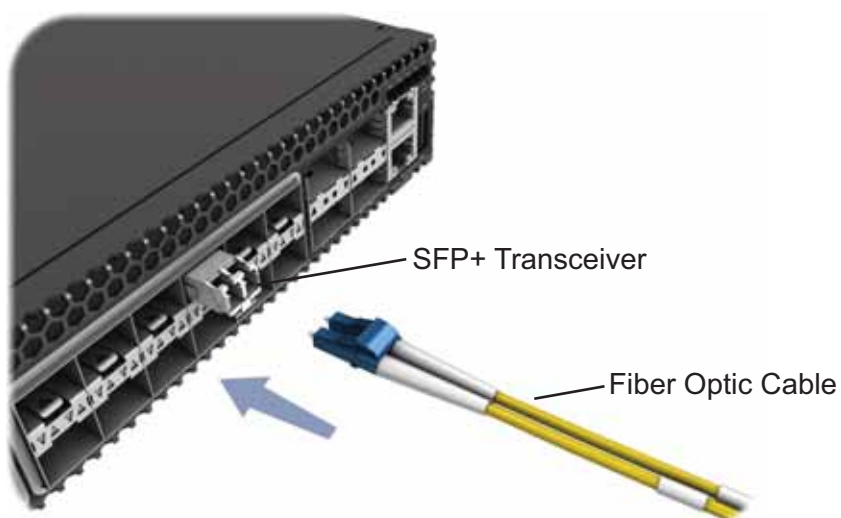
10GBASE-SR Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
<b>1000BASE-SX</b>			
62.5/125 micron multimode	160 MHz/km	2-220 m (7-722 ft)	LC
	200 MHz/km	2-275 m (7-902 ft)	LC
50/125 micron multimode	400 MHz/km	2-500 m (7-1641 ft)	LC
	500 MHz/km	2-550 m (7-1805 ft)	LC
<b>1000BASE-LX</b>			
9/125 micron single-mode	N/A	2 m - 10 km (7 ft - 6.2 miles)	LC



*The length of fiber optic cable for a single switched link should not exceed the relevant standards specified in this section. However, power budget constraints should also be considered when calculating the maximum fiber optic cable length for a particular link.*

### **WARNING**

- This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.
- When selecting a fiber SFP/SFP+ device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP/SFP+ transceiver.



**Figure 15. Making Connections to an SFP+ Transceiver**

Follow these steps to connect cables to SFP/SFP+ transceiver ports.

Instructions for Connecting to SFP/SFP+ Fiber Optic Ports	
Step	Action
1	Remove and keep the fiber port’s rubber cover. When not connected to a fiber cable, the rubber cover should be replaced to protect the optics.
2	Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.
3	Connect one end of the cable to the LC connector on one of the switch’s SFP transceivers and the other end to the LC port on the other device. Since both LC connectors are keyed, the cable can only be attached in the correct orientation (see <a href="#">Figure on page 32</a> ).
4	As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.

**NOTE** *Be sure to secure cables properly and route them away from the switch without exceeding the minimum bending radius for fiber cables (typically a few inches). Use cable ties to bundle cables together and secure coiled loops of excess cable. Do not let cables hang free supporting their own weight or pull in any way that puts stress on the connectors.*

### Connecting to QSFP+ Fiber Optic Ports

The switch includes four slots for 40 Gigabit Ethernet QSFP+ fiber-optic transceivers. Note that 40G fiber optic ports can provide either one 40 Gbps full duplex link, four independent 10G fiber optic links. Connecting a 40G QSFP+ port to four 10G SFP+ ports requires the use of a breakout cable.



**Table 9. Maximum 40 Gigabit Ethernet Fiber Cable Lengths**

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
<b>40GBASE-SR4</b>			
62.5/125 micron multimode	160 MHz/km	2-26 m (7-85 ft.)	LC
62.5/125 micron multimode	200 MHz/km	2-33 m (7-108 ft.)	LC
50/125 micron multimode	400 MHz/km	2-66 m (7-216 ft.)	LC
50/125 micron multimode	500 MHz/km	2-82 m (7-269 ft.)	LC
50/125 micron multimode	2000 MHz/km	2-300 m (7-984 ft.)	LC



*The length of fiber optic cable for a single switched link should not exceed the relevant standards specified in this section. However, power budget constraints should also be considered when calculating the maximum fiber optic cable length for a particular link.*

Follow these steps to connect cables to QSFP+ transceiver ports.



- *This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.*
- *When selecting a fiber QSFP+ device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 QSFP+ transceiver.*

#### Instructions for Connecting to QSFP+ Fiber Optic Ports

Step	Action
1	Remove and keep the fiber port's rubber cover. When not connected to a fiber cable, the rubber cover should be replaced to protect the optics.
2	Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.
3	Connect one end of the cable to the QSFP+ port on the switch and the other end to the QSFP+ port on the other device. Since QSFP+ connectors are keyed, the cable can only be attached in the correct orientation (see <a href="#">Figure 16 on page 34</a> ).
4	As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.



*Be sure to secure cables properly and route them away from the switch without exceeding the minimum bending radius for fiber cables (typically a few inches). Use cable ties to bundle cables together and secure coiled loops of excess cable. Do not let cables hang free supporting their own weight or pull in any way that puts stress on the connectors.*



**Figure 16. Connecting to a QSFP+ Transceiver**

### DAC Connections

Direct Attach Cable (DAC) is a method of connecting two SFP+/QSFP+ interfaces without using optics and fiber cable. A fixed length of twinaxial copper cable is terminated at each end with physically-compliant SFP+/QSFP+ transceivers that do not include all their normal electronic and optical components. The result is a low cost, low-latency, 10G/40G Ethernet solution for short distances, ideal for connections within the data center.

A 10G DAC connection is also known as twinaxial copper or 10GBASE-CR. DAC copper cables are available in pre-terminated lengths up to 5 m (16.4ft).

**Table 10. Maximum 10GBASE-CR 10 Gigabit Ethernet Cable Lengths**

Cable Type	Cable Lengths	Connector
Pre-terminated Direct Attach Cable (DAC) — (twinaxial copper cable)	1 m (3.28 ft)	SFP+
	3 m (9.8 ft)	
	5 m (16.4 ft)	

**Table 11. Maximum 40GBASE-CR4 40 Gigabit Ethernet Cable Lengths**

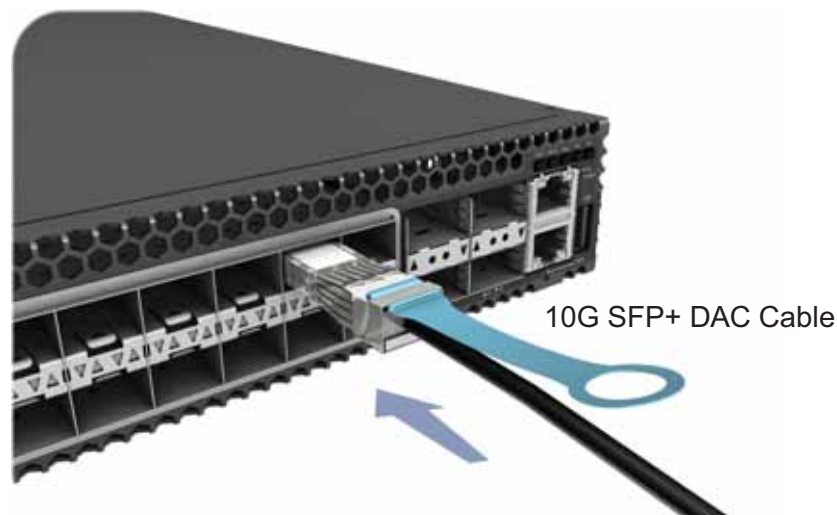
Cable Type	Cable Lengths	Connector
Pre-terminated Direct Attach Cable (DAC) — (twinaxial copper cable)	1 m (3.28 ft)	QSFP+
	2 m (6.56 ft)	
	3 m (9.8 ft)	
	5 m (16.4 ft)	

Follow these steps to make DAC connections.

Instructions for Making DAC Connections	
Step	Action
1	Plug the SFP+/QSFP+ transceiver connector on one end of a twinaxial copper cable segment into an SFP+/QSFP+ slot on the link device (see <a href="#">Figure 17 on page 35</a> ).
2	Plug the other end of the twinaxial cable into an SFP+/QSFP+ slot on the switch.
3	Check that the Link LED on the switch turns on green to indicate that the connection is valid.



*Connecting a 40G QSFP+ port to four 10G SFP+ ports requires the use of a breakout DAC cable.*



**Figure 17. Making DAC Connections**

## 4. SWITCH MANAGEMENT

To manage the switch, you can make a direct connection to the console port (out-of-band), or you can manage it through a network connection to the dedicated management port (out-of-band) using Telnet.

The switch's management port (RJ-45) provides a dedicated management channel that operates outside of the data transport network. This makes it possible to reconfigure or troubleshoot the switch over either a local or remote connection to the Management port when access through the data channel is not possible or deemed insecure.

For a detailed description of the switch's software features, refer to the *DCSS Administrator's Guide* available online at <https://supportforums.adtran.com>.

This chapter includes these sections:

- *Understanding the System Status LEDs on page 36*
- *Connecting to the Management Port on page 37*
- *Connecting to the Console Port on page 38*
- *Connecting to the USB Port on page 40*
- *Resetting the Switch on page 40*

### Understanding the System Status LEDs

The switch includes a display panel of key system LED indicators. The LEDs, which are located on the front panel, are shown below and described in the following table.

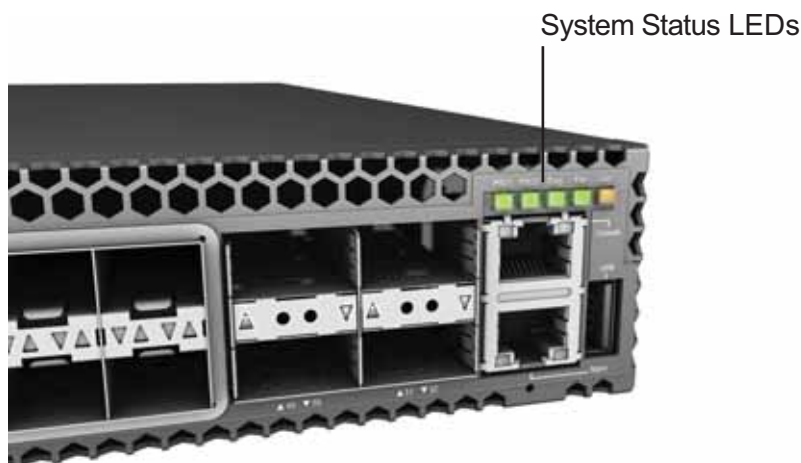


Figure 18. System LEDs

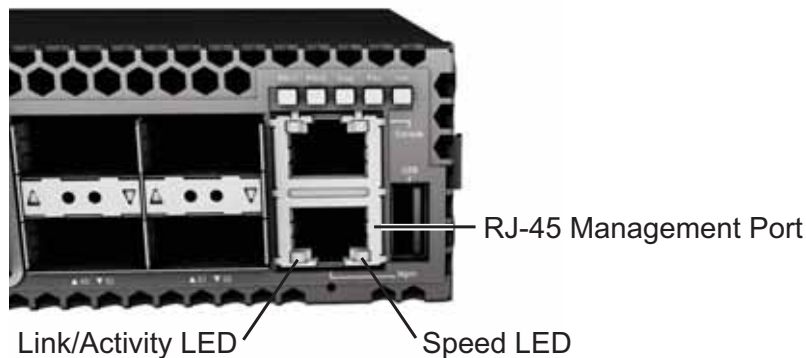
**Table 12. System Status LEDs**

LED	Color	Indication
<b>PSU1/PSU2</b>	Off	Unit is not receiving power.
	Green (solid)	Power supply is installed and operating normally.
	Amber (solid)	The power supply has detected a fault.
<b>Diag</b> (Diagnostic)	Green (solid)	The system diagnostic test has completed successfully.
	Amber (solid)	The system self-diagnostic test has detected a fault.
<b>Fan</b>	Green (solid)	Fans are operating normally.
	Amber (solid)	A fan failure has been detected.
<b>Loc</b> (Locater)	Amber (flashing)	Activated through remote software to assist identification of the switch unit within a rack.

### Connecting to the Management Port

The 10/100/1000BASE-T port labeled **Mgmt** provides a dedicated management interface which is segregated from the data traffic crossing the other ports. The **Mgmt** port will attempt to receive an IP address and default gateway from a DHCP server. If no DHCP server is present, you must use the **Console** port. Refer to the quick start guide shipped with the unit for connection instructions.

This port supports auto-negotiation, so the optimum transmission mode (half or full duplex) and data rate (10, 100, or 1000 Mbps) can be selected automatically, if this feature is also supported by the attached device.

**Figure 19. Management Port****Table 13. RJ-45 Management Port Status LEDs**

LED	Color	Indication
<b>Link/Activity</b>	Off	There is no valid link on the port.
	Green (solid)	Port has established a valid network connection
	Green (flashing)	There is activity on the port.
<b>Speed</b>	Green (solid)	There is a valid 10/100 Mbps link.
	Amber (solid)	There is a valid 1000 Mbps link.

To connect to the management port, use Category 5 or better unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Make sure the twisted-pair cable does not exceed 100 meters (328 ft) in length. This port supports automatic MDI/MDI-X pinout configuration, so you can use standard straight-through cables to connect to any other network device.

Follow these steps to connect to the Management port:

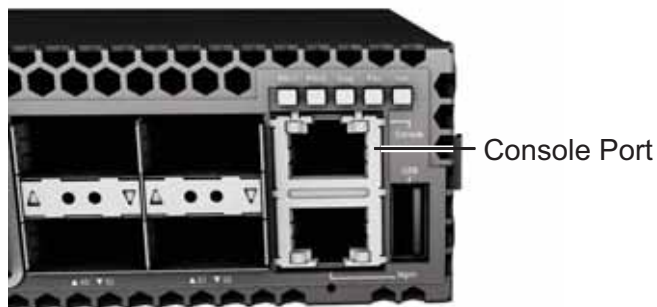
Instructions for Connecting to the Management Port	
Step	Action
1	Attach one end of a twisted-pair cable to an RJ-45 connector on a management network device (PC or another switch).
2	Attach the other end of the twisted-pair cable to the Management port on the switch.
3	As the connection is made, the <b>Mgmt</b> port LEDs (on the switch) will turn on to indicate that the connection is valid.

### Connecting to the Console Port

The RJ-45 **Console** port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The console device can be a PC or workstation running a VT-100 terminal emulator, or a VT-100 terminal. An RJ-45-to-DB-9 cable is supplied with the switch for connecting to a PC's RS-232 serial DB-9 DTE (COM) port.



*To connect to notebooks or other PCs that do not have a DB-9 COM port, use a USB to male DB-9 adapter cable (not included with the switch).*



**Figure 20. Console Port**

The following table describes the pin assignments used in the RJ-45-to-DB-9 console cable.

**Table 14. Console Cable Wiring**

Switch's 8-Pin Console Port	Null Modem	PC's 9-Pin DTE Port
6 RXD (receive data)	<-----	3 TDX (transmit data)
3 TDX (transmit data)	----->	2 RXD (receive data)
5 SGND (signal ground)	-----	5 SGND (signal ground)

The console port's configuration requirements are as follows:

- Default Baud rate.115200 bps
- Character Size.8 Characters
- Parity.None
- Stop bit.One
- Data bits.8
- Flow control.none



**Figure 21. Console Port Connection**

Follow these steps to connect to the Console port:

Instructions for Connecting to the Console Port	
Step	Action
1	Attach the DB-9 end of the included RJ-45-to-DB-9 serial cable to a DB-9 COM port connector on a management PC.
2	Attach the RJ-45 end of the serial cable to the Console port on the switch.
3	Configure the PC's COM port required settings using VT-100 terminal emulator software (such as HyperTerminal) running on the management PC.
4	Log in to the command-line interface (CLI) using default settings: User <b>admin</b> , Password null (there is no default password).

For a detailed description of connecting to the console and using the switch's command line interface (CLI), refer to the *DCSS Administrator's Guide* available online at <https://supportforums.adtran.com>.

### Connecting to the USB Port

The USB port on the switch front panel is for transferring configuration files from a USB storage device to the switch's flash memory.



Figure 22. USB Port

### Resetting the Switch

The reset button on the switch can be used to restart the device and set the configuration back to factory default values. Use a long thin object, such as the end of a paper clip, to press the reset button. One push of the button restarts the system software using default values.



Figure 23. Reset Button



## 5. TROUBLESHOOTING

### Diagnosing LED Indicators

**Table 15. Troubleshooting Chart**

Symptom	Action
PSU1/PSU2 LED is Off	<ul style="list-style-type: none"> <li>Check connections between the PSU, the power cord and the wall outlet.</li> <li>Contact your dealer for assistance.</li> </ul>
PSU1/PSU2 LED is on Amber	<ul style="list-style-type: none"> <li>Power cycle the PSU to try and clear the condition.</li> <li>Replace the PSU.</li> </ul>
Diag LED is on Amber	<ul style="list-style-type: none"> <li>Power cycle the switch to try and clear the condition.</li> <li>If the condition does not clear, contact your dealer for assistance.</li> </ul>
Fan LED is on Amber	<ul style="list-style-type: none"> <li>Check fans in the fan tray.</li> <li>Replace the fan tray as soon as possible.</li> </ul>
Link/Act LED is Off	<ul style="list-style-type: none"> <li>Verify that the switch and attached device are powered on.</li> <li>Be sure the cable is plugged into both the switch and corresponding device.</li> <li>Verify that the proper cable type is used and its length does not exceed specified limits.</li> <li>Check the attached device and cable connections for possible defects. Replace the defective cable if necessary.</li> </ul>

### System Self-Diagnostic Test Failure

If the Diag LED indicates a failure of the system power-on-self-test (POST), you can use a console connection to view the POST results. The POST results may indicate a failed component or help troubleshoot the problem. For more information on connecting to the console port and using the CLI, refer to the *DCSS Administrator's Guide* available online at <https://supportforums.adtran.com>.

Note a POST failure normally indicates a serious hardware fault that cannot be rectified or worked around. If you encounter a POST failure, you should contact your dealer for assistance.

### Power and Cooling Problems

If a power indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or PSU. However, if the switch powers off after running for a while, check for loose power connections, power losses or surges at the power outlet. If you still cannot isolate the problem, the PSU may be defective.

### Installation

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

