Software Version 7.13.2

TD140 Hardware Maintenance Guide

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WHAT'S NEW IN TD140 HARDWARE MAINTENANCE VERSION 7.13.2?

Feature ID	Description	
F-02349	**GTP Session Persistency on TD140** GTP session mapping data can now be persisted at the G10 probes that are bound to a TD140. To minimize data loss when a TD140 is rebooted, the bound G10 probes send the GTP session mapping data for open sessions back to the TD140 once it has recovered so it may continue to distribute the session traffic to the original probes. ■ ETH port on PPM40 Blade 1 is required for the TD140 to receive persisted session data from the G10 probes ■ An additional ethernet cable and IP address is needed to support the new persistence data port	TD140 Architecture Overview Network Connectivity

1 TD140 Overview

OVERVIEW

The TD140 Traffic Distributor is a GTPv1/GTPv2 load balancing network element used as a Gn/LTE monitoring solution to distribute coherent GTP sessions from the S1-U, S11, S5/S8, S4, and Gn interfaces among a pool of G10 probes. This product provides a complete, independent solution with software and hardware integrated into a common environment.

The TD140 supports all standalone G10 hardware configurations; up to 16 G10 probes are supported per TD140.

Figure 1.1 - TD140 Traffic Distributor

TD140 Architecture Overview

Figure 1.2 illustrates the TD140 architecture and data flow.

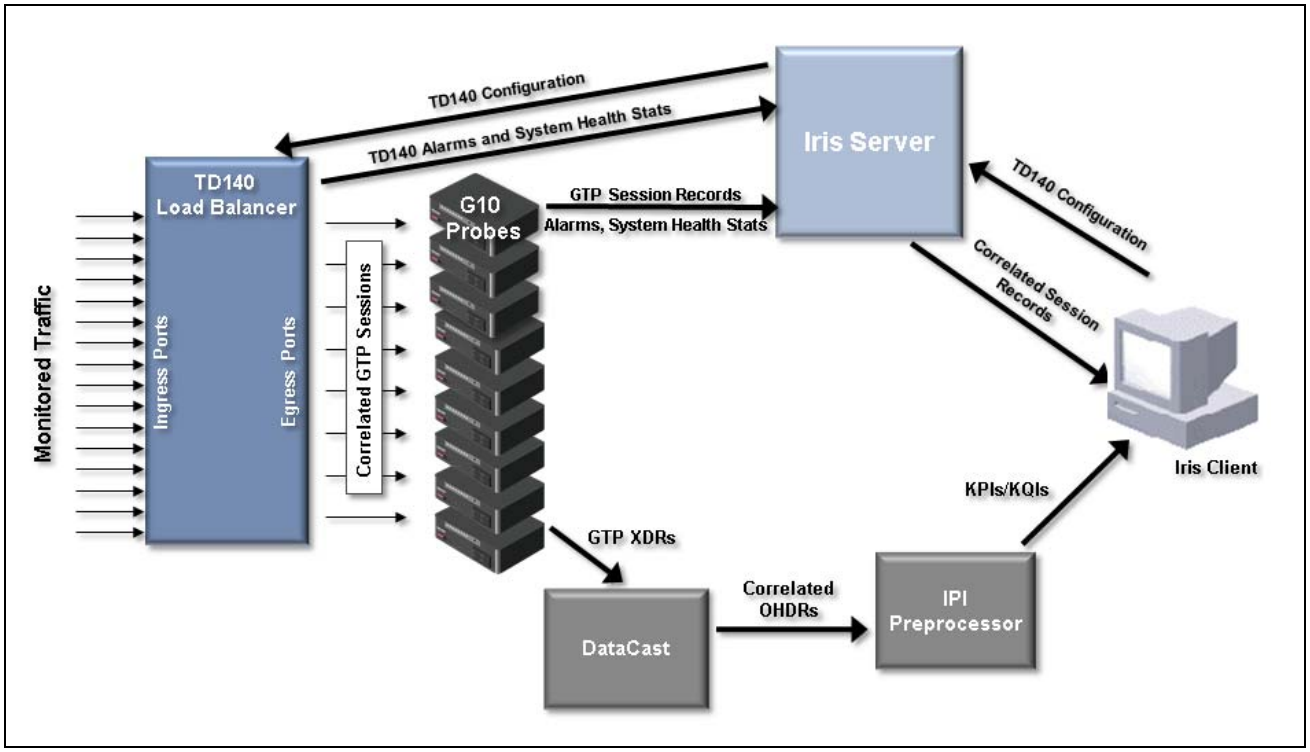


Figure 1.2 - TD140 System Architecture and Data Flow

Table 1.1 describes the functions of each network element.

Table 1.1 - TD140 Network Architecture Elements

Element	Function
TD140	■ At ingress ports, TD140 collects GTP traffic from S1-U, S11, S5/S8, S4, and Gn interfaces in the packet core network. ■ Other traffic (non-GTPv1/v2 IP protocols) is load balanced based on IP ■ At egress ports, TD140 distributes packets based on session correlation among a pool of G10s. It adds metadata including timestamp and port tag. ■ Generates alarms and forwards to Iris server. ■ Generates system health statistics for future use.
G10 Probes	■ Generates GTP session records and forwards to the Iris server. Session mapping is persisted at probes: - On failure/reboot of TD140, probes provide stored session mappings to TD140 - On failure of probe, configuration option to enable/disable rebalance of sessions across remaining probes ■ Generates GTP XDRs and streams them to DataCast. ■ Generates alarms and forwards to Iris server. ■ Generates system health statistics for future use.

Table 1.1 - TD140 Network Architecture Elements (Continued)

Element	Function
Iris Server	■ Correlates session records and forwards to ISA. ■ Stores TD140 configuration settings (configured in Irisview Admin on Iris client)
DataCast	■ Correlates XDRs and processes them into Output Hybrid Data Records (OHDRs) and forwards them to the IPI preprocessor.
IPI Preprocessor	■ Processes OHDRs and calculates and aggregates KPIs for use in IPI applications.
Iris Client	■ Admins configure TD140 settings. ■ Users view correlated session record results matching their filter criteria in ISA. ■ Users view KPIs/KQIs in IPI applications and reports.

TD140 HARDWARE COMPONENTS

The TD140's architecture consists of the components listed in **Table 1.2**:

Table 1.2 - TD140 Components

Element	Function
Chassis	The TD140 chassis has: ■ A Shelf Management Controller (ShMC) ■ Two redundant and hot-swappable PEMs ■ Two pluggable, hot-swappable fan trays ■ A Removable fan filter
Shelf Management Controller (ShMC)	The ShMC has two Gigabit Ethernet ports with RJ-45 connectors: ■ Port A - Used during initial TD140 configuration; not used during normal probe operation ■ Port B - OAM interface for communicating with Iris server
Packet Processing Module (PPM40)	The PPM40 packet processing module provides high-performance packet processing for the TD140. The PPM delivers I/O processing for 10 gigabit and 1 gigabit (Gb) Ethernet interfaces. Each PPM40 blade provides four egress port connections to the G10 probes. ■ PPM40 ETH port (Slot 1) - Used as OAM interface for receiving session data from the probes
PPM40 Rear Transition Module (RTM)	The PPM40 supports the PPM40 RTM, which connects to the back of the TD140 chassis. Each RTM provides the PPM40 with twelve ports: ■ Eight ingress ports for connection to monitored network ■ Four egress ports for connection to G10 probes

Figure 1.3 shows the front view of the TD140.

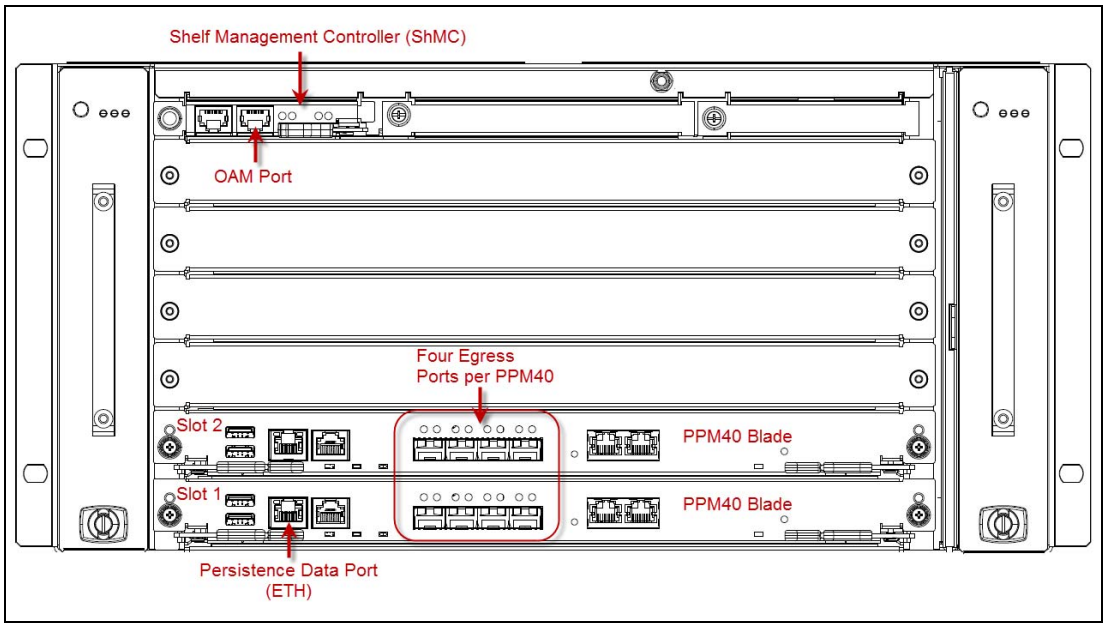


Figure 1.3 - TD140 Front View

Figure 1.4 shows the rear view of the TD140.

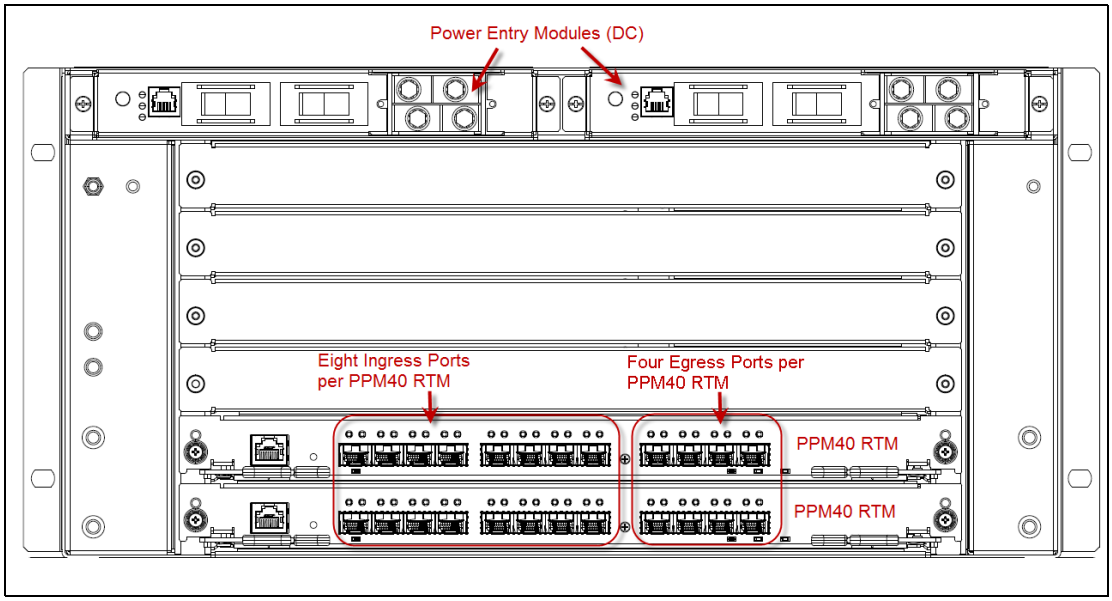


Figure 1.4 - TD140 Rear View

NETWORK CONNECTIVITY

A TD140 deployment currently requires the customer to provide two Ethernet connections and associated addresses as described in **Table 1.1**. See Ethernet Cabling Diagram for cabling details.

Table 1.3 - TD140 Network Connectivity

Port	Location	Details
OAM	OAM port on ShMC	■ Provides connectivity to Iris server for maintenance and configuration. ■ Provides timing connection; can be configured as Precision Time Protocol (PTP) or Network Time Protocol (NTP) ■ Supports 100/1000 Mbps Ethernet physical connections. It requires at least 100Mbps connectivity and supports IPv6. ■ 1G Ethernet, 1000base-T via RJ45 (single port)
Persistence Data Port	ETH port on PPM40 Blade 1	■ Receives session data from the probes ■ ETH port on PPM40 blade 1; connects to same LAN/WAN as OAM ports on probes ■ Supports 100/1000 Mbps Ethernet physical connections. It requires at least 100Mbps connectivity and supports IPv6. ■ 1G Ethernet, 1000base-T via RJ45 (single port)

Ethernet Cabling Diagram

Figure 1.5 shows the ingress and egress cable connections for the TD140 load balancer. See also Supported SFP or SFP+ Transceivers for SFP details. ***DO NOT connect the OAM cable to Port B until Network Connectivity is complete.***

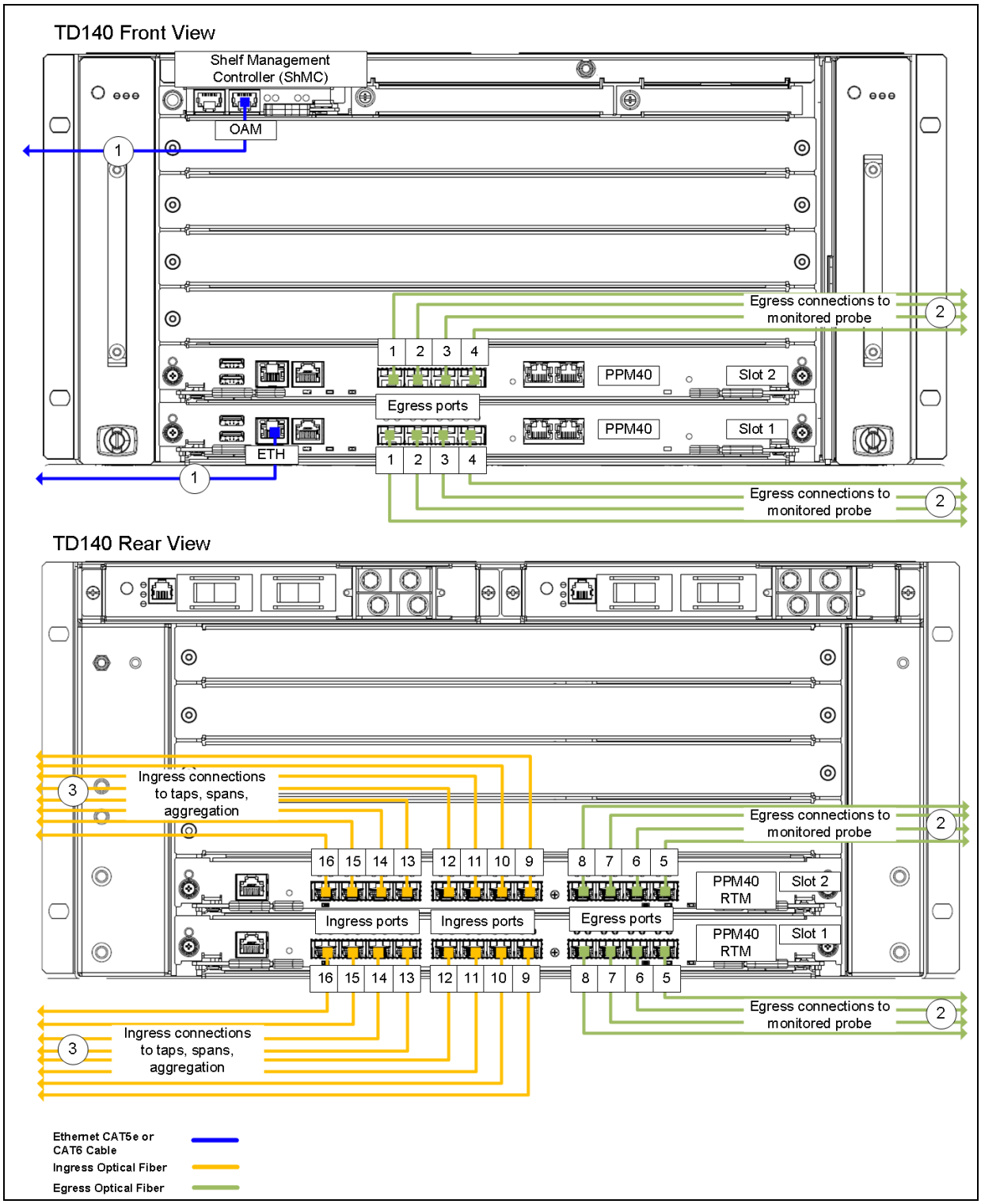


Figure 1.5 - TD140 Ethernet Ports

Table 1.4 lists the TD140 Ethernet Cables/Connections.

Table 1.4 - TD140 Ethernet Cables/Connections

Cable Type		TD140 Connection	Connects To
1	CAT5e or CAT6, Shielded 1G Ethernet, 1000base-T via RJ45	Shelf Management Controller (ShMC) OAM port PPM40 blade 1, ETH port	Local Area Network
2	10G Fiber Optic	PPM40 blades, Ports 1-4 PPM40 RTMs, Ports 5-8	G10 probes TRM100 RTM or IIC200 10G ports
3	1G or 10G Fiber Optic	PPM40 RTMs Ports 9-16	Taps, spans, or aggregation

Default Port Settings

Table 1.5 lists the default port settings for the TD140.

Table 1.5 - TD140 Default Port Settings

TD140 Port	Speed	Negotiation	Data Transmission
OAM Port (Shelf Management Module)	1 Gbps	Auto	Full duplex
ETH Port (PPM40 Blade 1)	1 Gbps	Auto	Full duplex
10G ports (PPM40 Ingress and Egress ports)	10 Gbps	Auto	Full duplex

2 TD140 Chassis Subsystem

TD140 Chassis

The chassis is the base element for the platform. The chassis is a sheet metal frame that forms a card cage, providing a means for joining the various elements of the platform into a coherent assembly ready to receive the modules required by the specific end-use application. While powering and providing thermal management for ATCA modules, the chassis supports the platform chassis management architecture, including hot-swapping and cooling support.

The chassis is composed of these elements:

- Six horizontal slots with full Rear Transition Module (RTM) support
- A backplane providing dual star Base interface and replicated mesh Fabric interface
- Two redundant and hot-swappable PEMs
- Two pluggable, hot-swappable fan trays
- Shelf Management Controller (ShMC)
- Removable fan filter

Figure 2.1 shows a front view of the TD140 with key components identified.

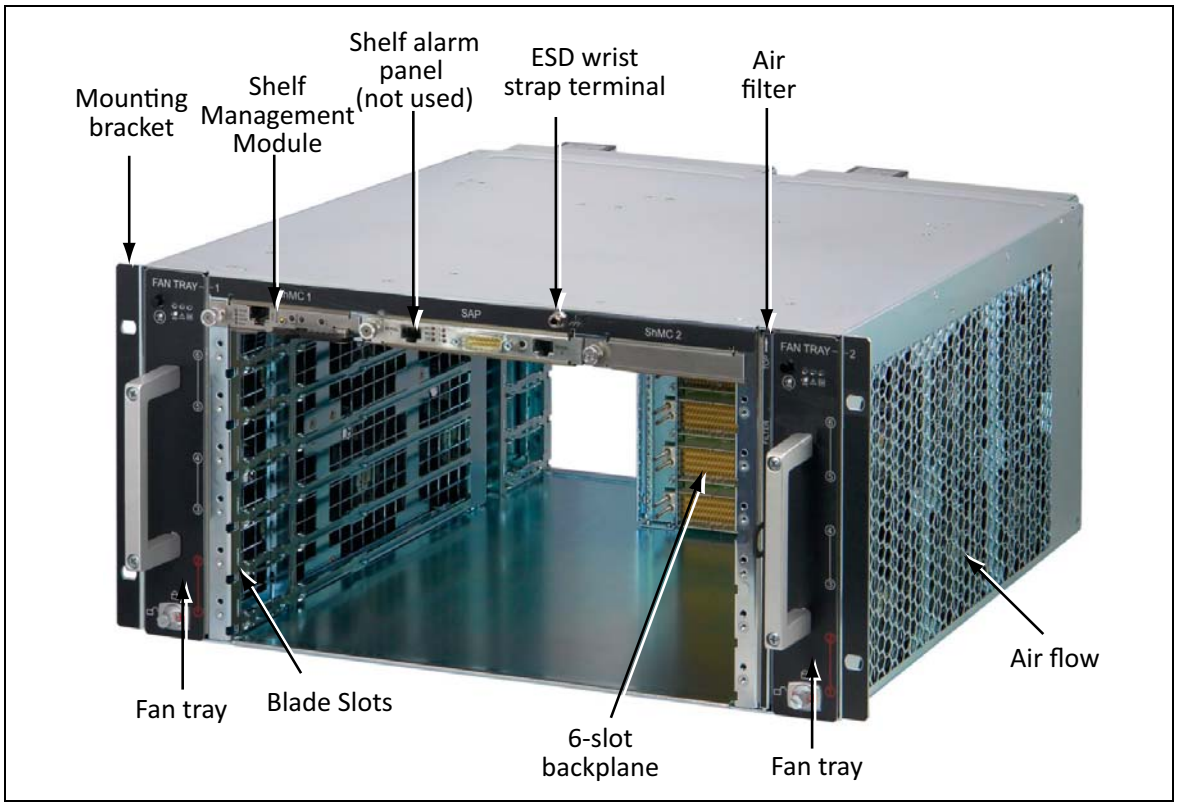


Figure 2.1 - Chassis Front View

Figure 2.2 shows a rear view of the TD140 chassis with key components identified.

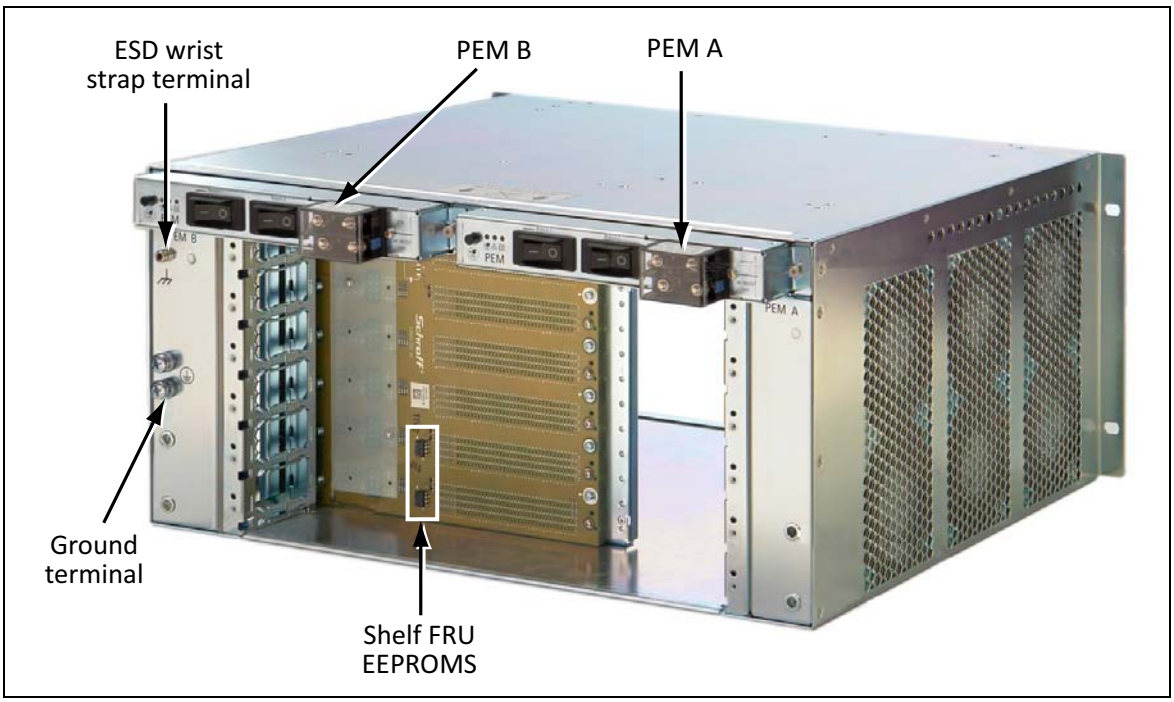


Figure 2.2 - TD140 Chassis Rear View

Shelf Management Controller (ShMC)

The front panel provides console interfaces and indicators for maintenance as well as configuration access to the shelf manager functions. The ShMC front panel is shown in **Figure 2.3**. Each front panel item is described in more detail in the following sections.

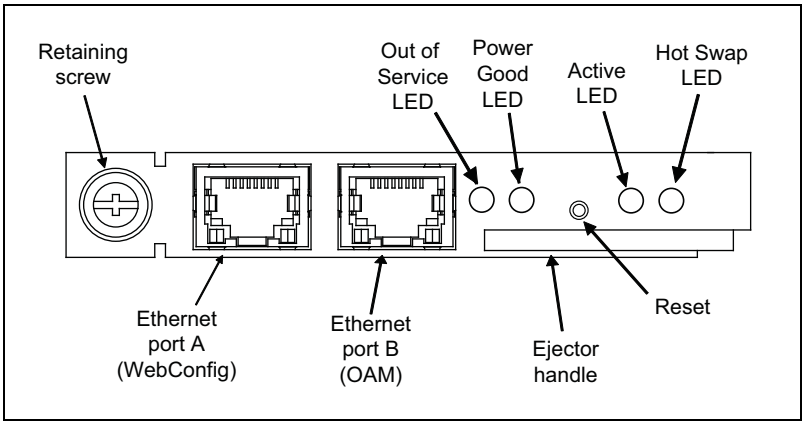


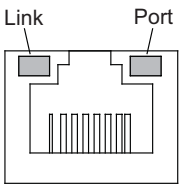
Figure 2.3 - ShMC Front Panel

Ethernet Ports

The front panel has two Gigabit Ethernet ports labeled A and B. The ports are RJ-45 connectors, and each connector has a link status and port status indicator LED.

Table 2.1 describes the front panel Ethernet status LEDs.

Table 2.1 - Ethernet Status LEDs

LED Purpose	Color	State	Explanation	LED Location
Link status	Green or Amber	Steady green	1000 Mbps	
		Steady amber	100 Mbps	
		Blinking	Link active	
		Off	No link established	
Port status	Green	Green	Port enabled	
		Off	Port disabled	

Front Panel LEDs

Four LEDs on the front panel indicate the operational status of the ShMC. **Table 2.2** describes the ShMC operational states represented by the four front panel status LEDs.

Table 2.2 - Status LEDs

LED	Color	State	Explanation
Out of Service (OOS)	Red	On	Out of service. Indicates a problem has been detected on the ShMC that prevents it from operating properly.
		Off	Operating normally.
Power Good (PWR)	Green	On	ShMC power supplies are within their respective operating ranges.
		Off	Power is bad from one or more supplies.
Active (ACT)	Amber	On	Active (performing assigned application) indicates the ShMC is the active shelf manager, instead of the standby backup unit.
		Off	Standby.
Hot Swap (H/S)	Blue	Steady	Ready for hot swap.
		Blinking	Transitioning.
		Off	Running.

Backplane

The six-slot ATCA monolithic backplane provides these features:

- Four ATCA node slots
- Two ATCA hub slots
- Two dedicated RCM slots
- Two PEM slots
- Two fan tray slots

Fan Trays

The platform contains two hot-swappable fan trays that force air through the platform for cooling. Each fan tray contains blowers and circuitry that controls their speed. The fan trays slide into the left and right sides of the chassis. Each fan tray is individually hot-swappable.

To deliver maximum air flow to modules installed in the chassis, the TD140 contains two interchangeable fan trays located on either side of the chassis card cage.

Each fan tray contains six high-speed, high airflow fans that are controlled as a group by the IPM controller in the fan tray.

The fans move air from the right side to the left side of the chassis in a push-pull arrangement. This arrangement provides excellent airflow as well as fault tolerance if a fan failure occurs.

The TD140 can be installed with an optional baffle to support front-to-back airflow. Refer to the* TD140 Installation Guide *for more information.

Figure 2.4 illustrates the airflow path through the chassis system.

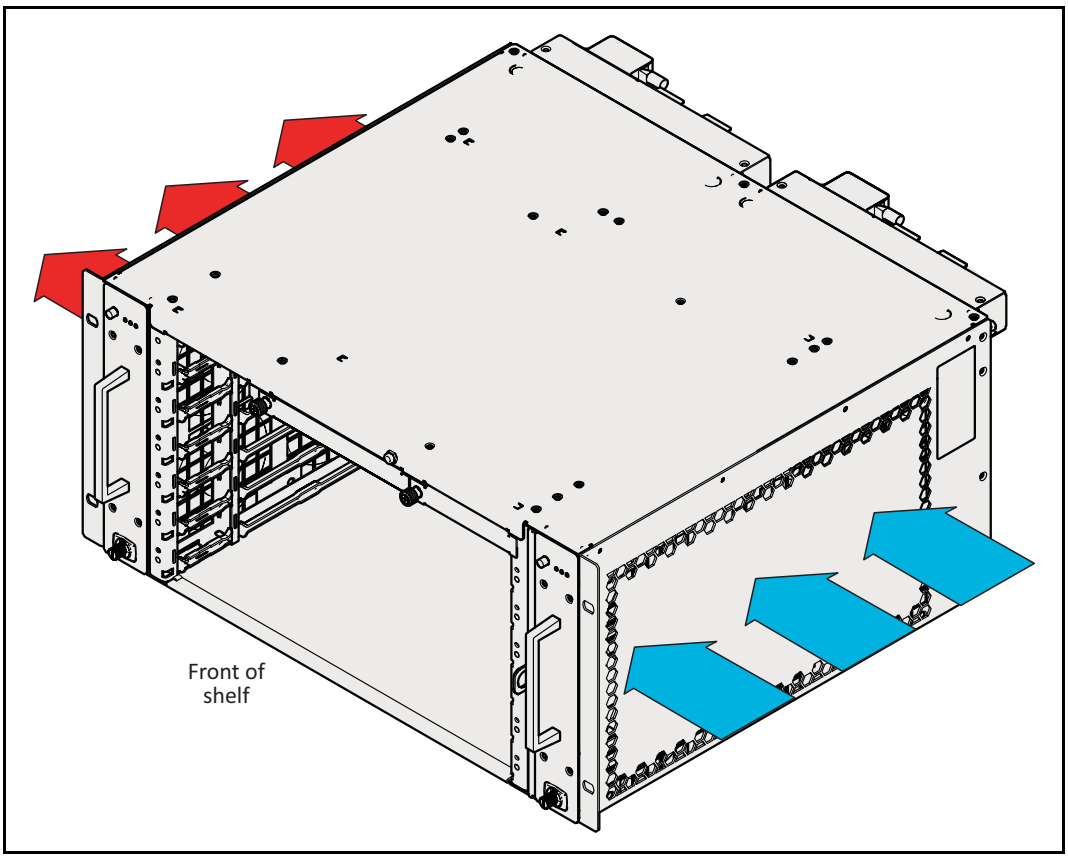


Figure 2.4 - TD140 System Airflow Path

Connectors and Indicators

Figure 2.5 shows the fan tray components and LED indicators.

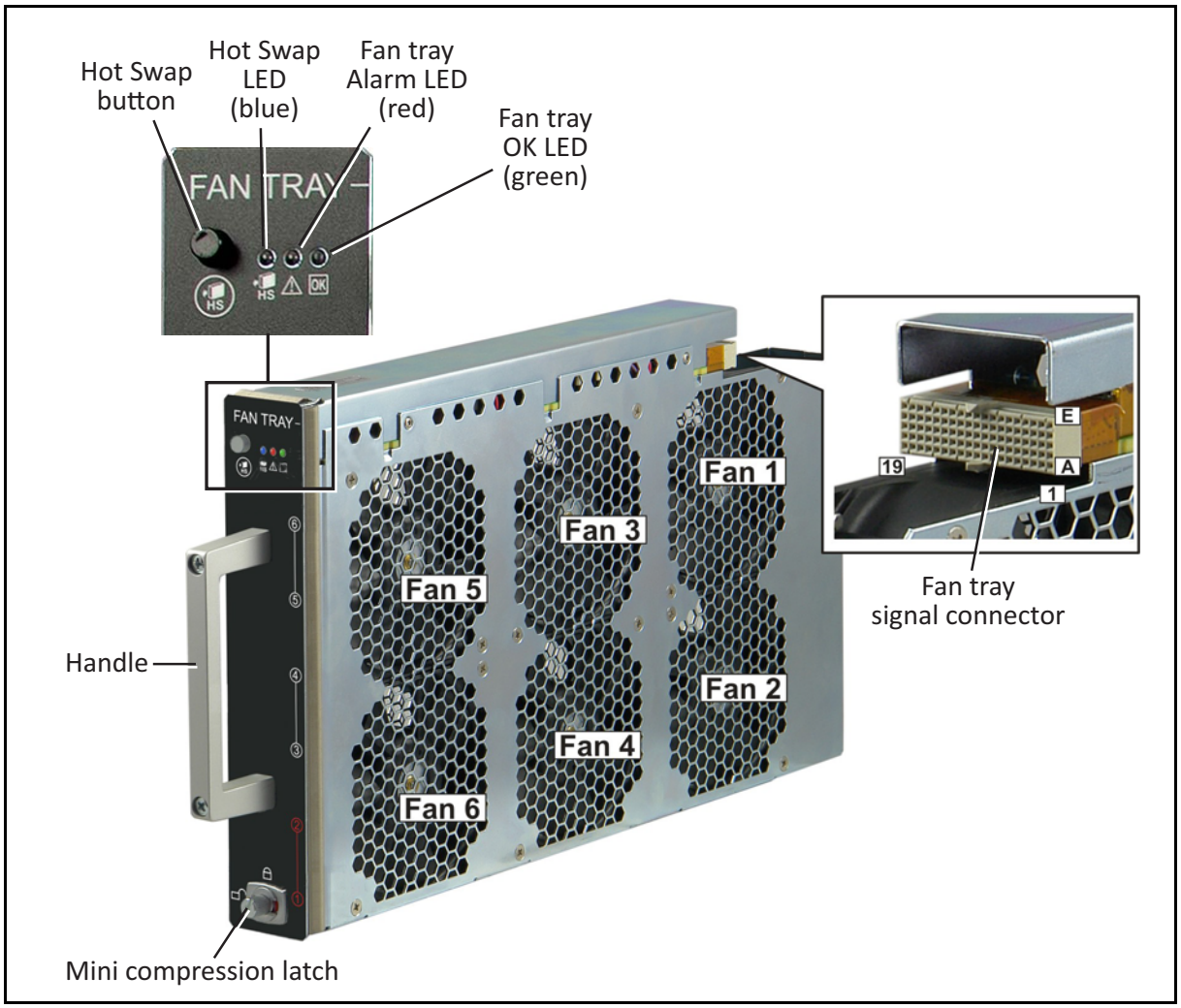


Figure 2.5 - Fan Tray Components and LEDs

Hot Swap Button

The hot swap button is used to remove the fan tray without powering off the platform.

Fan Tray LEDs

Table 2.3 describes the fan tray operational status as indicated by the LEDs.

Table 2.3 - Fan Tray LED Indicators

LED	Color	State	Condition
Hot swap LED	Blue	Solid	Fan tray can be removed safely.
		Blinking	Preparing for extraction.
		Off	Fan tray should not be removed, or there is no power to the fan tray.
Alarm LED	Red	Solid	Attention status (error condition).
		Off	Fan tray operating normally.
OK LED	Green	Solid	Normal operation.
		Off	No power to the fan tray.

Air Filter Tray

The chassis provides a front replaceable air filter installed in a removable tray located next to the right fan tray. The filter meets the requirements of the Telcordia Technologies Generic Requirements GR-78-CORE specification.

The air filter tray can be removed by pulling the two front air filter handles. To reinstall, push the air filter tray into the guide rails at each side of the chassis until the spring-mounted ball lock engages. See Figure 2.6.

Note: When installing the air filter, the filter element must be in the top position.

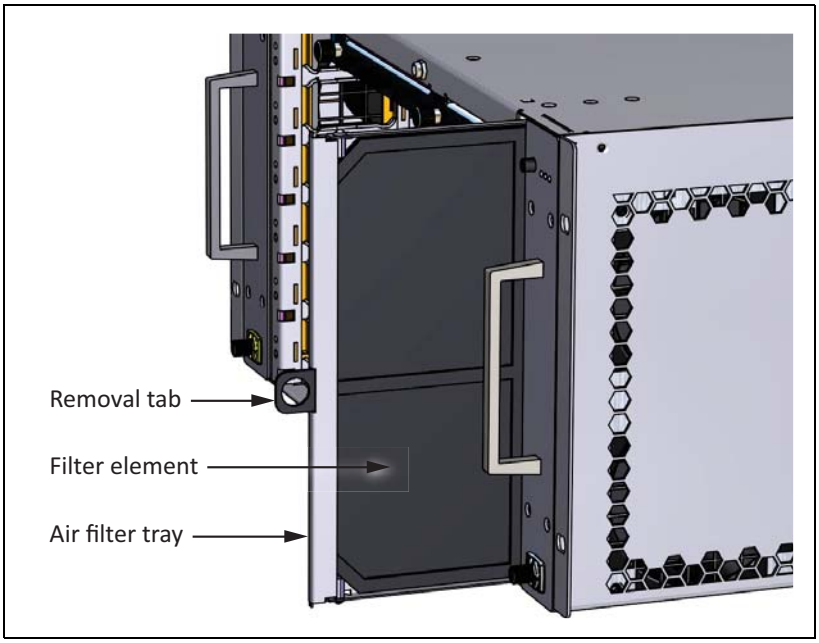


Figure 2.6 - Air Filter Tray

Air Filter Presence Sensor

The presence of the air filter is detected by a Hall effect sensor located on the Chassis Data Module (CDM). The Hall effect sensor is activated by a magnet mounted at the rear side of the air filter metal frame.

Power Entry Modules (PEMs)

Two pluggable, redundant Power Entry Modules (PEMs) are located at the upper rear side of the chassis. The PEMs provide dual redundant power sources for ATCA modules through the backplane. A failed PEM can be replaced without disruption of platform operation.

Each PEM provides power terminals for one 60 A power feed, which consists of a -48 VDC cable and its corresponding return cable.

Hot-swap functionality of the PEMs is provided by a hot-swap button and a blue (Hot Swap) LED. Additionally, a red (Alarm) LED and a green (OK) LED indicate the power status.

Front Panel

Figure 2.7 shows the interfaces and components on the PEM front panel.

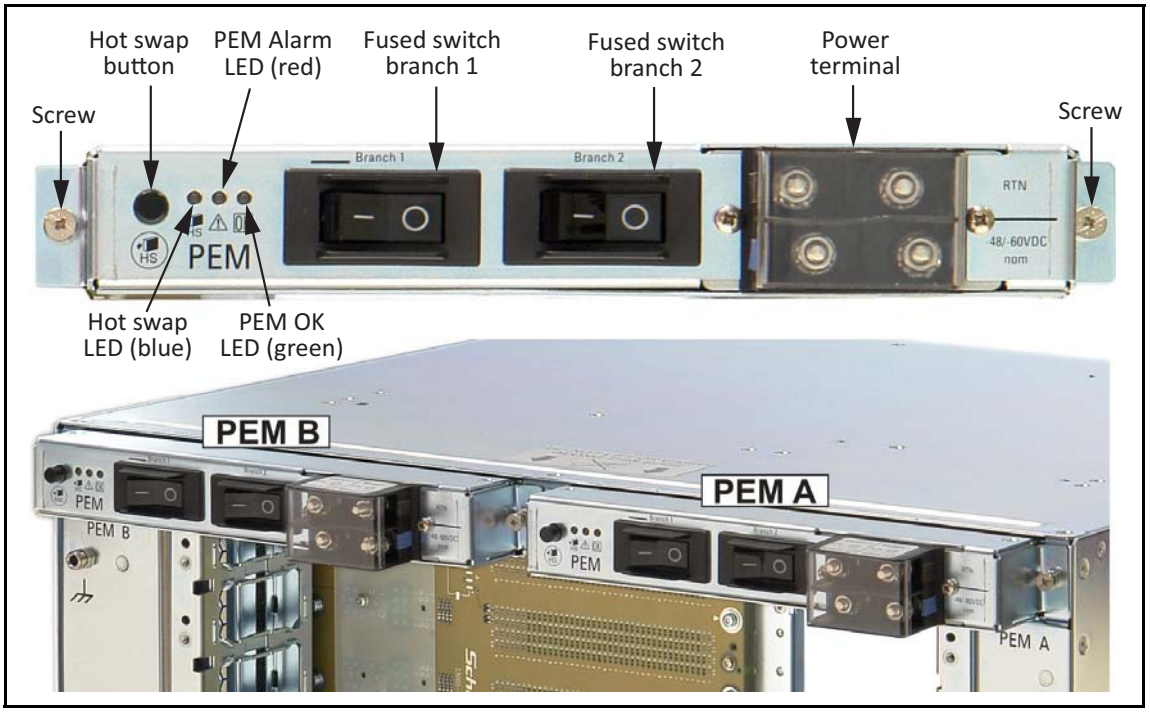


Figure 2.7 - PEM Front Panel

The hot-swap button is used to remove a PEM without powering off the platform.

Table 2.4 describes the PEM operating conditions according to the PEM LED indicators.

Table 2.4 - PEM LED Indicators

LED	Color	State	Condition
Hot-swap LED	Blue	On	PEM can be extracted safely.
		Blinking	IPMC is attempting to communicate with the Shelf Management Controller (ShMC).
		Off	The PEM is in its normal operating state.
Alarm LED	Red	On	PEM is experiencing problems.
		Off	PEM operates normally.
OK LED	Green	On	Power is adequate.
		Off	Power is inadequate.

Frame-Ground Connections

The chassis provides two frame-ground connection studs at the left rear part of the chassis. A ground cable should connect at least one of these frame-ground connection studs to the high-quality external ground used by the other equipment in your facility (or in the same rack).

The two studs permit the use of a double lug grounding connection to the platform frame to prevent rotation. Figure 2.8 shows the chassis ground connection at the rear of the TD140.

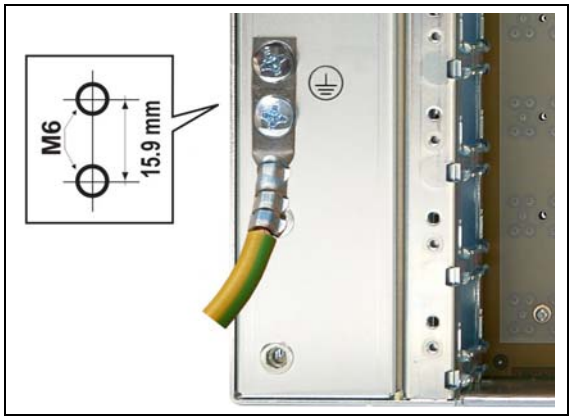


Figure 2.8 - TD140 Chassis Ground Connection

ESD Wrist Strap Terminals

A terminal for attaching an ESD wrist strap is located at the upper front and left rear of the chassis.

Blade Slots

The chassis provides six front and rear slots for 6 blades and their Rear Transition Modules (RTMs).

- Slots 1 and 2 are reserved for PPM40s and their RTMs.
- Slots 3-6 are currently not used and have filler plates installed.

Airflow Management Panels

If any front or rear slots are not occupied, airflow management panels must be installed to seal the card cage opening. The airflow panels perform these functions:

- Restrict the flow of air into unused slots so the balance of available airflow is directed to pass through occupied slots instead.
- Maintain the Electromagnetic Interference (EMI)/ Radio-Frequency Interference (RFI) integrity.

The panels use the card guide features in the card cage for alignment and retention within the space. They also have face panels with thumbscrews, consistent with a standard module, but do not have ejector latches.

3 Blades and RTMs

OVERVIEW

The TD140 load balancer is a scalable, modular device consisting of blades, Rear Transition Modules (RTMs), and other hardware components that allow minimal risk and dependency on other hardware devices.

The TD140 supports the following components:

- Packet Processing Module (PPM40)
- PPM40 RTM

Figure 3.1 shows the front view of the TD140 with the PPM40 blades installed.

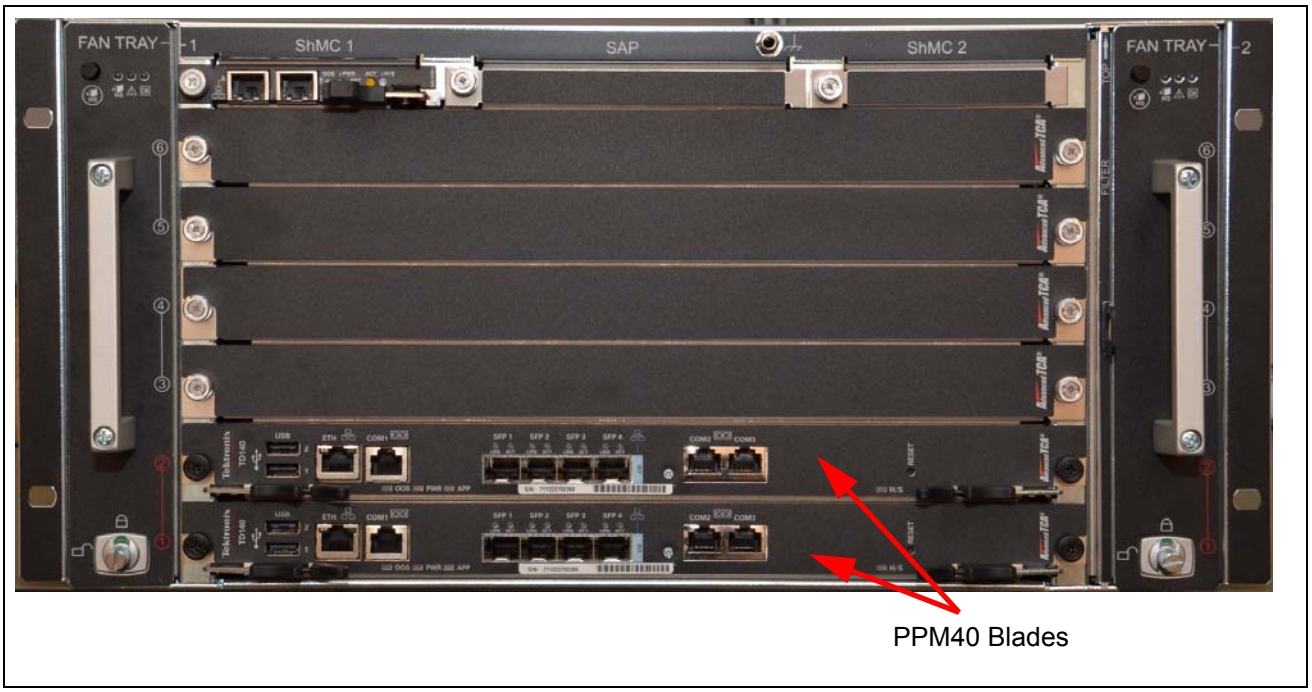


Figure 3.1 - TD140 - Front View

Figure 3.2 shows the rear view of the TD140 with the PPM40 RTMs installed.

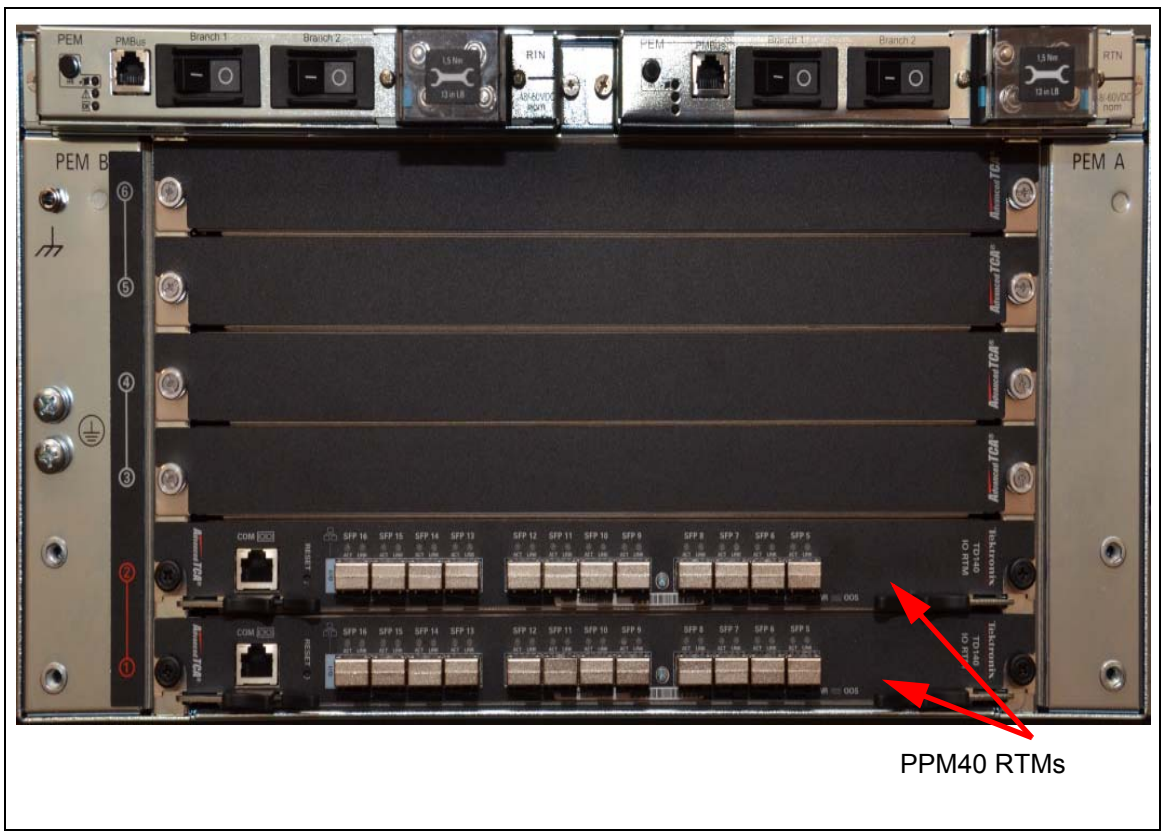


Figure 3.2 - TD140 - Rear View

PACKET PROCESSING MODULE (PPM40)

The PPM40 packet processing module (**Figure 3.3**) provides high-performance packet processing for the TD140. The PPM delivers I/O processing for 10 Gigabit (Gb) and 1 Gb Ethernet interfaces.

PPM40 Blade 1 is used for receiving persistence data from G10 probes through the ETH port. Refer to Network Connectivity for details.

Figure 3.3 - TD140 PPM40 Blade

Front Panel Interfaces and LEDs

The PPM front panel provides the external interfaces for accessing the Cavium Networks OCTEON II multi-core processors and Ethernet switches, as well as status indicators and mechanisms for securing and releasing the PPM from the shelf. The front panel also serves as an EMI/RFI barrier for the PPM. The front panel complies with PICMG 3.0 Revision 2.0.

Front Panel Features

- Top and bottom locking ejector latches, with a hot-swap switch for the bottom latch
- Top and bottom thumbscrews that secure the PPM into the shelf
- A recessed reset switch for the payload processors (packet processors and Local Management Processor [LMP])
- Four SFP/SFP+ sockets connected to the Fabric switch
- Status and activity LEDs for the front panel network interfaces

The following PPM40 features are not used:

- An RJ-45 10/100/1000BASE-T Ethernet connection to the LMP is used for session persistency
- An RJ-45 serial port connection to the LMP
- Two USB ports to the OCTEON processors
- Two RJ-45 dual serial port connections to the OCTEON processors (one for each processor)

Double-shielded cables are required for both serial and Ethernet port connections to minimize the possibility of issues related to external Electromagnetic Interference (EMI).

Figure 3.4 indicates the PPM front panel features.

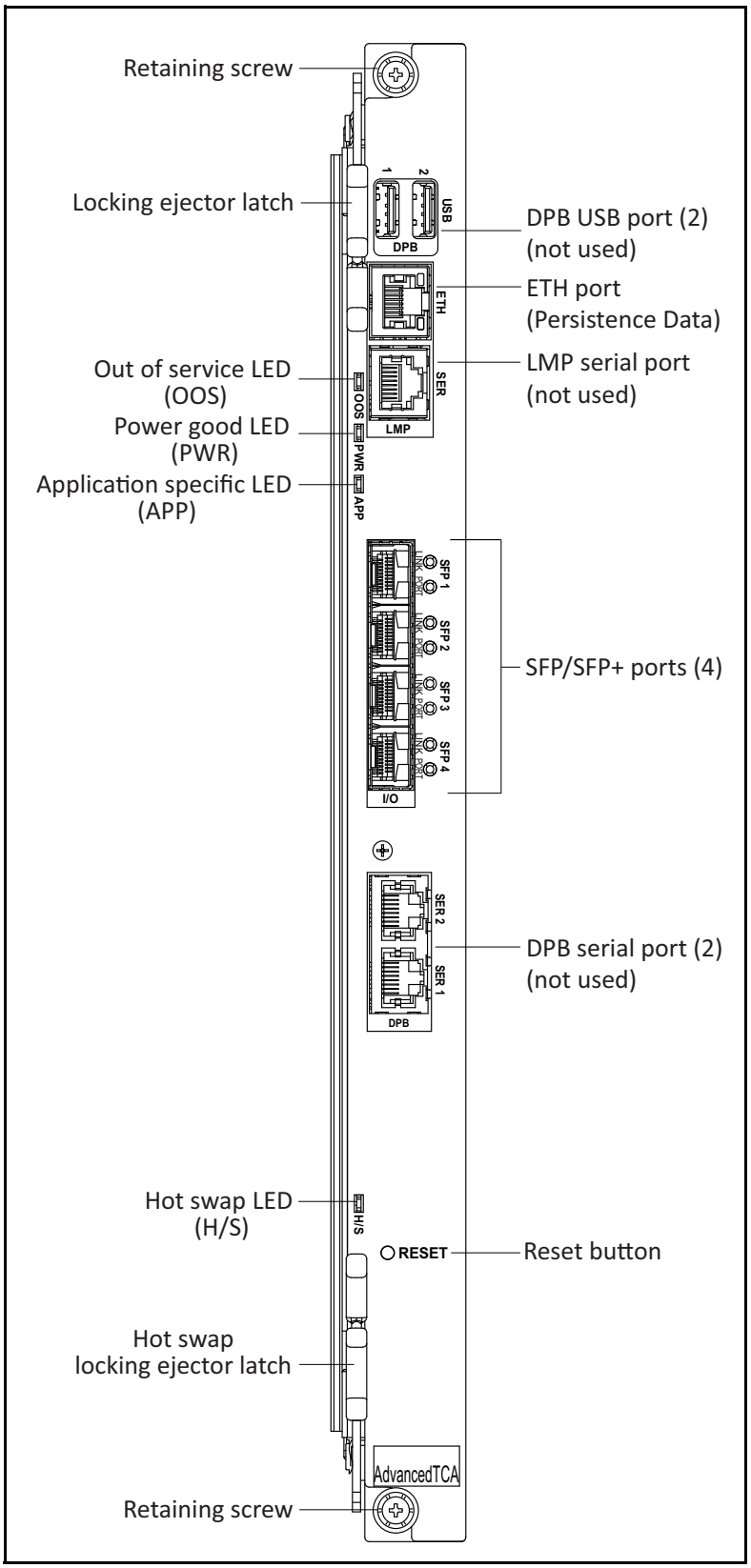


Figure 3.4 - PPM40 Front Panel

Front Panel LEDs

Table 3.1 provides details about the front panel LEDs.

Table 3.1 - Front Panel LEDs

Label	Definition	Color	LED States
ETH	Ethernet Activity	Green 	Indicates Ethernet link and activity. ▪ BLINKING GREEN—Ethernet Activity is occurring. ▪ SOLID GREEN—Ethernet Link is established. ▪ OFF—no Ethernet Link is established.
OOS	Out of service	Amber or Red[a] 	Indicates an out-of-service condition.
PWR	Power	Green or Amber[b] 	Indicates whether PPM power supplies are within tolerance. The possible states are: ▪ Green: All power supplies initially good, and power has not been removed ▪ Off: Module not powered on ▪ Amber: Application-defined; controlled by the IPMC
APP	Defined by application	Green or Amber 	Controlled by the LMP, with application-defined functionality.
H/S	Hot swap status	Blue 	Controlled by the IPMC with these possible states: ▪ Long blink: Activating the module after insertion ▪ Short blink: Preparing for hot swap ▪ Solid: Ready for hot swap ▪ Off: No hot-swap activity in progress

Table 3.1 - Front Panel LEDs (Continued)

Label	Definition	Color	LED States
SFP0 – SFP3	Network link and activity status	Green or Amber 	Controlled by the Fabric switch with these possible states: ▪ Green: Link operating at maximum speed ▪ Amber: Link operating at a speed slower than the fastest possible ▪ Off: Link failure ▪ Blink: SFP transceiver link is active. Blink rate is proportional to activity rate **Note:** This applies to SFP positions only. SFP+ positions do not blink.
SFP0 – SFP3	Network port status	Green or Amber 	Controlled by the Fabric switch with these possible states: ▪ Green: Port is enabled ▪ Amber: Port is in standby mode ▪ Off: Port is disabled ▪ Blink: SFP error has occurred (SFP fault, or wrong type of transceiver is installed)

a. The user application can select the LED color using the Set FRU LED State IPMI command.

b. The user application can control the LED color and illumination using the Set FRU LED State IPMI command.

SFP and SFP+ Sockets

The PPM front panel provides ports for high-bandwidth 1 Gb and 10 Gb Ethernet I/O transceivers. The ports are implemented as SFP and SFP+ (Small Form-Factor Pluggable) transceiver sockets, providing configurations for the number and type of Ethernet ports.

Each SFP or SFP+ module mates with a connector mounted to the PCB inside an SFP+ cage. The connector and cage combination provides the connection interface for the SFP or SFP+ modules. The modules provide access to the Fabric switch I/O on the PPM. Each Fabric SFP+ is connected to the Fabric switch using the 10 Gb SFI interface.

Important: Shielded cables are required for connections to the Ethernet SFP/SFP+ ports.

Reset Button

A reset button is provided on the front panel for resetting the PPM payload, which includes the Octeon processors, the LMP, the Ethernet switch, and associated peripherals. The switch is a recessed button labeled RESET.

Hot-Swap Switch

A hot-swap switch is located on the bottom of the PPM behind the bottom locking ejector handle. It is a normally open switch that is integrated with the bottom ejector latch mechanism so it reflects the state of the latch. The switch is connected (closed) when the ejector latch is fully inserted into the module and locked.

When the bottom ejector latch is opened, a signal is sent to the IPMC which causes the blue hot swap LED on the front panel to blink. When the LED is solid blue, the PPM is ready to be hot-swapped in the shelf. With hot-swapping, a module can be removed and reinserted in a shelf without resetting the module.

PPM40 RTM

The PPM40 supports the PPM40 RTM, which connects to the back of the TD140 chassis (**Figure 3.5**). Compliant with *PICMG 3.0 Advanced Telecommunications Computing Architecture R3.0*, the PPM40 RTM supplies maintenance and additional connectivity options to the PPM40 blade.

Each RTM provides the PPM40 with twelve ports supporting SFP (small form-factor pluggable) or SFP+ modules:

- Eight ingress ports for connection to monitored network
- Four egress ports for connection to G10 probes

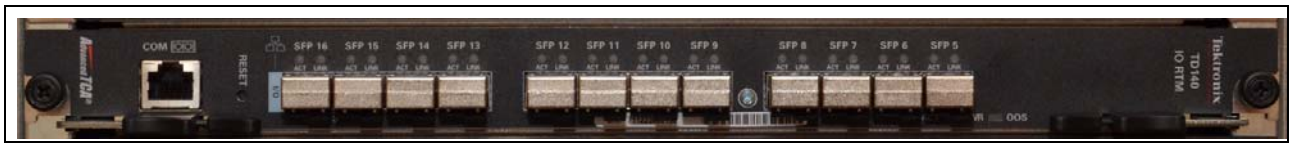


Figure 3.5 - TD140 PPM40 RTM

Front Panel Interfaces and LEDs

The RTM includes a metal front panel that provides interfaces to its functionality. The metal front panel also serves as an EMI/RFI barrier, and complies with PICMG 3.0 Revision 2.0.

The RTM front panel external interfaces include 12 SFP/SFP+ sockets, an RS232 serial port, port and system status LEDs, and a reset button. **Figure 3.6** shows the RTM front panel and calls out the interface features.

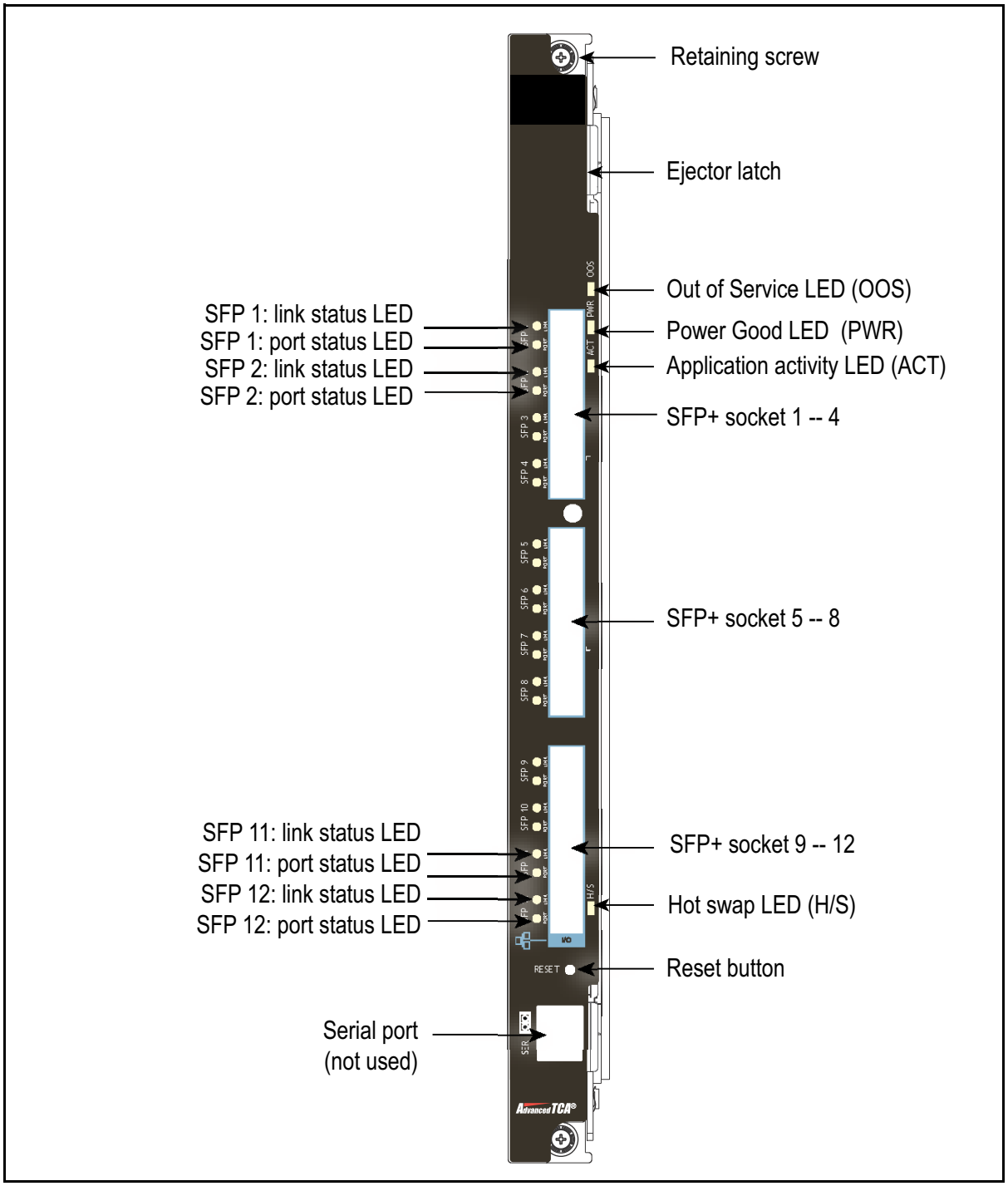


Figure 3.6 - PPM40 RTM Front Panel

Front panel LEDs

See **Figure 3.6** for the LED locations. **Table 3.2** describes the functions and operating states for the RTM front panel LEDs.

Table 3.2 - Front Panel LEDs

Label	LED ID	Definition	Color	LED State
OOS	LED1	Out of service	Red or amber[a] 	Indicates if the RTM is operational. The LED is controlled by the MMC on the RTM. ▪ Red or amber: RTM is out of service ▪ Off: RTM is operating normally
PWR	LED2	Power good	Green 	Indicates if the RTM is powered normally. The LED is controlled by the MMC. ▪ Green: Power to the RTM is normal ▪ Off: RTM is not powered or it is in the hot-swap process
ACT	LED3	Network active status	Amber 	Indicates if the application is active. The status of the LED depends on the application assigned. The LED is controlled by the MMC. ▪ Amber: Application activity ▪ Off: No activity

Table 3.2 - Front Panel LEDs (Continued)

Label	LED ID	Definition	Color	LED State
SFP 1 -- SFP 12	N/A	Link status	Green or Amber 	Link status indicator, controlled by the LED CPLD on the RTM. ▪ Solid green: Indicates a link is established at the maximum data rate supported by the installed transceiver. No data traffic is present on the port. ▪ Solid amber: Indicates a link is established at a speed less than the maximum data rate supported by the installed transceiver, such as 100 Mbps or 10 Mbps. No data traffic is present on the port. ▪ Blinking: Indicates link activity. Data traffic is present on the port. ▪ Off: Indicates link failure or port disabled.
		Port status	Green 	Indicates if the corresponding Fabric port is enabled. It is controlled by the LED CPLD on the RTM. ▪ Solid green: Port enabled ▪ Off: The front module is not installed, or the front module is installed but the port is disabled, or the front module is installed but there is a link failure.
H/S	BLUE LED	Hot swap	Blue 	The hot swap LED is controlled by the MMC on the RTM and indicates when it is safe to remove the RTM. The possible states are: ▪ Solid: Ready for hot swap ▪ Blinking: Transition between hot swap and running states. The RTM is not ready to be removed ▪ Off: Running status, no hot-swap activity in progress

a. The user application can set the LED color using the Set FRU LED State IPMI command.

4 TD140 Maintenance Guidelines

TD140 Maintenance Procedures

This chapter explains how to remove and replace components if they require service. Many of the components are static-sensitive and should be handled with care to prevent them from being damaged by ESD.

For instructions on mounting the TD140 in a rack, see the ***TD140 Installation Guide*** and the instructions provided by the rack's manufacturer.

Refer to the following sections for more information:

WARNINGS

- ***Before working on components, ensure that the power is removed from the power connection cables. When the system is powered on, do NOT touch the power terminals.***
- ***This TD140 is intended to be grounded. Ensure that the platform ground terminals are connected to protective earth (PE) ground of the building.***
- ***Follow ESD precautions and make sure you are adequately grounded before handling the module or the RTM.***

REPLACING A PPM

Refer to the following sections for more information:

- Remove the PPM
- Install the PPM

Remove the PPM

Perform the following steps:

1. Disconnect all cables from the RTM if it is installed. Power to the RTM will be lost once the PPM is removed.
2. Loosen the ejector handle thumbscrews on the PPM. Release the locking ejector latch that engages the hot-swap switch (**Figure 4.1**). This is the right ejector latch if the PPM is oriented horizontally, or the lower ejector latch if it is oriented vertically. Do not release the other latch at this time.

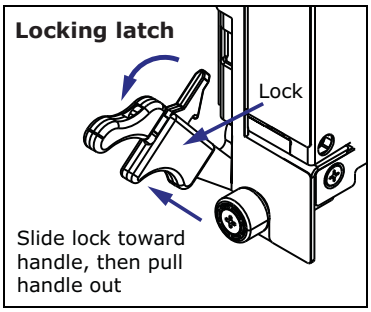


Figure 4.1 - PPM Locking Latch

Never force open a locking ejector latch. The locking mechanism must be disengaged to release the latch or damage to the latch could occur. Refer to Figure 4.1.

3. The hot swap blue light flashes on the PPM front panel. When the hot swap light turns solid blue, perform the next step.
4. Release the other PPM ejector latch (the non-hot swap latch).

5. Simultaneously pull both ejector handles to release the module from the slot.

6. Pull the module out of the slot and place the module on a flat, static-free surface.

7. To install a replacement module, hold its ejector latches in the open position and slide the module into the slot until the ejector latches touch the front of the shelf. Close both ejector latches and tighten the thumbscrews.

When the module is installed in a shelf with power applied, the blue hot swap LED flashes until the module is active and then turns off.

8. If you are not replacing the removed module with a replacement module, you must install an airflow management filler designed for the slot to maintain proper cooling and airflow through the shelf for the remaining modules.

9. Remove the grounding wrist strap when you are done handling the PPM, the RTM, and electrical equipment.

Install the PPM

This procedure assumes you are installing the PPM in an ATCA shelf and the shelf power is on. The ATCA shelf architecture lets you insert and remove the PPM from the shelf without powering down the system.

Perform the following steps:

1. Open both PPM locking ejector handles outward as indicated in the illustration below.

Do not force the ejector latches open. Make sure the release is pushed in before pulling the handle out. Refer to Figure 4.2.

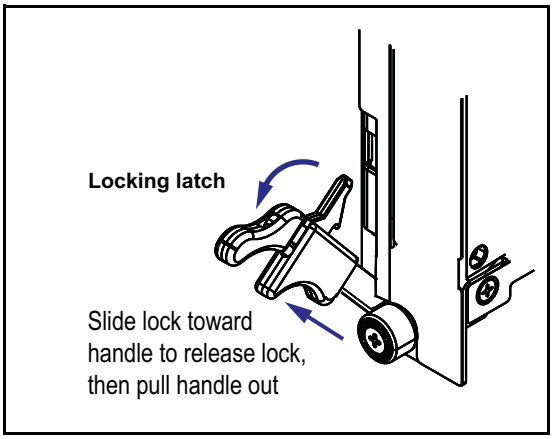


Figure 4.2 - PPM40 Handle Locking Latch

2. With both ejector handles fully open, slide the PPM into the shelf node slot until the ejector latches touch the front of the shelf. The PPM is correctly aligned and inserted when:

   - The PPM edges fit within the narrow shelf guide rails.
   - A hook on each ejector latch slides into a notch in the shelf just before the latch touches the shelf.
   - The PPM mates with the alignment receptacles of the corresponding RTM (if installed).

3. When the PPM is inserted all the way into the shelf, simultaneously close both ejector handles inward. This seats the PPM connectors into the shelf backplane (**Figure 4.3**).

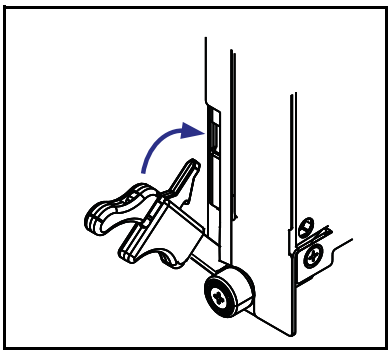


Figure 4.3 - Close Handles

The hot swap (H/S) LED flashes until the PPM is fully powered, then the H/S LED turns off and the power (PWR) or in service (IS) LED turns on.

The installation may have failed if the following LEDs illuminate as noted:

- The H/S LED remains solid blue or continues to flash after the PPM is inserted.
- The ATTN LED is lit.

4. Secure the PPM in its slot by hand-tightening the retaining screws on each end of the PPM front panel.

REPLACING A PPM40 RTM

Refer to the following sections for more information:

- Remove the PPM40 RTM
- Install the PPM40 RTM

Remove the PPM40 RTM

*Some RTMs have two locking ejector latches, and others have one locking ejector latch and one friction latch. It is important that the lock is released before opening a locking ejector latch. See **Figure 4.4** for an illustration of the ejector latches.*

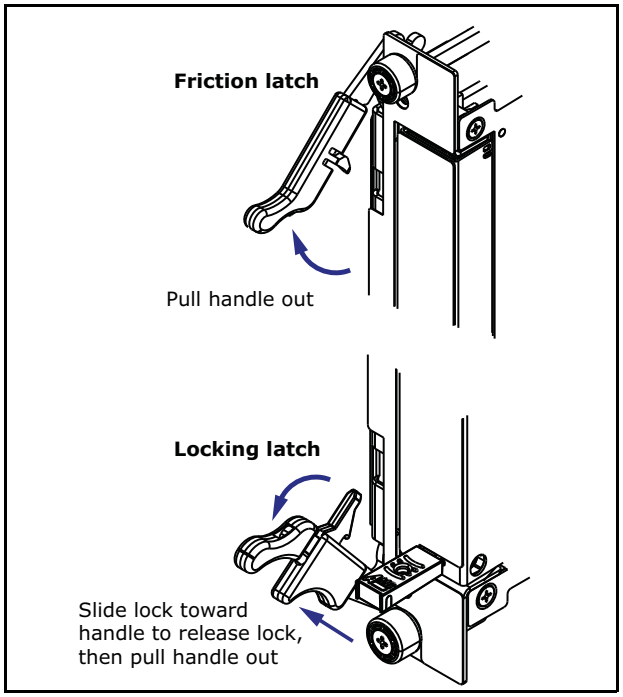


Figure 4.4 - Opening Ejector Latches

Perform the following steps:

1. Release the two retaining screws.
2. If one of the latches is a friction type, carefully pull the latch handle away from the RTM to open the latch. To open a locking ejector latch, disengage the lock by sliding the lock toward the handle to release the catch from the shelf latch rail, then pull the handle away from the RTM. See **Figure 4.4**.
3. Remove the RTM from the shelf.

Install the PPM40 RTM

Install the PPM40 RTM PRIOR to installing the PPM40 front module in the TD140 chassis.

Perform the following steps:

1. Remove the filler panel in the rear shelf slot where the RTM will be installed.
2. Open both ejector latches on the RTM (**Figure 4.5**).

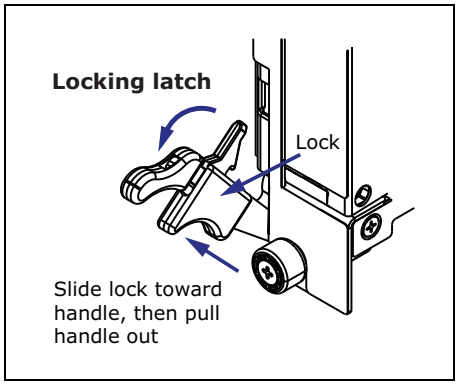


Figure 4.5 - RTM Handle Locking Latch

If the RTM uses locking ejector latches, do not force the ejector latch open. Make sure the release is pushed in before pulling the handle out. Refer to Figure 4.5.

3. Slide the RTM into the empty rear shelf slot.
4. Close both ejector latches and tighten the two retaining screws.
5. Verify the following:
   - The module's power LED is solid green.
   - The module's hot swap LED is off (this typically occurs within a minute).
   - The RTM's power LED is solid green.

REPLACING THE SHELF MANAGEMENT CONTROLLER (SHMC)

The replacement ShMC must have the same OS version as the ShMC it is replacing and must have the appropriate IP configured. Contact Tektronix Communications Customer Support for assistance with G10 ShMC replacement.

Refer to the following sections for more information:

- Remove the ShMC
- Install the ShMC

Remove the ShMC

Perform the following steps:

1. Release the ejector handle on the ShMC front panel and wait until the Hot Swap LED changes to steady blue. Steady blue indicates the ShMC can safely be removed from the shelf slot.
2. Loosen the ShMC retaining screw.
3. Ensure the ejector handle is fully opened so the ejector latch is released from the shelf card guide, then extract the ShMC from the shelf.

Install the ShMC

The replacement ShMCs must have the same OS version as the ShMC it is replacing and must have the appropriate IP configured. Contact customer support for assistance with G10 ShMC replacement.

A customer support representative will assist you with the following steps to install the ShMC into the shelf. Perform the following steps:

1. Using standard ESD precautions, remove the ShMC from its anti-static bag. Hold the ShMC by its circuit board edges and its front panel; avoid touching any components and connector pins.
2. Open the ShMC ejector handle and insert the module into the shelf card guides for the shelf manager slot.
3. Keep the ejector handle open and carefully slide the ShMC completely into the slot. When the ejector latch engages the shelf card guide, rotate the ejector handle toward the front panel until the ejector handle is locked in place and the ShMC is fully seated in the shelf.
4. Secure the ShMC into the shelf slot by tightening the retaining screw on the ShMC front panel. The ShMC automatically activates if power is applied to the shelf.
5. Observe the four LED status lights on the ShMC. If the module is operating properly, the LEDs display the states shown in **Table 4.1**.

Table 4.1 - LED States for Normal Operation

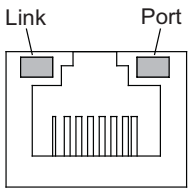
LED	State	Explanation
Out of Service (OOS)	Off	Operating normally
Power Good (PG)	GREEN On 	Power is good from all supplies

Table 4.1 - LED States for Normal Operation (Continued)

LED	State	Explanation
Active (ACT)	AMBER On	Active (performing assigned application)
Hot Swap (HS)	Off	Running

6. Verify the link and port status for the ShMC by observing the Ethernet port LEDs and referring to **Table 4.2**.

Table 4.2 - Link and Port Status

LED purpose	Color	State	Explanation	LED location
Link status	Green or Amber	Steady green	1000 Mbps	
		Steady amber	100 Mbps	
		Blinking	Link active	
		Off	No link established	
Port status	Green	Green	Port enabled	
		Off	Port disabled	

7. Contact Tektronix Communications Customer Support to complete the TD140 setup to provision IP addresses of the new ShMC.

REPLACING A FAN TRAY

Use care when handling the fan trays. Never handle the fan tray by its connector. Improper handling of fan trays could cause damage to the connector pins.

Perform the following steps:

1. Press the hot swap button on the fan tray front panel. The blue hot swap LED blinks.

The ShMC will shut down the fan tray. The ShMC may also increase the speed of the other fan tray to compensate for the deactivated fan tray.

2. Wait 60 seconds for the fan tray's impeller to stop spinning. Do not rely on the hot swap LED to indicate readiness for removal because the fan tray's hot swap LED stops blinking before the impeller stops spinning.

If you remove the fan tray while the impeller is still spinning, gyroscopic forces can cause the fan tray to move in unexpected ways. This may injure you directly or cause you to drop the fan tray, which may damage the equipment.

3. Release the locking screw that secures the fan tray to the shelf.

4. Grip the handle and pull out the fan tray. Be sure to support the fan tray as it comes out of the shelf.

5. Remove the replacement fan tray from the shipping box and perform a thorough inspection. Make sure all the connector pins on the fan tray are straight.

6. Slide the fan tray into the empty slot until it is fully seated in the shelf. Turn the locking screw to the locked position to secure the fan tray.

   The fan tray is operational when:

   - The fan tray's OK LED is solid green.
   - The fan tray's red Alarm LED is off.
   - The fan tray's blue Hot Swap LED is off.

7. Use the shelf management software to verify the fan tray is available as a resource and operating correctly.

REPLACING A PEM

If the PEM's red Alarm LED is on, use the shelf management software to determine whether the PEM needs to be replaced.

- ***Do not use a grounding wrist strap while working with power cables because this increases the risk of electrical shock.***
- ***Before making or breaking connections to the PEM, ensure the power feed cabling is not powered.***
- ***Do not touch a power cable when power is supplied.***
- ***Do not place wires, screwdrivers, meter probes, oscilloscope probes, or other electrically conducting material in contact with a live power cable or anything connected to a live power cable.***
- ***Do not wear any watches, bracelets, and rings when working with a live power cable or anything connected to a live power cable.***
- ***For maximum safety, be cautious and use tools with properly insulated handles.***
- ***Ignoring any of these precautions may cause personal injury or damage electronic equipment. An electrical current of up to 75 VDC may be present at any power connection.***

Figure 4.6 shows the locations of the PEM front panel components mentioned in these steps.

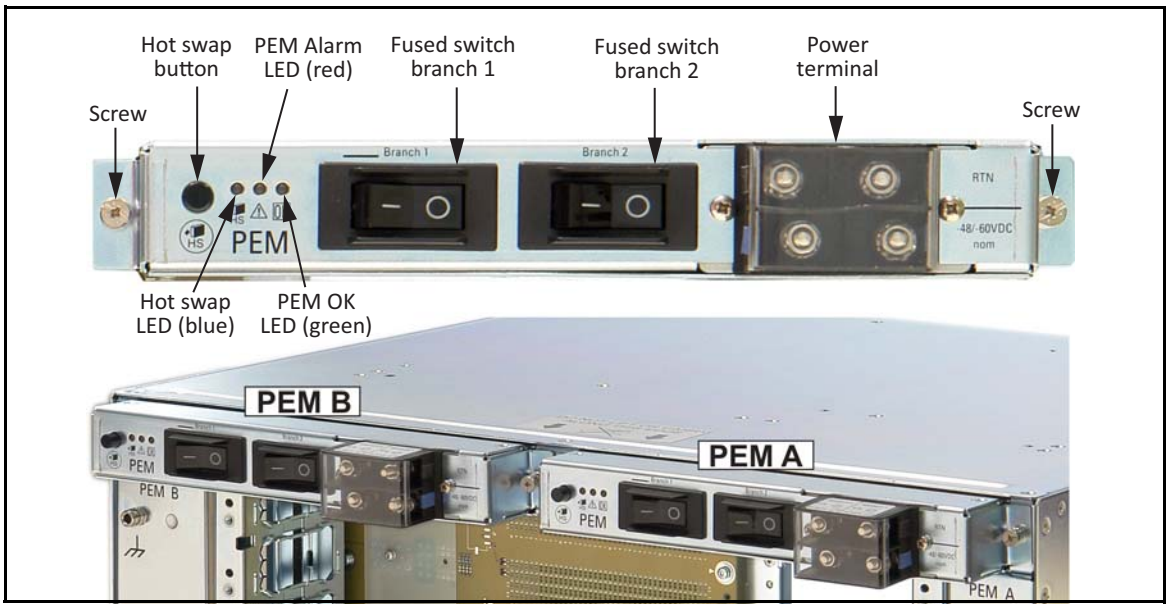


Figure 4.6 - PEM Front Panel

Perform the following steps:

1. Ensure that the redundant PEM is fully functional (its red Alarm LED is off).
2. Push the hot swap button until the blue hot swap LED starts blinking.
3. When the hot swap LED is solid blue, loosen both screws.
4. Shut off power to the PEM to be removed by setting both fused switch branches to OFF.
5. Remove the terminal cover and disconnect the power cables from the power terminal.
6. Pull out the PEM and put it into an ESD shielding bag.
7. Remove the replacement PEM from its ESD shielding bag and insert it into the empty slot.
8. Set both fused switch branches to ON.

The blue hot swap LED blinks until the PEM is fully functional. Only the red Alarm LED is lit until power is provided to the PEM.

9. Tighten the screws.
10. Reconnect the power cables to the power terminal.
11. Replace the terminal cover.
12. Restore the facility's power to the PEM.

13. Check that the PEM's OK LED is solid green.

When all the power feeds are present, only the green OK LED is lit.

CLEANING OR REPLACING THE INLET AIR FILTER

Routine air filter maintenance is required to ensure the shelf operates efficiently. Depending on your environment, you may need to change the air filter every 30 days. Do not wait longer than 90 days to change the air filter.

Keep extra filters available for changing the inlet air filter, but ensure the supply is no more than a year old. The ideal storage condition for the polyurethane foam is a cool, dry, dark environment. High temperature, humidity, and ultraviolet light adversely affect the filter media. Foam also degrades when exposed to solvents and sulfates, such as engine exhaust. Keeping relative humidity between 40% and 80% and temperature between 4.4° C and 32.2° C (40° F to 90° F) yields an acceptable environment. Covering the filters with dark plastic keeps the foam dry and protects it from ultraviolet light.

Cleaning the filter regularly helps ensure effective filtration and airflow. How often you perform filter maintenance depends entirely on the platform's environment. Some environments require more frequent maintenance than others.

Refer to the following sections for more information:

- Remove the Filter Tray and Filter
- Clean the Filter
- Replace the Filter and Install the Tray

Remove the Filter Tray and Filter

Perform the following steps:

1. Locate the removal tab on the front of the filter tray. The filter tray is on the left side of the right fan tray. See **Figure 4.7**.

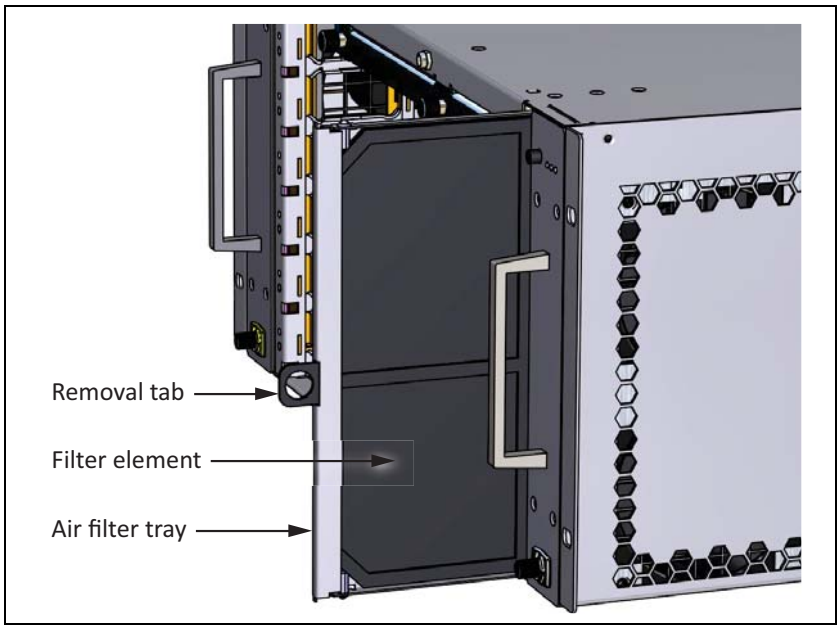


Figure 4.7 - Removing the Air Filter Tray

2. Grip the removal tab and pull the filter tray out. Note the side of the filter element that faces outward.
3. Push the filter element gently from the opposite side of the filter tray.
4. Remove the filter element from the filter tray. The shelf's filter sensor generates an error because the shelf is operating with the filter removed.

Clean the Filter

The inlet air filter can be cleaned using any of these methods:

- **Vacuum.** Remove accumulated dust and dirt with a few passes of a vacuum cleaner.
- **Oil-free compressor air.** Point the compressed air nozzle in the opposite direction of the filter's operating airflow so air blows from the filter's exhaust side toward its intake side.
- **Cold-water rinse.** Wash away collected dirt using plain water and a standard hose nozzle. Let the filter stand until completely dry before returning it to service.
- **Immersion in warm soapy water.** Dip the filter in a solution of warm water and mild detergent, then rinse it in clear water. Let it stand until completely dry.

Replace the Filter and Install the Tray

When the filter element is installed in the filter tray, make sure the same side is facing outward as when you removed it from the tray.

Perform the following steps:

1. With the filter tray removal tab facing you, grasp the tab and slide the filter tray into the filter slot at the front of the shelf.
2. Push the filter tray into the shelf until it clicks into place.

5 TD140 System Operating Specifications

OVERVIEW

The design of the TD140 load balancer enables you to install it in common switching, or other equipment frame lineups found in telecommunications central office environments. The following sections list the physical specifications, power and ground requirements, and appropriate specifications to which the TD140 probe conforms.

PHYSICAL DIMENSIONS

The TD140 is deployed in one of the following scenarios:

- Front-to-back cooling with baffle installed (**Table 5.1**)
- Side-to-side cooling without baffle installed (**Table 5.2**)

Table 5.1 lists the physical dimensions for the TD140 with the baffle installed.

Table 5.1 - Physical Dimensions with Baffle Installed

Dimension	Description
Model	80G, 2-blade, DC, front-to-back cooling with optional baffle installed
Measurements[a]	8U rack height (including baffle for front-to-back cooling) 13.97”H x 17.625”W x 17.9”D (24.7”D with required mount kit)
	Cage Only 5U rack height 8.72”H x 17.625”W x 17.9”D
Weight	95 lbs.
Rack Mount	4-post (only), 19-inch Min depth: 24.7 in. Max depth: 26.9 in.

a. Refer to the ***TD140 Installation Guide*** for rack space requirements. AC configurations require an additional 1U rack space to accommodate an AC rectifier.

Table 5.2 lists the physical dimensions for the TD140 without the baffle installed.

Table 5.2 - Physical Dimensions without Baffle Installed

Dimension	Description
Model	80G, 2-blade, DC, side-to-side cooling without baffle
Measurements[a]	Cage Only 5U rack height 8.72”H x 17.625”W x 17.9”D
Weight	65 lbs.
Rack Mount	4-post or 2-post, 19-inch, front/flush mount

a. Refer to the ***TD140 Installation Guide*** for rack space requirements. AC configurations require an additional 1U rack space to accommodate and AC rectifier.

POWER AND HEAT

Table 5.3 lists the power and heat specifications for the TD140 (Model: 80G, 2-blade, DC, front-to-back cooling).

Table 5.3 - TD140 DC Power and Heat Dimensions

Dimension	Value
Maximum current draw	50A (2x 30A breakers on each PEM)
Typical power draw (50-74% traffic)	600W (estimated)
Maximum power draw (100% traffic)	850W (estimated)
Typical heat dissipation (50-74% traffic)	2048 BTU/hr
Maximum heat dissipation (100% traffic)	2901 BTU/hr
Power Inputs	-40.5 VDC to -72 VDC

AC Rectifier

The TD140 internal power supplies only accept DC power. For TD140 installations requiring an AC power input, an optional AC rectifier (Figure 5.1) can be used to provide -48V DC output power for the TD140 from an AC source.

- IEC320-C20 sockets for AC inputs
- Requires IEC320-C19 power cord for AC/DC adapter input

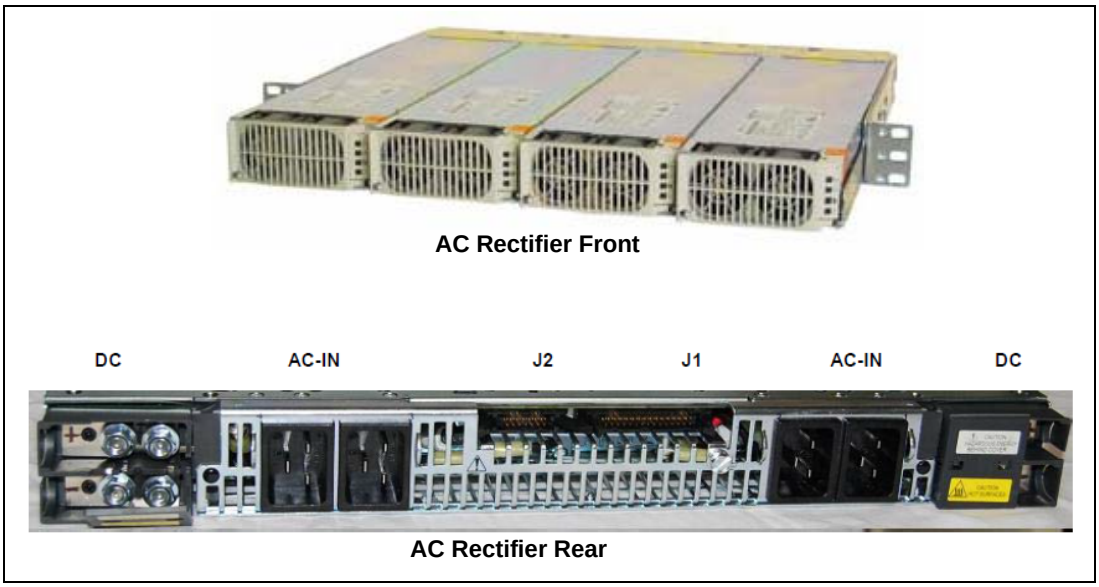


Figure 5.1 - AC Rectifier (Optional)

The AC power supply shelf supports up to four AC rectifier modules. The power output per rectifier is dependent on the AC input voltage. For the TD140 80G configuration, two AC rectifier modules are included. This provides redundant power. Load sharing between the modules is not ideal because the power paths are independent. This provides notification when a power rectifier fails.

Table 5.4 lists the power and heat specifications for the TD140 with an AC Rectifier.

Typical and maximum power draw will be distributed across the AC power feeds, but it will not be balanced. It is not unusual for a single AC rectifier to supply 80% of the power.

Table 5.4 - TD140 AC Power and Heat Dimensions (with AC Rectifier)

Dimension	Value
Maximum current draw	8.3A @ 110VAC / 9.7A @ 240VAC
Typical power draw (50-74% traffic)	662W (estimated)
Maximum power draw (100% traffic)	950W (estimated)
Typical heat dissipation (50-74% traffic)	2260 BTU/hr
Maximum heat dissipation (100% traffic)	3242 BTU/hr
Power Inputs	90 - 185VAC (1200W max per rectifier) 185 - 305VAC (2000W max per rectifier) 47 - 66Hz

ENVIRONMENTAL

- Temperature
  - +5°C (41°F) to +40°C (104°F), long term
  - -5°C (23°F) to +55°C (131°F), short term
- Humidity: +5% to +85%, no condensation
- NEBS level 1
- RoHS 6 of 6
- Unit marked for WEEE