

M40e and M160 Cooling System Installation Instructions

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This document describes how to remove and replace the cooling system components on the Juniper Networks M40e and M160 Internet router. The components include the air filter, fan tray, and impeller assemblies.

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Cooling System Description

The cooling system has the following components:

- Air filter, air intake vent, and intake cover—Provide an opening for room air to enter the router. The air intake vent and intake cover are located at the bottom of the chassis front, below the cable management system, as shown in Figure 2. Figure 1 shows an M40e router; The location of all components is the same on an M160 router. The air filter is hot-removable and hot-insertable and covers the air intake vent, preventing dust and other particles from entering the cooling system. The nonremovable air intake cover is located behind the air filter and provides electromagnetic compatibility (EMC) shielding.
- Front cooling subsystem—Cools the Physical Interface Cards (PICs), Flexible PIC Concentrators (FPCs) and midplane. This subsystem includes a fan tray located behind the cable management system and a large, central impeller behind the front interface, shown in Figure 1. Both components are hot-removable and hot-insertable.
- Rear cooling subsystem—Cools the Switching and Forwarding Modules (SFMs), host module, Packet Forwarding Engine Clock Generators (PCGs), and power supplies. This system includes an impeller located at the upper right of the chassis rear and another at the lower left, as shown in Figure 2. The two impellers are both hot-removable and hot-insertable, but not interchangeable.

Figure 1: Front of Chassis

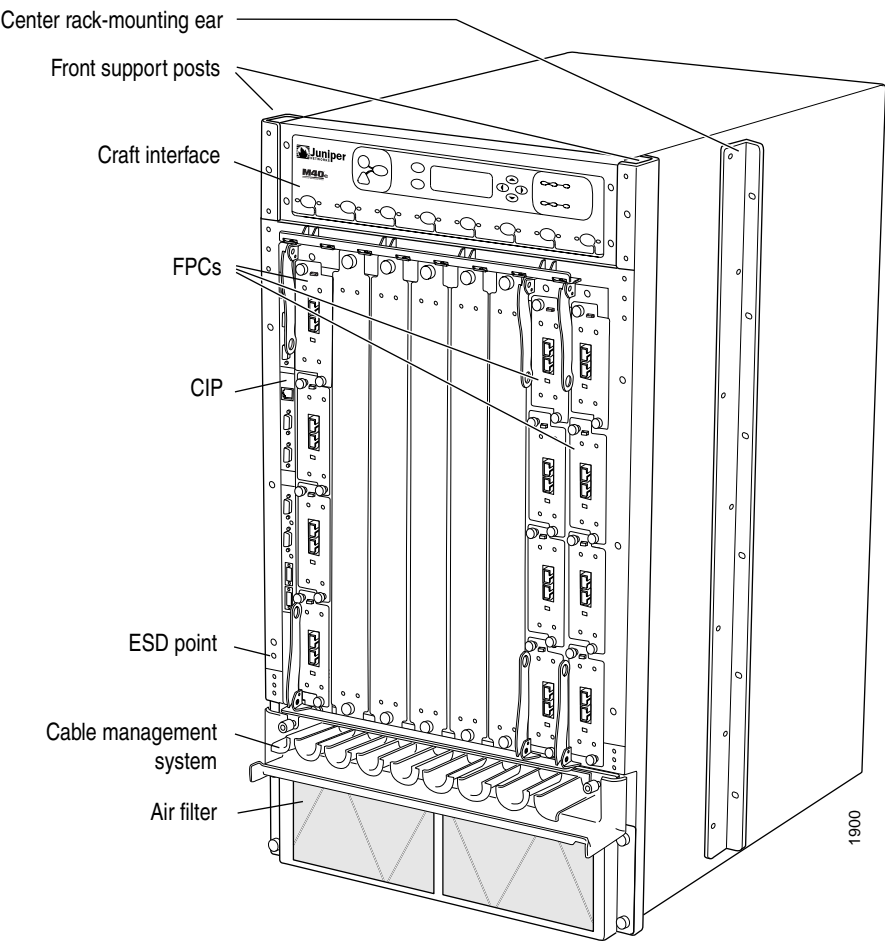
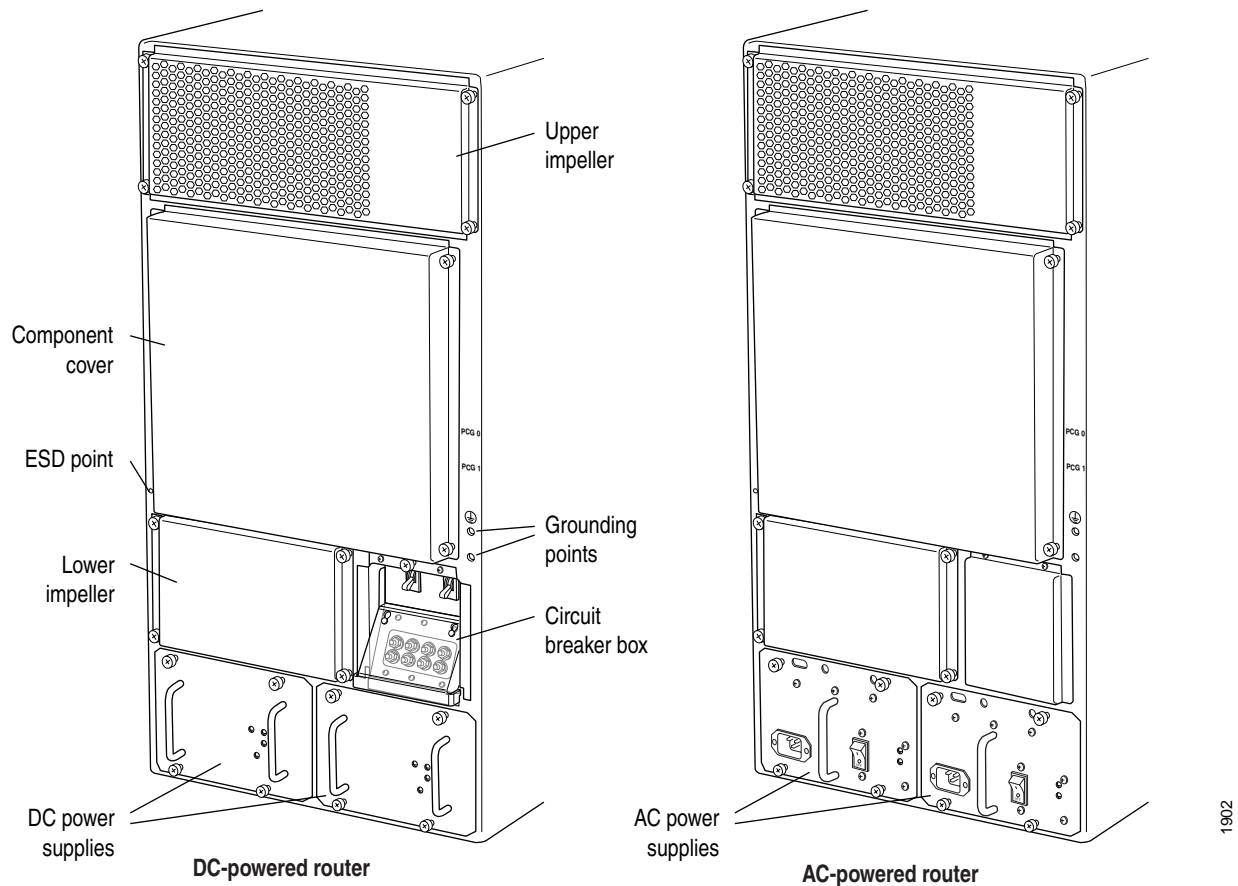
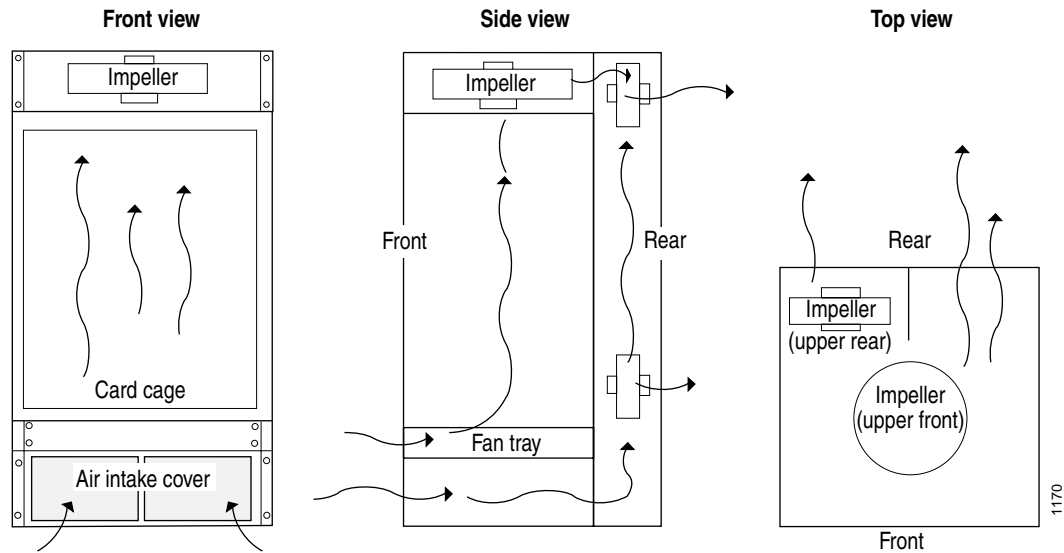


Figure 2: Rear of Chassis with Component Cover in Place

The Miscellaneous Control Subsystem (MCS) constantly monitors the temperature of the router's components. When the temperatures are below the acceptable maximum, the fans and impellers function at less than full speed. If the MCS detects that the temperature of a component has exceeded the acceptable maximum—for example, because an impeller is removed—it automatically increases the speed of the remaining impellers and fans to reduce the temperature. The fans and impellers can function at the higher speed for one half hour.

Figure 3 shows the airflow through the impellers and fan tray.

Figure 3: Airflow Through the Chassis

Tools and Parts Required

To remove and install cooling system components, you need the following tools and parts:

- Phillips (+) screwdrivers, numbers 1 and 2
- Flat-blade screwdriver, approximately 1/4 in. (6 mm)
- Electrostatic discharge (ESD) grounding wrist strap
- Electrostatic bag or antistatic mat for each component removed

Replacing the Air Filter

The air filter is located at the bottom of the chassis front (see Figure 1). Check the air filter regularly for dust and debris. Replace it as needed. The air filter is hot-removable and hot-insertable, but take note of the following caution.



CAUTION: Do not operate the router for more than a few minutes when the air filter has been removed. The fans and impellers are powerful enough to draw in foreign material, such as bits of wire, through the unfiltered air intake, which could damage router components.

To clean and replace the air filter, perform the following procedures:

- “Removing the Air Filter” on page 6
- “Installing the Air Filter” on page 7

Removing the Air Filter

To remove the air filter, follow this procedure:

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the thumbscrews at the corners of the air filter cover (), using a Phillips screwdriver if necessary.
3. Grasp the edges of the air filter cover and pull it and the air filter away from the front of the chassis as shown in .
4. Pull the air filter out of the air filter cover, as shown in .
5. Inspect the filter for dust, dirt, and holes. Replace the filter if needed as described in “Installing the Air Filter” on page 7 .

Figure 4: Removing the Air Filter

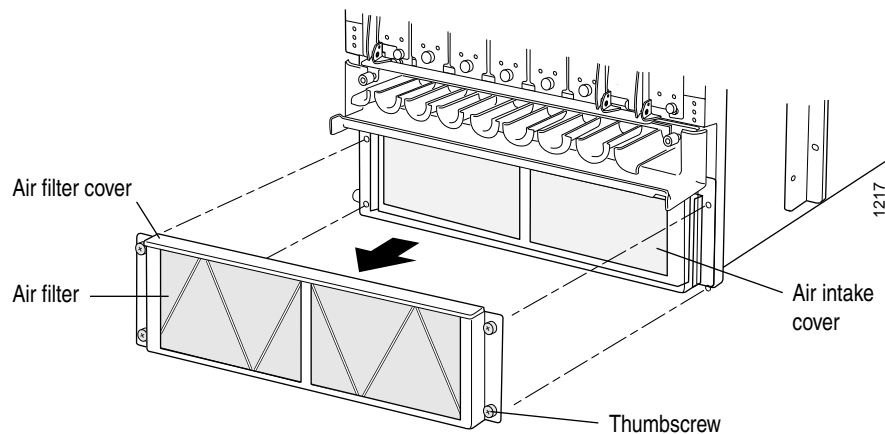
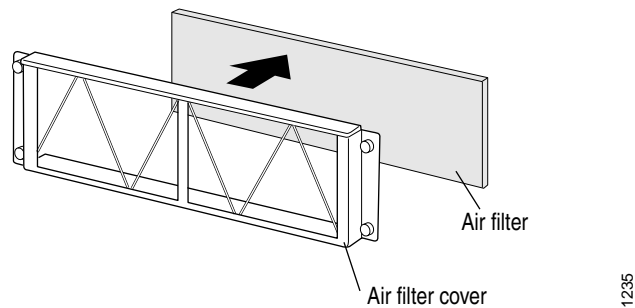
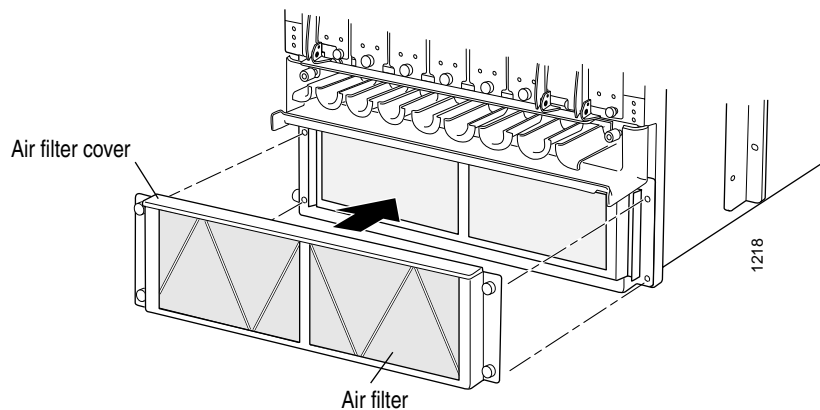


Figure 5: Removing the Filter from the Air Filter Cover

Installing the Air Filter

To install the air filter, follow this procedure:

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Gently press the replacement air filter into the air filter cover.
3. Grasp the sides of the air filter cover and push it and the filter firmly into place over the air intake vent, as shown in Figure 6.
4. Tighten the thumbscrews at the corners of the air filter cover.

Figure 6: Installing the Air Filter

Replacing the Fan Tray

The fan tray is located behind the cable management system on the front of the chassis, as shown in Figure 1, and weighs approximately 13 lbs (5.9 kg). It houses

four fans that blow room air onto the FPCs and midplane to cool them. The fan tray is hot-insertable and hot-removable. To replace it, perform the following procedures:

- “Removing the Fan Tray” on page 8
- “Installing the Fan Tray” on page 9

Removing the Fan Tray

To remove the fan tray, follow this procedure:

1. Safely stow any PIC cables out of the way as follows:
 - a. Unwrap the cables from the spools on the cable management system.
 - b. Remove the cables from the tray.
 - c. Arrange the cables so that they do not block the front of the cable management system and tray, and secure them with temporary fasteners so that they are not supporting their own weight as they hang from their connections.



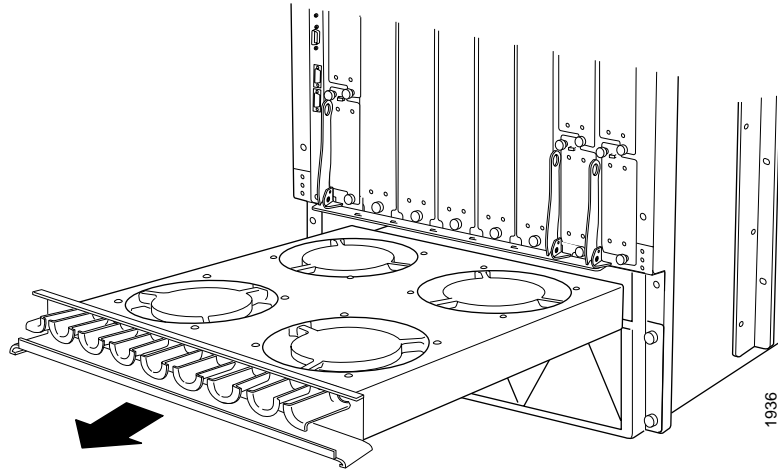
CAUTION: Never let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

2. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
3. Loosen the thumbscrews at the left and right sides of the cable management system, using a Phillips screwdriver if necessary.
4. Grasp the sides of the fan tray and pull firmly to slide it halfway out of the chassis (see Figure 7).



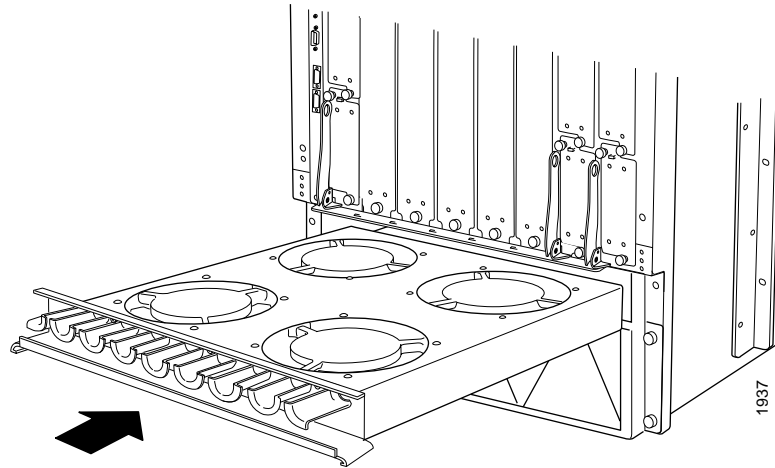
CAUTION: If the fans are still spinning, do not touch them with your fingers or any tool as you slide the fan tray out. To avoid injury, wait until the fans stop spinning before removing the fan tray.

5. When the fans are no longer spinning, slide the fan tray completely out of the chassis.

Figure 7: Removing the Fan Tray**Installing the Fan Tray**

To install the fan tray, follow this procedure (see Figure 8):

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Grasp the sides of the replacement fan tray and align the rear of the tray with the guides inside the chassis.
3. Slide the fan tray all the way into the chassis, taking care not to catch or pinch any dangling PIC cables with the edges of the tray. The fans start spinning as soon as the fan tray contacts the midplane.
4. Tighten the thumbscrews at the left and right ends of the cable management system.
5. Rearrange the PIC cables in the cable management system. For more information about proper cable arrangement, see the *M40e Internet Router Hardware Guide* or *M160 Internet Router Hardware Guide*.

Figure 8: Installing the Fan Tray

Replacing the Front Impeller Assembly

The front impeller assembly is located at the front of the chassis above the FPC card cage, as shown in Figure 1. The assembly weighs approximately 14.5 lb (6.6 kg), and is hot-removable and hot-insertable.

The craft interface is attached to the front of the front impeller assembly. If the replacement front impeller assembly you are installing does not have a replacement craft interface already installed on it, you must transfer the craft interface from the removed assembly to the replacement assembly. Perform the following procedures:

- “Removing the Front Impeller Assembly” on page 10
- “Detaching the Craft Interface from the Front Impeller Assembly” on page 11
- “Attaching the Craft Interface to the Front Impeller Assembly” on page 12
- “Installing the Front Impeller Assembly” on page 12

If the replacement front impeller assembly has a craft interface installed on it, perform only the procedures “Removing the Front Impeller Assembly” on page 10 and “Installing the Front Impeller Assembly” on page 12.

Removing the Front Impeller Assembly

To remove the front impeller assembly, follow this procedure: (See Figure 9, which shows the front impeller on an M40e router.)

1. Place an electrostatic bag on antistatic mat on a flat, stable surface to receive the assembly.
2. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

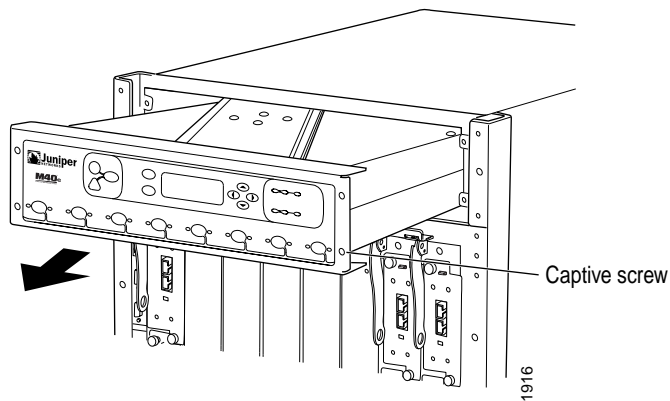
3. Using a Phillips screwdriver, loosen the captive screws at the corners of the craft interface.
4. Insert a flat-blade screwdriver into the gap around the craft interface and gently pry the impeller assembly forward until you can grasp the sides of the assembly and slide it halfway out of the chassis.



CAUTION: If the impeller is still spinning, do not touch it with your fingers or any tool as you slide the impeller assembly out. To avoid injury, wait until the impeller stops spinning before removing the assembly.

5. Place one hand under the assembly to support it. When the impeller is no longer spinning, slide the assembly completely out of the chassis and place it on the antistatic mat or in the electrostatic bag prepared in Step 1.
6. If you are replacing the front impeller assembly and the replacement assembly has a craft interface panel installed on it, proceed to “Installing the Front Impeller Assembly” on page 12. Otherwise, proceed to “Detaching the Craft Interface from the Front Impeller Assembly” on page 11.

Figure 9: Removing the Front Impeller Assembly



Detaching the Craft Interface from the Front Impeller Assembly

If you are replacing the front impeller assembly and the replacement assembly does not have a craft interface panel installed on the front, you must transfer the craft interface from the removed assembly to the replacement assembly. To detach the craft interface from the removed impeller assembly, follow this procedure:

1. If you are not immediately transferring the craft interface to a replacement impeller assembly, prepare an electrostatic bag or antistatic mat to receive it.
2. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Place the replacement front impeller assembly on an antistatic mat on a flat, stable surface, top side down, so that the lettering on the craft interface is upside down.
4. Using a Phillips screwdriver, loosen and remove the eight flat-head screws that secure the top and the bottom of the craft interface housing to the impeller assembly. Save the screws for reinstallation.
5. Using a Phillips screwdriver, loosen and remove the round-head screws from the rear of the craft interface. Two screws are located on each side, near the holes for the captive screws that secure the impeller assembly to the chassis. Save the screws for reinstallation.
6. Grasp the sides of the craft interface and pull it straight off the front of the impeller assembly.
7. If not immediately transferring it to a replacement impeller assembly, place it in the electrostatic bag or on the antistatic mat prepared in Step 1.

Attaching the Craft Interface to the Front Impeller Assembly

To attach the craft interface to the front impeller assembly, follow this procedure:

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Place the replacement impeller assembly top side up on an antistatic mat on a flat, stable surface.
3. Orient the craft interface so that the lettering is right side up. Make sure the connector on the rear of the interface is on the left end so that it will line up with the connector on the chassis.
4. When the connectors are aligned, push the craft interface straight back onto the face of the impeller assembly.
5. Using a Phillips screwdriver, install two round-head screws into the holes on each side of the craft interface. The holes are located near the holes for the captive screws that secure the impeller assembly to the chassis.
6. Using a Phillips screwdriver, install flat-head screws into the four holes along the top of the craft interface housing.
7. Carefully turn the impeller assembly over (top side down) and install flat-head screws into the four holes along the bottom of the craft interface housing.

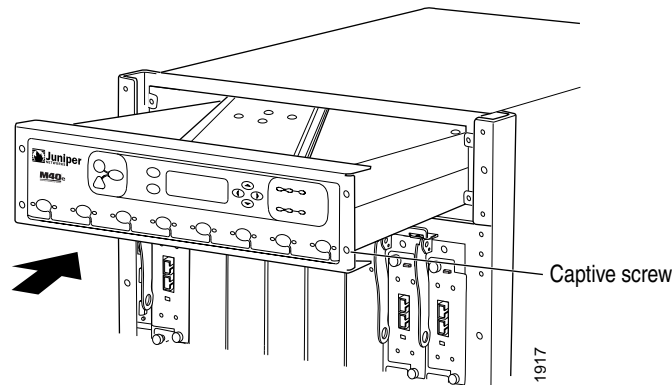
Installing the Front Impeller Assembly

To install the front impeller assembly onto the chassis, follow this procedure: (See Figure 10, which shows an M40e router.)

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

2. Grasp the sides of the replacement impeller assembly and align the rear of the assembly with the guides inside the chassis.
3. Using a Phillips screwdriver, tighten the captive screws at the corners of the craft interface.

Figure 10: Installing the Front Impeller Assembly



Replacing the Rear Upper Impeller Assembly

The rear upper impeller assembly is located at the upper left on the rear of the chassis, as shown in Figure 2. It weighs about 4 lb (1.8 kg). The assembly is hot-removable and hot-insertable. To replace it, perform the following procedures.

- “Removing the Rear Upper Impeller Assembly” on page 13
- “Installing the Rear Upper Impeller Assembly” on page 14

Removing the Rear Upper Impeller Assembly

To remove the rear upper impeller, follow this procedure (see Figure 11):

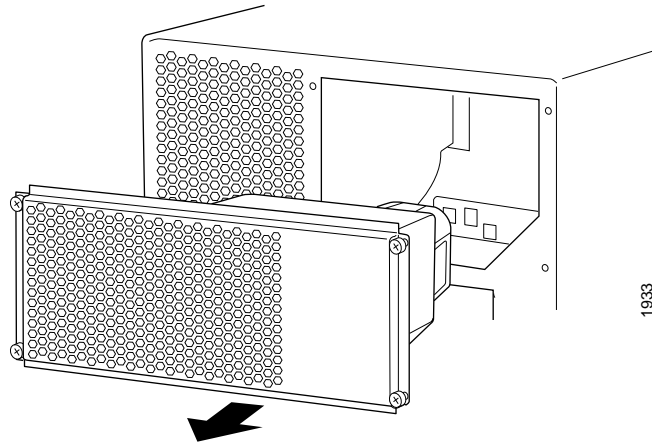
1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the thumbscrews at the corners of the impeller, using a Phillips screwdriver if necessary.
3. Grasp the screws at opposite corners of the impeller cover and slide the assembly halfway out of the chassis.



CAUTION: If the impeller is still spinning, do not touch it with your fingers or any tool as you slide the impeller assembly out. To avoid injury, wait until the impeller stops spinning before removing the assembly.

4. When the impeller is no longer spinning, slide the assembly completely out of the chassis.

Figure 11: Removing the Rear Upper Impeller Assembly

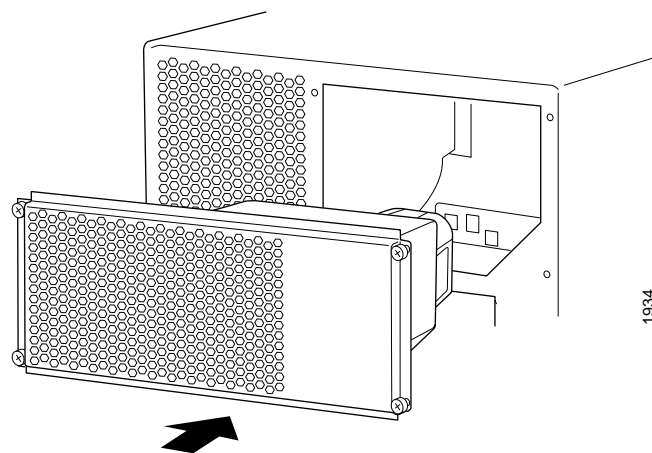


Installing the Rear Upper Impeller Assembly

To install the rear upper impeller assembly, follow this procedure (see Figure 12):

1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Slide the replacement assembly all the way into the chassis.
3. Tighten the thumbscrews at the corners of the impeller cover.

Figure 12: Installing the Rear Upper Impeller Assembly



Replacing the Rear Lower Impeller Assembly

The rear lower impeller assembly is located at the lower left of the rear on the chassis, above the left power supply, as shown in Figure 2. It weighs about 4 lb (1.8k kg).

The assembly is hot-removable and hot-insertable. To replace it, perform the following procedures:

- “Removing the Rear Lower Impeller Assembly” on page 15
- “Installing the Rear Lower Impeller” on page 15

Removing the Rear Lower Impeller Assembly

To remove the rear lower impeller assembly, follow this procedure (see Figure 13):

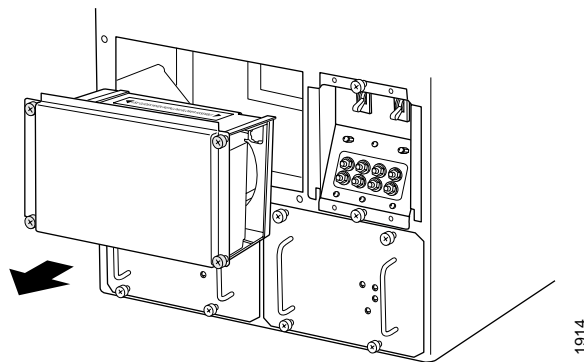
1. Attach an ESD strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the thumbscrews at the corners of the impeller, using a Phillips screwdriver if necessary.
3. Grasp the sides of the impeller assembly and slide it halfway out of the chassis.



CAUTION: If the impeller is still spinning do not put your fingers or any tool into the impeller assembly as you slide it out. To avoid injury, wait until the impeller stops spinning before removing it.

4. When the impeller is no longer spinning, slide the assembly completely out of the chassis.

Figure 13: Removing the Rear Lower Impeller Assembly

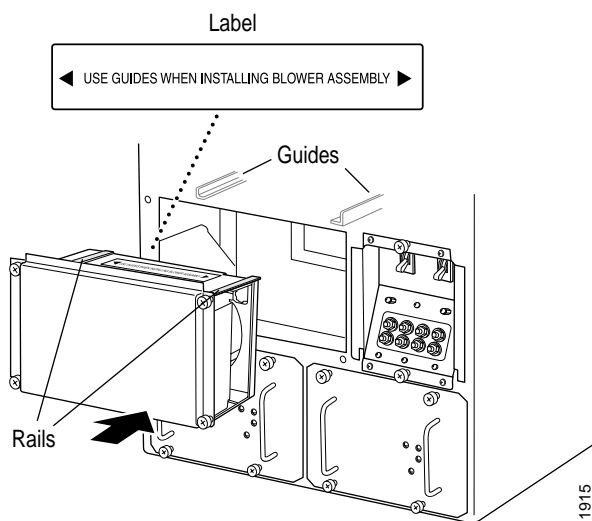


Installing the Rear Lower Impeller

To install the rear lower impeller, follow this procedure:

1. Attach an ESD strap to your bare wrist and connect the strap to one of the grounding points on the chassis.
2. Orient the replacement impeller so that the label is on the top, as shown in Figure 14.
3. Align the rails on the upper edges of the impeller assembly with the guides inside the chassis.
4. Push the impeller assembly up and to the right to start it into the chassis, then slide it all the way in.
5. Tighten the thumbscrews at the corners of the impeller cover.

Figure 14: Installing Rear Lower Impeller



List of Technical Publications

Table 1 lists the software and hardware books for Juniper Networks M-series and T-series routers and describes the contents of each book.

Table 1: Juniper Networks Technical Documentation

Book	Description
JUNOS Internet Software for M-series, T-series, and J-series Routing Platforms Configuration Guides	

Book	Description
<i>Feature Guide</i>	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.
<i>System Basics</i>	Provides an overview of the JUNOS software and describes how to install and upgrade the software. This manual also describes how to configure system management functions and how to configure the chassis, including user accounts, passwords, and redundancy.
<i>Network Interfaces and Class of Service</i>	Provides an overview of the network interface and class-of-service functions of the JUNOS software and describes how to configure the network interfaces on the router.
<i>MPLS Applications</i>	Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.
<i>Multicast Protocols</i>	Provides an overview of multicast concepts and describes how to configure multicast routing protocols.
<i>Network Management</i>	Provides an overview of network management concepts and describes how to configure various network management features, such as SNMP, accounting options, and cflowd.
<i>Policy Framework</i>	Provides an overview of policy concepts and describes how to configure routing policy, firewall filters, and forwarding options.
<i>Routing Protocols</i>	Provides an overview of routing concepts and describes how to configure routing, routing instances, and unicast routing protocols.
<i>Services Interfaces</i>	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the router.
<i>VPNs</i>	Provides an overview and describes how to configure Layer 2 and Layer 3 virtual private networks (VPNs), virtual private LAN service (VPLS), and Layer 2 circuits. Provides configuration examples.
JUNOS Software References	
<i>Network and Services Interfaces Command Reference</i>	Describes the JUNOS Internet software operational mode commands you use to monitor and troubleshoot network and services interfaces on Juniper Networks M-series and T-series routers.
<i>Protocols, Class of Service, and System Basics Command Reference</i>	Describes the JUNOS Internet software operational mode commands you use to monitor and troubleshoot most aspects of Juniper Networks M-series and T-series routers.

Book	Description
<i>System Log Messages Reference</i>	Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message.
JUNOScript API Documentation	
<i>JUNOScript API Guide</i>	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routers.
<i>JUNOScript API Configuration Reference</i>	Provides reference pages for the configuration tags in the JUNOScript API.
<i>JUNOScript API Operational Reference</i>	Provides reference pages for the operational tags in the JUNOScript API.
JUNOS Internet Software Comprehensive Index and Glossary	
<i>Comprehensive Index and Glossary</i>	Provides a complete index of all JUNOS Internet software books and the <i>JUNOScript API Guide</i> . Also provides a comprehensive glossary.
Hardware Documentation	
<i>Hardware Guide</i>	Describes how to install, maintain, and troubleshoot routers and router components. Each platform has its own hardware guide.
<i>PIC Guide</i>	Describes the router Physical Interface Cards (PICs). Each router platform has its own PIC guide.
JUNOScope Software Documentation	
<i>JUNOScope Software User Guide</i>	Describes the JUNOScope software graphical user interface (GUI), how to install and administer the software, and how to use the software to manage router configuration files and monitor router operations.
Release Notes	
<i>JUNOS Internet Software Release Notes</i>	Provide a summary of new features for a particular software release. Software release notes also contain corrections and updates to published JUNOS and JUNOScript manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures.
<i>Hardware Release Notes</i>	Describe the available documentation for the router platform and summarize known problems with the hardware and accompanying software. Each platform has its own release notes.
<i>JUNOScope Software Release Notes</i>	Contain corrections and updates to the published JUNOScope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures.

How to Request Support

For technical support, open a support case using the Case Manager link at <http://www.juniper.net/support/> or call 1-888-314-JTAC (within the United States) or 1-408-745-9500 (outside the United States).

For documentation issues, fill out the bug report form located at <http://www.juniper.net/techpubs/docbug/docbugreport.html>

Revision History

04 August 2004—Second Revision. Removed filter cleaning procedure.

15 February 2004—First Revision.

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