

## Chapter 39

# Monitoring Redundant Cooling System Components

You monitor and maintain redundant cooling system components to keep an acceptable operating temperature for the router chassis and its components. (See Table 113.)

**Table 113: Checklist for Monitoring Redundant Cooling System Components**

| Monitor Redundant Cooling System Component Tasks                     | Command or Action   |
|--|---|
| <b>Understanding Redundant Cooling System Components on page 524</b> |   |
| M5 and M10 Router Redundant Cooling System Components on page 525    |   |
| M7i Router Redundant Cooling System Components on page 526           |   |
| M10i Router Redundant Cooling System Components on page 527          |   |
| M20 Router Redundant Cooling System Components on page 527           |   |
| M40 Router Redundant Cooling System Components on page 529           |   |
| M40e and M160 Router Redundant Cooling System Components on page 531 |   |
| M320 Router Redundant Cooling System Components on page 533          |   |
| T320 Router Redundant Cooling System Components on page 534          |   |
| T640 Routing Node Redundant Cooling System Components on page 537    |   |
| <b>Displaying Redundant Cooling System Components on page 539</b>    | show chassis environment  |
| <b>Checking the Redundant Cooling System Status on page 541</b>      | See “Checking the Cooling System Status” on page 267.   |
| <b>Checking the Redundant Cooling System Alarms on page 541</b>      | See “Checking the Cooling System Alarms” on page 269 and “Display the Current Router Alarms” on page 61.    |
| <b>Removing a Cooling System Component on page 541</b>               | See “Replacing a Cooling System Component” on page 273.   |
| <b>Returning Redundant Cooling System Components on page 541</b>     | See “Return the Failed Component” on page 86, or follow the procedure in appropriate router hardware guide. |

## Understanding Redundant Cooling System Components

**Purpose** Inspect the router redundant cooling system components to ensure that air is flowing through the router to cool the components installed in the router chassis. If the router temperature exceeds a critical level, the router automatically shuts down.

**What Are Redundant Cooling System Components** Redundant cooling system components are more than just one fan or impeller installed in a router to ensure that the air is flowing through the router and that an acceptable temperature is maintained to cool the components installed in the chassis.

Table 114 describes the redundant cooling system components and characteristics for each routing platform.

**Table 114: Redundant Cooling System Components Characteristics Per Routing Platform**

| Cooling System Component    | M5 and M10             | M7i | M10i | M20               | M40     | M40e                                      | M160                                      | M320/T320 /T640                           |
|-----------------------------|------------------------|-----|------|-------------------|---------|---|---|---|
| Fan tray                    | 1 fan tray with 4 fans | 1   | 2    | 3 front<br>1 rear |         | 1   | 1 lower                                   | 2 front<br>1 rear                         |
| Power supply integrated fan | –                      | –   | –    | 2                 | 2       | –   | Cooled by air flowing through the chassis | Cooled by air flowing through the chassis |
| Impellers                   | –                      | –   | –    | –                 | 2 pairs | 1 central<br>1 rear upper<br>1 rear lower | 1 upper<br>2 rear                         | –   |
| Fan assemblies              | –                      | –   | –    | –                 | 3       | –   | –   | –   |
| Air filter                  | –                      | –   | –    | –                 | 1       | 1   | 1   | 1 front<br>1 rear                         |

The following sections describe the various routing platform cooling systems:

M5 and M10 Router Redundant Cooling System Components on page 525

M7i Router Redundant Cooling System Components on page 526

M10i Router Redundant Cooling System Components on page 527

M20 Router Redundant Cooling System Components on page 527

M40 Router Redundant Cooling System Components on page 529

M40e and M160 Router Redundant Cooling System Components on page 531

M320 Router Redundant Cooling System Components on page 533

T320 Router Redundant Cooling System Components on page 534

T640 Routing Node Redundant Cooling System Components on page 537

**M5 and M10 Router Redundant Cooling System Components**

The M5 and M10 router cooling system consists of a fan tray containing four fans that inserts into the left side of the chassis (left fans 1 through 4). The fan tray connects to the router midplane and provides side-to-side cooling. (See Figure 209.)

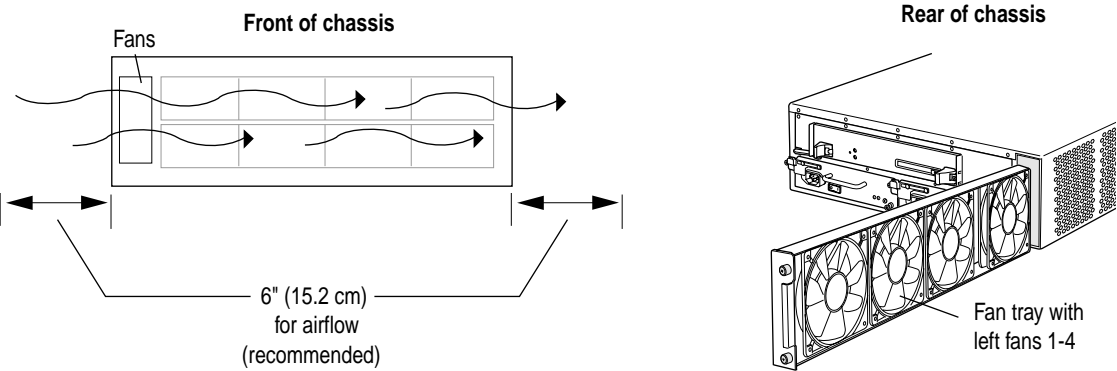
The fan tray is hot-removable and hot-insertable. You can remove and replace these components without powering down the system and disrupting routing functions.

The cooling system is fault-tolerant. The router can tolerate the failure of a single fan for approximately 36 hours. If a fan fails, the router issues a yellow alarm and the yellow alarm LED on the craft interface lights. If the router temperature exceeds the critical level, the router automatically shuts down.



**CAUTION:** Do not operate the router for more than 1 minute without a fan tray.

Figure 209: M5 and M10 Router Cooling System and Airflow



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## M7i Router Redundant Cooling System Components

The M7i router cooling system consists of a fan tray containing four individually fault-tolerant fans. The fan tray inserts into the left side of the chassis (left fans 1 through 4) and connects directly to the router midplane. If a single fan fails, the remaining fans continue to function indefinitely. The fan tray provides side-to-side cooling. (See Figure 210.)

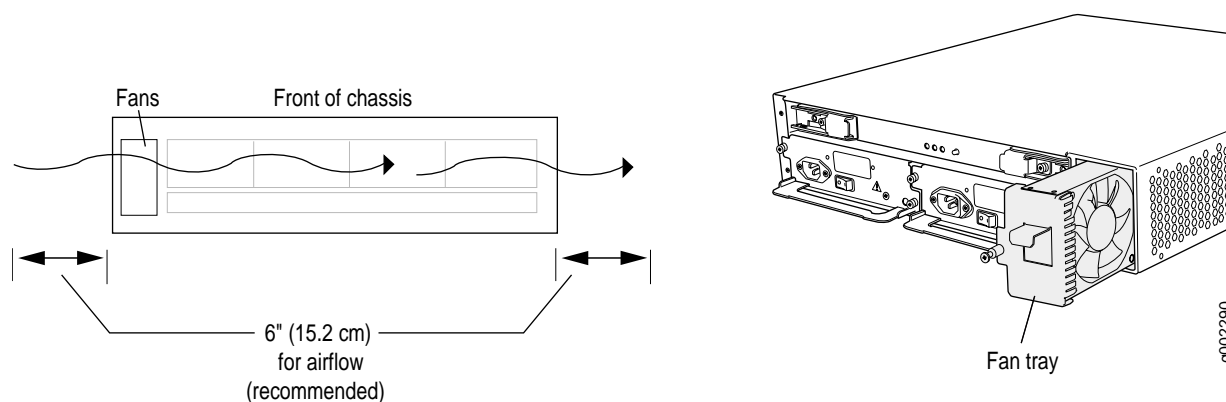
The fan tray is hot-removable and hot-insertable. You can remove and replace these components without powering down the system and disrupting routing functions.

The cooling system is fault-tolerant. The router can tolerate the failure of a single fan for approximately 36 hours. If a fan fails, the router issues a yellow alarm and the yellow alarm LED on the craft interface lights. If the router temperature exceeds the critical level, the router automatically shuts down.



**CAUTION:** Do not operate the router for more than 1 minute without a fan tray.

Figure 210: M7i Router Cooling System and Airflow



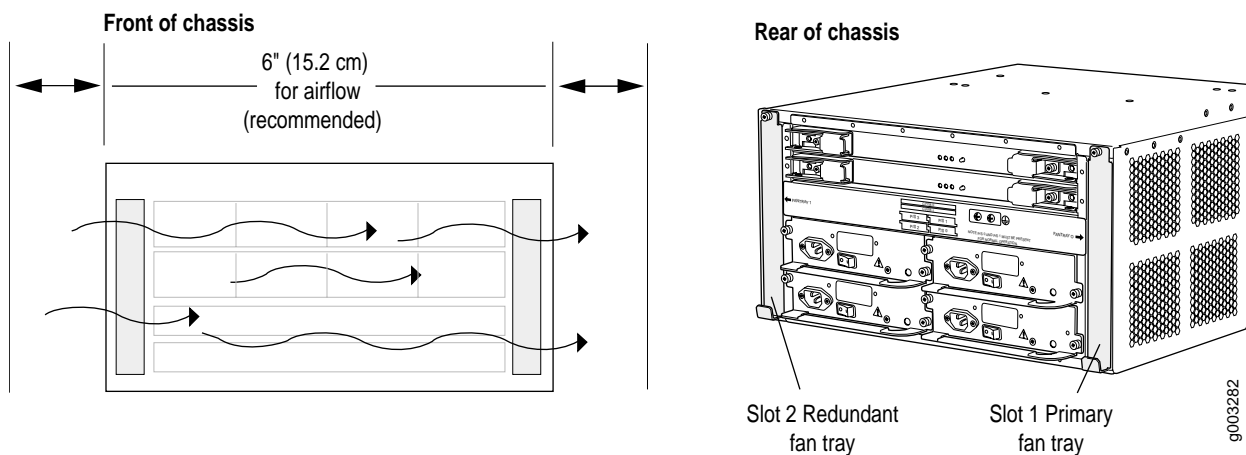
### M10i Router Redundant Cooling System Components

The M10i router cooling system consists of two fan trays, located along the left and right side of the chassis, that provide side-to-side cooling (see Figure 211). They connect directly to the router midplane. Each fan tray is a single unit containing eight individually fault-tolerant fans. If a single fan fails, the remaining fans continue to function indefinitely. For proper airflow, the primary fan tray should be installed in slot 1 (the left slot looking at the chassis from the rear) and must be installed for proper cooling at all times. The redundant fan tray, if present, should be installed in slot 0 on the right. This fan tray provides additional cooling and redundancy. The fan tray is hot-removable and hot-insertable.



**CAUTION:** Do not remove both fan trays for more than one minute while the router is operating. The fans are the sole source of cooling, and the router will overheat when they are absent.

Figure 211: M10i Router Cooling System Components and Airflow



### M20 Router Redundant Cooling System Components

The M20 router cooling system includes:

Three front fan trays—Cool the Flexible PIC Concentrators (FPCs) and the System and Switch Board (SSB). These fan trays are located on the left front side of the chassis.

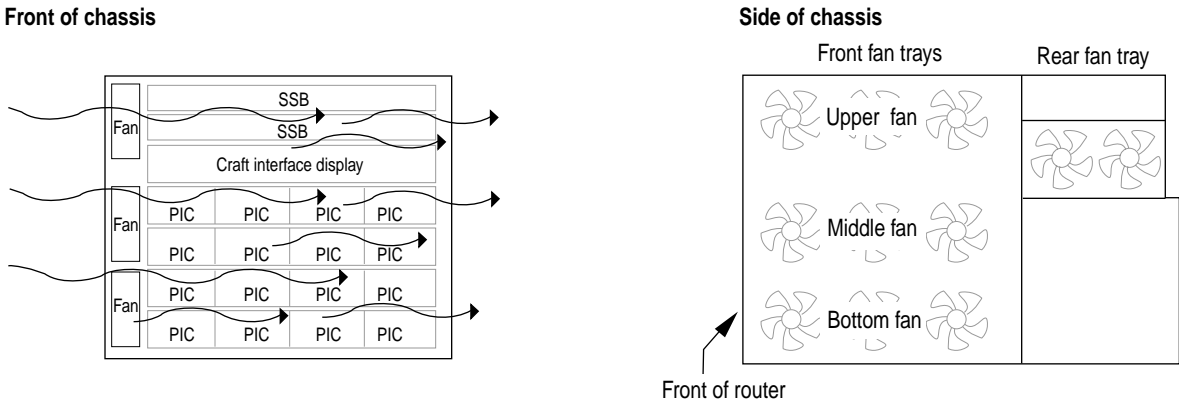
One rear fan tray—Cools the Routing Engine. This fan tray is located immediately to the right of the Routing Engine.

Power supply integrated fan—A built-in fan cools each power supply.

The four fan trays plug directly into the router midplane and work together to provide side-by-side cooling.

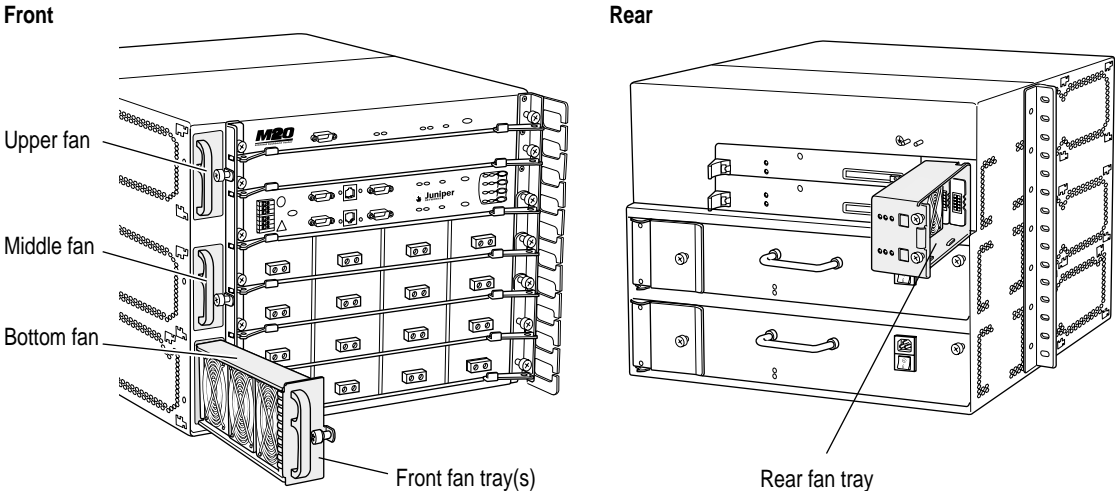
The fans operate in unison to maintain an acceptable operating temperature for the Routing Engine and midplane. Each cooling subsystem maintains a separate airflow, and each is monitored independently for temperature control. Figure 212 shows the M20 router cooling system components and airflow.

Figure 212: M20 Router Cooling System and Airflow



Both front and rear fan trays are hot-removable and hot-insertable. You can remove and replace these components without powering down the system and disrupting routing functions. Figure 213 shows the M20 router cooling system components.

Figure 213: M20 Router Cooling System Components



## M40 Router Redundant Cooling System Components

The M40 router cooling system consists of three separate subsystems (see Figure 214):

**Impellers**—Two redundant pairs of impellers (top impeller and bottom impeller) cool the Packet Forwarding Engine components (backplane, System Control Board [SCB], FPCs, and Physical Interface Cards [PICs]). During normal operation, both pairs of impellers function at less than full capacity.

**Triple fan assemblies**—Three load-sharing fans cool the backplane and the Routing Engine (rear left fan, rear center fan, and rear right fan).

**Power supply integrated fan**—A built-in fan cools each power supply.

Each cooling subsystem maintains a separate airflow, and each is monitored independently for temperature control. Figure 214 shows the M40 router cooling system airflow.

Temperature sensors on the backplane, the SCB, and the FPCs control the speed of the impellers. Impeller failure triggers the red alarm LED on the craft interface. If the temperature passes a certain threshold, the JUNOS software turns off the power supplies.

The M40 router is designed to run normally with all three fans sharing the load equally and running at half speed.

**Figure 214: M40 Router Cooling System and Airflow**

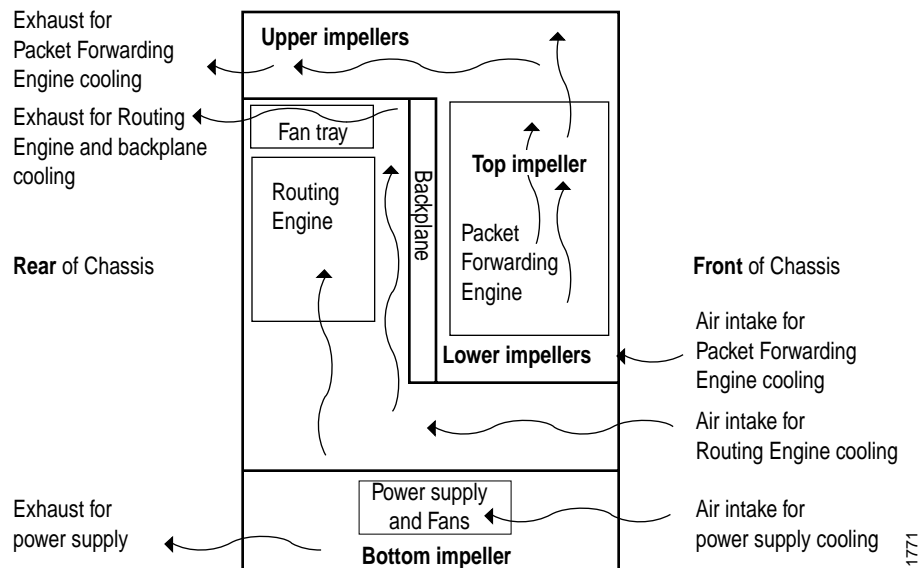


Figure 215 shows the M40 router cooling system impeller trays.

Figure 215: M40 Router Impeller Trays

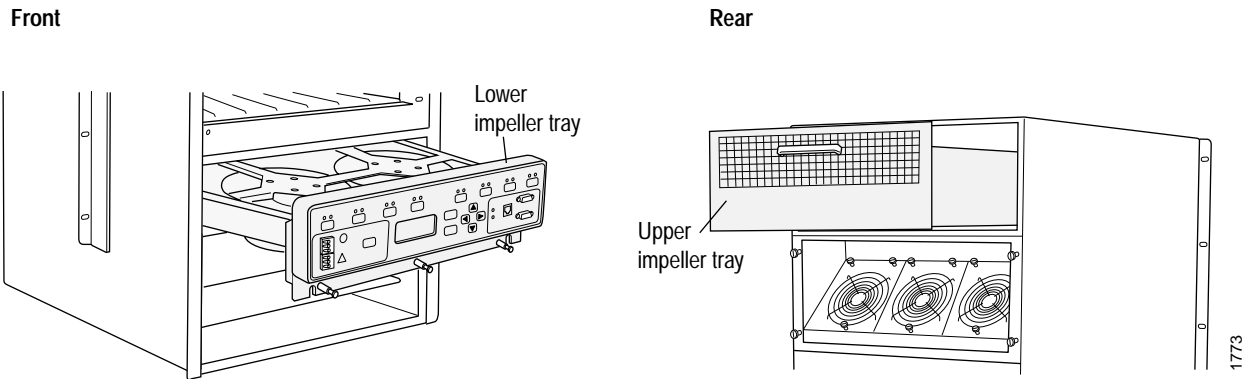
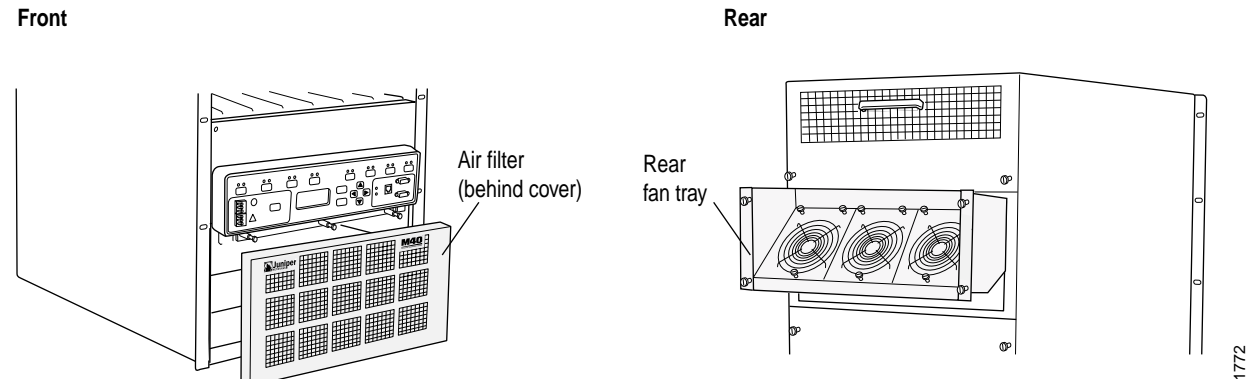


Figure 216 shows the M40 router air filter and fan tray.

Figure 216: M40 Router Air Filter and Fan Tray





## M40e and M160 Router Redundant Cooling System Components

The M40e and M160 routers include the following cooling system components:

**Front cooling subsystem**—Cools the FPCs, PICs, and midplane. It includes a fan tray located behind the cable management system and a large, central impeller behind the craft interface (fan tray front left, fan tray front right, fan tray rear left, fan tray rear right, and front top blower).

**Rear cooling subsystem**—Cools the Switching and Forwarding Modules (SFMs), host module, PFE Clock Generators (PCGs), and power supplies. It includes one impeller located at the upper right of the chassis rear and another at the lower left, as shown in Figure 217 (rear top blower and rear bottom blower). The upper and lower impellers are not interchangeable.

Figure 217 shows the M40e and M160 router cooling system components and airflow.

**Figure 217: M40e and M160 Router Cooling System and Airflow**

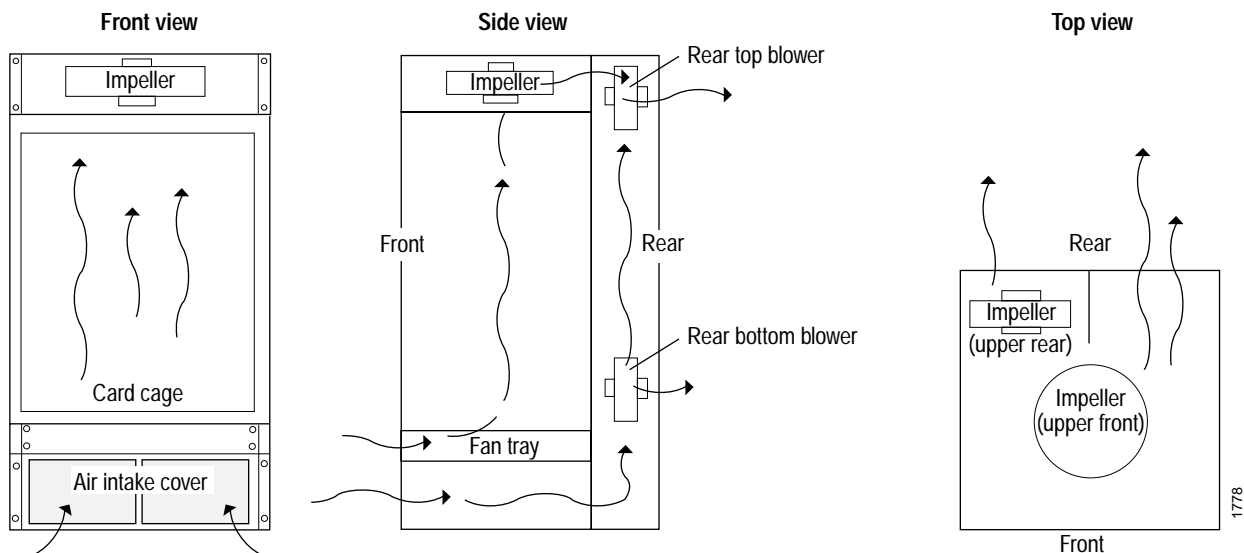
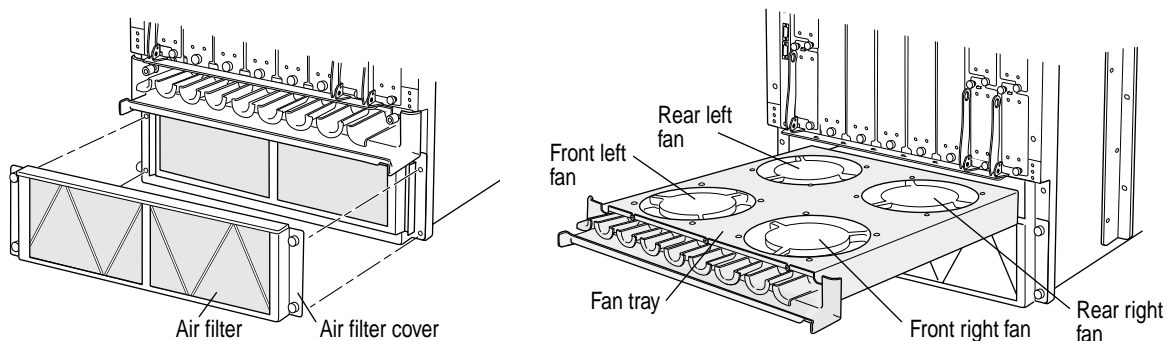


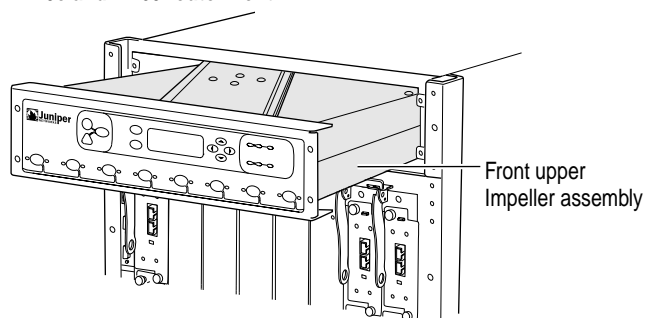
Figure 218 shows the M40e and M160 router cooling system components.

**Figure 218: M40e and M160 Router Cooling System Components**

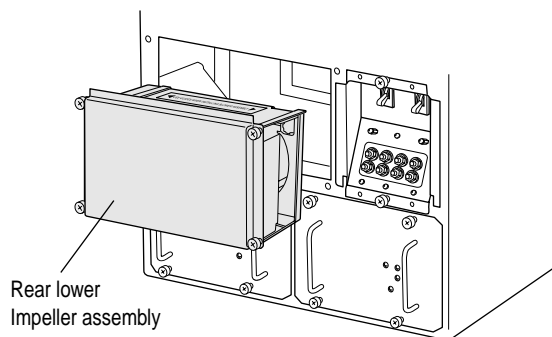
**M40e and M160 router front**



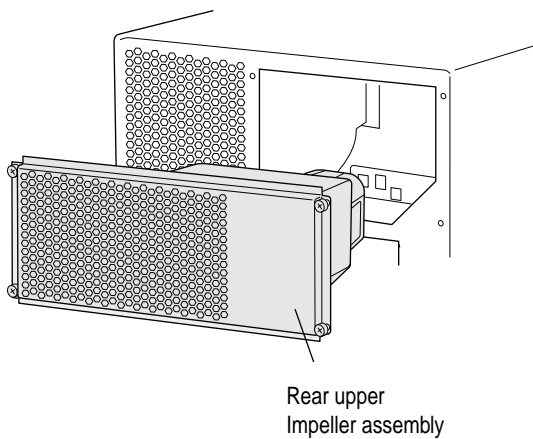
**M40e and M160 router front**



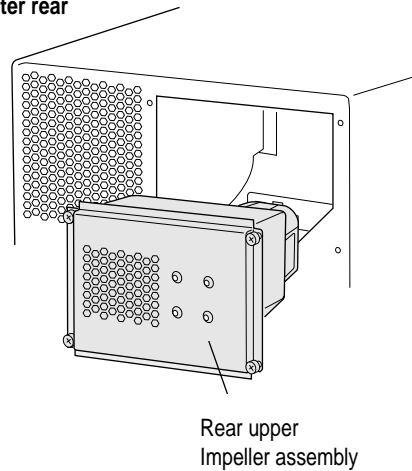
**M40e and M160 router rear**



**M40e router rear**



**M160 router rear**



**See Also**      Monitoring Power Supplies on page 217

### M320 Router Redundant Cooling System Components

The M320 router includes the following cooling system components:

- Two front fan trays
- Front air filter
- Rear fan tray
- Rear air filter

The cooling system components work together to keep all router components within the acceptable temperature range. All fan trays and filters are hot-insertable and hot-removable. The two front fan trays are interchangeable. The front and rear fan trays are not interchangeable.

Figure 219 shows the M320 router cooling system airflow.

**Figure 219: M320 Router Cooling System and Airflow**

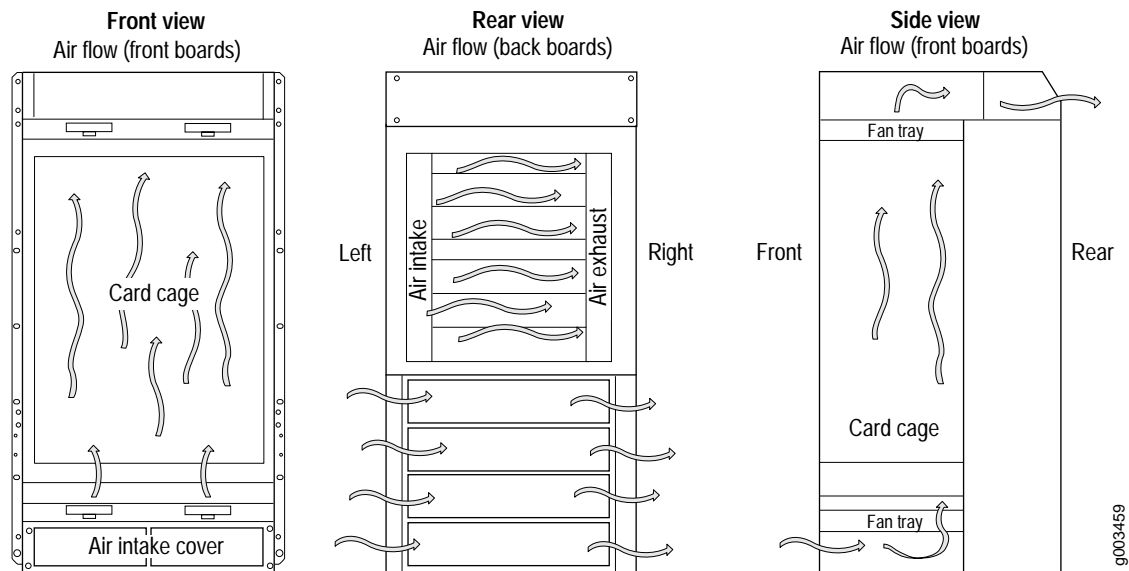
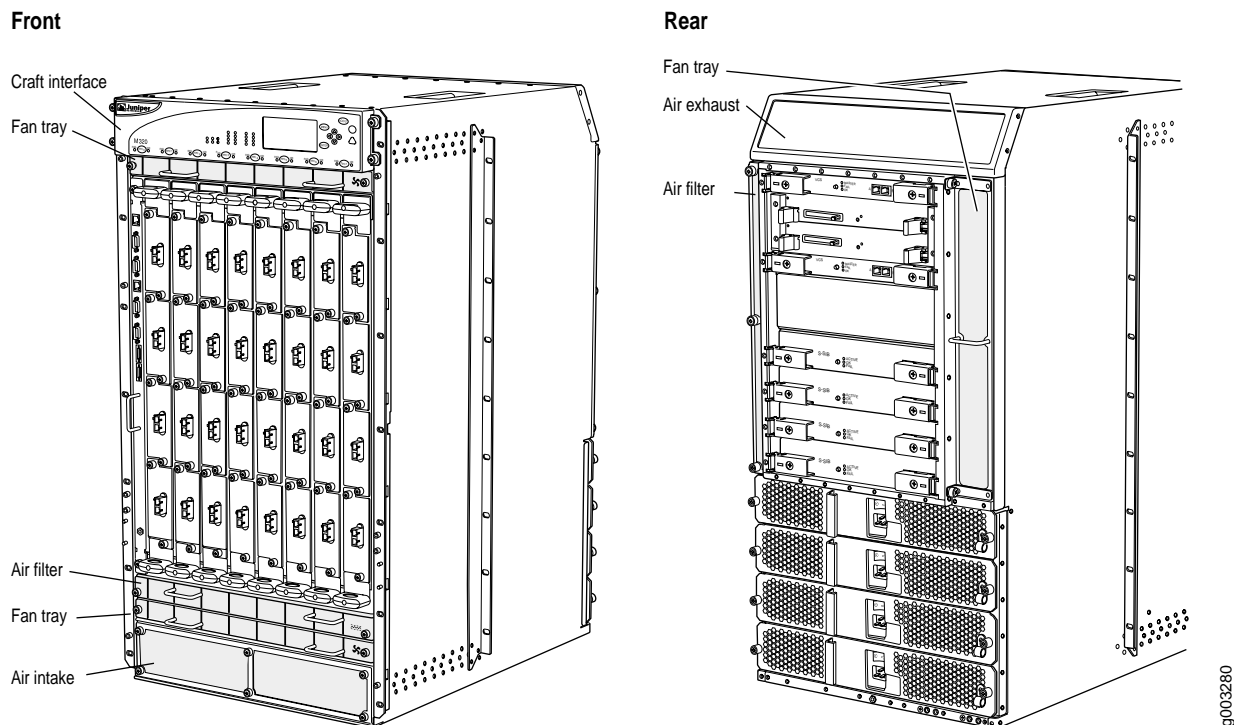


Figure 220 shows the M320 router cooling system components.

**Figure 220: M320 Router Cooling System Components**



The host subsystem monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails or the ambient temperature rises above a threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range. If the ambient maximum temperature specification is exceeded and the system cannot be adequately cooled, the Routing Engine shuts down some or all of the hardware components.

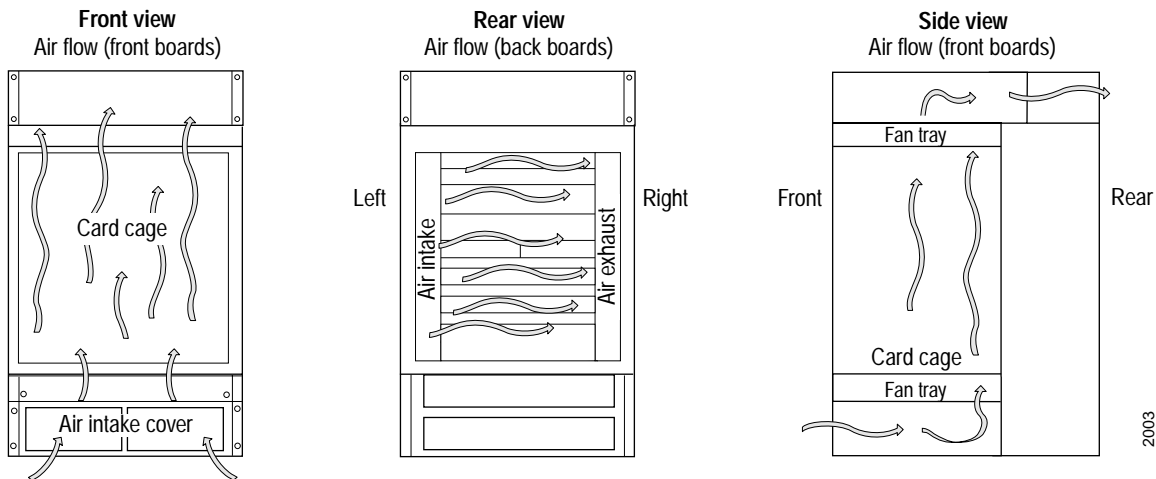
### ***T320 Router Redundant Cooling System Components***

The T320 router cooling system includes:

- Two front fan trays
- Front air filter
- Rear fan tray
- Rear air filter

The cooling system components work together to keep all router components within the acceptable temperature range (see Figure 221 on page 535). All fan trays and filters are hot-insertable and hot-removable. The two front fan trays are interchangeable. The front and rear fan trays are not interchangeable.

Figure 221: T320 Router Cooling System and Airflow

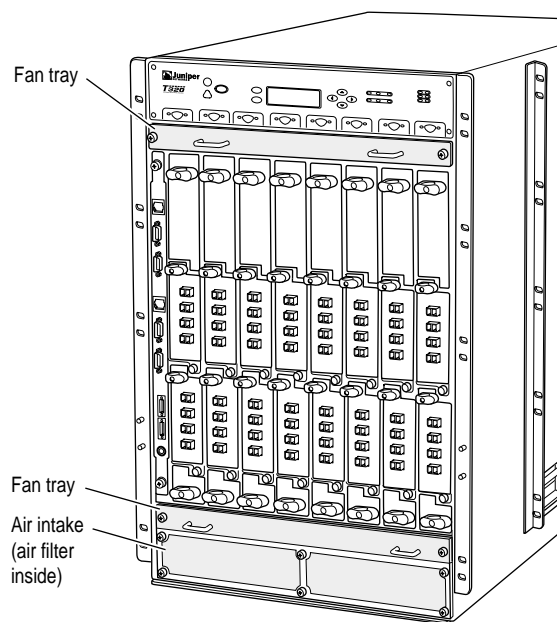


The cooling system has redundant components, which are controlled by the host subsystem. If one of the fans fails, the host subsystem increases the speed of the remaining fans to provide sufficient cooling for the router indefinitely.

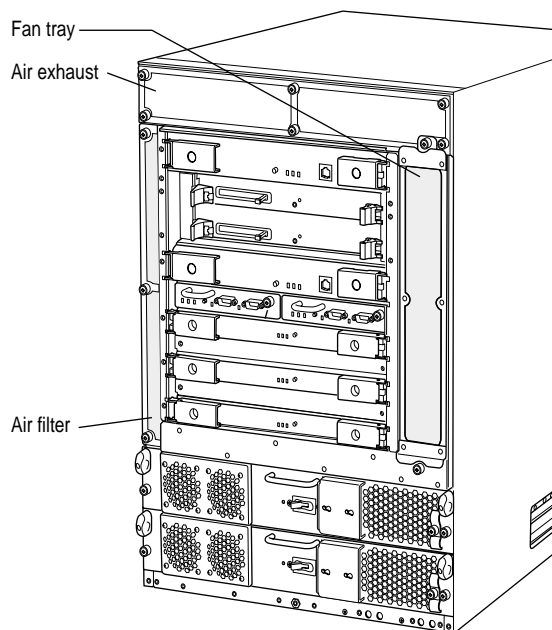
The host subsystem monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range. Cooling system components can be removed and replaced without powering down or disconnecting power to the router. Figure 222 shows the T320 router cooling system components.

**Figure 222: T320 Router Cooling System Components**

**Front**



**Rear**



g003283

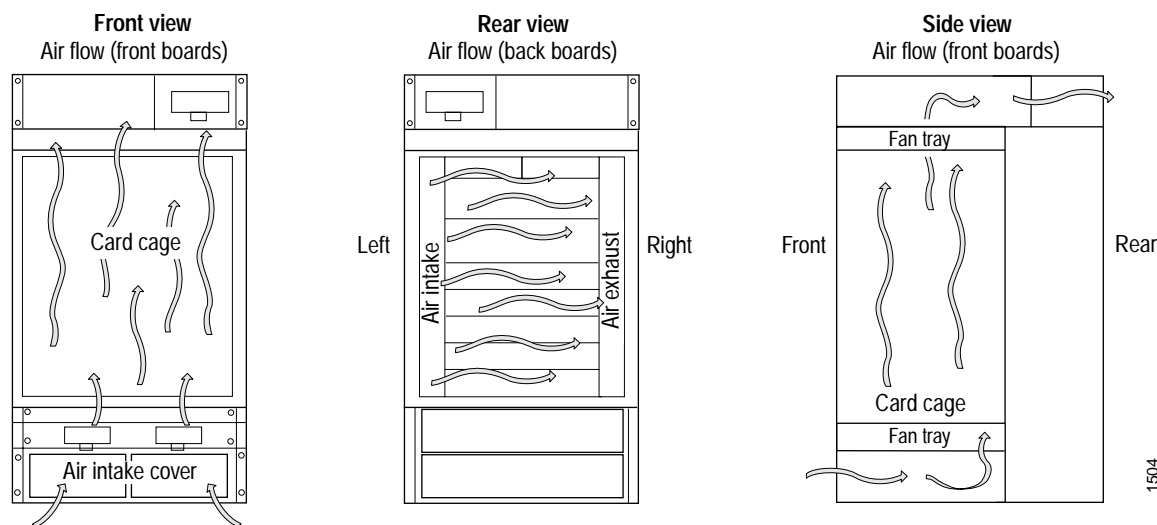
## T640 Routing Node Redundant Cooling System Components

The T640 routing node cooling system includes:

- Two front fan trays
- Front air filter
- Rear fan tray
- Rear air filter

The cooling system components work together to keep all router components within the acceptable temperature range (see Figure 223). All fan trays and filters are hot-insertable and hot-removable. The two front fan trays are interchangeable. The front and rear fan trays are not interchangeable.

**Figure 223: T640 Routing Node Cooling System and Airflow**

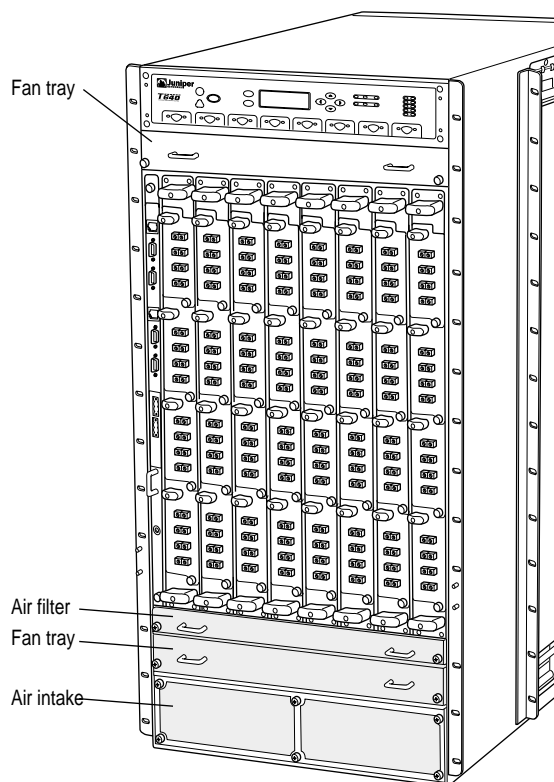


The cooling system has redundant components, which are controlled by the host subsystem. If one of the fans fails, the host subsystem increases the speed of the remaining fans to provide sufficient cooling for the router indefinitely.

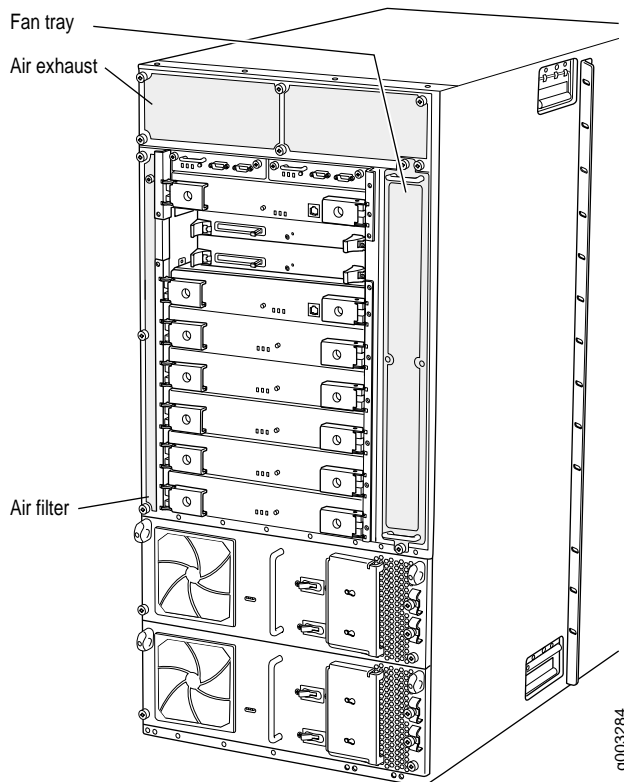
The host subsystem monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range. Cooling system components can be removed and replaced without powering down or disconnecting power to the router. Figure 224 on page 538 shows the T640 routing node cooling system components.

Figure 224: T640 Routing Node Cooling System Components

## Front



## Rear





## Displaying Redundant Cooling System Components

**Action** To display the redundant cooling system components that are installed in a routing platform, use the following command-line interface (CLI) command:

```
user@host> show chassis environment
```

**Sample Output** For M5 and M10 routers (see also Figure 209 on page 525):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Left Fan 1      OK      Spinning at normal speed
      Left Fan 2      OK      Spinning at normal speed
      Left Fan 3      OK      Spinning at normal speed
      Left Fan 4      OK      Spinning at normal speed
Misc  Craft Interface OK
```

For an M7i router (see also Figure 210 on page 526):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Fan 1           OK      Spinning at normal speed
      Fan 2           OK      Spinning at normal speed
      Fan 3           OK      Spinning at normal speed
      Fan 4           OK      Spinning at normal speed
```

For an M10i router (see also Figure 211 on page 527):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Fan Tray 0 Fan 1  OK      Spinning at normal speed
      Fan Tray 0 Fan 2  OK      Spinning at normal speed
      Fan Tray 0 Fan 3  OK      Spinning at normal speed
      Fan Tray 0 Fan 4  OK      Spinning at normal speed
      Fan Tray 0 Fan 5  OK      Spinning at normal speed
      Fan Tray 0 Fan 6  OK      Spinning at normal speed
      Fan Tray 0 Fan 7  OK      Spinning at normal speed
      Fan Tray 0 Fan 8  OK      Spinning at normal speed
      Fan Tray 1 Fan 1  OK      Spinning at normal speed
      Fan Tray 1 Fan 2  OK      Spinning at normal speed
      Fan Tray 1 Fan 3  OK      Spinning at normal speed
      Fan Tray 1 Fan 4  OK      Spinning at normal speed
      Fan Tray 1 Fan 5  OK      Spinning at normal speed
      Fan Tray 1 Fan 6  OK      Spinning at normal speed
      Fan Tray 1 Fan 7  OK      Spinning at normal speed
      Fan Tray 1 Fan 8  OK      Spinning at normal speed
```

For an M20 router (see also Figure 212 on page 528):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Rear Fan         OK      Spinning at normal speed
      Front Upper Fan  OK      Spinning at normal speed
      Front Middle Fan OK      Spinning at normal speed
      Front Bottom Fan OK      Spinning at normal speed
Misc  Craft Interface  OK
```

For an M40 router (see also Figure 214 on page 529):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Top Impeller    OK      Spinning at normal speed
      Bottom impeller OK      Spinning at normal speed
      Rear Left Fan   OK      Spinning at normal speed
      Rear Center Fan OK      Spinning at normal speed
      Rear Right Fan  OK      Spinning at normal speed
Misc  Craft Interface OK
```

For M40e and M160 routers (see also Figure 217 on page 531):

```
user@host> show chassis environment
Class Item          Status  Measurement
[...Output truncated...]
Fans  Rear Bottom Blower OK      Spinning at normal speed
      Rear Top Blower  OK      Spinning at normal speed
      Front Top Blower  OK      Spinning at normal speed
      Fan Tray Rear Left OK      Spinning at normal speed
      Fan Tray Rear Right OK     Spinning at normal speed
      Fan Tray Front Left OK     Spinning at normal speed
      Fan Tray Front Right OK    Spinning at normal speed
Misc  CIP              OK
```

For an M320 router (see also Figure 219 on page 533):

```
user@host> show chassis environment
Class Item          Status  Measurement
Fan  Top Left Front fan OK      Spinning at normal speed
     Top Right Rear fan OK      Spinning at normal speed
     Top Right Front fan OK     Spinning at normal speed
     Top Left Rear fan  OK      Spinning at normal speed
     Bottom Left Front fan OK    Spinning at normal speed
     Bottom Right Rear fan OK    Spinning at normal speed
     Bottom Right Front fan OK   Spinning at normal speed
     Bottom Left Rear fan OK     Spinning at normal speed
     Rear Fan 1 (TOP)   OK      Spinning at normal speed
     Rear Fan 2        OK      Spinning at normal speed
     Rear Fan 3        OK      Spinning at normal speed
     Rear Fan 4        OK      Spinning at normal speed
     Rear Fan 5        OK      Spinning at normal speed
     Rear Fan 6        OK      Spinning at normal speed
     Rear Fan 7 (Bottom) OK     Spinning at normal speed
```

For T320 routers and T640 routing nodes (see also Figure 221 on page 535, Figure 222 on page 536, Figure 223 on page 537, and Figure 224 on page 538):

```
user@host> show chassis environment
Class Item          Status  Measurement
Fans  Top Left Front fan OK      Spinning at normal speed
     Top Left Middle fan OK     Spinning at normal speed
     Top Left Rear fan  OK      Spinning at normal speed
     Top Right Front fan OK     Spinning at normal speed
     Top Right Middle fan OK    Spinning at normal speed
     Top Right Rear fan  OK     Spinning at normal speed
     Bottom Left Front fan OK    Spinning at normal speed
     Bottom Left Middle fan OK   Spinning at normal speed
     Bottom Left Rear fan OK     Spinning at normal speed
     Bottom Right Front fan OK   Spinning at normal speed
```

|                         |    |                          |
|-------------------------|----|--------------------------|
| Bottom Right Middle fan | OK | Spinning at normal speed |
| Bottom Right Rear fan   | OK | Spinning at normal speed |
| Fourth Blower from top  | OK | Spinning at normal speed |
| Bottom Blower           | OK | Spinning at normal speed |
| Middle Blower           | OK | Spinning at normal speed |
| Top Blower              | OK | Spinning at normal speed |
| Second Blower from top  | OK | Spinning at normal speed |

**What It Means** The command output shows the fans, impellers, or blowers monitored for the router type. The command output displays the fan, impeller, or blower status and the spinning speed. The status can be OK, Testing (during initial power-on), Failed, or Absent. Measurement indicates if the fan or impeller is spinning at normal or high speed.

## Checking the Redundant Cooling System Status

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**Action** For more information about checking the status of cooling system components, see “Checking the Cooling System Status” on page 267.

## Checking the Redundant Cooling System Alarms

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**Action** For more information about checking the cooling system alarms, see “Checking the Cooling System Alarms” on page 269. For more information about conditions that trigger cooling system alarms, see “Display the Current Router Alarms” on page 61.

## Removing a Cooling System Component

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For more information about removing or swap testing cooling system components, see “Replacing a Cooling System Component” on page 273.

## Returning Redundant Cooling System Components

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**Action** To return a cooling system component, see “Return the Failed Component” on page 86 or the appropriate router hardware guide.

