Chapter 14

Monitoring the Routing Engine

You monitor and maintain the Routing Engine, a key router component, to ensure that all system processes function normally, including routing protocols, packet forwarding tables, router interfaces, system management, JUNOS software and file system storage, and monitoring functions. (See Table 31.)

Table 31: Checklist for Monitoring the Routing Engine

Monitor Routing Engine Tasks	Command or Action
Understanding the Routing Engine on page 127	
Routing Engine Types and Characteristics on page 127 Routing Engine Locations on page 130 Routing Engine Redundancy on page 135 Routing Engine Component Companionship on page 135 Routing Engine Boot Devices on page 135 Routing Engine Storage Media on page 136	
Monitoring the Routing Engine Status on page 136	
1. Check the Detailed Routing Engine Status on page 137	show chassis routing-engine show chassis environment routing-engine
2. Check the Routing Engine LEDs on page 138	Check the M7i Routing Engine LEDs on page 139 Check the M20 Router Routing Engine LEDs on page 140 Check the M40 Router Routing Engine LEDs on page 142 Check the M40e and M160 Router Routing Engine LEDs on page 143 Check the M320 Router Routing Engine LEDs on page 144 Check the T320 Router Routing Engine LEDs on page 144 Check the T640 Routing Node Routing Engine LEDs on page 145
3. Check the Redundant Routing Engine Status from the Craft Interface CLI Output on page 146	show chassis craft-interface
Verifying Routing Engine Failure on page 149	
1. Check Core Files If the Routing Engine Reboots on page 149	List the Core Files Generated After A Crash Occurs on page 149 Display the Messages Log File After A Crash Occurs on page 150 Example of When No Core File Is Generated on page 150

Monitor Routing Engine Tasks	Command or Action
2. Example of Boot Messages If Routing Engine Fails to Boot on page 150	show system storage show system boot-messages show log messages
3. Check for Compact Flash Media and Hard Disk Failure on page 150	When the Compact Flash Is Removed from the Boot List on page 151 Determine Why Compact Flash Did Not Mount on page 151 When the Hard Disk Is Removed from the Boot List on page 152 Verify That the Hard Disk Did Not Mount on page 152 Verify That the Hard Disk Is Missing from The Boot List on page 153 View Alarms When Media Is Removed from the Boot List on page 153
4. Understand What Happens When Memory Failures Occur on page 154	
5. Check the Router File System and Boot Disk on page 154	show system storage
6. Display the Current Routing Engine Alarms on page 155	show chassis alarms
7. Display Error Messages in the System Log File on page 155	show log messages
8. Document the Events Prior to the Failure on page 156	Write down failure events as they occur. Turn on logging on your system console.
Getting Routing Engine Hardware Information on page 157	
1. Display Routing Engine Hardware Information on page 157	show chassis hardware
2. Locate the Routing Engine Serial Number ID Label on page 158	Locate the Routing Engine serial number ID label. If you see two serial numbers, give both to JTAC.
Removing a Routing Engine on page 161	The Routing Engine is hot-pluggable. Follow the procedures in the applicable router hardware guide. Note: The M5/M10 routers have a cover over the Routing Engine. The M40e and M160 routers have a cover over all the rear chassis components. Remember to remove the screws (M5/M10, M20, M40e, and M160 routers) or captive screws (T320 router and T640 routing node) next to the ejector clips before you remove the Routing Engine.

Understanding the Routing Engine

Purpose Inspect the Routing Engine to ensure that key system processes are operating normally.

What Is a Routing Engine The Routing Engine is a key component in the router. It is primarily responsible for the protocol intelligence of the router. Thus, it is responsible for creating a routing table, which consists of all routes learned by all protocols running on the router. The Routing Engine interprets the routing table, generates a subset of routes to be used for all forwarding purposes, and places them in the forwarding table. The Routing Engine also holds the microcode for the Packet Forwarding Engine.

The Routing Engine is responsible for user interaction functions, such as the command-line interface (CLI), Simple Network Management Protocol (SNMP) management, and craft interface interaction.

The Routing Engine consists of the following components:

- Intel Pentium compact Peripheral Component Interconnect (PCI) platform
- Nonrotating compact flash drive (RAM disk)
- Standard rotating hard drive
- Removable media drive

The JUNOS software resides on the compact flash drive, with an alternate copy residing on the system hard drive.

This section also includes the following information:

Routing Engine Types and Characteristics on page 127

Routing Engine Locations on page 130

Routing Engine Redundancy on page 135

Routing Engine Component Companionship on page 135

Routing Engine Types and Characteristics

This section lists the Routing Engine characteristics that are supported in each routing platform. It also shows the Routing Engine component supported in each routing platform. This section covers the following routing platforms:

M7i and M10i Router Routing Engine on page 128

M5, M10, M20, M40, M40e, and M160 Router Routing Engines on page 129

M320 Router Routing Engine on page 129

T320 Router and T640 Routing Node Routing Engine on page 130

Table 32 lists the Routing Engine type characteristics for each routing platform.

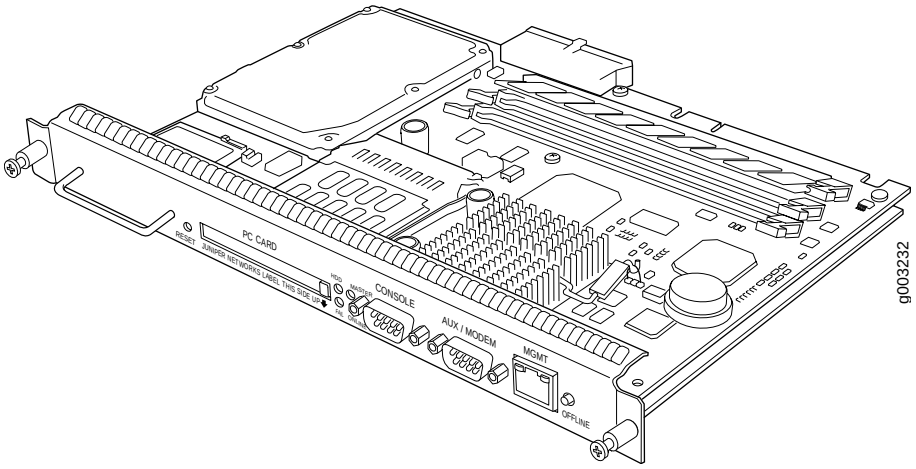
Table 32: Routing Engine Characteristics Per Routing Platform

Routing Engine	CLI Name	Processor	Memory	Hard Drive	Routing Platforms
RE-M40 (RE-200)	RE1	Intel Pentium 200 MHz	256 MB	6.4 GB	M40
RE-333 – 768	RE2	Intel Pentium2 333 MHz	768 MB 256 MB (M5, M10)	10 – 20 GB	M5, M10, M20, M40 (requires new housing)
RE-600 – 2048	RE3	Intel Pentium3 600 HHz	2048 MB	30 GB	M5, M10, M20, M40, M40e, M160, T320, T640
RE-1600 – 2048	RE4	Intel Pentium4 1.6 GHz	2048 MB	30 GB	M320, T320, T640
RE-400 – 256 + 512 Upgrade	RE5	Intel Celeron 400 MHz	768 MB	20 GB	M7i, M10i

M7i and M10i Router Routing Engine

Figure 34 shows the Routing Engine that is supported in the M7i and M10i routing platforms. For the current Routing Engines supported on these routing platforms, see Figure 32.

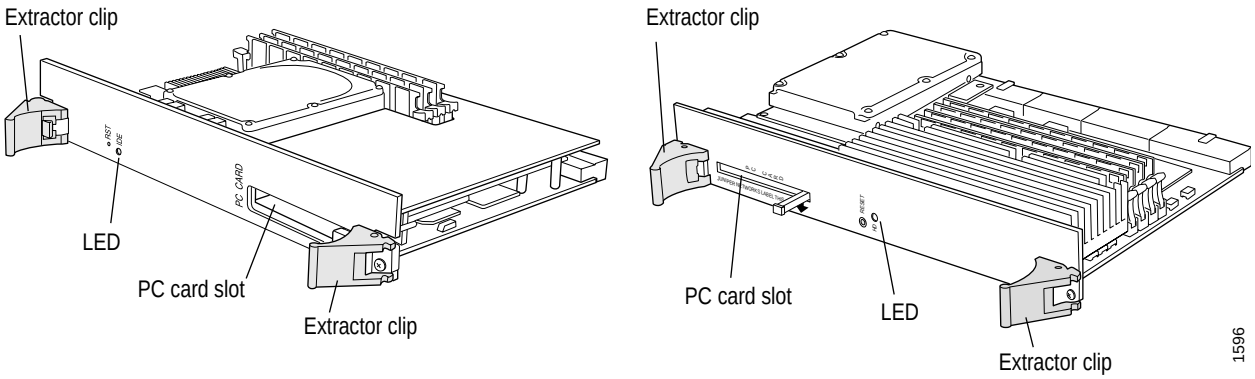
Figure 34: M7i and M10i Router Routing Engine



M5, M10, M20, M40, M40e, and M160 Router Routing Engines

Figure 35 shows the Routing Engines that are supported in the M5, M10, M20, M40, M40e, and M160 routing platforms. For the current Routing Engines supported on these routing platforms, see Figure 32 on page 128.

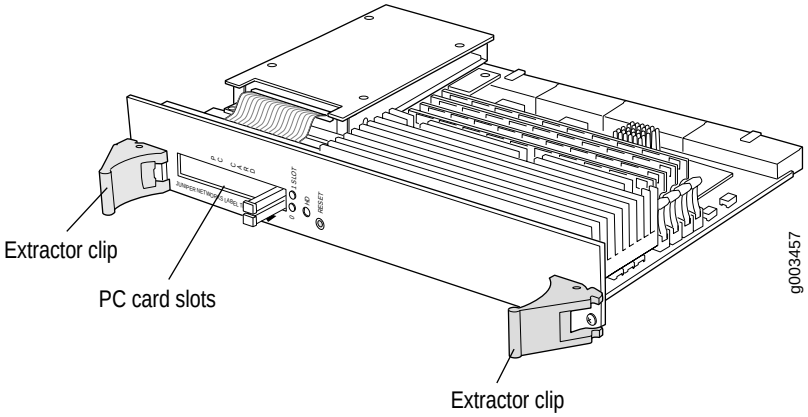
Figure 35: M5, M10, M20, M40, M40e, and M160 Router Routing Engines



M320 Router Routing Engine

Figure 36 shows the Routing Engine that is supported in the M320 routing platform. For the current Routing Engines supported on these routing platforms, see Figure 32 on page 128.

Figure 36: M320 Router Routing Engine



T320 Router and T640 Routing Node Routing Engine

Figure 37 shows the Routing Engine that is supported in the M320 routing platform. For the current Routing Engines supported on these routing platforms, see Figure 32 on page 128.

Figure 37: T320 Router and T640 Routing Node Routing Engine

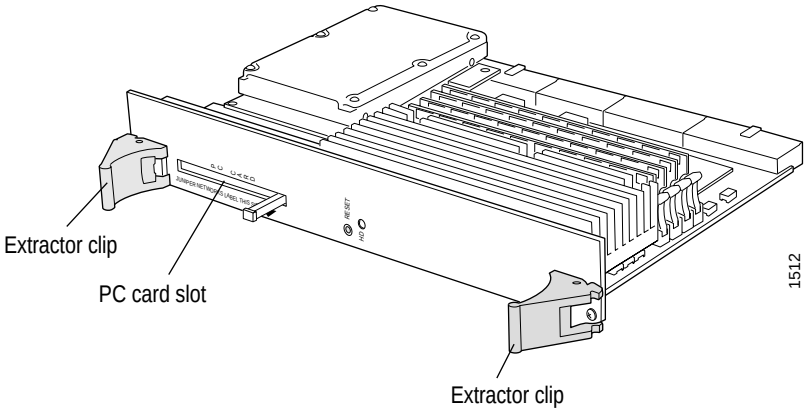


Figure 38 shows the Routing Engine location in the M5, M10, and M20 Internet routers.

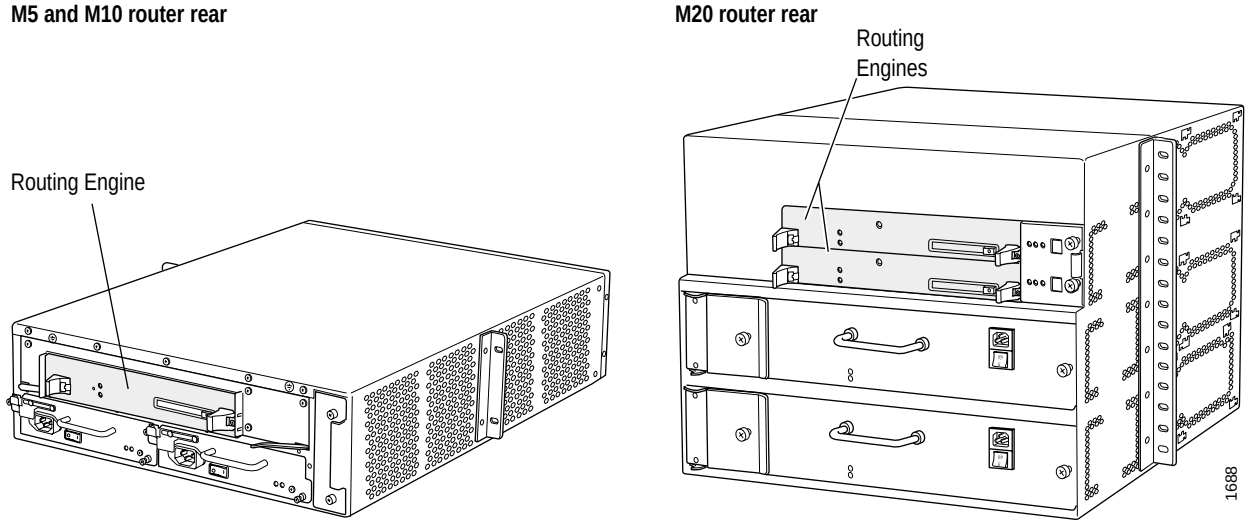
Routing Engine Locations

This section shows where the Routing Engines are installed in each Routing Platform. This section includes the following locations:

M5, M10, and M20 Router Routing Engines Location

Figure 38 shows the Routing Engine location in the M5, M10, and M20 routing platforms.

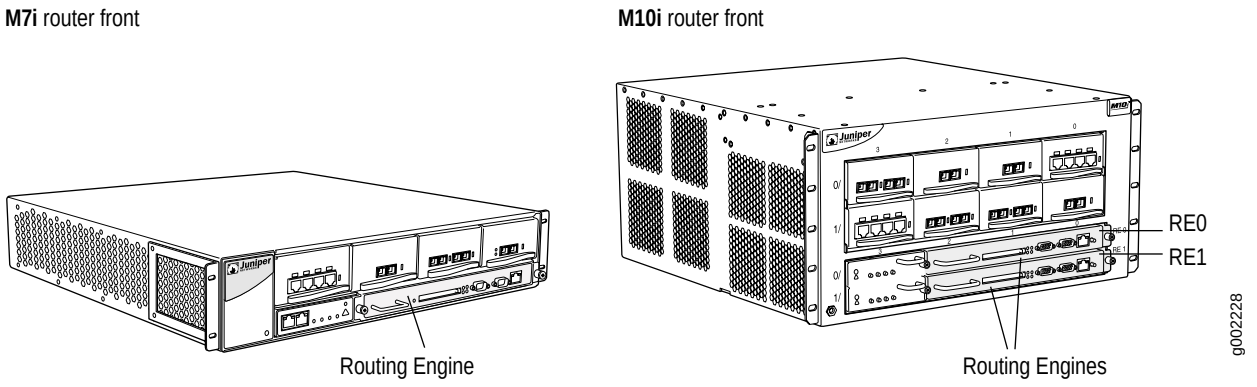
Figure 38: M5, M10, and M20 Router Routing Engine Location



M7i and M10i Router Routing Engine Location

Figure 39 shows the Routing Engine location in the M7i and M10i routers.

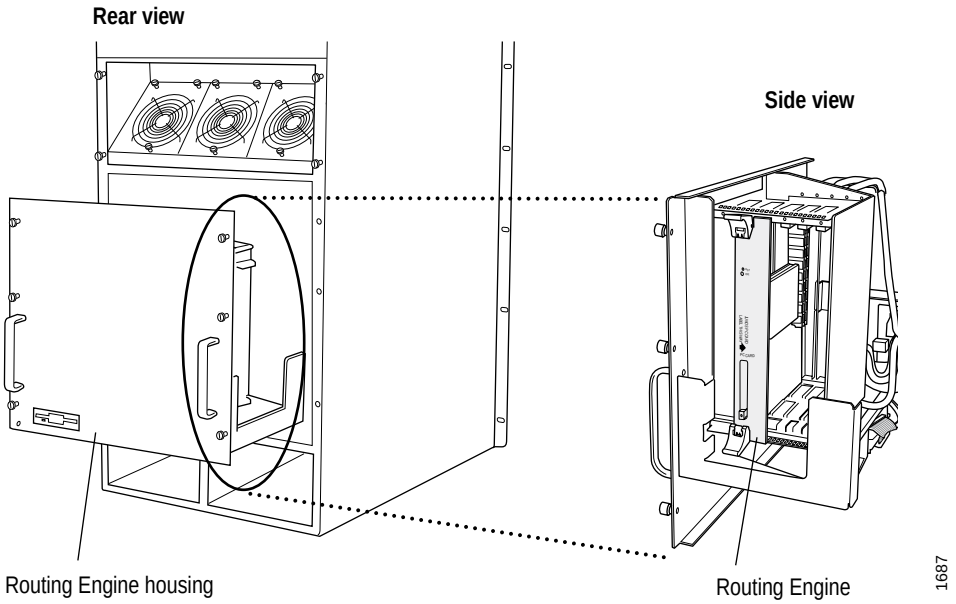
Figure 39: M7i and M10i Router Routing Engine Location



M40 Router Routing Engine Location

Figure 40 shows the location of the Routing Engine on the M40 router.

Figure 40: M40 Router Routing Engine Location



On the M40 Internet router, the Routing Engine module resides in a metal housing at the back of the chassis, below the fans, in a compartment behind the card cage (see Figure 40).

The M40 router supports three Routing Engine models: RE-M40 (RE1), RE-333 (RE2), and RE-600 (RE3). See Table 32 on page 128.

All M40 routers shipped before mid-2001 had RE-M40 Routing Engines. All M40 routers shipped after mid-2001 have the RE-333 Routing Engine and housing. You could also upgrade to the RE-600 (RE3) Routing Engine.

The RE-333 and the RE-600 Routing Engines share the same housing, which is different from the RE-M40. Therefore, if you want to upgrade from an RE-M40 to an RE-333 or RE-600, you must also upgrade the Routing Engine housing.

NOTE: Effective July 15, 2001, the RE-M40 Routing Engine was replaced by the RE-333 Routing Engine, which was made available with JUNOS software, release 4.2. After July 15, 2004, the RE-M40 Routing Engine is no longer supported. See "Routing Engine Characteristics Per Routing Platform" on page 128.

See also the End-of-sale and End-of-service Announcement for the M40 routing platform and products at https://www.juniper.net/support/eol/.

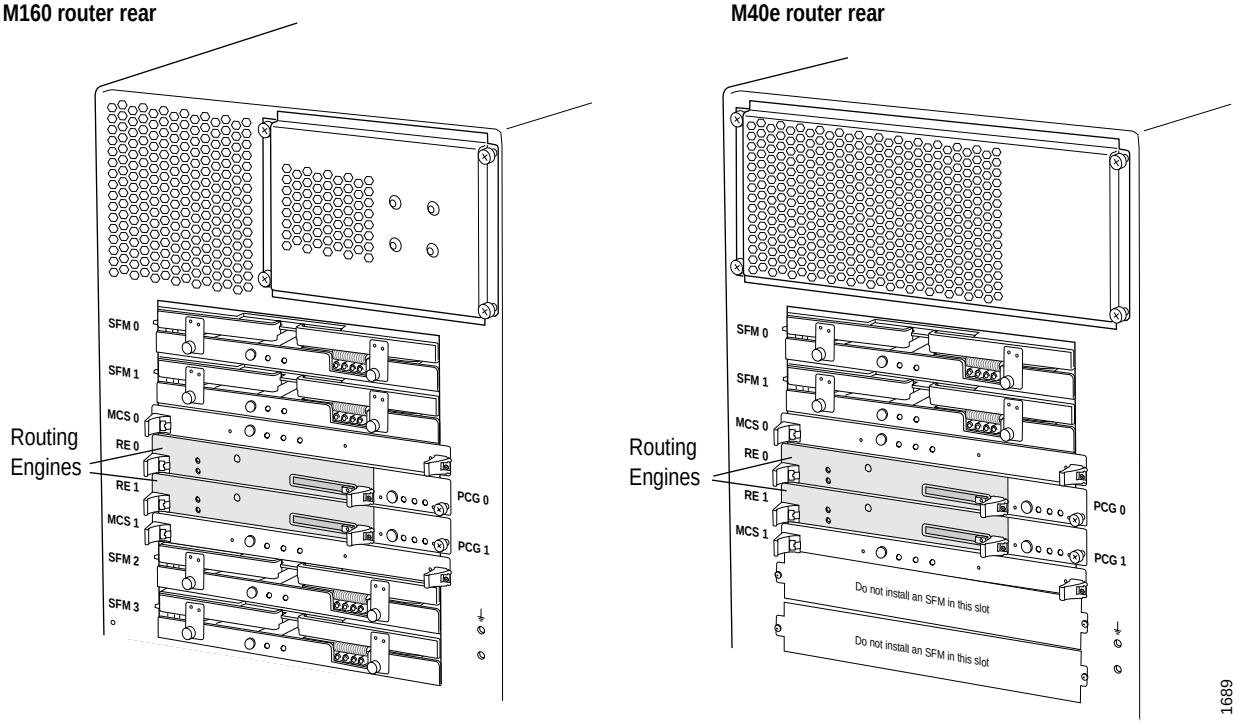
If you upgrade the Routing Engine housing, the PCMCIA card slot is not accessible and you must use the LS-120 PC card. If you want to install a new version of the JUNOS software, you must use the LS-120 drive.

You can replace the entire Routing Engine housing or just the Routing Engine.

M40e and M160 Router Routing Engine Location

Figure 41 shows the Routing Engine location on the M40e and M160 router.

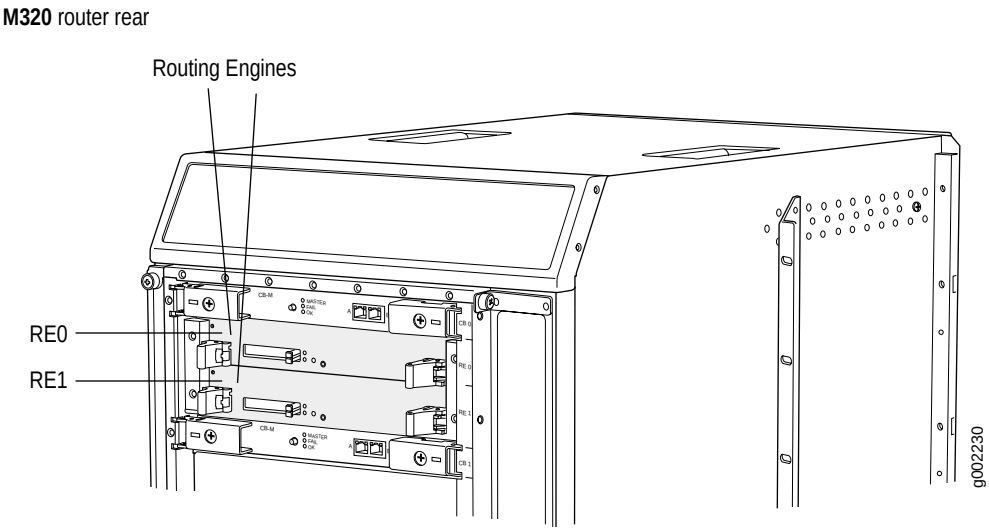
Figure 41: M40e and M160 Router Routing Engine Location



M320 Router Routing Engine Location

Figure 42 show the Routing Engine location on the M320 Internet router.

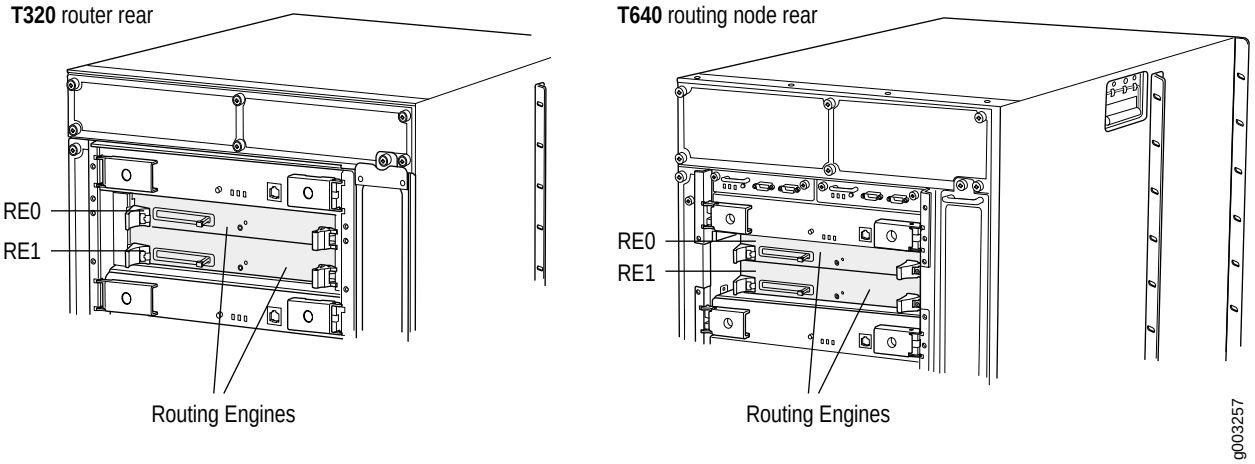
Figure 42: M320 Router Routing Engine Location



T320 Router and T640 Routing Node Routing Engine Location

Figure 43 shows the Routing Engine location on the T320 router and T640 routing node.

Figure 43: T320 Router and T640 Routing Node Routing Engine Location



Routing Engine Redundancy

Table 33 show the routing platforms that can have redundant Routing Engines. See “Routing Engine Component Companionship” on page 135.

Table 33: Redundant Routing Engines

Characteristic	M5/ M10	M7i	M10i	M20	M40	M40e/M160	M320/T320/ T640
Redundant Routing Engines			X works with HCM	X		X (Host Module) works with MCS	X (Host Subsystem) works with Control Board

Routing Engine Component Companionship

On the M10i router, the Routing Engine works with its companion High-Availability Chassis Manager (HCM) to provide control and monitoring functions for router components. For more information about the HCM, see “Monitoring the HCM” on page 431. For more information about monitoring Redundant HCMs, see “Monitoring Redundant HCMs” on page 623.

For information about monitoring redundant Routing Engines, see “Host Redundancy Overview” on page 463 and “Monitoring Redundant Routing Engines” on page 491.

On the M40e and M160 routers, the host module provides the routing and system management functions. The host module consists of the Routing Engine and the Miscellaneous Control Subsystem (MCS). For more information about the host module, see “Monitoring the Host Module” on page 341. For more information about the MCS, see “Monitoring the MCS” on page 359.

On the M320 router, T320 router, and T640 routing node, the host subsystem provides the routing and system management functions. The host subsystem consists of the Routing Engine and the Control Board. For more information about the host subsystem, see “Monitoring the Host Subsystem” on page 289. For information about the Control Boards, see “Monitoring the Control Board” on page 301.

For more detailed information about the Routing Engine, see the appropriate router hardware guide.

Routing Engine Boot Devices

Generally the router boots on the primary boot device, which is the flash disk. This device contains the current router configuration and the last three committed configurations in the juniper.conf, juniper.conf.1.gz, juniper.conf.2.gz, and juniper.conf.3.gz files, respectively. These files are located in the /config directory.

If the flash disk fails, the router attempts to boot from the hard disk, which is the alternate boot device.

If a removable media is installed when the router boots, the router attempts to boot the image on it. If the booting fails, the router tries the flash drive and then the hard disk.

If the router boots from an alternate boot device, the JUNOS software displays a message indicating this when you log in to the router. For example, this message shows that the software booted from the hard disk (/dev/ad2s1a):

```
login: username
Password: password
Last login: date on terminal

--- JUNOS 6.4 R1 built date
---
--- NOTICE: System is running on alternate media device (/dev/ad1).
```

Routing Engine Storage Media

The router has three forms of storage media:

Flash drive, which is a nonrotating drive. When a new router is shipped from the factory, the JUNOS software is preinstalled on the flash drive.

Hard disk, which is a rotating drive. When a new router is shipped from the factory, the JUNOS software is preinstalled on the hard disk. This drive is also used to store system log files and diagnostic dump files.

Removable media, either a PC card or an LS-120 floppy disk. The removable media that ships with each router contains a copy of the JUNOS software.

Table 43 on page 154 shows the storage media device names (as of JUNOS release 5.x and above) by Routing Engine type.

See Also "Host Redundancy Overview" on page 463

"Monitoring Redundant Routing Engines" on page 491

Monitoring the Routing Engine Status

For information about conditions that trigger Routing Engine alarms, see "Display the Current Router Alarms" on page 61.

Steps To Take To monitor the Routing Engine status, follow these steps:

1. Check the Detailed Routing Engine Status on page 137
2. Check the Routing Engine LEDs on page 138

Step 1: Check the Detailed Routing Engine Status

Action To display a detailed status of the Routing Engine, use the following JUNOS CLI operational mode command:

```
user@host> show chassis routing-engine
```

Sample Output

```
user@host> show chassis routing-engine
Routing Engine status
  Slot 0
    Current state: Master
    Election priority: Master
  Temperature                 41 C / 105 degrees F
  DRAM                          765 Mbytes
  CPU utilization
    User                        0 percent
    Background                  0 percent
    Kernel                      0 percent
    Interrupt                   0 percent
    Idle                      100 percent
  Serial ID                     39000004f8bdec01
  Start time                    2000-01-04 22:02:58 UTC
  Uptime                          14 hours, 45 minutes, 40 seconds
    Load averages                 1 minute   5 minute  15 minute
                          0.05         0.04         0.01
  Slot 1
    Current state     Backup
    Election priority     Backup (default)
  Temperature                 41 C / 105 degrees F
  DRAM                          765 Mbytes
  CPU utilization
    User                        0 percent
    Background                  0 percent
    Kernel                      0 percent
    Interrupt                   2 percent
    Idle                       98 percent
  Serial ID                     f2000004f903a801
  Start time                    2000-01-04 01:28:02 UTC
  Uptime                          20 hours, 38 minutes, 1 seconds
```

What It Means The command output displays the Routing Engine slot number, current state (Master, Backup, or Disabled), election priority (Master or Backup), and the airflow temperature. The command output also displays the total DRAM available to the Routing Engine processor, the CPU utilization percentage, and the Routing Engine serial number for the slot. The command output displays when the Routing Engine started running, how long the Routing Engine has been running, and the time, uptime, and load averages for the last 1, 5, and 15 minutes.

Check the Uptime to ensure that the Routing Engine has not rebooted since it started running.

Alternative Actions (For M7i, M10i, M40e, M160, M320, and T320 routers and the T640 routing node) To check the status and temperature of the Routing Engines, use the following CLI command:

user@host> **show chassis environment routing-engine**

```
user@host> show chassis environment routing-engine
Route engine 0 status:
  State:              Present Master
  Temperature:          0 degrees C / 32 degrees F
Route engine 1 status:
  State:              Present
```

The command output displays the Routing Engine slot number, operating state, temperature, and whether it is operating as the master or backup. The state can be Present or Absent.

To check the status and temperature of a particular Routing Engine, use the following CLI command:

user@host> **show chassis environment routing-engine** *slot*

Step 2: Check the Routing Engine LEDs

Steps To Take To check the Routing Engine status LEDs, do one of the following:

1. Check the M7i Routing Engine LEDs on page 139
2. Check the M10i Router Routing Engine LEDs on page 139
3. Check the M20 Router Routing Engine LEDs on page 140
4. Check the M40 Router Routing Engine LEDs on page 142
5. Check the M40e and M160 Router Routing Engine LEDs on page 143
6. Check the M320 Router Routing Engine LEDs on page 144
7. Check the T320 Router Routing Engine LEDs on page 144
8. Check the T640 Routing Node Routing Engine LEDs on page 145

Check the M7i Routing Engine LEDs

Action Check the four LEDs located on the Routing Engine faceplate. A green LED labeled HDD, a blue LED labeled MASTER, a red LED labeled FAIL, and a green LED labeled ONLINE indicate Routing Engine status. Table 34 describes the LED states.

Table 34: M7i and M10i Router Routing Engine LED States

Label	Color	State	Description
HDD	Green	Blinking	There is read/write activity on the PC card.
MASTER	Blue	On steadily	Routing Engine is functioning as master.
FAIL	Red	On steadily	Routing Engine is not operational.
ONLINE	Green	On steadily	Routing Engine is running normally.

Check the M10i Router Routing Engine LEDs

The M10i router Routing Engine has four LEDs indicating Routing Engine status: a green LED labeled HDD, a blue LED labeled MASTER, a red LED labeled FAIL, and a green LED labeled ONLINE.

Figure 44: M10i Routing Engine LEDs

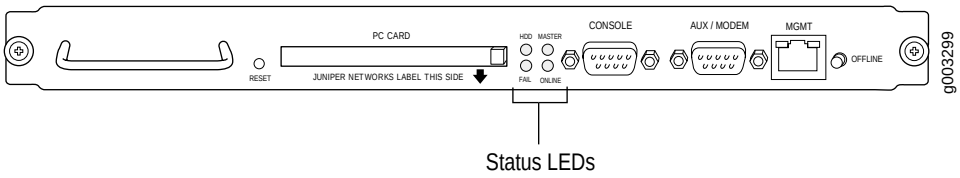


Table 35 describes the M10i router Routing Engine LEDs.

Table 35: M10i Router Routing Engine LEDs and Buttons

Label	Color	State	Description
HDD	Green	Blinking	There is read/write activity on the PC card.
MASTER	Blue	On steadily	Routing Engine is functioning as master.
FAIL	Red	On steadily	Routing Engine is not operational.
OFFLINE	Green	On steadily	Routing Engine is running normally.

You can see the Routing Engine LEDs on the Routing Engine panel located on the back of the router.

Check the M20 Router Routing Engine LEDs

The M20 router Routing Engine LEDs and buttons are located near the middle of the craft interface above and below the Juniper Networks logo (see Figure 45).

Figure 45: M20 Router Craft Interface Routing Engine LEDs and Buttons

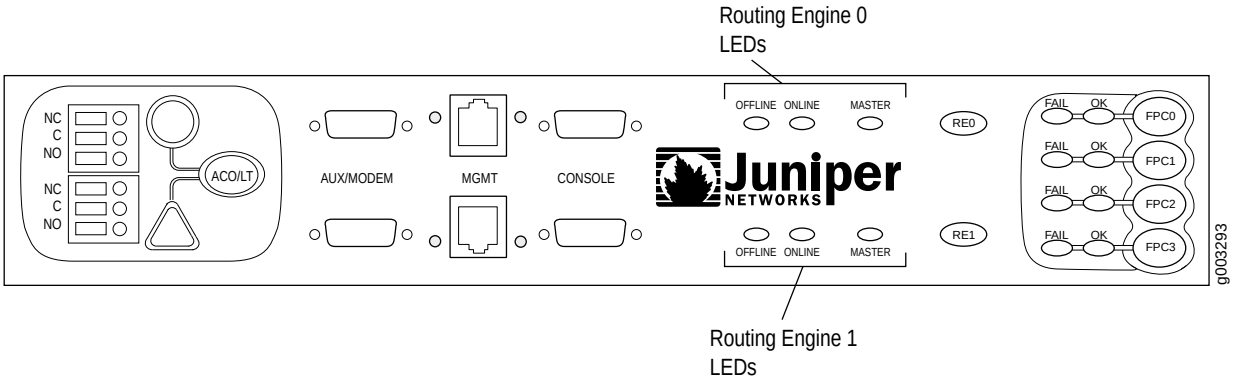


Table 36 describes the M20 router Routing Engine LEDs.

Table 36: M20 Router Routing Engine LEDs and Buttons

Label	Shape	Color	State	Description
MASTER	□	Blue	On steadily	Routing Engine is functioning as master.
ONLINE	□	Green	On steadily	Routing Engine has successfully booted and is running normally.
OFFLINE	○	Amber	On steadily	Routing Engine is not operational, or is in reset mode.
RE0, RE1	⬭	—	—	Press to take the Routing Engine offline.

You can see the Routing Engine LEDs on the craft interface or on the Routing Engine panel located on the back of the router (see Figure 46).

Figure 46: M20 Router Routing Engine Panel

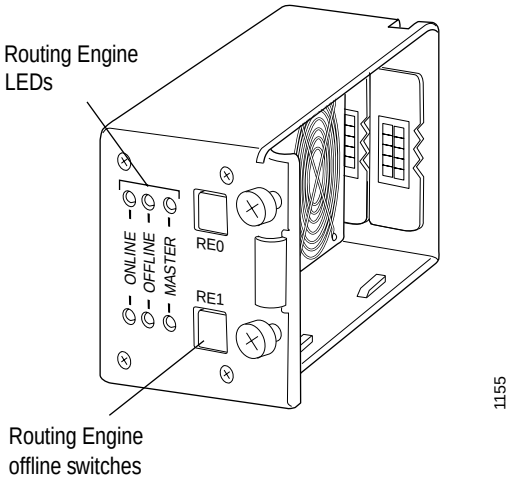


Figure 37 describes the Routing Engine panel LEDs.

Table 37: Routing Engine Panel LEDs

Label	Color	State	Description
OFFLINE	Amber	On steadily	Routing Engine is not operational or is in reset mode.
ONLINE	Green	On steadily	Routing Engine is running normally.
MASTER	Blue	On steadily	Routing Engine is functioning as master.

Check the M40 Router Routing Engine LEDs

Check the Routing Engine LEDs on the bottom right of the craft interface. A red Fail LED and a green OK LED indicate the status of the Routing Engine. The green OK LED should light steadily. Figure 47 shows the Routing Engine LEDs.

Figure 47: M40 Router Craft Interface Routing Engine LEDs

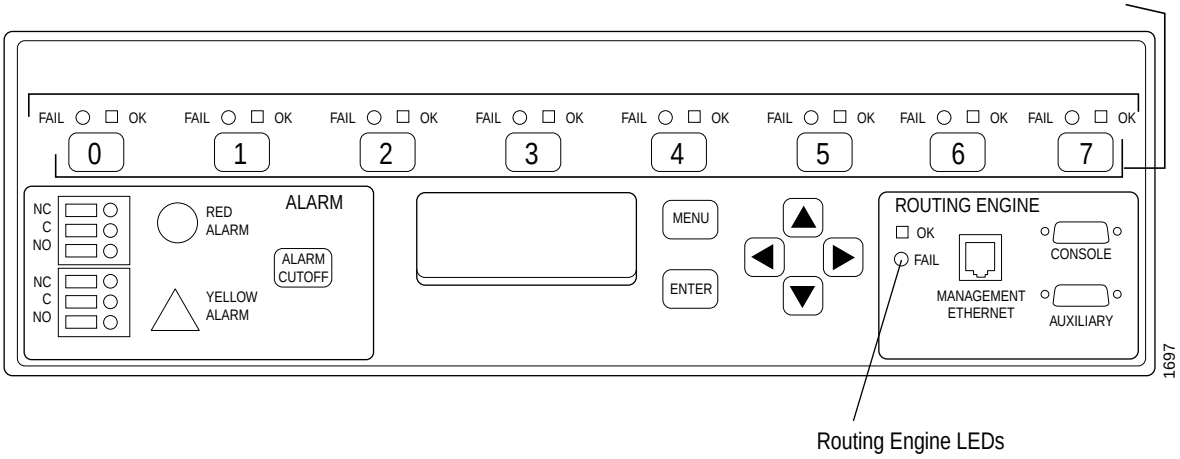


Table 38 describes the Routing Engine LED states.

Table 38: M40 Router Routing Engine LEDs

Label	Shape	Color	State	Description
OK	□	Green	On steadily	Presence of the Routing Engine is detected by the System Control Board (SCB).
OK	□	Green	Blinking	Routing Engine is starting up.
FAIL	○	Red	On steadily	Presence of the Routing Engine is not detected by the SCB, or the Routing Engine is not operational.

Check the M40e and M160 Router Routing Engine LEDs

Check the host module LEDs on the upper right of the craft interface. Three LEDs—one green MASTER, one green ONLINE, and one red OFFLINE—indicate the status of each host module. The LEDs marked HOST0 show the status of the Routing Engine in slot RE0 and the MCS in slot MCS0. The LEDs marked HOST1 show the status of the Routing Engine in slot RE1 and the MCS in slot MCS1.

Figure 48 shows the host module LEDs on the M40e and M160 router craft interface.

Figure 48: M40e and M160 Router Redundant Host Module LEDs

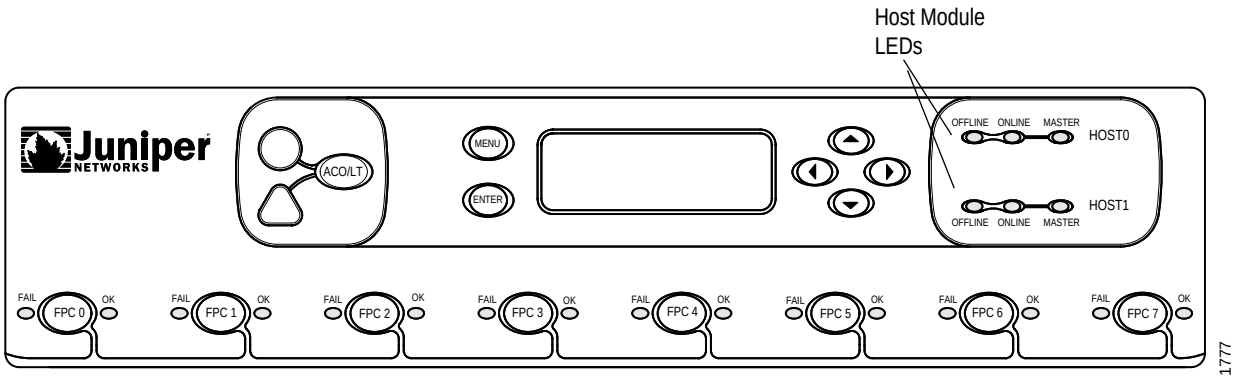


Table 39 describes the host module LEDs.

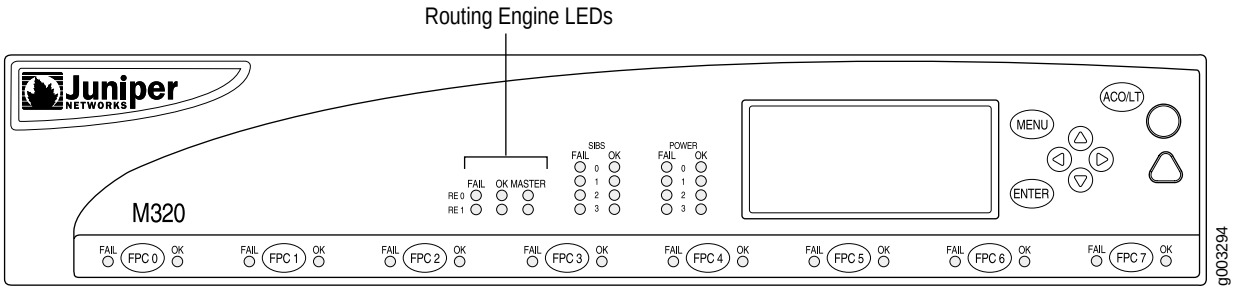
Table 39: M40e and M160 Router Host Module LEDs

Label	Shape	Color	State	Description
MASTER	◯	Green	On steadily	Host module (Routing Engine and MCS) is functioning as master.
ONLINE	◯	Green	On steadily	Host module is present and operational.
			Blinking	Host module is starting up.
OFFLINE	◯	Red	On steadily	Host module is not present, or is present but not operational.

Check the M320 Router Routing Engine LEDs

Figure 49 shows the host module LEDs on the M320 router craft interface.

Figure 49: M320 Router Redundant Host Module LEDs



Each host subsystem has three LEDs, located in the middle of the craft interface, that indicate status. The LEDs labeled RE0 show the status of the Routing Engine in slot RE0 and the Control Board in slot CB0. The LEDs labeled RE1 show the status of the Routing Engine in slot RE1 and the Control Board in slot CB1. Table 40 describes the functions of the host subsystem LEDs.

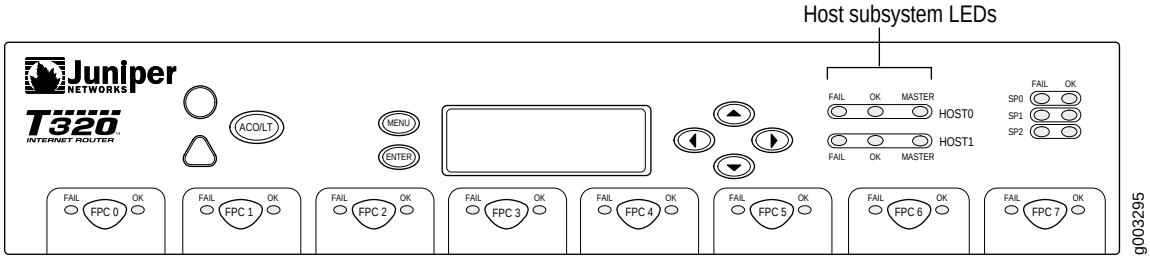
Table 40: M320 Router Host Subsystem LEDs

Label	Color	State	Description
FAIL	Red	On steadily	Host module is offline.
OK	Green	On steadily	Host module is online and functioning normally.
MASTER	Green	On steadily	Host module is functioning as master.

Check the T320 Router Routing Engine LEDs

Figure 50 shows the host module LEDs on the T320 router craft interface.

Figure 50: T320 Router Redundant Host Module LEDs



Each host subsystem has three LEDs, located on the upper right of the craft interface, which indicate status. The LEDs labeled HOST0 show the status of the Routing Engine in slot RE0 and the Control Board in slot CB0. The LEDs labeled HOST1 show the status of the Routing Engine in slot RE1 and the Control Board in slot CB1.

Table 41 describes the functions of the host subsystem LEDs.

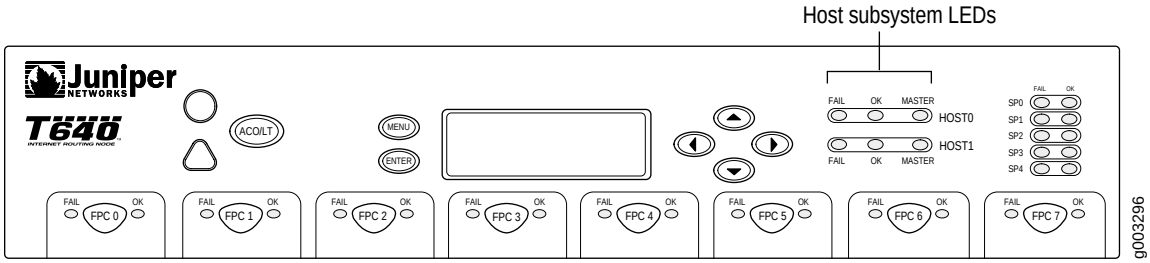
Table 41: T320 Router Host Subsystem LEDs

Label	Color	State	Description
OK	Green	On steadily	Host module is online and functioning normally.
FAIL	Red	On steadily	Host module is offline.
MASTER	Green	On steadily	Host module is functioning as master.

Check the T640 Routing Node Routing Engine LEDs

Figure 51 shows the host module LEDs on the T640 routing node craft interface.

Figure 51: T640 Routing Node Redundant Host Module LEDs



Each host subsystem has three LEDs, located on the upper right of the craft interface, which indicate status. The LEDs labeled HOST0 show the status of the Routing Engine in slot RE0 and the Control Board in slot CB0. The LEDs labeled HOST1 show the status of the Routing Engine in slot RE1 and the Control Board in slot CB1. Table 42 describes the functions of the host subsystem LEDs.

Table 42: T640 Routing Node Host Subsystem LEDs

Label	Color	State	Description
OK	Green	On steadily	Host module is online and functioning normally.
FAIL	Red	On steadily	Host module is offline.
MASTER	Green	On steadily	Host module is functioning as master.

Step 3: Check the Redundant Routing Engine Status from the Craft Interface CLI Output

Action To view the Routing Engine status from the craft interface, use the following CLI command:

```
user@host> show chassis craft-interface
```

Sample Output

```
user@host> show chassis craft-interface
```

For M10i routers:

```
Red alarm:              LED off, relay off
Yellow alarm:           LED on, relay on
Routing Engine OK LED:  On
Routing Engine fail LED: Off

FPCs    0  1
------------
Green   *  *
Red     .  .

LCD screen:
    +--------------------+
    |waddle              |
    |1 Alarm active      |
    |Y: Backup RE Active |
    |                    |
    +--------------------+
```

For M20 routers:

```
Red alarm:              LED off, relay off
Yellow alarm:           LED off, relay off
Routing Engine OK LED:  On
Routing Engine fail LED: Off

FPCs    0  1  2  3
-------------------
Green   .  *  *  .
Red     .  .  .  .

LCD screen:
   +--------------------+
   |myrouter            |
   |Up: 5+00:16:57      |
   |                    |
   |0pps Load           |
   +--------------------+
```

For M40e/M160 routers:

```
FPM Display contents:
   +--------------------+
   |myrouter            |
   |1 Alarm active      |
   |Y: PEM 0 Absent     |
   |                    |
   +--------------------|
```

```
Front Panel System LEDs:
Host     0    1
-----------------------
OK       *    *
Fail     .    .
Master   *    .
```

For M320 routers:

```
FPM Display contents:
[...Output truncated...}
Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .


[...Output truncated...]
```

For T320 routers:

```
FPM Display contents:
[...Output truncated...}
Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .
[...Output truncated...]
```

For T640 routing nodes:

```
FPM Display contents:
    +--------------------+
    |bananas-re0         |
    |Up: 7+00:20         |
    |                    |
    |Fans OK             |
    +--------------------|

Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .

Front Panel Alarm Indicators:
-----------------------------
Red LED      .
Yellow LED   .
Major relay  .
Minor relay  .
```

```
Front Panel FPC LEDs:
FPC   0  1  2  3  4  5  6  7
---------------------------------------
Red   .  *  .  .  .  .  .  .
Green *  .  *  *  .  *  .  .

CB LEDs:
  CB  0  1
--------------
Amber .  .
Green *  .
Blue  *  .

SCG LEDs:
  SCG 0  1
--------------
Amber .  .
Green *  *
Blue  *  .

SIB LEDs:
  SIB 0  1  2  3  4
--------------------------
Red   .  .  .  .  .
Green *  *  *  *  *
```

What It Means The M10i router craft interface command output displays the LED status of the master Routing Engine, indicating whether the OK and Fail LEDs are on or off. It also displays that the backup Routing Engine is active.

The M20 router craft interface command output displays the LED status of the master Routing Engine, indicating whether the OK and Fail LEDs are on or off.

The M40e and M160 router craft interface command output also displays the LED status of both the master and backup host modules that include the master and backup Routing Engines. By default, the master host module (Host 0) has components installed in slots RE0 and MCS0; the backup host module (Host 1) has components installed in slots RE1 and MCS1.

The T640 routing node craft interface command output indicates that RE0 is the master Routing Engine, and that it is active. The status under the backup Routing Engine (RE1) has no indicators.

Verifying Routing Engine Failure

NOTE: Routing Engine failures can include compact flash failure and hard disk failure. If the Routing Engine has a compact flash failure and hard disk failure at the same time, you will not be able to boot up the Routing Engine.

The following sections describe how to check for the following failure conditions:

NOTE: The M7i and M10i routers by default come with no compact flash.

Steps To Follow

1. Check Core Files If the Routing Engine Reboots on page 149
2. Example of Boot Messages If Routing Engine Fails to Boot on page 150
3. Check for Compact Flash Media and Hard Disk Failure on page 150

Step 1: Check Core Files If the Routing Engine Reboots

List the Core Files Generated After A Crash Occurs

A vmcore file is only generated if the Routing Engine has a kernel crash. Kernel crashes can be generated by such things as a bug in the kernel software or bad memory. If the router has a kernel crash, the vmcore.<*n*> file is generated while the Routing Engine comes back up.

Action A vmcore file is always saved in /var/crash/. To view the core file that is generated when a crash occurs, use the following CLI command:

```
user@host> file list /var/crash/ detail
```

Sample Output

```
user@host> file list /var/crash/ detail
/var/crash/:
total 892856
-rw-r--r--  1 root  wheel         2 May 14  2004 bounds
-rw-r--r--  1 root  wheel   11959693 Oct 13  2003 kernel.0
-rw-r--r--  1 root  wheel   10114127 May 14  2004 kernel.1
-rw-r--r--  1 root  wheel         5 Feb 26  1997 minfree
-rw-------  1 root  wheel  805240832 Oct 13  2003 vmcore.0
-rw-------  1 root  wheel  805240832 May 14  2004 vmcore.1
```

What It Means The command output lists the vmcore.<*n*> files that have been generated.

Display the Messages Log File After A Crash Occurs

Action You might see the following in the /var/log/messages file after the router comes back up after a kernel crash occurred. To view the messages log file, use the following CLI command:

```
user@host> show log messages
```

Sample Output

```
user@host> show log messages
Mar  9 12:22:02 host savecore: Router crashed.....
Mar  9 12:22:02 host savecore: reboot after panic: Loss of soft watchdog Mar  9 12:22:02 host savecore: system went
down at Sun Mar  9 12:22:02 2003 Mar  9 12:22:02 host savecore: Selective dump will be saved now
```

What It Means A kernel crash occurred and a core file has been generated.

Example of When No Core File Is Generated

When a power outage occurs, no kernel crash core file is generated. To view the messages log file, use the following CLI command:

```
user@host> show log messages
```

Sample Output

```
user@host> show log messages
Aug 15 15:35:58 host /kernel: checking for core dump...
Aug 15 15:35:59 host /kernel: savecore: Router rebooted. Cause unknown....
Aug 15 15:35:59 host savecore: Router rebooted. Cause unknown....
```

What It Means The kernel checks for a core dump file when the router reboots.

Example of Boot Messages If Routing Engine Fails to Boot

The following example shows boot messages that occur when a Routing Engine remains in a constant boot loop. In this condition, contact JTAC for further analysis and assistance.

```
Trying to boot from PCMCIA Flash Card ...
Trying to boot from Compact Flash ...
Trying to boot from Ethernet ...
```

Step 2: Check for Compact Flash Media and Hard Disk Failure

If the Routing Engine has a compact flash failure, the router boots from the hard disk. When you log in to the router, the JUNOS software CLI will indicate that the router has booted from alternate media.

If the Routing Engine has a hard drive failure, the router boots from the compact flash as usual. However, the router cannot write to the hard drive.

When the Compact Flash Is Removed from the Boot List

You can have a compact flash error when conditions, such as a HARD READ error occurs. When the compact flash is removed from the boot list, the following message displays you log in to the router:

```
login: user

--- JUNOS 6.0R1.6 built 2003-09-24 04:06:27 UTC
---
--- NOTICE: System is running on alternate media device     (/dev/ad1s1a).
---

user@host>
```

Action Check to see which file system is mounted by using the following CLI command:

```
user@host> show system storage
```

Sample Output

```
user@host> show system storage
Filesystem       512-blocks      Used     Avail Capacity Mounted on
/dev/ad1s1a        218690     56502    144694    28%  /
devfs                  32        32         0   100%  /dev/
/dev/vn0            18316     18316         0   100%  /packages/mnt/jbase
devfs                  32        32         0   100%  /dev/
/dev/vn1            45448     45448         0   100% /packages/mnt/jkernel-6.0R1.6
/dev/vn2            20532     20532         0   100%  /packages/mnt/jpfe-M160-6.0R1.6
/dev/vn3             3580      3580         0   100%  /packages/mnt/jdocs-6.0R1.6
/dev/vn4            20728     20728         0   100%  /packages/mnt/jroute-6.0R1.6
/dev/vn5             9256      9256         0   100%  /packages/mnt/jcrypto-6.0R1.6
mfs:139           4064278         2   3739134     0%  /tmp
/dev/ad1s1e         24234         4     22292     0%  /config
procfs                 8         8         0   100%  /proc
/dev/ad1s1f     52492630   7988510  40304710    17%  /var
```

What It Means The command output will not show ad0 (the compact-flash) mounted, but instead, ad1 (the hard disk) has the root file system mounted.

Determine Why Compact Flash Did Not Mount

Action To determine why the compact-flash did not get mounted, use the following CLI command:

```
user@host> show system boot-messages | match "ad0|ad1"
```

```
user@host> show system boot-messages | match "ad0|ad1"
ad0: not attached, missing in Boot List
ad1: 28615MB <FUJITSU MHS2030AT> [58140/16/63] at ata0-slave using BIOSDMA Mounting root from
ufs:/dev/ad1s1a
```

What It Means The command output shows that the compact flash (ad0) was removed from the boot list.

When the Hard Disk Is Removed from the Boot List

The following boot messages list on the console shows symptoms that signify a hard disk failure. These messages are not in the boot-messages log file.

Sample Output

```
/dev/ad1s1f: CAN'T CHECK FILE SYSTEM.
/dev/ad1s1f: UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY.
```

```
Can't open /dev/ad1s1f: Device not configured
WARNING:
WARNING: /var mount failed, building emergency /var
WARNING:
dumpon: sysctl: kern.dumpdev: Device not configured
mgd: commit complete
dumpon: sysctl: kern.dumpdev: Device not configured
mgd: commit complete
```

What it Means The boot messages show that the hard disk (ad1) was removed from the boot list (using JUNOS, release 6.1R1.4).

Verify That the Hard Disk Did Not Mount

Action To verify that the hard disk (ad1) did not get mounted, use the following CLI command:

```
user@host> show system storage
```

Sample Output The following sample output was taken from a RE-333 Routing Engine.

```
user@host> show system storage
Filesystem       512-blocks      Used     Avail Capacity Mounted on
/dev/ad0s1a          218690     60294    140902     30%  /
devfs                    32        32         0    100%  /dev/
/dev/vn0              20044     20044         0    100%  /packages/mnt/jbase
devfs                    32        32         0    100%  /dev/
/dev/vn1              51920     51920         0    100%  /packages/mnt/jkernel-6.1R1.4
/dev/vn2              22328     22328         0    100%  /packages/mnt/jpfe-M160-6.1R1.4
/dev/vn3               3844      3844         0    100%  /packages/mnt/jdocs-6.1R1.4
/dev/vn4              23328     23328         0    100%  /packages/mnt/jroute-6.1R1.4
/dev/vn5               8820      8820         0    100%  /packages/mnt/jcrypto-6.1R1.4
mfs:139              127006     16914     99932     14%  /tmp
/dev/ad0s1e           24234        28     22268      0%  /config
procfs                    8         8         0    100%  /proc
```

What It Means The command shows that the hard disk (ad1) is not mounted. Instead, /var now exists only in the swap partition (mfs:139), so any contents saved to /var will not be saved at the next reboot.

```
user@host> start shell
user@host% ls -l /
total 47
-rw-r--r--  1 root  wheel  4735 Mar 31  2001 COPYRIGHT
dr-xr-xr-x  2 root  wheel   512 Jan 20  2004 altconfig
dr-xr-xr-x  2 root  wheel   512 Jan 20  2004 altroot
drwxr-xr-x  2 root  wheel   512 Dec 29 12:00 bin
dr-xr-xr-x  3 root  wheel   512 Feb  4 23:16 boot
drwxr-xr-x  3 root  wheel   512 Feb  3 18:08 config
dr-xr-xr-x  4 root  wheel  2084 Feb  4 23:18 dev dr-xr-xr-x  7 root  wheel  1536 Feb  4 23:19 etc
lrwxr-xr-x  1 root  wheel    17 Dec 29 12:02 kernel -> /packages/jkernel
dr-xr-xr-x  2 root  wheel   512 Jan 20  2004 mnt
drwxr-xr-x  2 root  wheel   512 Feb  3 21:16 modules
drwxr-xr-x  3 root  wheel  1536 Feb  3 21:19 packages
dr-xr-xr-x  1 root  wheel   512 Feb  4 23:29 proc
dr-xr-xr-x  2 root  wheel   512 Feb  3 21:15 root
dr-xr-xr-x  3 root  wheel  1536 Feb  3 21:15 sbin
drwxrwxrwt  3 root  wheel   512 Feb  4 23:19 tmp
dr-xr-xr-x  8 root  wheel   512 Dec 29 12:00 usr
```

```
lrwxr-xr-x  1 root  wheel     8 Feb  4 23:18 var -> /tmp/var
```

What It Means The example shows that var has a symbolic link to the /tmp/var directory. It resides under the /tmp/var directory, and is mounted on the mfs partition.

Verify That the Hard Disk Is Missing from The Boot List

Action To verify that the hard disk (ad1) is missing from the boot list, use the following CLI command:

```
user@host> show system boot-messages | match "ad0|ad1"
```

Sample Output

```
user@host> show system boot-messages | match "ad0|ad1"
ad0: 122MB <SanDisk SDCFB-128> [980/8/32] at ata0-master using PIO4
ad1: not attached, missing in Boot List
Mounting root from ufs:/dev/ad0s1a
```

What It Means The device is taken out of the boot list because of an error condition, such as a HARD READ errror.

View Alarms When Media Is Removed from the Boot List

Action To display an alarm that is generated when media (compact flash or hard disk) is removed from the boot list, use the following CLI command:

```
user@host> show chassis alarms
```

Sample Output

```
user@host> show chassis alarms
1 alarms currently active
Alarm time               Class  Description
2005-02-04 23:19:27 CET  Major  hard-disk missing in Boot List
```

What It Means When the router is operational and the hard disk is removed from the boot list, a minor yellow alarm is generated. When the router is rebooted and the hard disk is still removed from the boot list, a red major alarm is generated.

What It Means The command output displays a major alarm indicating what media is missing from the boot list and the time and date when the event occurred.

Step 3: Understand What Happens When Memory Failures Occur

Most Juniper Networks Routing Engines support Error Checking and Correction (ECC) protected memory. There are two types of memory errors: single-bit and multiple-bit.

A single-bit error is when a single 0 or 1 bit is incorrect. The system detects and corrects single-bit errors, then logs the event in the /var/log/eccd file. If there are persistent single-bit errors, the Routing Engine controller reboots the Routing Engine. Persistent single-bit errors could be a symptom of bad RAM.

Multiple-bit errors are when multiple bits are incorrect. By default, if a multiple-bit error is detected, a nonmaskable interrupt (NMI) is generated to interrupt the Routing Engine and panic the kernel causing the router to subsequently reboot. The Routing Engine panics the kernel, and leaves a vmcore file.Multi-bit parity error detection was implemented in JUNOS software release 5.3 and above.

Step 4: Check the Router File System and Boot Disk

Action Table 43 specifies the storage media by Routing Engine type. The device names are displayed when the router boots. To display the Routing Engine type on some routers, use the show chassis hardware CLI command.

Table 43: Storage Media Device Names

Storage Media	RE-M40 (RE1)	RE-400 (RE5)	RE-333 (RE2) / RE-600 (RE3)	RE-1600 (RE4)
Flash drive	ad0	ad0	ad0	ad0
Hard disk	ad2	ad1	ad1	ad1
Removable media	afd0	ad3	ad3	ad3 and ad4

Action To check the router file system and on which disk the router booted, use the following CLI command:

```
user@host> show system storage
```

Sample Output

```
user@host> show system storage
Filesystem  1K-blocks     Used    Avail Capacity  Mounted on
/dev/ad0s1a     65687    26701    33732    44%    /
devfs              16       16        0   100%    /dev/
/dev/vn1         9310     9310        0   100%    /packages/mnt/jbase
/dev/vn2         8442     8442        0   100%    /packages/mnt/jkernel-5.0R5.1
/dev/vn3        11486    11486        0   100%    /packages/mnt/jpfe-5.0R5.1
/dev/vn4         5742     5742        0   100%    /packages/mnt/jroute-5.0R5.1
/dev/vn5         1488     1488        0   100%    /packages/mnt/jcrypto-5.0R5.1
/dev/vn6          792      792        0   100%    /packages/mnt/jdocs-5.0R5.1
mfs:181        762223        3   701243     0%    /tmp
/dev/ad0s1e     25263        7    23235     0%    /config
procfs              4        4        0   100%    /proc
/dev/ad1s1f   7156052   337194  6246374     5%    /var
```

What It Means The command output displays statistics about the amount of free disk space in the router's file systems, including the amount used, the amount available, and the percentage of system space being used. The values are displayed in 1024-byte (1KB) blocks.

Filesystem is the name of the file system on which the Routing Engine booted. The command output also displays the directory to which the file system is mounted. During normal operation, the / and /config directories are from the compact flash drive and the /var directory is from the hard drive. If the router booted off the hard drive, the show system storage command will show all three directories on the hard drive. If the hard drive fails and the router booted off the compact flash drive, the show system storage command will show all three directories on the compact flash drive.

Step 5: Display the Current Routing Engine Alarms

To display information about the conditions that trigger Routing Engine alarms for each router type, see “Display the Current Router Alarms” on page 61.

NOTE: An event may occasionally cause the Routing Engine not to boot and you will not be able to display the current alarms.

Action To display the current Routing Engine alarms, use the following CLI command:

```
user@host> show chassis alarms
```

Sample Output

```
user@host> show chassis alarms
1 alarms currently active
Alarm time               Class  Description
2001-07-22 15:12:19 PDT  Major  hard-disk missing in Boot List
2002-05-14 09:20:36 PDT  Major  compact-flash missing in Boot List
2002-05-14 09:20:31 PDT  Minor  Boot from alternate media
```

What It Means The command output displays the alarm time, severity level, and description.

Step 6: Display Error Messages in the System Log File

Action To view Routing Engine error messages in the system log file, use the following CLI command:

```
user@host> show log messages
```

Sample Output For compact flash drive errors:

```
user@host> show log messages
Feb  3 07:58:17 host /kernel: ad0: HARD WRITE ERROR blk# 135783 status=51 error=10 Feb  3 07:58:17 host /kernel:
ad0: HARD WRITE ERROR blk# 137633 status=51 error=10 Feb  3 07:58:47 host /kernel: ad0: HARD WRITE
ERROR blk# 135731 status=51 error=10 Feb  3 07:58:47 host /kernel: ad0: HARD WRITE ERROR blk# 135783
status=51 error=10 Feb  3 07:58:47 host /kernel: ad0: HARD WRITE ERROR blk# 137633 status=51 error=10
```

For hard drive errors:

```
user@host> show log messages
Jun  3 12:00:28 router /kernel: ad1: WRITE command timeout - resetting
Jun  3 12:00:44 router /kernel: ata0: resetting devices ..
Jun  3 12:00:44 router /kernel: ata0:  Succeeded in resetting devices.
Jun  3 12:00:28 router /kernel: ad1: WRITE command timeout - resetting
Jun  3 12:00:17 router /kernel: ata0: resetting devices ..
```

What It Means The messages system log file records the time the failure or event occurred, the severity level, a code, and a message description. Use the show log messages CLI command to browse error messages that are generated at least 5 minutes before and after an event. You can also use the show log messages | match “*device-name*” command to view error messages that are specific to a device name. Use this information to diagnose a problem and to let JTAC know what error messages were generated and the router events prior to the event. For more information about system log messages, see the *JUNOS Software System Log Messages Reference*.

Step 7: Document the Events Prior to the Failure

Action To document events that occurred prior to a Routing Engine failure, follow these steps:

1. Write down any events such as an abrupt router shutdown because of a power outage, a software upgrade, a configuration commit, or a system snapshot request.

2. Write down any recovery procedures attempted. If the Routing Engine reported some errors on the hard drive but appeared to be working fine or a backup Routing Engine is available, it may not be necessary to recover.

3. Turn on logging to your console to start capturing screen output. This is especially useful if a terminal server is connected to the Routing Engine console port.

4. While you have screen capturing enabled, boot the Routing Engine and look at the router boot messages.

Getting Routing Engine Hardware Information

Steps To Take To get hardware information for a failed Routing Engine, follow these steps:

1. Display Routing Engine Hardware Information on page 157

2. Locate the Routing Engine Serial Number ID Label on page 158

Step 1: Display Routing Engine Hardware Information

Action To display the Routing Engine hardware information, use the following CLI command:

```
user@host> show chassis hardware
```

Sample Output For an M20 router with two Routing Engines:

```
user@host> show chassis hardware
Hardware inventory:
Item            Version  Part number  Serial number     Description
Chassis
Backplane       REV 03   710-001517   AA7915
Power Supply A  Rev 01   740-001465   000011            AC
Power Supply B  Rev 01   740-001465   000016            AC
Display         REV 04   710-001519   AE6019
Routing Engine 0                      32000004f8ff1201  RE-2.0
Routing Engine 1 REV 01  740-003239   AARCHOO           RE-2.0
[...Output truncated...]
```

For M40 router components:

```
user@host> show chassis hardware
Hardware inventory:
Item            Version  Part number  Serial number     Description
Backplane       REV 02   710-000073   S/N AA0053
```

```
Power supply A   Rev 2    740-000235   S/N 000042       DC
Maxicab          REV X1   710-000229   S/N AAO139
Minicab          REV X1   710-000482   S/N AA0201
[...Output truncated...]
```

What It Means The sample output for an M20 router displays the Routing Engine, slot number, and serial number, and indicates that it is present in the router. Give this information to JTAC if the Routing Engine fails.

The sample output for an M40 router shows that the maxicab is the (Motorola) Routing Engine, and the minicab is the Routing Engine and Packet Forwarding Engine interface.

On other routers, the Routing Engine serial number is located in the host hardware inventory line.

Step 2: Locate the Routing Engine Serial Number ID Label

If the Routing Engine fails, you cannot see the Routing Engine hardware information when you use the show chassis hardware command. You must manually locate the serial number ID label on the component

Some Routing Engines may have more than one serial number. Contact your Juniper Networks support representative if you need assistance in determining which serial number to provide.

Action Look on the Routing Engine for the serial number ID label.

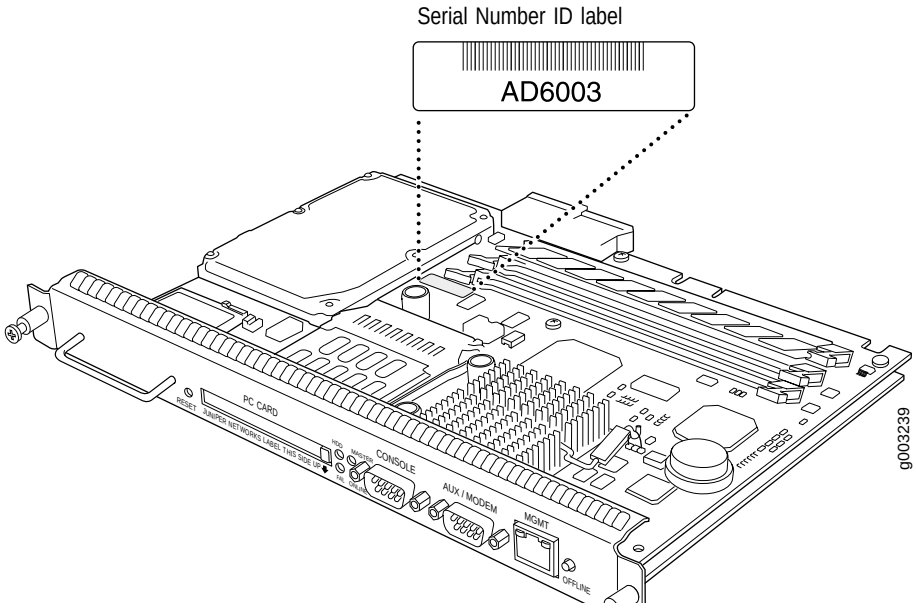
M7i Router Routing Engine Serial Number ID Label Location

The serial number ID label is located on the left side near the midplane connector.

M10i Router Routing Engine Serial Number ID Label Location

The serial number ID label is located on the left side, near the back (see Figure 52).

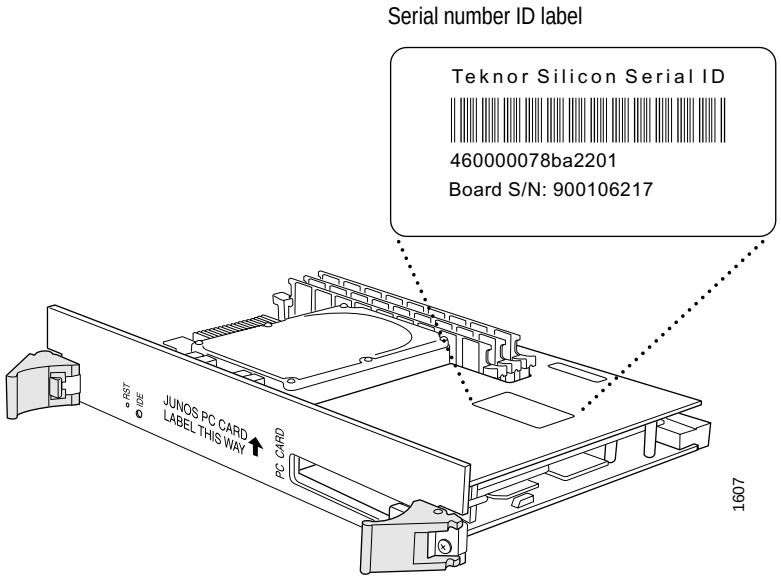
Figure 52: M10i Router Routing Engine Serial Number ID Label Location



Teknor Type 2 Routing Engine Serial Number ID Label Location

For all routers with a Type 2 (Teknor) Routing Engine, the serial number ID label is located on the top right side of the Routing Engine (see Figure 53 on page 159). If there are multiple labels on the Routing Engine, the label marked “Teknor Silicon Serial ID” is the correct serial number. The serial number ID label includes two serial numbers: a 16-digit number on the top and a 10-digit number on the bottom. Give both serial numbers to JTAC.

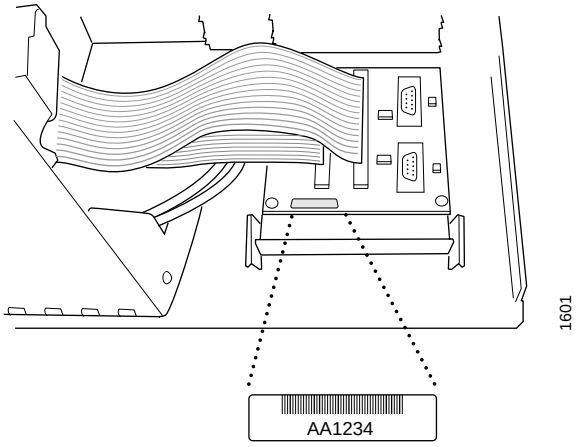
Figure 53: Routing Engine Serial Number ID Label Location for All Routers



M40 Router Routing Engine Serial Number ID Label Location

For M40 routers, the serial number that you use depends on whether you purchased the Routing Engine housing or just the Routing Engine. If you purchased the Routing Engine housing, the serial number is located on the maxicab, as shown in Figure 54. If you purchased the Routing Engine only, remove the Routing Engine and locate the serial number ID label, as shown in Figure 54. If there are multiple labels on the Routing Engine, the label marked “Teknor Silicon Serial ID” is the correct serial number.

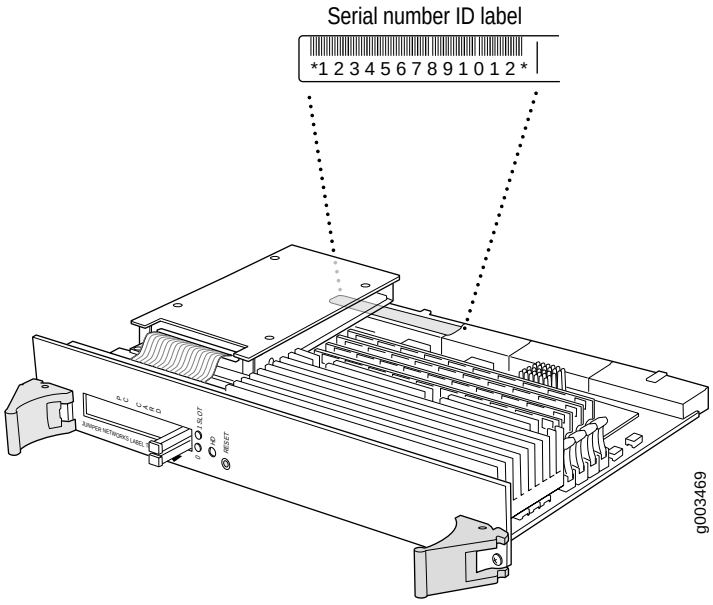
Figure 54: M40 Router Routing Engine Serial Number ID Label



M320 Router Serial Number ID Label Location

The serial number label is located on the right side of the top of the Routing Engine (see Figure 55).

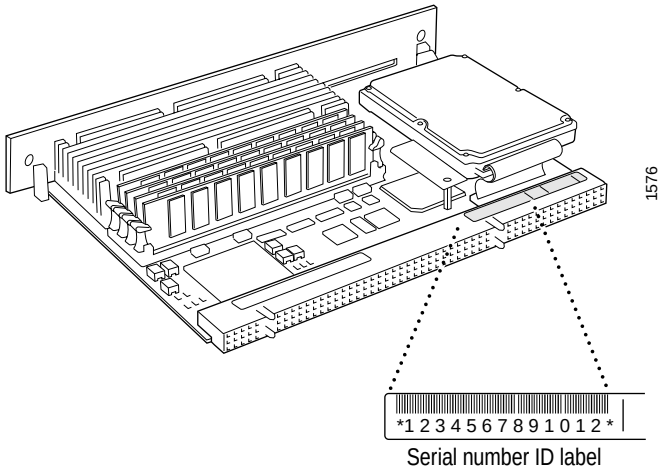
Figure 55: M320 Router Routing Engine Serial Number ID Label Location



T320 Router and T640 Routing Node Serial Number ID Label Location

For the T320 router and T640 routing node, the serial number ID label is located on the right side of the top of the Routing Engine (see Figure 56).

Figure 56: T320 Router and T640 Routing Node Routing Engine Serial Number ID Label



Removing a Routing Engine

Action To replace the Routing Engine, see the appropriate router hardware guide See also, “Replacing a Redundant Routing Engine” on page 506..

NOTE: The M5 and M10 routers have a cover over the Routing Engine. The M40e and M160 routers have a cover over all the rear chassis components.