Chapter 15

Monitoring FPCs

You monitor and maintain Flexible PIC Concentrators (FPCs) to connect Physical Interface Cards (PICs) to the rest of the router so that incoming packets are forwarded across the midplane to the appropriate destination ports. (See Table 44.)

Table 44: Checklist for Monitoring FPCs

Monitor FPC Tasks	Command or Action
Understanding FPCs on page 164	
FPC Numbering on page 165	
Checking the FPC Status on page 166	
1. Check FPC Status and Utilization on page 166	show chassis fpc
2. Check FPC Status and Uptime on page 167	show chassis fpc detail *fpc-slot*
3. (M40e, M160, M320, and T320 routers and T640 routing node only) Check FPC Status and Temperature on page 167	show chassis environment fpc *fpc-slot*
4. Check the FPC LED States on page 168	show chassis craft-interface Or, physically check the FPC LEDs on the Front Panel Module (FPM).
Checking for FPC Alarms on page 169	
1. Display the Current FPC Alarms on page 169	show chassis alarms
2. Display FPC Error Messages in the System Log File on page 170	show log messages | match “fpc| kernel | tnp”
3. Display FPC Error Messages in the Chassis Daemon Log File on page 171	show log chassisd | match fpc
Verifying FPC Failure on page 173	
1. Document Events Prior to the FPC Failure on page 173	Document a software upgrade, hardware upgrade, or reset.
2. Check the FPC Installation on page 173	Check that the FPC is seated in the slot. Try to bring the FPC online.
3. Check the FPC Fuses on page 174	The fuses for the and FPCs are located in the rear of the midplane behind the power supply in slot PEM0.
4. Take the FPC Offline on page 175	Press the offline button for approximately 3 seconds.
5. Perform an FPC Swap Test on page 176	Replace the FPC with one that you know works.
6. Display the FPC Software Version Information on page 176	show version brief
7. Display the FPC Hardware Information on page 177	show chassis hardware

Monitor FPC Tasks	Command or Action
8. Locate the FPC Serial Number ID Label on page 177	M20 Internet router—With the FPC in horizontal position, look on the top back right of the FPC. M40 Internet router—With the FPC in vertical position, look on the back left side of the FPC. M40e and M160 routers—With the FPC in vertical position, look on the center right side of the FPC. For M320 routers—On an FPC3, the serial number ID label is located on the center of the right side. On an FPC2, the serial number label is located on the top PIC slot. For T320 routers—On an FPC3, the serial number ID label is located on the center of the right side. On an FPC1 and FPC2, the serial number ID label is located near the top PIC slot. For T640 routing nodes—On an FPC3, the serial number label is located on the center of the right side. On an FPC2, the serial number label is located near the top PIC slot.
Replacing an FPC on page 181	See “Return the Failed Component” on page 86. Follow the procedure in the appropriate router hardware guide.

Understanding FPCs

Purpose Inspect the FPCs to ensure that they connect PICs to the rest of the router so that incoming packets are forwarded across the midplane to the appropriate destination port.

What Is an FPC The FPC is a component of the Packet Forwarding Engine. FPCs house the various PICs used in the router.

The FPCs installed in the router depend on the platform and the PICs needed. Table 45 provides some FPC characteristics for each router type.

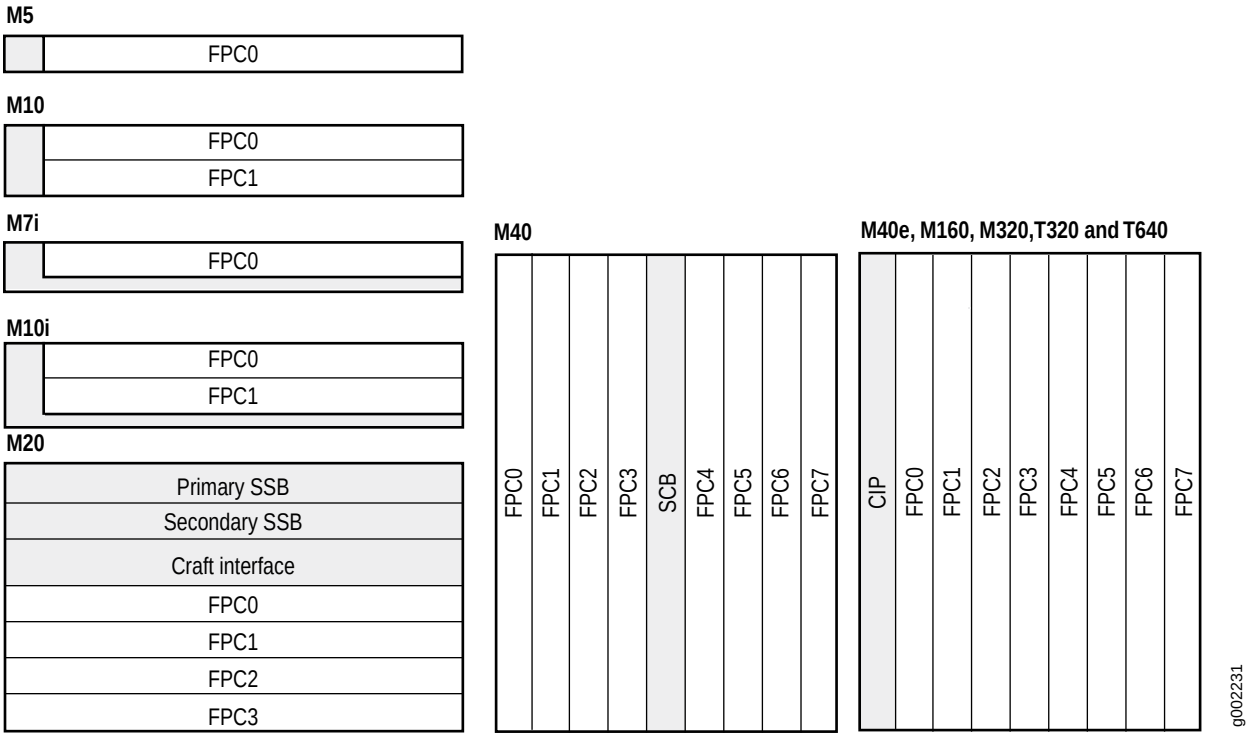
For a listing of available FPCs and supported PICs, see the appropriate router hardware guide and router PIC guide.

Table 45: FPC Characteristics Per Routing Platform

FPC Characteristic	M5 / M10	M7i	M10i	M20	M40	M40e	M160	M320	T320	T640
FPC types supported per router	FPC built into the FEB	FPC built into the router	FPC built into the router	FPC	FPC	M40e-FPC1, M40e-FPC2	FPC1, FPC2	FPC1, FPC2, FPC3	FPC1, FPC2, FPC3	FPC2, FPC3
FPC slots per router	1/2	1	2	4	8	8	8	8	8	8

Figure 57 shows the location and numbering of the FPCs in each router platform.

Figure 57: FPC Numbering



FPCs are hot-insertable and hot-removable. You can remove and replace them without powering down the router or disrupting the routing functions.

See Also “Monitoring PICs” on page 183

Checking the FPC Status

Steps To Take To check the FPC status, follow these steps:

1. Check FPC Status and Utilization on page 166
2. Check FPC Status and Uptime on page 167
3. Check FPC Status and Temperature on page 167
4. Check the FPC LED States on page 168

Step 1: Check FPC Status and Utilization

Action To display brief status and utilization information for all FPCs installed in the router, use the following JUNOS command-line interface (CLI) operational mode command:

```
user@host> show chassis fpc
```

Sample Output

```
user@m160> show chassis fpc
Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State      (C)  Total  Interrupt    DRAM (MB) Heap     Buffer
  0  Online       43   3       0          32        1        39
  1  Online       47   3       0          32        1        39
  2  Online       42   3       0          32        1        40
  3  Online       40   4       0          32        1        39
  4  Online       41   4       0          32        1        39
  5  Online       42   0       0          32        1        39
  6  Empty         0   0       0          0         0        0
  7  Empty         0   0       0          0         0        0
```

What It Means Use the show chassis fpc command to identify whether there is a problem with any of the FPCs installed in the router. The command output displays a brief status of all the FPCs installed in the router. The state can be online, dead, diag, dormant, empty, online, probed, or probe-wait. If the FPC state is dead, an alarm occurs. For more detailed information about the FPC states, see the *JUNOS Protocols, Class of Service, and System Basics Command Reference*.

The temperature is that of the air flowing past the FPC. If the temperature is too high, an alarm occurs.

The CPU and memory information is the total percentage of CPU being used by the FPC processor, the total CPU being used by the FPC processor, the percentage of CPU being used for interrupts, and the total DRAM available to the FPC processor. The percentage of heap space (dynamic memory) reflects the buffer space being used by the FPC processor. If the heap space exceeds 80 percent, there might be a software problem (memory leak).

The output also displays the percentage of buffer space being used by the FPC processor for buffering internal messages.

Step 2: Check FPC Status and Uptime

Action To display the status and uptime for a particular FPC slot, use the following CLI command:

user@host> **show chassis fpc detail** *fpc-slot*

Sample Output

```
user@M160> show chassis fpc detail 3
Slot 3 information:
  State                          Online
  Temperature                 36 degrees C / 96 degrees F
  Total CPU DRAM                 32 Mbytes
  Total SRAM                  4 Mbytes
  Total SDRAM                 256 Mbytes
  I/O Manager ASIC information      Version 2.0, Foundry IBM, Part number 0
  I/O Manager ASIC information      Version 2.0, Foundry IBM, Part number 0
  I/O Manager ASIC information      Version 2.0, Foundry IBM, Part number 0
  Start time:                 2002-03-19 13:13:26 PST
  Uptime:                     6 days, 1 hour, 19 minutes, 36 seconds
```

What It Means The command output shows status information for the FPC in slot 3, including the operating state. The state can be online, dead, diag, dormant, empty, online, probed, or probe-wait. If the FPC state is dead, an alarm occurs. For more detailed information about the FPC states, see the *JUNOS Protocols*, *Class of Service* , *and System Basics Command Reference*. The command output also shows temperature, memory usage, I/O Manager application-specific integrated circuit (ASIC) version level, start time, and uptime. The uptime is important to determine how long the FPC has been operational. A small uptime means that the FPC came online a short time ago and could indicate a possible FPC error condition.

Syntax show chassis fpc <pic-status <*fpc-slot*>>
show chassis fpc <detail <*fpc-slot*>>

Step 3: Check FPC Status and Temperature

Action (M40e, M160, M320, and T320 routers and T640 routing node only) To display the FPC status and temperature for a particular FPC slot, use the following CLI command:

user@host> **show chassis environment fpc** *fpc-slot*

```
user@m160> show chassis environment fpc 0
FPC 0 status:
  State                       Online
  Temperature              39 degrees C / 102 degrees F
  Power:
    1.5 V                  1496 mV
    2.5 V                  2485 mV
    3.3 V                  3306 mV
    5.0 V                  4991 mV
    5.0 V bias             4993 mV
    8.0 V bias             8251 mV
  CMB Revision                12
```

What It Means The command output displays the status of the FPC in slot 0, including the state, temperature, voltage levels on the FPC, and the revision level of the chassis management bus slave. The state can be Unknown, Empty, Present, Ready, Announce online, Online, Offline, or Diagnostics. An Offline state indicates an FPC error condition.

Step 4: Check the FPC LED States

Action To check the FPC LED status, use the following CLI command:

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

Sample Output

```
user@host> show chassis craft-interface
[...Output truncated...]
Front Panel FPC LEDs:
FPC   0  1  2  3  4  5  6  7
-------------------------------------
Red   .  .  .  .  .  .  .  .
Green *  *  .  .  .  .  .  .
[...Output truncated...]
```

What It Means The Front Panel FPC LEDs section displays the status of each FPC. The FPCs have two operational states: Green (OK), and Red (Fail). Asterisks (*) indicate the operating state. Dots indicate an off state for LEDs. If both red and green LEDs have dots, the FPC slot is empty. Asterisks in the Green state indicate that the FPCs in slots 0 and 1 are operating normally. No FPCs are installed in slots 2 through 7.

Alternative Action (For all routers except the M5, M7i, M10, and M10i) You can also check the FPC status by looking at the LEDs on the faceplate. Each FPC has two LEDs that report its status. Only one LED state can occur at a time. Table 46 describes the FPC LEDs.

Table 46: FPC LEDs on the Faceplate

Label	Shape	Color	State	Description
OK	□	Green	On steadily	FPC is functioning normally.
			Blinking	FPC is starting up.
FAIL	◯	Red	On steadily	FPC has failed.

(For all routers except the M5, M7i, M10, and M10i, you can check the FPC status by looking at the FPC LEDs on the craft interface. Table 47 describes the functions of the FPC LEDs.

Table 47: FPC LEDs on the Craft Interface

Label	Color	State	Description
FAIL	Red	On steadily	FPC has failed.
OK	Green	On steadily	FPC is functioning normally.
		Blinking	FPC is starting up.

Checking for FPC Alarms

Steps To Take To check for FPC alarms, follow these steps:

1. Display the Current FPC Alarms on page 169
2. Display FPC Error Messages in the System Log File on page 170
3. Display FPC Error Messages in the Chassis Daemon Log File on page 171

Step 1: Display the Current FPC Alarms

Action You can display current FPC alarms at the command line or 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
 2002-04-16 15:09:00 UTC Major  Too many unrecoverable errors
```

What It Means The command output displays the current FPC alarms, including the time the alarm occurred, the severity level, and the alarm description. At the command line, you see the following FPC error messages:

```
Too many unrecoverable errors
Too many recoverable errors
```

From the router craft interface LCD screen, you see the following:

```
Slot x: errors
```

Alternative Actions Check for FPC alarms on the router craft interface. You can physically look at the craft interface or use the show chassis craft-interface command. When a red or yellow alarm occurs, the craft interface goes into alarm mode. Alarm mode preempts idle mode, displaying a message to alert you of serious alarm conditions. In alarm mode, the screen displays the following information:

```
+--------------------+
|myrouter            |
|1 Alarm active      |
|R: Slot 2:errors    |
|                    |
+--------------------+
```

The craft interface output provides the following information:

First line—Name of the router.

Second line—Number of alarms active on the router.

Third and fourth lines—Individual alarms, with the most severe condition shown first. Each line indicates whether the alarm is a red (R) or yellow (Y) alarm.

For more information about the craft interface, see “Monitoring the Craft Interface” on page 197 or the appropriate hardware guide.

For more information about craft interface alarms, see “Display the Current Router Alarms” on page 61.

Step 2: Display FPC Error Messages in the System Log File

Action To check for FPC error messages in the system log messages file, use the following CLI command:

```
user@host> show log messages | match fpc
```

Check for error messages at least 5 minutes before and after an FPC alarm occurs.

Sample Output The following output displays when you browse through the messages log file using the time and date stamp to look for error messages that occur 5 minutes before and after the FPC event:

```
user@host> show log messages
Mar 10 09:20:31 cls-edge-02 ssb RDP: Keepalive timeout for rdp.(scb:chassis).(fpc1:36865) (elapsed 5595)
Mar 10 09:20:33 cls-edge-02 ssb SSB(0): Slot 0, serial number S/N BD9709.
Mar 10 09:20:37 cls-edge-02 ssb BCHIP 1: SRAM test failed.
Mar 10 09:20:37 cls-edge-02 ssb CM(0): Slot 1: B-chip diagnostics failed
Mar 10 09:20:37 cls-edge-02 ssb CM(0): Slot 1: Unrecoverable error; probe failed
Mar 10 09:20:37 cls-edge-02 ssb CM(0): Slot 1: Too many unrecoverable errors, going off-line
Mar 10 09:20:37 cls-edge-02 ssb CM(0): ALARM SET: (Major) Slot 1: Too many unrecoverable errors
Mar 10 09:20:37 cls-edge-02 ssb CM(0): Slot 1: Off-line
Mar 10 09:20:38 cls-edge-02 ssb PFEMAN: FPC socket closure indicated
Mar 10 09:20:38 cls-edge-02 ssb PFEMAN: closing FPC 1 socket
Mar 10 09:20:42 cls-edge-02 ssb PFEMAN: FPC socket closure indicated
Mar 10 09:20:42 cls-edge-02 ssb PFEMAN: close on unlisted socket, 0xb0e200
```

The following output displays when you use the | match filter command to look for specific information in the messages log file:

```
user@host> show log messages | match fpc
Mar 31 05:07:58 bopper fpc6 D4-6/0 AMCC: Transmitter laser bias out of range.
Mar 31 05:08:37 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 2, power on timeout, retry 1,
restarting
Mar 31 05:08:44 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 5, power on timeout, retry 1,
restarting
Mar 31 05:10:19 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 2, power on timeout, retry 2,
restarting
Mar 31 05:10:26 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 5, power on timeout, retry 2,
restarting
Mar 31 05:12:00 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 2, power on timeout, retry 3,
restarting
Mar 31 05:12:07 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: fpc 5, power on timeout, retry 3,
restarting
Mar 31 05:13:41 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: FPC 2 unresponsive, setting offline!
Mar 31 05:13:48 bopper chassisd[630]: CHASSISD_FRU_UNRESPONSIVE: FPC 5 unresponsive, setting offline!
```

What It Means When an FPC fails, the System and Switch Board (SSB), System Control Board (SCB), and Switching and Forwarding Modules (SFMs) generate error messages. 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 | match fpc command to view only FPC error messages. Use this information to diagnose an FPC problem and to let the Juniper Networks Technical Assistance Center (JTAC) know what error messages were generated and the router events prior to the FPC problem. For more information about system log messages, see the *JUNOS System Log Messages Reference*.

Step 3: Display FPC Error Messages in the Chassis Daemon Log File

Action To display FPC error messages in the chassisd log file, use the following CLI command:

user@host> **show log chassisd | match "fpc | kernel | tnp"**

Sample Output

```
user@host> show log chassisd | match "fpc | kernel | tnp"
Nov 11 15:58:31 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=0, tnpaddr=2
Nov 11 15:58:42 m40-2 tnp.bootpd[2497]: BOOTPD_BOOTSTRING: Boot string: boot 1 fpc.jbf
Nov 11 15:58:42 m40-2 tnp.tftpd[2647]: TFTPD_CONNECT_INFO: tftp read from addr 16 port 1024 file fpc.jbf
Nov 11 15:58:42 m40-2 tnp.bootpd[2497]: BOOTPD_BOOTSTRING: Boot string: boot 1 fpc.jbf
Nov 11 15:58:43 m40-2 tnp.tftpd[2649]: TFTPD_CONNECT_INFO: tftp read from addr 17 port 1024 file fpc.jbf
Nov 11 15:58:44 m40-2 tnp.tftpd[2651]: TFTPD_CONNECT_INFO: tftp read from addr 18 port 1024 file fpc.jbf
Nov 11 15:58:45 m40-2 tnp.tftpd[2653]: TFTPD_CONNECT_INFO: tftp read from addr 19 port 1024 file fpc.jbf
Nov 11 15:58:46 m40-2 tnp.tftpd[2655]: TFTPD_CONNECT_INFO: tftp read from addr 20 port 1024 file fpc.jbf
Nov 11 15:58:47 m40-2 tnp.tftpd[2657]: TFTPD_CONNECT_INFO: tftp read from addr 21 port 1024 file fpc.jbf
Nov 11 15:58:47 m40-2 fpc6 TFTP Error - Timeout
Nov 11 15:58:47 m40-2 fpc7 TFTP Error - Timeout
Nov 11 15:58:48 m40-2 tnp.tftpd[2659]: TFTPD_CONNECT_INFO: tftp read from addr 22 port 1024 file fpc.jbf
Nov 11 15:58:49 m40-2 tnp.tftpd[2661]: TFTPD_CONNECT_INFO: tftp read from addr 23 port 1024 file fpc.jbf
Nov 11 15:58:50 m40-2 tnp.tftpd[2663]: TFTPD_CONNECT_INFO: tftp read from addr 22 port 1024 file fpc.jbf
Nov 11 15:58:50 m40-2 fpc6 TFTP read - saw block 1, expected 572
Nov 11 15:58:51 m40-2 tnp.tftpd[2665]: TFTPD_CONNECT_INFO: tftp read from addr 23 port 1024 file fpc.jbf
Nov 11 15:58:51 m40-2 fpc6 TFTP read - saw block 1, expected 731
Nov 11 15:58:51 m40-2 fpc7 TFTP read - saw block 1, expected 200
Nov 11 15:58:52 m40-2 fpc6 TFTP read - saw block 1, expected 775
Nov 11 15:58:52 m40-2 fpc7 TFTP read - saw block 1, expected 265
Nov 11 15:58:52 m40-2 tnp.tftpd[2647]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:58:53 m40-2 fpc6 TFTP read - saw block 1, expected 782
Nov 11 15:58:53 m40-2 fpc7 TFTP read - saw block 1, expected 340
Nov 11 15:58:54 m40-2 fpc7 TFTP read - saw block 1, expected 428
Nov 11 15:58:54 m40-2 fpc6 TFTP read - saw block 1, expected 1016
Nov 11 15:58:55 m40-2 fpc7 TFTP read - saw block 1, expected 531
Nov 11 15:58:57 m40-2 tnp.tftpd[2649]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:58:57 m40-2 tnp.tftpd[2651]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:58:58 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=1, tnpaddr=16
Nov 11 15:58:58 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 0 restart
Nov 11 15:59:00 m40-2 tnp.tftpd[2653]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:59:00 m40-2 tnp.tftpd[2659]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:59:01 m40-2 tnp.tftpd[2655]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:59:02 m40-2 tnp.tftpd[2661]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:59:02 m40-2 tnp.tftpd[2657]: TFTPD_SENDCOMPLETE_INFO: Sent 2335 blocks of 1024 and 1 block of
```

```
960 for file '/usr/share/pfe/fpc.jbf'
Nov 11 15:59:03 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=2, tnpaddr=17
Nov 11 15:59:03 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 1 restart
Nov 11 15:59:03 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=3, tnpaddr=18
Nov 11 15:59:03 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 2 restart
Nov 11 15:59:06 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=4, tnpaddr=19
Nov 11 15:59:06 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 3 restart
Nov 11 15:59:07 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=5, tnpaddr=22
Nov 11 15:59:07 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 6 restart
Nov 11 15:59:07 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=6, tnpaddr=20
Nov 11 15:59:08 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 4 restart
Nov 11 15:59:08 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=7, tnpaddr=23
Nov 11 15:59:08 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 7 restart
Nov 11 15:59:09 m40-2 /kernel: pfe_listener_connect: conn established: listener idx=8, tnpaddr=21
Nov 11 15:59:09 m40-2 chassisd[2476]: CHASSISD_EVENT: fpc slot 5 restart
```

What It Means The chassisd log file is a database that provides the date, time, and a component status message. The chassisd database is dynamic. It is initialized at router startup and is updated when components are added or removed. The sample command output shows the results of a multiple item search in the log file (“fpc | kernel | tnp”): error messages for the FPC, kernel, and Trivial Networking Protocol (TNP) that indicate communication issues between the Routing Engine and the Packet Forwarding Engine components.

Verifying FPC Failure

Action To verify an FPC failure, follow these steps:

1. Document Events Prior to the FPC Failure on page 173
2. Check the FPC Installation on page 173
3. Check the FPC Fuses on page 174
4. Take the FPC Offline on page 175
5. Perform an FPC Swap Test on page 176
6. Display the FPC Software Version Information on page 176
7. Display the FPC Hardware Information on page 177
8. Locate the FPC Serial Number ID Label on page 177

Step 1: Document Events Prior to the FPC Failure

Action To document an FPC failure, record any events that may have led to the FPC failure, such as a software upgrade, hardware upgrade, or a reset. Capture system log file error messages 5 minutes before and after a failure event by using the show log messages command and use the time and date stamp to browse the file. You can use the show log messages | match command to view certain common error messages and help identify why an FPC failure occurred.

Step 2: Check the FPC Installation

Action To check the FPC installation and verify an FPC failure, follow these steps:

1. Make sure that the FPC is seated in its slot. Use a screwdriver to check that the screws at the top and bottom of the card carrier are tight.

2. Try to bring the FPC online. Press the online button on the craft interface or FPM for a few seconds. If the FPC does not come online, it has probably failed.

3. If the FPC comes online, check the FPC detailed status with the following CLI command:

   user@host> **show chassis fpc detail** *fpc-slot*

Alternative Action For the M40e, M160, M320 and T320 routers and T640 routing node, to bring the FPC online, use the request chassis fpc *slot-number* online command.

Step 3: Check the FPC Fuses

The M40e and M160 router fuses are located in a fuse box at the rear of the midplane, behind the lower rear impeller assembly. You must remove the lower impeller assembly to access the fuses, as described in the appropriate hardware guide.

The M320 router requires fuses for the FPCs. The fuses for the and FPCs are located in the rear of the midplane behind the power supply in slot PEM0.

When the fuse for an FPC blows, the FPC stops functioning even though it is installed correctly and the power supplies are providing power to the router.

For the M40e and M160 routers, when a fuse has blown but the power supplies are still delivering power to router, the amber LED adjacent to the fuse lights. For vertically oriented fuses (in the groups labeled J241 through J244.

Another indication that a fuse has blown is when the colored indicator bulb inside it becomes visible through the clear cover on the fuse. For information about the indicator bulb color for each fuse type, see the appropriate router hardware guide.

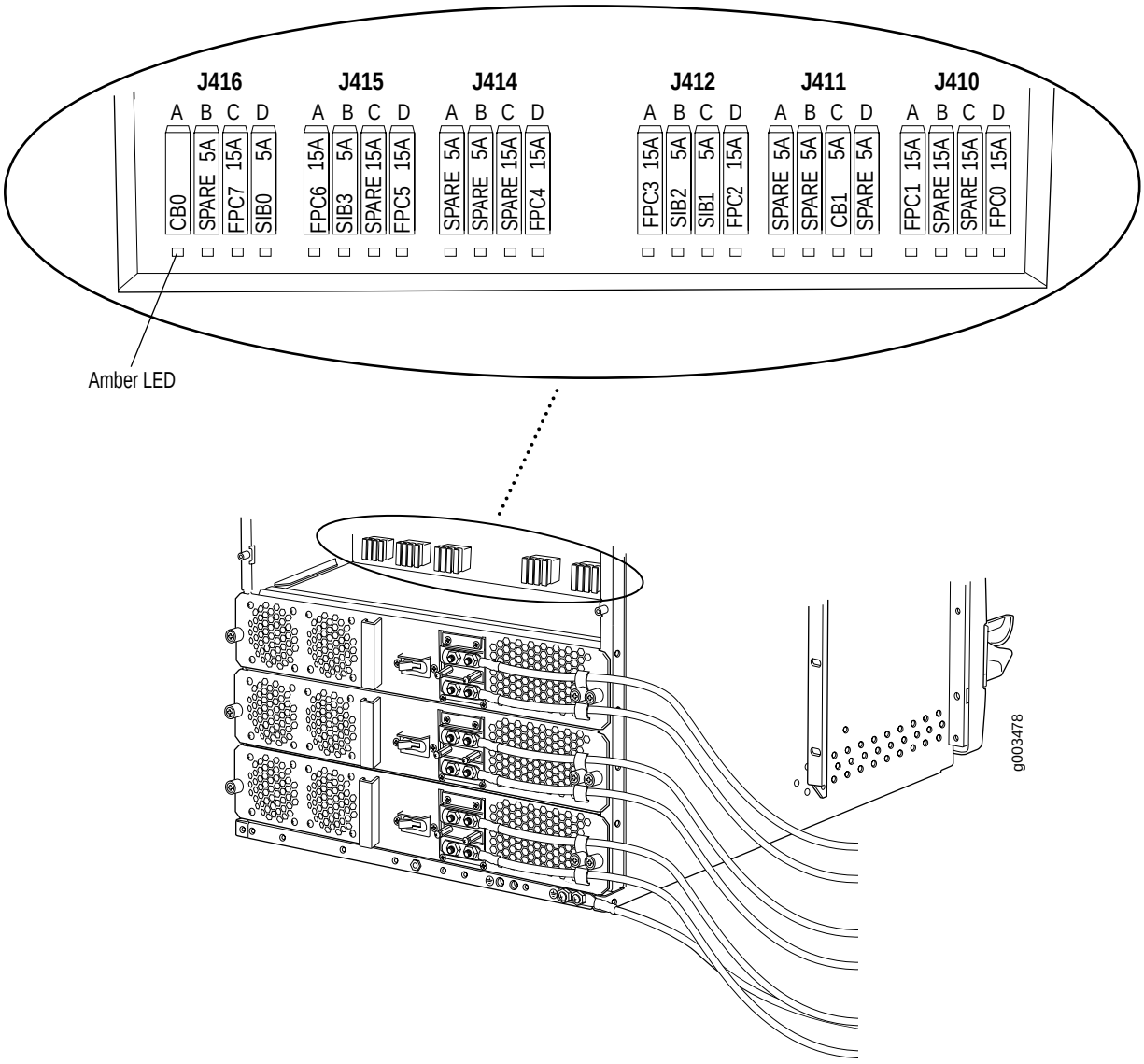
A blown fuse can cause a component to fail even though it is correctly installed and the power supplies are functioning. Check for a blown fuse in the following circumstances:

The LED that indicates normal operation for the component fails to light.

The appropriate CLI show chassis environment command indicates that the component is installed but is not receiving power.

Figure 58 shows the location of the M320 fuses in the rear of the midplane for the FPC. (The labels shown in the figure do not appear on the actual fuses—the clear cover on every fuse reads BUSS GMT-X—and might not match the labels on the midplane. Ignore the labels on the midplane.)

Figure 58: Component Fuses in the M320 Router Midplane



Step 4: Take the FPC Offline

The FPCs are hot-insertable and hot-removable. When you remove an FPC, the router continues to function, although the PIC interfaces installed on the FPC no longer function.

Action To take an FPC offline, press the offline button for approximately 3 seconds, and follow the instructions in the appropriate router hardware guide.

Step 5: Perform an FPC Swap Test

CAUTION: Before performing a swap test, always check for bent pins in the midplane and check the FPC for stuck pins in the connector. Pins stuck in the component connector can damage other good slots during a swap test.

Action To perform a swap test on an FPC, follow these steps:

1. Remove the FPC that you suspect has failed from the router chassis.
2. Inspect the router midplane for bent pins. Inspect the FPC connector for pins that are stuck. If you find a bent or stuck pin, see “Return the Failed Component” on page 86.
3. If there are no bent or stuck pins and there is a spare FPC slot in the router, insert the FPC that failed into a spare slot. If the FPC still fails, see “Return the Failed Component” on page 86. If there is no spare FPC slot, insert an FPC that you know works into the slot where the FPC failed. If the FPC works, the replaced FPC failed. If the FPC does not work, the FPC slot has failed.

Step 6: Display the FPC Software Version Information

Action To display the version of kernel software running on the router, use the following CLI command:

```
user@host> show version brief
```

Sample Output

```
user@host> show version brief
Hostname: host
Model: m160
JUNOS Base OS boot [5.5R1.2]
JUNOS Base OS Software Suite [5.5R1.2]
JUNOS Kernel Software Suite [5.5R1.2]
JUNOS Packet Forwarding Engine Support [5.5R1.2]
JUNOS Routing Software Suite [5.5R1.2]
JUNOS Online Documentation [5.5R1.2]
JUNOS Crypto Software Suite [5.5R1.2]
```

What It Means The command output displays the router hostname, model number, and the version of software running on the router. The kernel software version is important when diagnosing FPC issues. You will need this information when you contact JTAC.

Step 7: Display the FPC Hardware Information

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

user@host> **show chassis hardware**

Sample Output

```
user@host> show chassis hardware
Hardware inventory:
Item         Version  Part number  Serial number     Description
[...Output truncated...]
FPC 0         REV 01   710-001292   AE3843
  PIC 0       REV 04   750-000617   AE2495          1x OC-48 SONET, SMIR
FPC 1         REV 07   710-000175   AA3408
  PIC 0       REV 01   750-001323   AB1244          1x Tunnel
  PIC 1       REV 05   750-000613   AA3151          1x OC-12 SONET, SMIR
FPC 3         REV 01   710-000175   AA0048
  PIC 0       REV 04   750-000613   aa0343          1x OC-12 SONET, SMIR
  PIC 1       REV 05   750-000616   AA1394          1x OC-12 ATM, MM
  PIC 2       REV 04   750-000613   AA0377          1x OC-12 SONET, SMIR
  PIC 3       REV 04   750-000613   AA0378          1x Tunnel
FPC 5         REV 07   710-000175   AA3475
  PIC 0       REV 04   750-000611   AA3506          4x OC-3 SONET, MM
  PIC 2       REV 06   750-001072   AA1785          1x G/E, 1000 BASE-SX
FPC 7         REV 07   710-000175   AA3409
  PIC 1       REV X1   750-000603   AAO181          4x OC-3 SONET, SMIR
```

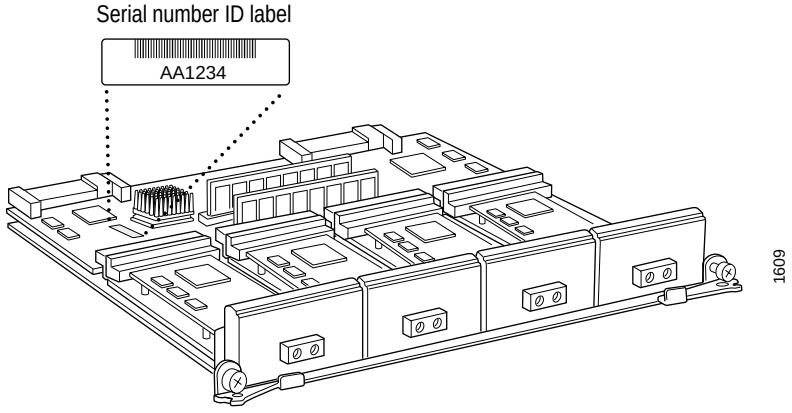
What It Means The command output displays each FPC installed in the router, including the version level, part number, serial number, and description. The output also displays a description of the PICs installed in each FPC. You will need this information when you contact JTAC.

Step 8: Locate the FPC Serial Number ID Label

Action The serial number ID label is small, rectangular, and has the component serial number and bar code on it. To locate the FPC serial number ID label, do one of the following:

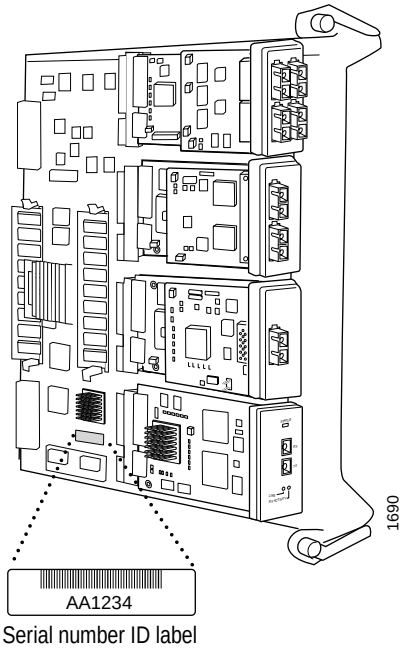
M20 router—With the FPC in horizontal position, look on the top back right of the FPC (see Figure 59).

Figure 59: M20 Router FPC Serial Number ID Label



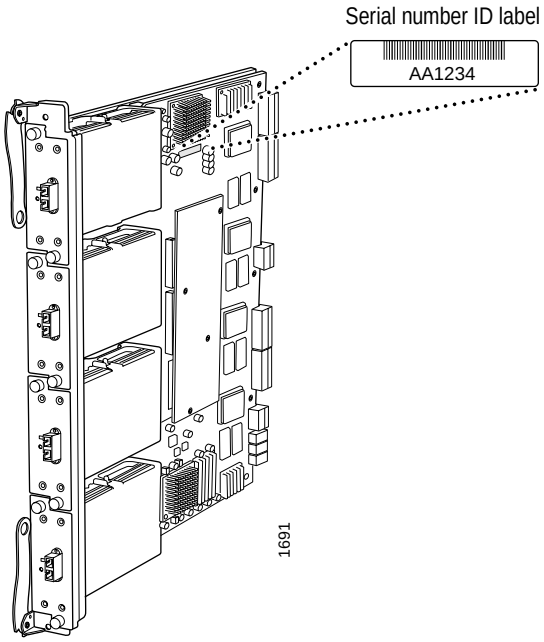
M40 router—With the FPC in vertical position, look on the back left side of the FPC (see Figure 60).

Figure 60: M40 Router FPC Serial Number ID Label



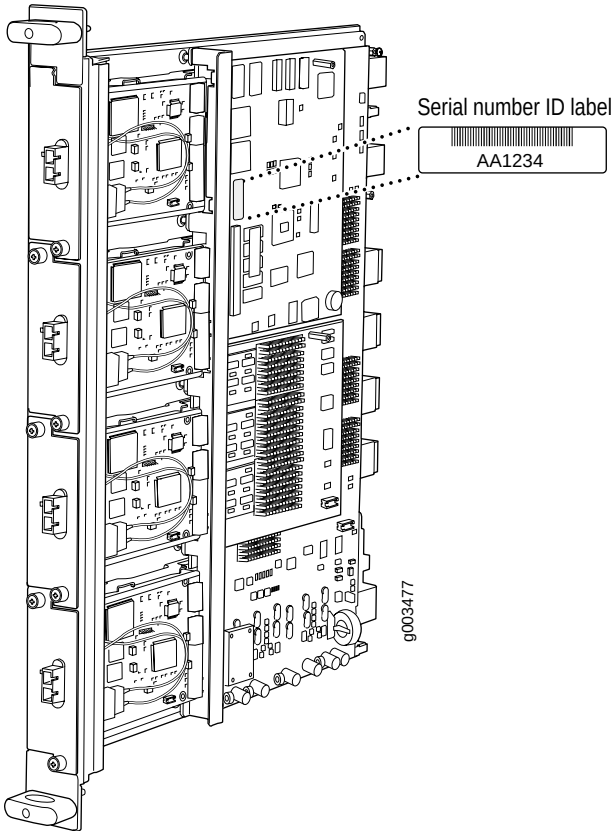
M40e and M160 routers—With the FPC in vertical position, look on the center right side of the FPC (see Figure 61).

Figure 61: M40e and M160 Router FPC Serial Number ID Label



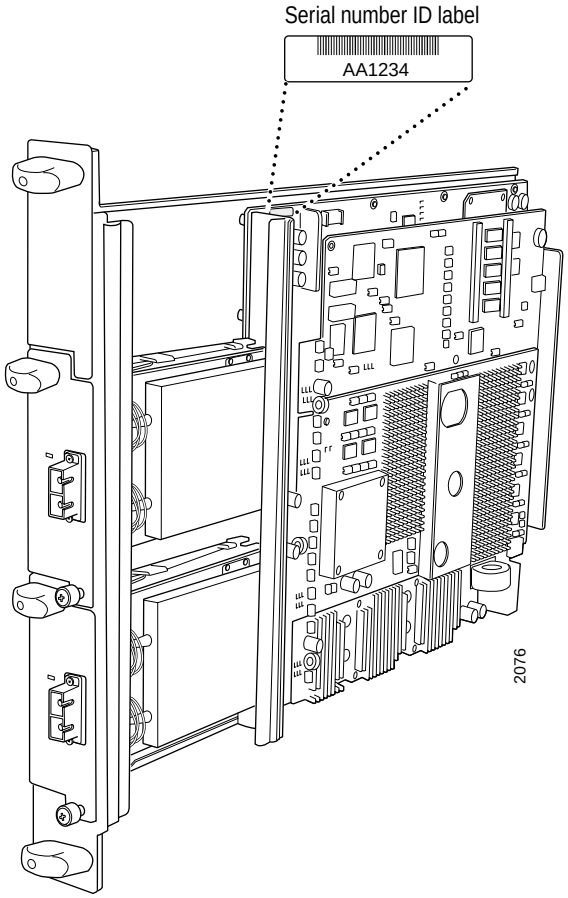
M320 routers—The serial number ID label is located on the center of the right side of the FPC3 (see Figure 62). On an FPC2, the serial number label is located on the top PIC slot.

Figure 62: M320 FPC Serial Number ID Label



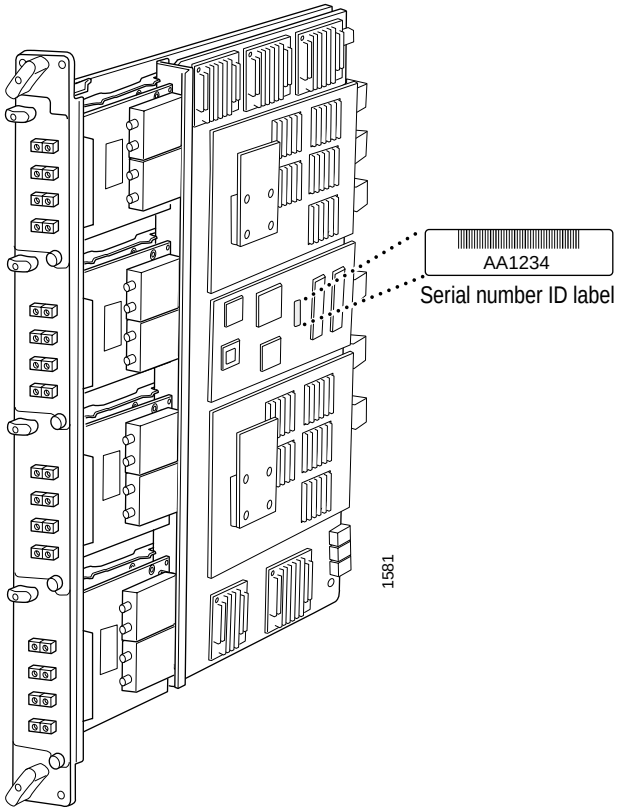
T320 routers—The serial number ID label is located on the center of the right side of the FPC3 (see Figure 63). On an FPC1 and FPC2, the serial number ID label is located near the top PIC slot.

Figure 63: T320 Router FPC Serial Number ID Label



T640 routing nodes— The serial number label is located on the center of the right side of the FPC3 (see Figure 64). On an FPC2, the serial number label is located near the top PIC slot.

Figure 64: T640 Routing Node Serial Number Label



Replacing an FPC

The FPC is hot-removable and hot-insertable. You can remove or replace it without powering down the router and disrupting routing functions. However, you must first take the FPC offline by pressing the FPC offline button on the router craft interface for all router platforms except the M5 and M10 routers.

Action To return a failed FPC, see “Return the Failed Component” on page 86. To replace an FPC, see the appropriate router hardware guide.