Chapter 28

Monitoring the PCG

You monitor the Packet Forwarding Engine Clock Generator (PCG) to ensure that a clocking signal is generated to synchronize the internal M40e and M160 router Packet Forwarding Engine components. (See Table 89.)

Table 89: Checklist for Monitoring the PCG

Monitor PCG Tasks	Command or Action
Understanding the PCG on page 370	
Monitoring the PCG Status on page 371	
1. Monitor the PCG Environmental Status on page 371	show chassis environment show chassis environment pcg
2. Display the PCG LED States at the Command Line on page 372	show chassis craft-interface
3. Look at the PCG LEDs on the Faceplate on page 373	Remove the rear component cover and look on the PCG faceplate at the back of the M40e or M140 router chassis.
Determining PCG Mastership on page 373	
1. Display the PCG Master in the Craft Interface Output on page 373	show chassis craft-interface
2. Look at the PCG LEDs on the Faceplate on page 374	Remove the rear component cover and look on the PCG faceplate at the rear of the M40e or M160 router chassis.
3. Display the Packet Forwarding Engine Current Clock Source on page 374	show chassis clocks
Displaying PCG Alarms on page 375	
1. Display Current PCG Alarms on page 375	show chassis alarms
2. Display PCG Error Messages in the System Log File on page 375	show log messages
3. Display PCG Error Messages in the Chassis Daemon Log File on page 375	show log chassisd
Verifying PCG Failure on page 376	
1. Check the PCG Connection on page 376	Check the thumbscrew on the right side of the PCG.
2. Check the PCG Fuses on page 377	The M40e and M160 router fuses are located in a fuse box at the rear of the midplane, behind the lower rear impeller assembly.

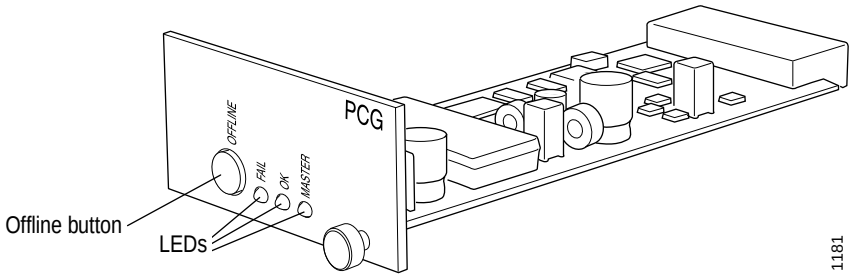
Monitor PCG Tasks	Command or Action
3. Perform a PCG Swap Test on page 378	1. Take the PCG offline. 2. Replace the PCG with one that you know works. 3. Bring the PCG online. 4. Check the PCG status.
Getting PCG Hardware Information on page 378	
1. Display the PCG Hardware Information on page 379	show chassis hardware
2. Locate the PCG Serial Number ID Label on page 379	Look on the top of the PCG, close to the midplane connector.
Replacing the PCG on page 379	See “Return the Failed Component” on page 86, or follow the procedure in the M40e or M160 router hardware guide.

Understanding the PCG

Purpose You monitor the PCGs to ensure that they generate a clock signal to synchronize the modules and application-specific integrated circuits (ASICs) that make up the Packet Forwarding Engine.

What Is a PCG The PCG supplies a 125-MHz system clock to synchronize the modules and ASICs that make up the Packet Forwarding Engine (see Figure 153).

Figure 153: PCG Component



A router has two PCGs. They are located at the rear of the chassis in the slots labeled PCG0 and PCG1, to the right of the Routing Engine slots.

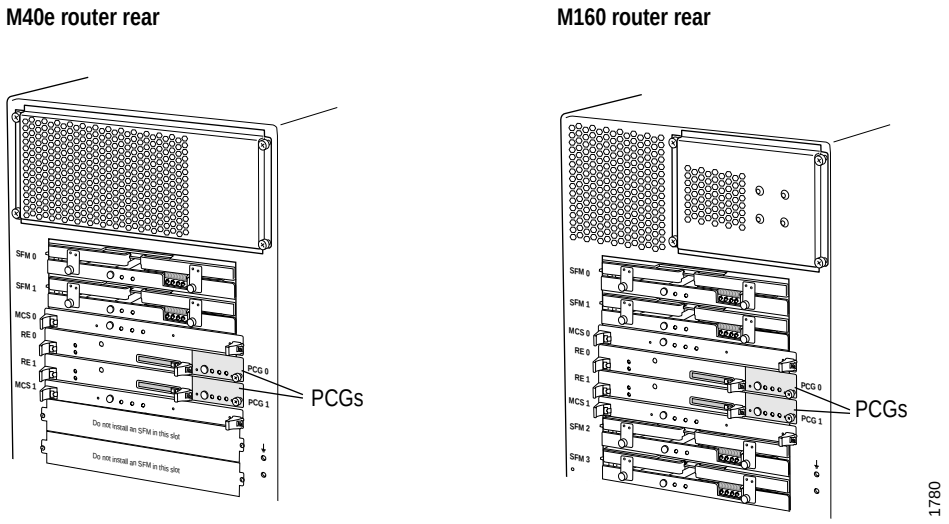
Both PCGs send clock signals to the Packet Forwarding Engine modules, along with a signal indicating which is the master clock source. The master Routing Engine controls which PCG is master and which is backup.

The PCGs are field-replaceable and hot-pluggable. You can remove and replace them without powering down the router; however, the routing functions of the system are interrupted when a PCG is removed.

Removing the backup PCG does not affect the functioning of the router. Taking the master PCG offline causes the Flexible PIC Concentrators (FPCs) and Switching and Forwarding Modules (SFMs) to power down and restart with the other PCG selected as master. The forwarding and routing functions are interrupted during this process.

Figure 154 shows the location of the PCGs on the M40e and M160 router chassis.

Figure 154: M40e and M160 Router PCG Location



Monitoring the PCG Status

Steps To Take To monitor the PCG status, follow these steps:

1. Monitor the PCG Environmental Status on page 371
2. Display the PCG LED States at the Command Line on page 372
3. Look at the PCG LEDs on the Faceplate on page 373

Step 1: Monitor the PCG Environmental Status

Action To monitor the PCG environment status, use the following JUNOS software command-line interface (CLI) command:

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

Sample Output

```
user@host> show chassis environment
Class Item              Status     Measurement
Power PEM 0             OK
    PEM 1               OK
Temp  PCG 0             OK         41 degrees C / 105 degrees F
    PCG 1               OK         39 degrees C / 102 degrees F
[...Output truncated...]
```

What It Means The command output displays the status and temperature for each PCG.

Alternative Action If there is a problem with the PCG status, you can display more detailed PCG environmental information with the following CLI command:

user@host> **show chassis environment pcg**

The command output is as follows:

```
user@host> show chassis environment pcg
PCG 0 status:
  State                  Online - PFE clock source
  Temperature              41 degrees C / 105 degrees F
  Frequency:
    Setting              125.00 MHz
    Measurement            125.03 MHz
  Power:
    3.3 V                3266 mV
    5.0 V bias             4981 mV
    8.0 V bias             8168 mV
  CMB Revision               12
PCG 1 status:
  State                  Online
  Temperature              39 degrees C / 102 degrees F
  Frequency:
    Setting              125.00 MHz
    Measurement            125.03 MHz
  Power:
    3.3 V                3271 mV
    5.0 V bias             4971 mV
    8.0 V bias             8175 mV
  CMB Revision               12
```

The command output displays the status for each PCG slot 0 and 1. The operating status can be Present, Online, Offline, or Empty. If Online, it can be the current PFE clock source or backup. The command output displays the temperature of the air flowing past the PCG and the frequency setting and measurement for the PCG. The command output also displays information about the PCG power supplies and the revision level of the chassis management bus (CMB) slave.

Step 2: Display the PCG LED States at the Command Line

Action To display the PCG LED states, use the following CLI command:

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

Sample Output

```
user@host> show chassis craft-interface
[...Output truncated...]
PCG LEDs:
  PCG  0   1
--------------
Amber  .   .
Green  *   *
Blue   *   .

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

What It Means The command output is for an M160 router. The PCGs in slots 0 and 1 are online and are functioning normally. The status colors represent the possible PCG operating states: Amber (Fail), Green (OK), and Blue (Master). The (*) indicates the current operating state.

Step 3: Look at the PCG LEDs on the Faceplate

Action To view the PCG LEDs, remove the rear component cover and look on the PCG faceplate at the rear of the M40e or M160 router chassis (see Figure 153 on page 370 and Figure 154 on page 371). Table 90 describes the functions of these LEDs.

Table 90: PCG LEDs

Color	Label	State	Description
Blue	MASTER	On steadily	PCG is master.
Green	OK	On steadily	PCG is operating normally.
		Blinking	PCG is starting up.
Amber	FAIL	On steadily	PCG has failed.

Determining PCG Mastership

The PCGs function as redundant components. For information about monitoring redundant PCGs, see “Monitoring Redundant PCGs” on page 595.

Steps To Take To determine which PCG is operating as the master, follow these steps:

1. Display the PCG Master in the Craft Interface Output on page 373
2. Look at the PCG LEDs on the Faceplate on page 374
3. Display the Packet Forwarding Engine Current Clock Source on page 374

Step 1: Display the PCG Master in the Craft Interface Output

Action To determine the PCG master from the craft interface status information, use the following CLI command:

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

Sample Output

```
user@host> show chassis craft-interface
[...Output truncated...]
PCG LEDs:
  PCG  0   1
---------------
Amber  .   .
Green  *   *
Blue   *   .

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

What It Means The command output shows that PCG 0 is the master because the blue MASTER LED is on.

Step 2: Look at the PCG LEDs on the Faceplate

Action To check the PCG LEDs, look on the PCG faceplate at the rear of the M40e or M160 router chassis (see Figure 153 on page 370 and Figure 154 on page 371). Table 90 describes the PCG LED states. If the blue MASTER LED on the PCG faceplate is on steadily, the PCG is functioning as master.

Step 3: Display the Packet Forwarding Engine Current Clock Source

The Packet Forwarding Engine current clock source is the master PCG.

Action To display the PCG master from the Packet Forwarding Engine clock source output, use the following CLI command:

```
user@host> show chassis clocks
```

Sample Output

```
user@host> show chassis clocks
PFE clock status:
  Current source          PCG 0
  Measured frequency      125.03 MHz
Reference clock status:
  Current source          Primary
  Primary source          Internal
  Secondary source        Internal
  Tertiary source         Internal
  Rollover algorithm      Holdover
  PLL mode                Free-running
  PLL errors              0
  Sync message current    0x00
  Sync message normal     0x00
  Sync message override   0x00
```

What It Means The command output shows that the PCG in slot 0 is the primary clock source.

Displaying PCG Alarms

Steps To Take To display PCG alarms and error messages, follow these steps:

1. Display Current PCG Alarms on page 375
2. Display PCG Error Messages in the System Log File on page 375
3. Display PCG Error Messages in the Chassis Daemon Log File on page 375

Step 1: Display Current PCG Alarms

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

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

Sample Output

```
user@host> show chassis alarms
2 alarms currently active
Alarm time               Class  Description
2002-06-11 20:30:29 PDT  Minor PCG 0 Not Online
2002-06-11 20:30:32 PDT  Minor No PCGs Online
```

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

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

Action To display the PCG error messages in the system log file, use the following CLI command:

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

Sample Output

```
user@host> show log messages
Jun 11 20:31:31 myrouter chassisd[553]: CHASSISD_NO_GOOD_PCGS:
```

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. You can also use the show log messages | match pcgs command to see error messages that are generated when a PCG fails or is offline. Use this information to diagnose a problem and to let the Juniper Networks Technical Assistance Center (JTAC) know what error messages were generated and the router events that occurred before and after the problem. For more information about system log messages, see the *JUNOS System Log Messages Reference*.

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

Action To display the PCG error messages in the chassis daemon (chassisd) log file, use the following CLI command:

```
user@host> show log chassisd
```

Sample Output

```
user@host> show log chassisd
Jun 11 20:31:17 FPC 7 - Disable Power [addr 0x17 cmd 0x10]
Jun 11 20:31:17 CMB readback FPC 7 [0xf7, 0xf2] -> 0x26
Jun 11 20:31:17 power disable verified, FPC 7
Jun 11 20:31:17 CHASSISD_IFDEV_DETACH: ifdev_detach(7)
Jun 11 20:31:17 ifd so-7/0/0 marked as gone
Jun 11 20:31:19 PCG 0 set alarm 0x3
Jun 11 20:31:19 alarm op fru 1 op 1 reason 3
Jun 11 20:31:19 send: yellow alarm set, class 100 obj 110 reason 3
Jun 11 20:31:19 CMB cmd to PCG 0 [0xe2], Disable Power [0x10]
Jun 11 20:31:19 PCG 0 - Disable Power [addr 0x2 cmd 0x10]
Jun 11 20:31:19 CMB readback PCG 0 [0xe2, 0xf2] -> 0x6
Jun 11 20:31:19 power disable verified, PCG 0
Jun 11 20:31:19 CMB cmd to PCG 0 [0xe2], Blue LED Off [0x16]
Jun 11 20:31:19 PCG 0 - Blue LED Off
Jun 11 20:31:19 CMB cmd to PCG 0 [0xe2], Green LED Off [0x1a]
Jun 11 20:31:19 PCG 0 - Green LED Off
Jun 11 20:31:19 CMB cmd to PCG 0 [0xe2], Amber LED Off [0x18]
Jun 11 20:31:19 PCG 0 - Amber LED Off
Jun 11 20:31:19 mcs_intr_handler fpm_mcsfd 10
Jun 11 20:31:19 mcs_intr mcs_ints_pending 0x7cbf20 button_status 0x0
Jun 11 20:31:19 bp_handle_button_intr button status 0x0
Jun 11 20:31:21 reading FPC 0 initial state
Jun 11 20:31:21 CMB readback FPC 0 [0xf0, 0xff] -> 0xc
Jun 11 20:31:21 reading FPC 0 ideeprom
Jun 11 20:31:21 reading FPC 1 initial state
Jun 11 20:31:21 CMB readback FPC 1 [0xf1, 0xff] -> 0xc
Jun 11 20:31:21 reading FPC 1 ideeprom
Jun 11 20:31:21 reading FPC 2 initial state
Jun 11 20:31:21 CMB readback FPC 2 [0xf2, 0xff] -> 0xc
Jun 11 20:31:21 reading FPC 2 ideeprom
Jun 11 20:31:21 reading FPC 6 initial state
Jun 11 20:31:21 CMB readback FPC 6 [0xf6, 0xff] -> 0xc
Jun 11 20:31:21 reading FPC 6 ideeprom
Jun 11 20:31:21 reading FPC 7 initial state
Jun 11 20:31:21 CMB readback FPC 7 [0xf7, 0xff] -> 0xc
Jun 11 20:31:21 reading FPC 7 ideeprom
Jun 11 20:31:21 gen_sfm_wait_mask 0x0
Jun 11 20:31:21 ...power sequencer started...
```

What It Means The chassisd database 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.

Verifying PCG Failure

Steps To Take To verify PCG failure, follow these steps:

1. Check the PCG Connection on page 376
2. Perform a PCG Swap Test on page 378

Step 1: Check the PCG Connection

Action To check the PCG connection, make sure the PCG is properly seated in the midplane. Check the thumbscrew on the right side of the PCG.

Step 2: Check the PCG Fuses

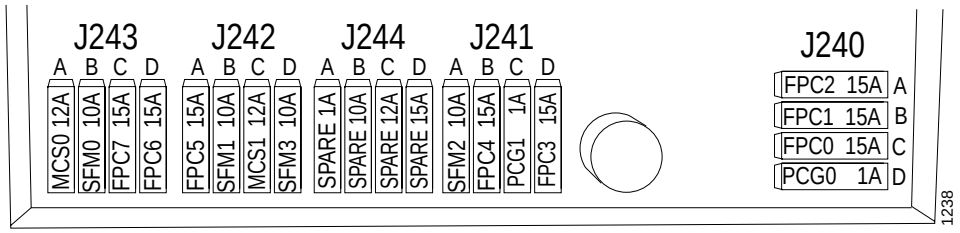
Action Check the PCG fuses to check for failure.

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 router hardware guide.

When the fuse for an PCG blows, the PCG 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. See Figure 155.

Figure 155: M40e and M160 Router Fuses



Another indication that a fuse has blown is that 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.

Step 3: Perform a PCG Swap Test

CAUTION: Before performing a swap test, always check for bent pins in the midplane and check the PCG 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 a PCG, follow these steps:

1. Have an antistatic mat ready.
2. Attach an electrostatic discharge (ESD) wrist strap to your bare wrist, and connect the wrist strap to one of the two ESD points on the chassis.
3. Remove the rear component cover by loosening the screws on the corners of the cover and pulling it straight out from the chassis.
4. Press the offline button on the faceplate of the PCG and hold it down until the Red FAIL LED lights (about 3 seconds).
5. Loosen the thumbscrew on the right side of the PCG.
6. Grasp the thumbscrew and slide out the PCG.
7. Align the rear of the PCG with the guides inside the chassis.
8. Slide the PCG all the way into the card cage until it contacts the midplane.
9. Tighten the thumbscrew on the right side of the PCG faceplate.
10. Verify that the PCG is properly installed by looking at the LEDs on the PCG faceplate. The green OK LED should light steadily.

Getting PCG Hardware Information

Steps To Take To get the PCG hardware information, follow these steps:

1. Display the PCG Hardware Information on page 379
2. Locate the PCG Serial Number ID Label on page 379

Step 1: Display the PCG Hardware Information

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

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

Sample Output

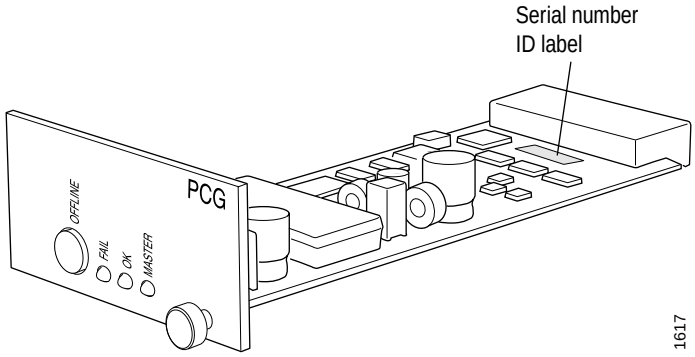
```
user@host> show chassis hardware
Hardware inventory:
Item          Version  Part number  Serial number     Description
Chassis                                20079           M160
Midplane      REV 03   710-001245   AB4132
FPM CMB       REV 02   710-001642   AB3264
FPM Display   REV 02   710-001647   AB3046
CIP           REV 04   710-001593   AB3284
PEM 0         Rev 03   740-001243   KM28409          DC
PEM 1         Rev 03   740-001243   KM13359          DC
PCG 0         REV 02   710-001568   AB3013
PCG 1         REV 02   710-001568   AB3000
```

What It Means The command output displays the PCG slot number, revision level, part number, and serial number.

Step 2: Locate the PCG Serial Number ID Label

Action To locate the PCG serial number ID label, look on the top of the PCG, close to the midplane connector. See Figure 156.

Figure 156: PCG Serial Number ID Label



Replacing the PCG

The PCGs are hot-pluggable. You can remove and replace them without powering down the router, but the routing functions of the system are interrupted when the PCG is removed.

If both PCGs are installed and functioning normally, PCG0 is the master PCG and PCG1 is the backup by default.

Removing the backup PCG does not affect the functioning of the router. Taking the master PCG offline causes the FPCs and SFMs to power down and restart, with the other PCG selected as master. The forwarding and routing functions are interrupted during this process.

Action To replace a PCG, see “Return the Failed Component” on page 86, or the procedure to return a field-replaceable unit in the M40e or M160 router hardware guide.