Chapter 45

# Monitoring Redundant PCGs

You monitor redundant Packet Forwarding Engine clock generators (PCGs) to ensure that a clocking signal is generated to synchronize the internal M40e and M160 router Packet Forwarding Engine components. (See Table 125.)

**Table 125: Checklist for Monitoring Redundant PCGs**

| Monitor Redundant PCG Tasks | Command or Action |
|---|---|
| **Understanding Redundant PCGs on page 596** | |
| **Displaying Redundant PCG Hardware Information on page 597** | show chassis hardware |
| **Monitoring Redundant PCG Status on page 597** | |
| 1. Monitor the Redundant PCG Environmental Status on page 597 | show chassis environment<br>show chassis environment pcg |
| 2. Display the Redundant PCG Status from the Craft Interface on page 598 | show chassis craft-interface |
| 3. Check the PCG LED Status on the Faceplate on page 599 | Remove the rear component cover and look on the PCG faceplate at the back of the M40e or M160 router chassis. |
| **Determining Redundant PCG Mastership on page 599** | |
| 1. Display the PCG Master from the Craft Interface on page 599 | show chassis craft-interface |
| 2. Check the PCG LEDs on the Faceplate on page 600 | 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 600 | show chassis clocks |
| **Displaying PCG Failure Alarms on page 600** | show chassis alarms |
| **Replacing a PCG on page 601** | See “Return the Failed Component” on page 86, or follow the procedure in the M40e or M160 router hardware guide. |
| **Bringing the Replaced PCG Online on page 602** | request chassis pcg slot *slot-number* online |
| **Verifying That the Replaced PCG Is Online on page 602** | |
| 1. Display the Replaced PCG Environmental Status on page 602 | show chassis environment pcg |
| 2. Display PCG Messages in the System Log File on page 603 | show log messages \| match PCG |
| 3. Display PCG Error Messages in the Chassis Daemon Log File on page 603 | show log chassisd \| match PCG |

**See Also** Monitoring the PCG on page 369

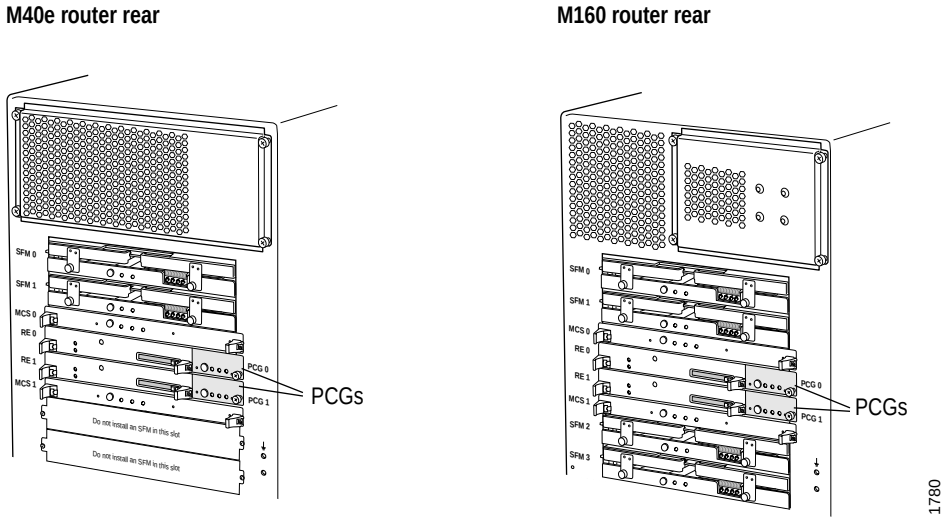
## Understanding Redundant PCGs

**Purpose** You monitor redundant 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 Are Redundant PCGs** Redundant PCGs are two PCGs installed in a router. The PCG supplies a 125-MHz system clock to synchronize the modules and ASICs that make up the Packet Forwarding Engine.

The M40e and M160 routers have two PCGs located at the rear of the chassis in the slots labeled PCG0 and PCG1, to the right of the Routing Engine slots (see Figure 230).

**Figure 230: M40e and M160 Router PCG Location**




During normal operation, both PCGs generate a 125-MHz clock signal to the Packet Forwarding Engine modules, along with a signal indicating which is the master clock source. One PCG is designated as the master. The master Routing Engine controls which PCG is master and which is backup.

The modules and ASICs in the Packet Forwarding Engine that use the clock signal to gate packet processing use only the signal from the master PCG.

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

If the master PCG fails or you remove it from the chassis, the Packet Forwarding Engine resets so that the components start using the signal from the other PCG (which becomes the master). Packet forwarding halts while there is no clock signal because the Packet Forwarding Engine does not accept incoming packets. If the backup PCG fails or is removed, router function is not affected.

## Displaying Redundant PCG Hardware Information

**Action** To display redundant PCG hardware information, use the following JUNOS software command-line interface (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
[...Output truncated...]
```

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

## Monitoring Redundant PCG Status

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

1. Monitor the Redundant PCG Environmental Status on page 597
2. Display the Redundant PCG Status from the Craft Interface on page 598
3. Check the PCG LED Status on the Faceplate on page 599

### *Step 1: Monitor the Redundant PCG Environmental Status*

**Action** To monitor the PCG environment status, use the following 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 slot number, status, and temperature of 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:

```
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. The operating status can be Present, Online, Offline, or Empty. If Online, it can be the current PFE clock source (master) 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 Redundant PCG Status from the Craft Interface*

**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: Check the PCG LED Status on the Faceplate*

**Action** To check the PCG LEDs, remove the rear component cover and look on the PCG faceplate at the rear of the M40e or M160 router chassis.

Table 126 describes the functions of these LEDs.

**Table 126: 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 Redundant PCG Mastership

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

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

1. Display the PCG Master from the Craft Interface on page 599
2. Check the PCG LEDs on the Faceplate on page 600
3. Display the Packet Forwarding Engine Current Clock Source on page 600

### *Step 1: Display the PCG Master from the Craft Interface*

**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 PCG0 is the master because the blue MASTER LED is on.

### *Step 2: Check 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. Table 126 on page 599 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 or master.

## Displaying PCG Failure 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.

## Replacing a PCG

The PCGs are hot-pluggable. You can remove and replace them without powering down the router; however, 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 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.

**Action** To remove and replace a PCG, follow these steps:

1. Lay an electrostatic bag or antistatic mat on a flat, stable surface to receive the PCG.
2. Attach an electrostatic discharge (ESD) strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
3. Remove the rear component cover by loosening the screws at the corners of the cover and pulling it straight off of the chassis.
4. Press and hold the offline button on the PCG faceplate until the amber LED labeled FAIL lights, which takes about 3 seconds.

   If you are removing the master PCG, forwarding halts while the Packet Forwarding Engine resets so that the components start using the clock signal from the other PCG, which becomes the master.
5. Loosen the mounting screw on the right edge of the PCG faceplate, using a Phillips screwdriver if necessary.
6. Grasp the screw and slide the PCG about halfway out of the chassis.

**CAUTION:** Be careful to slide the PCG straight out of the chassis to avoid bending any of the pins on the underside of the board.

7. Place one hand under the PCG to support it, slide it completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.
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.
11. Reinstall the rear component cover and tighten the thumbscrews on the corners of the cover to secure it to the chassis.

## Bringing the Replaced PCG Online

**Action** To bring the replaced PCG online, use the following CLI command:

user@host> **request chassis pcg slot** *slot-number* **online**

**Sample Output**
```
user@host> request chassis pcg slot 0 online
Online initiated, use ‘show chassis environment pcg” to verify
```

**What It Means** The PCG in slot 0 is brought online.

## Verifying That the Replaced PCG Is Online

**Steps To Take** To verify that the replaced PCG is online, follow these steps:

1. Display the Replaced PCG Environmental Status on page 602
2. Display PCG Messages in the System Log File on page 603
3. Display PCG Error Messages in the Chassis Daemon Log File on page 603

### *Step 1: Display the Replaced PCG Environmental Status*

**Action** To verify that the replaced PCG is online, use the following CLI command:

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

**Sample Output**
```
user@host> show chassis environment pcg
PCG 0 status:
  State                  Online
  Temperature            30 degrees C / 86 degrees F
  Frequency:
    Setting              125.00 MHz
    Measurement          125.01 MHz
  Power:
    3.3 V                3278 mV
    5.0 V bias           4986 mV
    8.0 V bias           8222 mV
  CMB Revision           12
PCG 1 status:
  State                  Online - PFE clock source
  Temperature            43 degrees C / 109 degrees F
  Frequency:
    Setting              125.00 MHz
    Measurement          124.95 MHz
  Power:
    3.3 V                3269 mV
    5.0 V bias           4991 mV
    8.0 V bias           8222 mV
  CMB Revision           12
```

**What It Means** When the replaced PCG is brought online, it does not automatically become master. It remains as the backup PCG until the master PCG fails, or you manually switch it to master by using the request chassis pcg online slot 1 CLI command.

### *Step 2: Display PCG Messages in the System Log File*

**Action** To display the PCG error messages in the system log file to verify that a replaced PCG is online, use the following CLI command:

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

**Sample Output**

```
user@host> show log messages | match PCG
Aug 27 15:20:52 myrouter craftd[563]: Minor alarm cleared, PCG 0 Not Online
Aug 27 15:20:52 myrouter alarmd[562]: Alarm cleared: PCG color=YELLOW,
class=CHASSIS, reason=PCG 0 Not Online
```

**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 pcg 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 and verify that a replaced PCG is online, use the following CLI command:

```
user@host> show log chassisd | match PCG
```

**Sample Output**

```
user@host> show log chassisd | match PCG
Aug 27 15:20:51 PCG 0 power verified on in 16 ms
Aug 27 15:20:52 reading PCG 0 initial state
Aug 27 15:20:52 CMB readback PCG 0 [0xe2, 0xff] -> 0xc
Aug 27 15:20:52 reading PCG 0 ideeprom
Aug 27 15:20:52 CMB cmd to PCG 0 [0xe2], Green LED On [0x1b]
Aug 27 15:20:52 PCG 0 - Green LED On
Aug 27 15:20:52 PCG 0 clear alarm 0x3
Aug 27 15:20:52 alarm op fru 1 op 0 reason 3
Aug 27 15:20:52 send: yellow alarm clear, class 100 obj 110 reason 3.
```

**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.