



Managing Performance

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Note

[Performance Data](#) contains field descriptions for each PM table.

What Is Performance Management?

Performance management (PM) in a network is the configuration and measurement of network traffic for the purpose of providing a consistent and predictable level of service. PM involves monitoring the network activity and adjusting the design or the configuration of the network to improve its performance and traffic handling. PM provides network and system performance reporting for determining acute and chronic problems, service level reporting, and performance optimization.

Measuring performance can identify:

- Normal baseline network performance, which can then be compared to abnormal network behavior
- Current or potential utilization problems
- Slow response time
- Application, server, and network availability
- Optimum data transfer times

Performance data is useful for capacity reporting when drafting budgets or considering network redesigns. It can be used to identify congestion and trouble areas in the network that need to be relieved, either through additional equipment or through network reconfiguration. It can also be used to identify devices that are being underutilized or have available chassis slots.

Performance measurement includes:

- Performance monitoring—The collection of performance-related data from network devices. This data is useful for fine-tuning the performance of the device and for monitoring potentially service-affecting problems.

- Performance reporting—The presentation of the collected data, which can then be used to analyze faults, growth, and capacity of the network.

You can set thresholds on the reported performance data. These thresholds generate events that can be used in performance and fault management.

The PM process is as follows:

1. Gather network data and statistics
2. Analyze network performance and identify critical issues
3. Optimize network performance
4. Plan customer capacity
5. Plan network capacity

What Performance Data is Available?

The following areas of performance are useful for measurement:

- Availability—The amount of time for which a network system or application is available to the user. From a network perspective, availability is the reliability of the individual components in the network. Accurately measuring availability of a distributed network is difficult and not very practical.
- Response time—The time required for traffic to travel between two points, typically measured for a round trip; the time that the packet takes to reach its destination and for a response to return to the sender. Response time is the best measure of how users perceive the network's performance.
- Accuracy—The amount of interface traffic that does not result in error. Accuracy can be expressed in terms of a percentage that compares the success rate to the total packet rate over a period of time. A decreased accuracy rate should be used to trigger a closer investigation of the network.
- Utilization—Measures the use of a particular resource over time. Utilization is usually expressed as a percentage of a resource's maximum operational capacity. It can be used to identify congestion or potential congestion throughout the network, as well as underutilized resources. Sudden jumps in resource utilization can indicate a fault condition.

Cisco Prime Optical provides the following wizards to query PM data:

- PM Query by NE Model (for non-CTC-based NE models only)
- PM Query by Category



Note

PM data collection is not available for the ONS 15216.



Note

Make sure that the NE and the Prime Optical server are synchronized. The NE generates PM statistics at 15-minute or 1-day intervals. The server collects 1-day PM data at 00:00 Greenwich Mean Time (GMT), regardless of the NE time or its time zone.



Note

When configuring PM data collection, enable it for an NE on only one Prime Optical server. CTC-based NEs do not support simultaneous sessions on HTTP for bulk PM data collection. If you enable PM data collection on multiple Prime Optical servers, one of the servers might go down with the following error

messages:

```
Server Error: 503 Service Unavailable  
Operating System Error Nr:3997698: S_objLib_OBJ_UNAVAILABLE  
Too many concurrent PM downloads
```

**Note**

An alarm is generated for every piece of lost PM data for CTC-based NEs. A PM lost alarm (15 minutes or 1 day) is generated when Prime Optical cannot collect PM data for 15 minutes or for 1 day when the NEs PM data collection is set to either 15 Min Robust or 1 Day Robust. If there are outstanding PM Retrieval Fail alarms, these alarms are cleared and the PM lost alarm is generated.

How is Performance Data Collected?

Performance data collection is the process of collecting performance-related data from network devices and storing them in a database or data file. This information can then be used for locating, diagnosing, and correcting network problems to increase network reliability and effectiveness, and to ensure that fault management can be more than just handling emergencies. The data can also be used to increase the productivity of network users. There are two methods of collecting performance data:

- **Active polling**—Involves actively obtaining specific management data from network devices. The collected data is then stored in a database and used later for reporting. The advantage of active polling is that as long as a managed device is accessible, data is collected and stored at regular intervals. A disadvantage is that collecting large amounts of data can impact the performance of the managed device or the network. Also, reports might take a long time to generate.
- **Event reporting**—A managed device or agent generates a trap or event that is received and logged. This method requires that events be generated based only on thresholds, and the EMS assumes that the lack of an event indicates that the item being measured is performing within acceptable ranges. The advantage here is that the potential impact to the network is lessened. The disadvantages of event reporting are that traps are unreliable and you might not be able to determine the start or stop of an event. It can also be difficult to determine the duration and frequency of an event.

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- [Activating or Deactivating Performance Monitoring, page 10-8](#)
- [Enabling or Disabling PM Data Collection on an Individual NE, page 10-9](#)
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Viewing Performance Monitoring for an NE

To view PM data for an NE, you must first collect the data. To collect the PM data, you need to activate the PM service for your NE and then enable PM collection on that NE. The PM service can be activated either before or after the PM collection is enabled on the NE(s). The PM data is not available until both operations are completed and the first PM collection occurs.

Enabling Performance Monitoring

Performance monitoring is optional, but you must enable it if you want to monitor threshold alarms and performance parameters.

Performance monitoring can be enabled on NEs by using the device CLI. For information about using the CLI, see the relevant hardware documentation.



Note

PM data collection is resource intensive in terms of CPU, disk space, and DCN utilization, so you should exercise proper planning and resource monitoring for PM data collection.


Understanding the PM Service Pane

Use the **PM Service** pane (**Administration > Control Panel**) to activate or deactivate global PM data collection and change NE PM data collection parameters. When you click **Save** to save your change, the change takes effect immediately.

Table 10-1 Field Descriptions for the PM Service Pane

Field	Description
PM Data Storage	PM data storage status. If set to Normal, all performance data collected is displayed in the PM data tables. If set to Optimized, performance data with all zero values and performance data with all invalid flags are not displayed and are not stored in the database.
Robust PM Collection Queue	Number of 15-minute and 1-day outstanding robust PM registers. Click Clear Robust PM Queue to clear the queue.
PM 15-Min Retrieval Fail Alarm	Enable or disable a retrieval fail alarm for 15-minute PM data. Check the Enable check box; then, enter the number of seconds between each retry, and enter the number of retries to attempt before the alarm is generated.

Table 10-1 Field Descriptions for the PM Service Pane (continued)

Field	Description
PM 1-Day Retrieval Fail Alarm	Enable or disable a retrieval fail alarm for 1-day PM data. Check the Enable check box; then, enter the number of minutes between each retry, and enter the number of retries to attempt before the alarm is generated.
Real-Time PM Performance Parameters	<p>When a real-time PM session is running, it polls the NE for x number of attributes every 10 to 900 seconds. The data it returns is stored entirely in transient memory. Use the following fields to limit the scope of the real-time PM session:</p> <ul style="list-style-type: none"> • Maximum number of concurrent real-time PM sessions—Specify the maximum number of concurrent real-time PM sessions allowed per client. The range is from 1 to 5 sessions; the Cisco default is 5. • Maximum number of polled real-time PM objects—Specify the maximum number of objects that can be polled in a single real-time PM session. The range is from 1 to 100 objects; the Cisco default is 100. • Maximum number of rows held in cache—Specify the maximum number of rows that can be held in the real-time memory buffer per session. When this limit is reached, the oldest rows are removed from the buffer to make room for new rows. The range is from 100 to 5000 rows; the Cisco default is 1000. <p> Note Depending on the PM table launch selection criteria, the number of rows displayed might be less than the maximum number of rows specified.</p>

Understanding the Individual PM Service Panes

The **PM Service** properties pane (**Administration > Control Panel > PM Service**) displays information about the status of performance monitoring for the selected NE. You can also stop or start an individual PM service instance. The individual **PM service** panes are broken down by NE:

- ONS 15305
- CTC-Based PM Service Panes
 - ONS 15310 CL/ONS 15310 MA/ONS 15327/ONS 15454/CPT 600/CPT 200
 - ONS 15310 MA SDH/ONS 15454 SDH/CPT 600 SDH/CPT 200 SDH
 - ONS 15600
 - ONS 15600 SDH
 - CRS

ONS 15305

The **ONS 15305 PM Service** pane displays ONS 15305 NE PM service information. [Table 10-2](#) provides the descriptions.

Table 10-2 Field Descriptions for the ONS 15305 PM Service Pane

Field	Description
Status Tab	
Service Status	Current status of the service: Active or Not Active.
Service Action	Stops or starts a process. Notice that the Service Action button toggles between Activate and Deactivate, and that the Service Status field changes accordingly.
Threshold	Number of NEs that will be serviced by one instance of the PM service.
Debug Tab	
Overall Logging	Click the Enable radio button to enable overall debugging and to select debug modules for the PM service. Click the Disable radio button to disable overall debugging.
Debug Modules	If overall logging is enabled, lists the modules that can be used for debugging. Select a module from the Available list; then, click the Add button to add the module to the Selected list. Use the Remove button to return the module to the Available list. Debug logging will be performed on the modules in the Selected list.
PM Service Instance	
Start Service Instance, Stop Service Instance	Allows you to stop or start an individual PM service instance. If you click Start Service Instance , the service status changes to <i>Running</i> . If you click Stop Service Instance , the status changes to <i>Stopped</i> .
Dump Cache	Click the Dump Cache button to export the PM service cache to the log file related to the selected PM service instance.
Debug Table	Click the Debug Table button to open the Prime Optical NE Module Level Debug Table window, which displays the debug state of the selected NEs and lists the modules for which debugging is active.
Overall Logging for the Instance	Click the Disable button to disable overall logging for the PM service instance.
Managed NEs	The list of managed NEs shows which NEs are currently being managed by the selected service instance. If you stop the specified service instance, the NEs in the list are no longer managed.

CTC-Based PM Collection Parameters

The **CRS-Based PM Collection Parameters** displays the PM service information. The following table provides descriptions.

Table 10-3 Field Descriptions for the CTC-Based PM Collection Parameters

Field	Description
PM Collection Parameters Tab	
DS1 PM Collection	Enable or disable DS1 PM data collection.
DS3 PM Collection	Enable or disable DS3 PM data collection.
Physical/Section/Line PM Collection	Enable or disable physical, section, and line PM data collection on OC-N cards.
STS PM Collection	Enable or disable SONET STS Path PM data collection.
VT PM Collection	Enable or disable SONET VT Path PM data collection.
Data PM Collection	Enable or disable data (Ethernet, POS, SAN, 8B10B) PM data collection.

Table 10-3 Field Descriptions for the CTC-Based PM Collection Parameters (continued)

Field	Description
Physical/OTN/Encryption PM Collection	Enable or disable physical, OTN G.709 Section, OTN G.709 Path, OTN FEC PM, and Encryption PM data collection on DWDM cards.
SNMP PM Collection	Enable or disable CoS PM data collection.
E1 PM Collection	Enable or disable E1 PM data collection.
E3 PM Collection	Enable or disable E3 PM data collection.
E4 PM Collection	Enable or disable E4 PM data collection.
DS3I PM Collection	Enable or disable DS3I PM data collection.
High Order PM Collection	Enable or disable high order PM data collection.
Low Order PM Collection	Enable or disable low order (VC-3, VC-11, and VC-12) PM data collection.
Physical/Section PM Collection	Enable or disable physical or section (regenerator section [RS] and multiplex section [MS]) PM data collection on STM-N cards.
Status Tab	
Service Status	Current status of the service: Active or Not Active.
Service Action	Stops or starts a process. Notice that the Service Action button toggles between Activate and Deactivate, and that the Service Status field changes accordingly.
Threshold	Number of NEs that will be serviced by one instance of the PM service. Note Starting with CTM R9.2, one instance of the PM service can handle up to 2000 NEs.
BLSR-Ring Switch Interval	Allows you to set the BLSR switch interval, in seconds. The Cisco default is 60 seconds.
TL1 Tunnel Connection Timeout	Allows you to set the time it takes to set up a TL1 tunnel connection between the Prime Optical server and the tunneled NE (TNE). When a new NE is added using the Add NE wizard, you can connect to the new NE using a TL1 tunnel. The Prime Optical server establishes a TCP/IP connection to a non-Cisco GNE (NGNE), and the NGNE establishes an OSI connection to the TNE. If the Prime Optical server cannot set up the TL1 tunnel connection before the specified TL1 tunnel connection timeout, the Add NE operation fails and the TNE connection state becomes unavailable.
Audit Trail Collection Interval	Allows you to set the audit trail collection interval, in minutes.
L2 Service Resync Delay	Allows you to configure the delay after which Prime Optical performs a Cisco IOS configuration synchronization on ML cards to keep the NE and the Prime Optical Data Provisioning Service synchronized. This operation synchronizes the L2 topology. Full Cisco IOS configuration synchronization is performed automatically by Prime Optical to keep the NE and the Prime Optical Data Provisioning Service synchronized. Full configuration resynchronization might be delayed depending on Prime Optical server usage. For the Prime Optical server deployed as a monitoring server, the recommended value for the delay parameter is 2 minutes (120 seconds). For the Prime Optical server deployed as a provisioning server, the recommended value for the delay parameter is 10 minutes (600 seconds).
ENEs List Poll Interval	Time interval in which all CTC-based GNEs in Prime Optical need to refresh their list of ENEs. The list of ENEs for each GNE is obtained and compared with the existing ENE list. If there are any changes to the ENE list, topology changes are carried out so that the Domain Explorer will reflect the current topology with correct GNE and ENE icons.
Debug Tab	

Table 10-3 Field Descriptions for the CTC-Based PM Collection Parameters (continued)

Field	Description
Overall Logging	Click the Enable radio button to enable overall debugging and to select debug modules for the PM service. Click the Disable radio button to disable overall debugging.
Debug Modules	If overall logging is enabled, lists the modules that can be used for debugging. Select a module from the Available list; then, click the Add button to add the module to the Selected list. Use the Remove button to return the module to the Available list. Debug logging will be performed on the modules in the Selected list.
PM Service Instance	
Start Service Instance, Stop Service Instance	Allows you to stop or start an individual PM service instance. If you click Start Service Instance , the service status changes to <i>Running</i> . If you click Stop Service Instance , the status changes to <i>Stopped</i> . The list of managed NEs shows which NEs are currently being managed by the selected service instance. If you stop the specified service instance, the NEs in the list are no longer managed.
Dump Cache	Click the Dump Cache button to export the PM service cache to the log file related to the selected PM service instance.
Debug Table	Click the Debug Table button to open the Prime Optical NE Module Level Debug Table window, which displays the debug state of the selected NEs and lists the modules for which debugging is active.
Overall Logging for the Instance	Click the Disable button to disable overall logging for the PM service instance.
Managed NEs	The list of managed NEs shows which NEs are currently being managed by the selected service instance. If you stop the specified service instance, the NEs in the list are no longer managed.

Activating or Deactivating Performance Monitoring

- Step 1** In the **Domain Explorer** window, choose **Administration > Control Panel**.
- Step 2** In the **Control Panel** window, expand **PM Service**.
- Step 3** Select an NE type.
- Step 4** All the NEs monitored by the server stop collecting PM data if you click the **Deactivate** button in the **PM Configuration** tab or **Status** tab > **Service Action** field. (Notice that the service status toggles to *Not Active*.) Click **Activate** to resume PM data collection.



Note If you need to activate or deactivate the PM Service again, go to the **Service Monitor** table (**Administration > Service Monitor** in the **Domain Explorer**) to verify that the service has stopped or started before clicking the **Activate** or **Deactivate** button again.

- Step 5** Ensure that the PM Service has started. In the **Domain Explorer**, choose **Administration > Service Monitor**. The **Service Monitor** table should include an entry for the relevant PM Service.

**Note**

If the PM Service is active and the NE time is changed so that the difference between the Prime Optical server time and the NE time is 30 minutes, the existing PM buckets (for the time stamps corresponding to the next collection interval on the NE, after the time change) collected by Prime Optical are marked as In Maintenance. Prime Optical collects PM buckets again for the same time stamps.

Enabling or Disabling PM Data Collection on an Individual NE

**Note**

See [Selectable Collection of PM Data Parameters, page 2-11](#) for information on setting PM data collection.

- Step 1** In the **Domain Explorer** or **Subnetwork Explorer** tree, select the NE node for which to stop or start PM data collection. The **Network Element Properties** pane opens.
- Step 2** In the **Status** tab > **PM Collection** area, set the PM data collection state. Options vary by NE type:
- 15 Min—Check this box to enable collection of PM data every 15 minutes. Uncheck to disable PM data collection.
 - 1 Day—Check this box to enable collection of PM data every 24 hours. Uncheck to disable PM data collection.
 - 15 Min Robust—Check this box to enable collection of PM data every 15 minutes and attempt to fill in gaps in PM data collection should they occur.
 - 1 Day Robust—Check this box to enable collection of PM data every 24 hours and attempt to fill in gaps in PM data collection should they occur.

**Caution**

If robust PM data collection is enabled, do not set PM data storage to Optimized.

**Note**

- You cannot collect robust PM data until at least one 15-minute or one 1-day interval has been collected in normal operation.
- Robust PM data collection applies only to CTC-based NEs, ONS 15305 NEs and CRS NE (support from CRS 5.13 only). Robust PM data collection is not supported for the ONS 15216.

- Step 3** Click **Save** to save changes to the database.
- Step 4** In the **confirmation** dialog box, click **Yes**. The changes take effect immediately.

**Note**

The maximum number of ONS 15305 NEs that can have PM data collection enabled is 10 for a small network, 30 for a medium network, and 50 for a large or high-end network.

Enabling or Disabling PM Data Collection by PM Category for CTC-Based NEs



Note See [Selectable Collection of PM Data Parameters, page 2-11](#) for information on setting PM data collection.

-
- Step 1** In the **Domain Explorer** window, choose **Administration > Control Panel**.
- Step 2** In the **Control Panel** window, expand **PM Service**.
- Step 3** Complete one of the following options:
- For the ONS 15305 R3.0, choose **ONS 15305**.
 - For the ONS 15310 CL, ONS 15310 MA SONET, ONS 15327, ONS 15454 SONET or CRS (starting from version 5.13) choose **CTC-Based** NEs.
 - For the ONS 15310 MA SDH or ONS 15454 SDH, choose **CTC-Based**.
 - For the ONS 15600 SONET, choose **ONS 15600**.
 - For the ONS 15600 SDH, choose **ONS 15600 SDH**.
- Step 4** Click the **PM Collection Parameters** tab, and enable or disable the various PM parameters. The following tables describe each parameter in detail:
- For the ONS 15305 R3.0, see [Table 10-2](#).
 - For the ONS 15310 CL, ONS 15310 MA SONET, ONS 15327, and ONS 15454 SONET, see [Table 10-3](#).
- Step 5** After making your selections, click **Save**.
-

Enabling or Disabling PM Retrieval Fail Alarms for CTC-Based NEs

Enabling the PM retrieval fail alarm allows Prime Optical to monitor failed collection of PM data when PM collection is set to either 15 Min Robust or 1 Day Robust. It lets you set the number of times for Prime Optical to collect PM data before declaring PM data retrieval failure.

-
- Step 1** In the **Domain Explorer** window, choose **Administration > Control Panel**.
- Step 2** Click **PM Service**. The **PM Service** pane opens.
- Step 3** To enable 15-minute PM retrieval fail alarms, click **Enable** in the **PM 15-min Retrieval Fail Alarm** area; then, specify the following:
- Seconds between Retries—Wait time, in seconds, between attempts to retrieve PM data. The range is from 5 to 15; the Cisco default is 5.
 - Number of Retries—Number of times to retrieve PM data. The range is from 1 to 6; the Cisco default is 6.
- Step 4** To enable 1-day PM retrieval fail alarms, click **Enable** in the **PM 1-day Retrieval Fail Alarm** area; then, specify the following:

- Minutes between Retries—Wait time, in seconds, between attempts to retrieve PM data. The range is from 15 to 60; the Cisco default is 15.
- Number of Retries—Number of times to retrieve PM data. The range is from 1 to 6; the Cisco default is 6.

Step 5 Click **Save**.

Specifying the PM Data Display

For CTC-based NEs, the display of PM data is affected by the PM Data Storage setting in the **Control Panel**. To specify whether to display PM data in normal or optimized mode for CTC-based NEs:

Step 1 In the **Domain Explorer** window, choose **Administration > Control Panel**.

Step 2 Click **PM Service**. The **PM Service** pane opens.

Step 3 In the **PM Data Storage** area, choose the PM data storage from the drop-down list:

- Normal—All performance data is collected and displayed in the PM data tables.
- Optimized—Performance data with all zero values and performance data with all invalid flags are not displayed and are not stored in the database.



Caution If robust PM data collection is enabled, do not set PM data storage to Optimized.

Step 4 Click **Save**.

Viewing the Robust PM Collection Queue

Step 1 In the **Domain Explorer** window, choose **Administration > Control Panel**.

Step 2 Click **PM Service**. The **PM Service** pane opens.

Step 3 In the **Robust PM Collection Queue** area are the following display-only fields:

- Number of 15-Min Registers Outstanding—Number of performance data collections carried out every 15 minutes that are not yet scheduled for collection.
- Number of 1-Day Registers Outstanding—Number of performance data collections carried out every 24 hours that are not yet scheduled for collection.

Step 4 (Optional) Click **Clear Robust PM Queue** to clear the queue. Then, click **Save**.

Using the Self Monitor Table

When Prime Optical comes close to or exceeds the limits of its performance, it might result in a reduction in the response time of the system. In this case, error messages are displayed to tell you to restore normal operation. The **Self Monitor** table allows you to monitor parameters that help in determining when Prime Optical is close to the limit of its performance.

The **Self Monitor** table displays information about Prime Optical threshold parameters. These parameters are collected and evaluated based on the NE model types. Self-monitoring can be used for CPU usage, memory usage, and disk usage. You can filter the **Self Monitor** table on the collection time, the model type, and the parameter name.

To view the **Self Monitor** table, choose **Administration > Self Monitor** in the **Domain Explorer**. The following table provides descriptions.

Table 10-4 Field Descriptions for the Self Monitor Table

Column Name	Description
Alias ID	Alias name of the NE.
Parameter Name	Name of the parameter. See the Alarm Configuration pane in the Control Panel for a list of monitored parameters.
Model Type	NE model type. When NE model types are not applicable, “System” is displayed as the model type.
Collection Time (time zone)	Time when Prime Optical collected the parameter data.
Value	Total number of seconds to retrieve the information for the name of the parameter.
NE ID	Name of the selected NE. If you open the Self Monitor table without selecting an NE, the NE ID is <i>CTM</i> .

Filtering the Self Monitor Table

-
- Step 1** In the **Domain Explorer** window, choose **Administration > Self Monitor**.
 - Step 2** In the **Self Monitor** table, choose **File > Filter** (or click the **Filter Data** tool). The **Filter** dialog box opens.
 - Step 3** Specify the filter parameters described in the following table.
 - Step 4** After making your selections, click **OK**.
-

Table 10-5 Field Descriptions for the Self Monitor Table Filter Dialog Box

Tab	Description
Collection Time (time zone)	<p>You can filter data for a specified time period, ranging from the past hour to the past 180 days. Additionally, you can click the User Specified radio button to specify exact filter start and end times by date and hour. The time zone can be GMT, a user-defined offset from GMT, or local time, depending on what is specified in the User Preferences dialog box. Use the calendar tool to choose the year, month, and day:</p> <ul style="list-style-type: none"> • Year—Click the year combo box or the double arrow (<<, >>) at the bottom of the calendar. • Month—Click the month combo box or the single arrow (<, >) at the bottom of the calendar. • Day—Click the day number on the calendar. The current date is shown in blue. <p>If you want to filter data and the time period is not important, click No Time Specified.</p>
Model Type	You can move NE model types back and forth between the list of available model types and selected model types. The filter runs on the model types in the Selected Model Type list.
Parameter Name	You can move parameters back and forth between the list of available parameter names and selected parameter names. The filter runs on the parameters in the Selected Parameter Names list.

How Do I Query, View, Filter, and Graph PM Data?

This section describes the tools you use to query, view, filter, and graph the data displayed in PM tables.

Using the PM Table Query

The **PM table query** opens when you select an NE, group, or domain node in the **Domain Explorer** and choose **Performance > PM Query by Category** or **PM Query by NE Model**.

- Use the **PM Query by Category** wizard to filter PM data based on the PM category.
- Use the **PM Query by NE Model** wizard to filter PM data by NE model.

Using the PM Query by Category Wizard

Use the **PM Query by Category** wizard to view PM data by PM category.



Note

The CPT 200 and CPT 600 NEs support only the Ethernet, SONET, OTN, and Optical categories.

- Step 1** In the **Domain Explorer** tree, select the management domain, group, or NE node for which to view historical performance data, and choose **Performance > PM Query by Category**. [Table 10-6](#) provides descriptions. Fields shown depend on the PM category selected.
- Step 2** In the **Category** area, choose the category and type from the drop-down lists.
- Step 3** Select the PM data collection interval (15 Minute, 1 Day, or Real-Time).



Note

The Real-Time option is disabled if you select a management domain or group node. The Real-Time option is enabled only if you select a single NE in the **Domain Explorer** tree.

Step 4 (Optional) Click **Next**.



Note Depending on the NE type selected, some of the following screens might not appear. If a screen does not appear, skip the step and move on to the next one.

Step 5 The **PM Query Wizard by Category** window is displayed with the list of the selected ports displayed according to the query.

Step 6 In the **Near End/Far End Selection** screen, select whether to filter for near-end or far-end PM data; then, click **Next**.

Step 7 In the **Module Category** screen, select the module category from the list; then, click **Next**.

Step 8 In the **RPR Type Selection** screen, select the type of RPR 802.17 data to display; then, click **Next**.

Step 9 In the **Physical Location** screen, depending on the NE type, select the rack, subrack (shelf), slot, subslot, and port from the list; then, click **Next**.

Step 10 In the **Module Type Selection** screen, add or remove module types from the lists; then, click **Next**.



Note For real-time PM data collection, the **Module Type Selection** screen lists only the module that corresponds to the slot selected in the **Physical Location** screen.

Historical data might have been collected on a module that is no longer present at the selected physical location. Therefore, for historical PM data collection, the modules are not filtered by physical location.

Step 11 Click **Finish**. The **PM table** opens. See [Performance Data](#) for field descriptions for each PM table.



Note PM data is collected from PLIM ports which are VTXP enabled.

Table 10-6 Field Descriptions for the PM Query by Category Wizard

Field	Description
Category Selection Screen	
Category	Select a PM category from the list. Available categories vary by selected NE.
Type	Select a PM query type for the NE. PM types vary by selected category.
15 Minute	Filters for PM data received in the last 15 minutes. 15-minute PM data can be queried for a range of time from the past hour to the past 30 days.
1 Day	Filters for PM data received in the last day. 1-day PM data can be queried for a range of time from the past 7 days to the past 180 days.
Real-Time (<i>CTC-based NEs</i>)	<p>Launches a real-time PM report, which allows you to examine the current value of a PM parameter in granularities finer than the standard 15-minute or 1-day interval. You can view and modify the polling interval for the real-time PM reporting session. You can end a real-time PM session at any time and export the data.</p> <p>Note You can also launch a real-time PM session from a selected row in a PM table. This is useful if you want to query on a single physical location (for example, Slot 1, Port 1).</p>

Table 10-6 Field Descriptions for the PM Query by Category Wizard (continued)

Field	Description
User Specified	Specify exact filter start and end times by date and hour. Use the calendar tool to choose the year, month, and day: <ul style="list-style-type: none"> Year—Click the year combo box or the double arrow (<<, >>) at the bottom of the calendar. Month—Click the month combo box or the single arrow (<, >) at the bottom of the calendar. Day—Click the day number on the calendar. The current date is shown in blue.
Category Selection Screen TPs	
NE ID	Name of the selected NE.
Module Name	Module for which PM data is displayed.
Physical Location	Slot and port number for which PM data is displayed.
Near End/Far End Selection Screen	
Near End	Filters for near-end PM data.
Far End	Filters for far-end PM data.
Module Category Screen	
Module Category	Select a module category from the list. Available categories vary by selected NE. This screen appears only if you select Ethernet as both the category and type in the Category Selection screen.
RPR Type Selection Screen	
RPR Type Selection	Filters RPR 802.17 PM data by MIB group: <ul style="list-style-type: none"> Span Stats In Span Stats Out Client Stats In Client Stats Out Error Stats
Physical Location Screen	
Physical Location	Filters PM data by slot, subslot, or port. Use the lists to select the slot, subslot, or port for which you want to display PM data. If you select a CTC-based NE, you can filter fault and performance data by shelf, slot, and port.
Module Type Selection Screen	
Available Modules	List of modules that are available for PM filtering. Select a module and click Add to move it to the Selected Modules list.
Selected Modules	List of modules that are selected for PM filtering. Select a module and click Remove to remove it from filtering consideration.

The following table shows which PM tables are available for each category.

Table 10-7 *PM Tables by Category*




Category	PM Tables
SONET	SONET Section PM table
	SONET Line PM table
	SONET STS Path PM table
	SONET VT1.5 Path PM table
	SONET VT2 Path PM table
SDH	SDH Regenerator Section PM table
	SDH Multiplex Section PM table
	SDH Higher Order Virtual Container PM table
	SDH Lower Order VC3 PM table
	SDH Lower Order VC12 PM table
	SDH Lower Order VC11 PM table
DSn	DS1 PM table
	DS3 PM table
	DS3I PM table
DWDM	B1 Counters PM table
	FEC Counters PM table
	B1 and FEC Counters PM table
	Ethernet Parameters PM table
Edge SDH	Edge SDH Regeneration Section PM table
	Edge SDH Multiplex Section PM table
	Edge SDH Higher Order VC4 PM table
	Edge SDH Lower Order PM table
Edge Statistics	Edge Statistics DCC PM table
	Edge Statistics LAN PM table
	Edge Statistics WAN PM table
En	E1 PM table
	E3 PM table
Encryption	OTN Encryption Table
Ethernet	Ethernet PM table
	Ethernet POS PM table
	Ethernet CoS PM table
	Ethernet GFP PM table
	Ethernet LEX PM table
IP SLA	IP SLA PM table

Table 10-7 PM Tables by Category (continued)

Category	PM Tables
OTN	OTN G.709 Section PM table
	OTN G.709 Path PM table
	OTN FEC PM table
Optical	Optical Physical PM table
SAN	SAN PM table
8B10B	8B10B PM table
RPR	RPR 802.17 PM table

PM Query by NE Model Wizard

Use the **PM Query by NE Model** wizard to view PM data by non-CTC-based NE model.

-
- Step 1** Make sure that performance monitoring is enabled on the NE. See [Activating or Deactivating Performance Monitoring, page 10-8](#).
- Step 2** In the **Domain Explorer** tree, select the management domain, group, or NE node for which to view historical performance data and choose **Performance > PM Query by NE Model**. [Table 10-8](#) provides descriptions. Fields depend on the type of NE and PM selected.
- Step 3** In the **NE Model** area, choose the NE model and NE type from the drop-down lists.
-  **Note** You can only select non-CTC-based NEs.
-
- Step 4** Select the PM data collection interval (15 Minute, 1 Day, or Real-Time).
-  **Note** The Real-Time option is disabled if you select a management domain or group node. The Real-Time option is enabled only if you select a single NE in the **Domain Explorer** tree.
-
- Step 5** (Optional) Click **Next**.
-  **Note** Depending on the NE type selected, some of the following screens might not appear. If a screen does not appear, skip the step and move on to the next one.
-
- Step 6** In the **Near End/Far End Selection** screen, select whether to filter for near-end or far-end PM data; then, click **Next**.
- Step 7** In the **Module Category** screen, select the module category from the list; then, click **Next**.
- Step 8** In the **RPR Type Selection** screen, select the type of RPR 802.17 data to display; then, click **Next**.
- Step 9** In the **Physical Location** screen, depending on the NE type, select the rack, subrack (shelf), slot, subslot, and port from the list; then, click **Next**.
- Step 10** In the **Module Type Selection** screen, add or remove module types from the lists; then, click **Next**.



Note For real-time PM data collection, the **Module Type Selection** screen lists only the module that corresponds to the slot selected in the **Physical Location** screen.

Historical data might have been collected on a module that is no longer present at the selected physical location. Therefore, for historical PM data collection, the modules are not filtered by physical location.

Step 11 Click **Finish**. The PM table opens. See [Performance Data](#) for field descriptions for each PM table.

Table 10-8 Field Descriptions for the PM Query by NE Model Wizard

Field	Description
NE Model Selection Screen	
NE Model	Select a non-CTC-based NE model from the list.
Type	Select a PM query type for the NE. The PM types vary by selected NE model.
15 Minute	Filters for PM data received in the last 15 minutes. 15-minute PM data can be queried for a range of time from the past hour to the past 30 days.
1 Day	Filters for PM data received in the last day. 1-day PM data can be queried for a range of time from the past 7 days to the past 180 days.
User Specified	Specify exact filter start and end times by date and hour. Use the calendar tool to choose the year, month, and day: <ul style="list-style-type: none"> • Year—Click the year combo box or the double arrow (<<, >>) at the bottom of the calendar. • Month—Click the month combo box or the single arrow (<, >) at the bottom of the calendar. • Day—Click the day number on the calendar. The current date is shown in blue.
Near End/Far End Selection Screen	
Near End	Filters for near-end PM data.
Far End	Filters for far-end PM data.
RPR Type Selection Screen	
RPR Type Selection	Filters RPR 802.17 PM data by MIB group: <ul style="list-style-type: none"> • Span Stats In • Span Stats Out • Client Stats In • Client Stats Out • Error Stats
Physical Location Screen	
Slot	Filters PM data by slot.
Port	Filters PM data by port.
Shelf	Filters PM data by shelf.

Table 10-8 Field Descriptions for the PM Query by NE Model Wizard (continued)

Field	Description
Module Type Selection Screen	
Available Modules	List of modules that are available for PM filtering. Select a module and click Add to move it to the Selected Module list.
Selected Modules	List of modules that are selected for PM filtering. Select a module and click Remove to remove it from filtering consideration.
Real-Time PM Attribute Selection Screen	
Interface Name (also Card, Physical Location, and so on)	Select the type of entity to monitor from this list. The label changes depending on the type of PM selected.
Available PM Attributes	List of real-time attributes that are available for PM filtering. Select an attribute and click Add to move it to the Selected PM Attributes list.
Selected PM Attributes	List of real-time attributes that are selected for PM filtering. Select an attribute and click Remove to remove it from filtering consideration.

The following table shows which PM tables are available for each NE.

Table 10-9 PM Tables by NE Type

NE	Available PM Tables
ONS 15216	—
ONS 15305	—
	Note See Table 10-7 , “PM Tables by Category.”
ONS 15310 CL	Physical PM table
	SONET Section PM table
	SONET Line PM table
	SONET STS Path PM table
	SONET VT1.5 Path PM table
	DS3 PM table
	DS1 PM table
	POS PM table
	CoS PM table
	Ethernet PM table
	GFP PM table

Table 10-9 PM Tables by NE Type (continued)

NE	Available PM Tables
ONS 15310 MA SONET	Physical PM table
	SONET Section PM table
	SONET Line PM table
	SONET STS Path PM table
	SONET VT1.5 Path PM table
	DS1 PM table
	DS3 PM table
	CoS PM table
	POS PM table
	Ethernet PM table
	GFP PM table
ONS 15310 MA SDH	Physical PM table
	DS3 PM table
	CoS PM table
	POS PM table
	Ethernet PM table
	GFP PM table
	Lower Order VC12 PM table
	Lower Order VC3 PM table
	SDH E1 PM table
	SDH E3 PM table
	SDH RS PM table
	SDH MS PM table
	SDH HO PM table
CRS 5.13 (from CRS 5.X)	Optical Physical PM Table
	Ethernet PM table (For Real-Time only)
	OTN FEC PM Table
	OTN PM table

Configuring PM Collection Settings

Use the **PM Collection Settings** wizard to configure PM collection settings by NE type.

- Step 1** Make sure that performance monitoring is enabled on the NE. See [Activating or Deactivating Performance Monitoring, page 10-8](#).

- Step 2** In the **Domain Explorer** tree, select the management domain, group, or NE node for which to configure PM collection settings and choose **Performance > PM Collection Settings**. The following table provides descriptions. Fields depend on the type of NE selected.
- Step 3** In the **NE Selection** screen, complete the following substeps:
- In the **NE Model** area, choose the NE model for PM collection settings from the drop-down list.
 - In the **Network Elements** area, click the **Add** and **Remove** buttons to move NEs of the selected type to the Selected NEs list. (Use the **Remove** button to remove NEs from the list.) By default, the Selected NEs list contains all of the NEs of the selected type in the **Domain Explorer** or **Subnetwork Explorer** when the wizard was launched.
 - Click **Next**.
- Step 4** Depending on the NEs selected in the previous step, select the PM data collection intervals in one of the following screens:
- PM Collection Selection (15 Min, 1 Day)—NEs that support 15-minute, 15-minute robust, 1-day, and 1-day robust PM collection (CTC-based NEs, ONS 15310, and ONS 15305).
 - PM Collection Selection (15 Min Only)—NEs that support only 15-minute PM collection.
- Step 5** Click **Finish**.
- The PM data collection settings are applied to all of the NEs in the Selected NEs list.

Table 10-10 Field Descriptions for the PM Collection Settings Wizard

Field	Description
NE Selection Screen	
NE Model	Select the NE type for which you want to configure PM collection settings. The type you select determines the NEs that are displayed in the Network Elements area.
Network Elements	Use the Add and Remove buttons to move the NEs for which you want to configure PM collection settings to the Selected NEs list, or to remove NEs from the list.
PM Collection Selection (15 Min, 1 Day) Screen	
15 Min	If checked, 15-minute PM data collection is configured for the NEs you selected in the NE Selection screen.
1 Day	If checked, 1-day PM data collection is configured for the NEs you selected in the NE Selection screen.
15 Min Robust	(Available only if 15 Min is checked) If checked, 15-minute robust PM data collection is configured for the NEs you selected in the NE Selection screen.
1 Day Robust	(Available only if 1 Day is checked) If checked, 1-day robust PM data collection is configured for the NEs you selected in the NE Selection screen.
PM Collection Selection (15 Min Only) Screen	
15 Min	If checked, 15-minute PM data collection is configured for the NEs you selected in the NE Selection screen.

Launching the PM Table for Layer 3 Links from the Network Map

-
- Step 1** In the **Domain Explorer** or **Subnetwork Explorer** tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool).
- Step 2** Right-click a Layer 3 link in the **Network Map** and choose **Link PM Data** from the right-click menu.
-

Managing Real-Time PM Data

Prime Optical supports the ability to launch a real-time PM report from the **PM Query** wizard or from a single row in a PM table. This feature allows you to examine the current value of a PM parameter in granularities finer than the standard 15-minute or 1-day interval. You can view and modify the polling interval for the real-time PM reporting session.



Note

Real-time PM reporting applies only to CTC-based NEs.

The following real-time PM selection options are available:

- **Polling**—When selected, Prime Optical periodically polls the selected PM parameter(s) on the selected NE. The polling intervals are 10 to 900 seconds—For CTC-based NEs



Note

You can specify the real-time polling interval in the **Real-Time Polling** dialog box. See [Changing the Real-Time Polling Interval, page 10-23](#).

- **Refresh**—Allows you to start polling of real-time attributes if real-time polling is disabled in the **Real-Time Polling** dialog box.
- **Baseline**—When selected, the most recently collected data set is saved into a buffer. All new values are recalculated as they arrive based on the saved baseline values.



Note

Not all values can be saved as a baseline. For example, null and string values cannot be saved as baseline values.

- **Clear Baseline**—Sets the baseline values to zero.
- **Clear**—Clears the current real-time PM buffer of all values.

Each 15-minute or 1-day PM table has a corresponding real-time PM table. However, not all of the fields in the historical PM tables are shown in the real-time PM tables. The first fields in real-time PM tables are:

- **Alias ID**—Alias name of the selected NE.
- **Module Name**—Module for which PM data is displayed.
- **Physical Location**—Slot and port number for which PM data is displayed.
- **Interface**—Interface name of the selected NE.
- **Time Stamp**—Time when the performance statistics were collected.

- Maintenance—Whether the NE was under maintenance when the performance data was collected.

The remaining fields are the actual real-time attributes being polled.

When a real-time PM session is running, it polls CTC-based NEs for x number of attributes every 10 to 900 seconds. The data it returns is stored entirely in transient memory. You can use the **PM Service** properties pane in the **Control Panel** window to limit the scope of the real-time PM session. See [Understanding the PM Service Pane, page 10-4](#).

- To launch a real-time PM report from the **PM Query** wizard, see [Using the PM Query by Category Wizard, page 10-13](#) or [PM Query by NE Model Wizard, page 10-17](#). In the **NE Model Selection** screen, click the **Real-Time** radio button.
- To launch a real-time PM report from a single row in a PM table, select a row and choose **View > Launch Real-Time Performance Session** (or click the **Launch Real-Time Performance Session** tool).
- To clear the real-time PM counters on the NE, choose **View > Clear PM Counters on NE** (or click the **Clear PM Counters on NE** tool).



Note

Use the toolbar icons to manage the real-time display. See [Icons and Menus Displayed in Prime Optical](#) for an explanation of the icons.

Changing the Real-Time Polling Interval

By default, the real-time PM session polls the attributes every 10 seconds for CTC-based NEs. You can configure the polling interval from 10 to 900 seconds.

-
- Step 1** Launch a real-time PM table.
- Step 2** Choose **View > Specify Real-Time Polling Interval** (or click the **Specify the Real-Time Polling Interval** tool). The **Real-Time Polling** dialog box opens.
- Step 3** In the **Specify Real-Time Polling Interval** field, enter a number from 10 to 900 seconds.
- Step 4** Complete one of the following options:
- To save the change, click **Apply**.
 - To save the most recently collected data set into a buffer, click **Baseline**. All new values are recalculated as they arrive based on the saved baseline values.
 - To set the baseline values to zero, click **Clear Baseline**. This disables the baseline set.
 - To discard changes and close the dialog box, click **Cancel**.
-

Enabling or Disabling Real-Time Polling

-
- Step 1** Launch a real-time PM table.
- Step 2** Choose **View > Specify Real-Time Polling Interval** (or click the **Specify the Real-Time Polling Interval** tool).
- Step 3** To disable real-time polling, uncheck the **Enable Real-Time Polling** check box. To enable real-time polling, leave this check box checked. When automatic polling is enabled, you do not need to manually refresh the real-time PM table.

Step 4 Click **Apply**.


Filtering PM Data

Use the **Filter** dialog box (**File > Filter**) to filter data according to criteria that you select, and then display the results in a table. The following table provides descriptions.

**Note**

The **Filter** dialog box is not available for real-time PM data.

Table 10-11 Field Descriptions for the PM Table Filter

Tab	Description
Time Stamp (also <i>Time Period</i>)	<p>Filters PM data for a specified time period, ranging from the past hour to the past 6 months. Additionally, you can click the User Specified radio button to specify exact filter start and end times by date and hour. The time zone used can be GMT, an offset from GMT, or local time, depending on what you specified in the User Preferences dialog box. Use the calendar tool to choose the year, month, and day:</p> <ul style="list-style-type: none"> • Year—Click the year combo box or the double arrow (<<, >>) at the bottom of the calendar. • Month—Click the month combo box or the single arrow (<, >) at the bottom of the calendar. • Day—Click the day number on the calendar. The current date is shown in blue. <p>If you want to filter events and the time period is not important, click No Time Specified.</p>
NE ID (also <i>Network Elements</i>)	Filters PM data by NE. PM data will display for NEs in the Selected list. Use the Add and Remove buttons to select the NEs for which you want to display PM data.
Module Name (also <i>Managed Entities</i> ; not available for all NEs)	Filters PM data by module. PM data will display for modules in the Selected list. Use the Add and Remove buttons to select the modules for which you want to display PM data.
Physical Location	<p>Filters PM data by rack, subrack (shelf), slot, subslot, card, or port. (Options depend on the type of NE selected.) Use the drop-down lists to choose the entity for which you want to display PM data.</p> <p> Note Physical location includes shelf, slot, and port information; for example, Shelf: 1, Slot: 14, Port: 0</p>

Using PM Data Graphs

PM tables contain a **Plot** tab that allows you to plot historical or real-time PM data in a graphical view that is stored in the Prime Optical database. You can plot a maximum of three PM parameters at a time per graph. You can select a line or bar graph type and you can display multiple traces on the same set of axes for comparison. Prime Optical automatically scales the graph's Y-axis to best show the values of the measured parameters. You can launch a graph of PM data for the following data types:

- One PM parameter on one board
- Multiple PM parameters on one board



Note Parameters must have similarly scaled ranges, such as errored seconds and severely errored seconds. For example, you cannot plot bit errored rate and errored seconds on the same graph. Instead, these parameters are plotted on separate graphs.

- One PM parameter on multiple boards



Note Boards must all support the selected PM parameter.

Complete the following steps to use PM data graphs:

-
- Step 1** View PM data by PM category (see [Using the PM Query by Category Wizard, page 10-13](#)) or non-CTC-based NE Model (see [PM Query by NE Model Wizard, page 10-17](#)).
- Step 2** From the PM table, select the row of the NE, port, or slot for which you want to view the PM data on a graph.
- Step 3** Choose **View > Plot** (or click the **Plot** tool).



Note To plot the graph, you must choose **View > Plot** or click the **Plot** tool. If you simply click the **Plot** tab (without choosing **View > Plot** or clicking the **Plot** tool), the graph is not filled out.

In the **Plot** tab, the graph is displayed. The graph can plot a maximum of three PM parameters. The graph's status bar displays the selection context in the following format:

```
<NE_ID>:<Module>:<Physical_location>:<Interface>:<Time_stamp [Time_zone]>
```



Note *Physical-location* includes shelf, slot, and port information; for example, Shelf: 1, Slot: 14, Port: 0.

- Step 4** Use the **plot-specific toolbar** buttons to manage the graphical display. Choose **View > Zoom In**, **Zoom Out**, or **Fit in Window** to adjust the zoom level. You can also click the **Zoom In**, **Zoom Out**, or **Fit in Window** tools.
-

**Note**

If Prime Optical cannot complete samples retrieval in a certain time frame (for example, due to a temporary loss of communication), the PM graph interpolation will be traced from the last sample that was retrieved before the malfunction occurred to the first sample that was retrieved after normal behavior was restored.

Configuring a Graph

Use the **Graph Parameters Selection** dialog box to modify the parameters that are plotted in a graph.

- Step 1** From the **PM** table, select the row for which you want to view the PM data on a graph.
- Step 2** Choose **View > Graph Configure** (or click the **Configure Graphing Parameters** tool). The **Graph Parameters Selection** dialog box opens.
- Step 3** For historical PM graphs, select the start and end times in the **Time Panel** area. Choose the date, hour, and minute from the corresponding drop-down lists.

**Note**

Real-time PM graphs do not have a **Time Panel** area, because a time range does not apply to real-time data.

- Step 4** In the **Parameter Selection** area, select the parameters from the Available Parameters list that you want to plot in the graph. You can generate a maximum of three graphs and each graph can plot a maximum of three parameters.
- Step 5** Click the **Add** button that corresponds to the graph where the parameter will be plotted. Selected parameters are listed in the Selected Parameters: Graph *number* list.
- Step 6** To remove parameters from the Selected Parameters: Graph *number* list, select parameters and click **Remove**.
- Step 7** Click **OK**. The graph is displayed in the **Plot** tab. The status bar displays the module name, physical location, interface, date range, and time stamp range.
- Step 8** You can adjust the zoom level for each graph. Click a graph and choose **View > Zoom In**, **Zoom Out**, or **Fit in Window**. You can also click the **Zoom In**, **Zoom Out**, or **Fit in Window** tools.
- Step 9** You can normalize or restore the Y axes values in historical PM graphs. Choose **View > Normalize Y Axes** or **Restore Y Axes** (or click the **Normalize Y Axes** or **Restore Y Axes** tools). The Normalize option allows you to normalize axes values and compare data of the same type (for example, receive versus transmit packets). The Restore option restores axes values to the previous graph visualization.

**Note**

The Normalize and Restore options do not apply to real-time PM graphs.

Printing a Graph

-
- Step 1** After viewing PM data on a graph or configuring a graph, choose **File > Print Graph** (or click the **Print Graph** tool). The **Print** dialog box opens.
- Step 2** Select your printer and configure the page setup options, as necessary.
- Step 3** Click **OK**.



Note PM graphs might not print completely on some printers with the default page setup settings. In this case, you need to change the printer setup. To do this, click **Properties** in the **Print** dialog box. Click **Advanced**. Change the scaling to a value that prints the complete graph; for example, 10% or 20%. Click **OK**.

Understanding How Prime Optical Displays the Interface Field

Prime Optical displays the **Interface** field in PM tables as follows:

- ONS 15305

Prime Optical representation:

Interface-type#Interface-type-numberAUG4-AUG4-number/AUG1-AUG1-number/TUG3-TUG3-number/TUG2-TUG2-number/TU12-TU12-number

where:

- *Interface-type* is the affected interface object
- *Interface-type-number* is the interface number
- *AUG4-number* is the AUG4 number (applies to VC-4, VC3, and VC12)
- *AUG1-number* is the AUG1 number (applies to VC-4, VC3, and VC12)
- *TUG3-number* is the TUG3 number (applies only to VC3 and VC12 interfaces)
- *TUG2-number* is the TUG2 number (applies only to VC12 interfaces)
- *TU12-number* is the TU2 number (applies only to VC12 interfaces)

- SDH

Prime Optical representation:

Interface-type#VC4-number/VC3-VC3-number/TUG2-TUG2-number/VC12-VC12-number

where:

- *Interface-type* is the affected interface object (for example, VC4, VC4-2c, VC3, VC12, and so on)
- *VC4-number* is the VC4 number in that interface (applies only to VC4, VC3, and VC12 interfaces)
- *VC3-number* is the VC3 number in that VC4 (applies only to VC3 interfaces)
- *TUG2-number* is the TUG2 number in that VC3 (applies only to VC12 interfaces)
- *VC12-number* is the VC12 number in that TUG2 (applies only to VC12 interfaces)

For example, for alarms on a VC12 interface with VC4-number = 1, VC3-number = 2, TUG2-number = 1, and VC12-number = 2, Prime Optical displays VC12 #1/VC3-2/TUG2-1/VC12-2, where the first field is the affected interface and VC4 number (#VC4-number). This example indicates that the alarm is on the VC12 interface with the VC4 number equal to 1 (VC12 #1).

- SONET

Prime Optical representation:

Interface-type#STS-number/VT-group-number-VT-number-in-group

where:

- *Interface-type* is the affected interface object (for example, STS1, STS3c, VT-1, and so on)
- *STS-number* is the STS number on that interface (applies only to STS and VT interfaces)
- *VT-group-number* is the VT group number for that STS number (applies only to VT interfaces)
- *VT-number-in-group* is the VT number in that VT group (applies only to VT interfaces)

For example:

- For a VT path-level alarm with STS-number = 1, VT-group-number = 2, and VT-number-in-group = 1, Prime Optical displays VT-1 #1/2-1, where the first field is the affected interface and STS number (#STS-number). This example indicates that the alarm is a VT path-level alarm with STS-number = 1 (VT-1 #1).
- For an STS path-level alarm with STS-number = 1, Prime Optical displays STS3c #1, where the first field is the affected interface and STS number (#STS-number). This example indicates that the alarm is an STS path-level alarm with STS-number = 1 (STS3c #1).