Alarm Monitoring and Management

This chapter describes Cisco Transport Controller (CTC) alarm management. To troubleshoot specific alarms, refer to the *Cisco ONS 15454 Troubleshooting Guide*. Chapter topics include:

- Overview, page 1
- Documenting Existing Provisioning, page 1
- Viewing Alarm Counts on the LCD for a Node, Slot, or Port, page 2
- Viewing Alarms, page 3
- Alarm Profiles, page 9
- Suppressing Alarms, page 13
- Provisioning External Alarms and Controls, page 13
- Audit Trail, page 14

14.1 Overview

The CTC detects and reports SONET alarms generated by the Cisco ONS 15454 and the larger SONET network. You can use CTC to monitor and manage alarms at the card, node, or network level. Default alarm severities conform to the Telcordia GR-253 standard, but you can reset alarm severities in customized alarm profiles or suppress CTC alarm reporting. For a detailed description of the standard Telcordia categories employed by ONS nodes, refer to the *Cisco ONS 15454 Troubleshooting Guide*.

Note ONS 15454 alarms can also be monitored and managed through TL1 or a network management system (NMS).

14.2 Documenting Existing Provisioning

In the card, node, or network-level CTC view, choose File > Print to print CTC information in graphical or tabular form on a Windows-provisioned printer. Choose File > Export to export card, node, or network information as editable delineated text files to other applications. Printing and exporting data are useful for record keeping or troubleshooting purposes.

Print card, node, or network CTC information in graphical or tabular form on a Windows-provisioned printer, or export card, node, or network information as editable delineated text files to other applications. This feature is useful for viewing the node inventory, circuit routing, or alarm data in network record keeping and troubleshooting.

Whether you choose to print or export data, you can choose from the following options:

- Entire frame—Prints or exports the entire CTC window including the graphical view of the card, node, or network. This option is available for all windows.

- Tabbed view—Prints or exports the lower half of the CTC window containing tabs and data. The printout includes the selected tab (on top) and the data shown in the tab window. For example, if you print the History window Tabbed View, you print only history items appearing in the window. This option is available for all windows.

- Table contents—Prints or exports CTC data in table format without graphical representations of shelves, cards, or tabs. This option is available only for CTC table data, so it does not apply to:

    - Provisioning > General, Protection, SNMP, or Timing windows

    - Provisioning > Network > General window

    - Provisioning > UCP > Node window

    - Provisioning > WDM-ANS > Provisioning window (Release 4.5)

    - Maintenance > Database, Protection, Diagnostic, or Timing windows

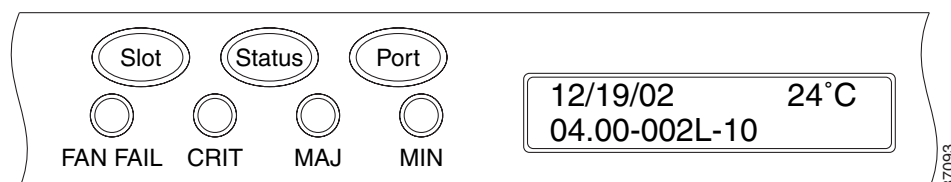   - Maintenance > Cross-Connect > Cards window

    The Table Contents option prints all the data contained in a table with the same column headings. For example, if you print the History window Table Contents view, you print all data included in the table whether or not items appear in the window.

14.3 Viewing Alarm Counts on the LCD for a Node, Slot, or Port

You can view node, slot, or port-level alarm counts and summaries using the buttons on the ONS 15454 LCD panel. The Slot and Port buttons toggle between display types; the Slot button toggles between node display and slot display, and the Port button toggles between slot and port views. Pressing the Status button after you choose the display mode will change the display from alarm count to alarm summary.

The ONS 15454 has a one-button update for some commonly viewed alarm counts. If you press the Slot button once and then wait eight seconds, the display will automatically change from a slot alarm count to a slot alarm summary. If you press the Port button to toggle to port-level display, you can use the Port button to toggle to a specific slot and to view each port's port-level alarm count. Figure 14-1 shows the LCD panel layout.

Figure 14-1   The LCD Panel

14.4 Viewing Alarms

In the card, node, or network-level CTC view, click the Alarms tab to display the alarms for that card, node, or network. The Alarms window shows alarms in conformance with Telcordia GR-253. This means that if a network problem causes two alarms, such as loss of frame (LOF) and loss of signal (LOS), CTC only shows the LOS alarm in this window because it supersedes the LOF and replaces it.

Table 14-1 lists the column headings and the information recorded in each column.

Table 14-1   Alarms Column Descriptions

Column	Information Recorded
New	Indicates a new alarm. To change this status, click either the Synchronize button or the Delete Cleared Alarms button.
Date	Date and time of the alarm.
Node	Node where the alarm occurred (appears only in network view).
Object	TL1 access identifier (AID) for the alarmed object. For an STSmon or VTmon, the object.
Eqpt Type	Card type in this slot.
Slot	Slot where the alarm occurred (appears only in network and node view).
Port	Port where the alarm is raised. For STSTerm and VTTerm, the port refers to the upstream card it is partnered with.
Sev	Severity level: CR (critical), MJ (major), MN (minor), NA (not-alarmed), NR (not-reported).
ST	Status: R (raised), C (clear)
SA	When checked, indicates a service-affecting alarm
Cond	The error message/alarm name. These names are alphabetically defined in the "Alarm Troubleshooting" chapter of the *Cisco ONS 15454 Troubleshooting Guide.*
Description	Description of the alarm.
Num	An incrementing count of alarm messages.
Ref	The reference number assigned to the alarm.

Table 14-2 lists the color codes for alarm and condition severities.

Table 14-2   Color Codes for Alarms and Conditions

Color	Description
Red	Raised Critical (CR) alarm
Orange	Raised Major (MJ) alarm
Yellow	Raised Minor (MN) alarm
Magenta	Raised Not-Alarmed (NA) condition
Blue	Raised Not-Reported (NR) condition
White	Cleared (C) alarm or condition

Release 4.1 and 4.5 have TL1 port-based alarm numbering that identifies an alarmed STS or VT by its STS on a port rather than the STS on the optical card. The numbering is present in the STS alarm (STSTerm and STSMon) and VT alarm (VTTerm and VTMon) TL1 access identifier (AID). Table 14-3 lists the object numbering schemes for MON and TERM objects.

Table 14-3   TL1 Port-Based Alarm Numbering Scheme

Object	STS or VT AID	Port No.
MON object	STS-<Slot>-<Port>-<STS> For example, STS-6-1-6	Port=1
	VT1-<Slot>-<Port>-<STS>-<VT Group>-<VT> For example, VT1-6-1-6-1-1	
TERM object	<Upstream Slot>-<Port>-<STS> For example, STS-6-3-6	Port=1
	<Upstream Slot>-<Port>-<STS>-<VT Group>-<VT> For example, VT1-6-3-6-1-1	

14.4.1 Viewing Alarms With Each Node's Time Zone

By default, alarms and conditions are displayed with the time stamp of the CTC workstation where you are viewing them. But you can set the node to report alarms (and conditions) using the time zone where the node is located by clicking Edit > Preferences, and clicking the Display Events Using Each Node's Timezone check box.

14.4.2 Controlling Alarm Display

You can control the display of the alarms shown on the Alarms window. Table 14-4 shows the actions you can perform in the Alarms window.

Table 14-4   Alarm Display

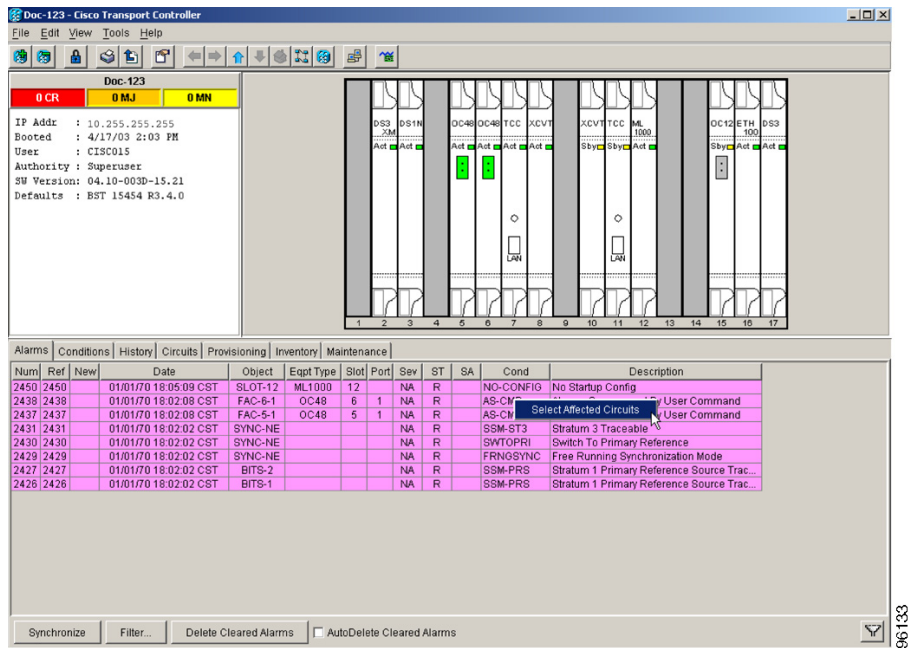| Button	Action
Filter	Allows you to change the display on the Alarms window to show only alarms that meet a certain severity level, occur in a specified time frame, and/or reflect specific conditions. For example, you can set the filter so that only critical alarms display on the window.
	If you enable the Filter feature by clicking the Filter icon button in one CTC view, such as node view, it is enabled in the others as well (card view and network view).
Synchronize	Updates the alarm display. Although CTC displays alarms in real time, the Synchronize button allows you to verify the alarm display. This is particularly useful during provisioning or troubleshooting.
Delete Cleared Alarms	Deletes alarms that have been cleared.

Table 14-4   Alarm Display (continued)

Button	Action
AutoDelete Cleared Alarms	If checked, CTC automatically deletes cleared alarms.
Filter tool	Enables or disables alarm filtering in the card, node, or network view. When enabled or disabled, this state applies to other views for that node and for all other nodes in the network. For example, if the Filter tool is enabled in the node (default login) view Alarms window, the network view Alarms window and card view Alarms window also show the tool enabled. All other nodes in the network also show the tool enabled.

14.4.3 Viewing Alarm-Affected Circuits

A user can view which ONS 15454 circuits are affected by a specific alarm by positioning the cursor over the alarm in the Alarm window and right-clicking. A shortcut menu is displayed (Figure 14-2). When the user selects the Select Affected Circuits option, the Circuits window opens to show the circuits that are affected by the alarm (Figure 14-3 on page 14-6).

Figure 14-2   Select Affected Circuits Option

Figure 14-3   Viewing Alarm-Affected Circuits

The alarm display can be filtered to keep particular alarm severities, or alarms that occur between certain dates, from appearing in the Alarms window (Figure 14-2 on page 14-5). You can set the parameters of the filter by clicking the Filter button at the bottom-left of the Alarms window. You can turn the filter on or off by clicking the Filter icon button at the bottom-right of the window. CTC retains your filter activation setting. For example, if you turn the filter on and then log out, CTC makes the filter active the next time your user ID is activated.

14.4.4 Conditions Tab

The Conditions window displays retrieved fault conditions. A condition is a fault or status detected by ONS 15454 hardware or software. When a condition occurs and continues for a minimum period, CTC raises a condition, which is a flag showing that this particular condition currently exists on the ONS 15454.

The Conditions window shows all conditions that occur, including those that are superseded. For instance, if a network problem causes two alarms, such as LOF and LOS, CTC shows both the LOF and LOS conditions in this window. Having all conditions visible can be helpful when troubleshooting the ONS 15454. If you want to retrieve conditions that obey a root-cause hierarchy (that is, LOS supersedes and replaces LOF), you can exclude the same root causes by checking a check box in the window.

Fault conditions include reported alarms and not-reported or not-alarmed conditions. Refer to the trouble notifications information in the *Cisco ONS 15454 Troubleshooting Guide* for more information about alarm and condition classifications.

14.4.5 Controlling the Conditions Display

You can control the display of the conditions on the Conditions window. Table 14-5 on page 14-7 shows the actions you can perform in the window.

Table 14-5   Conditions Display

Button	Action
Retrieve	Retrieves the current set of all existing fault conditions, as maintained by the alarm manager, from the ONS 15454.
Filter	Allows you to change the Conditions window display to only show the conditions that meet a certain severity level or occur in a specified time. For example, you can set the filter so that only critical conditions display on the window. There is a Filter icon button on the lower-right of the window that allows you to enable or disable the filter feature.

14.4.5.1 Retrieve and Display Conditions

The current set of all existing conditions maintained by the alarm manager can be seen when you click the Retrieve button. The set of conditions retrieved is relative to the view. For example, if you click the button while displaying the node view, node-specific conditions are displayed. If you click the button while displaying the network view, all conditions for the network (including ONS 15454 nodes and other connected nodes such as ONS 15454) are displayed, and the card view shows only card-specific conditions.

You can also set a node to display conditions using the time zone where the node is located, rather than the time zone of the PC where they are being viewed. See the "Viewing Alarms With Each Node's Time Zone" section on page 4 for more information.

14.4.5.2 Conditions Column Descriptions

Table 14-6 lists the Conditions window column headings and the information recorded in each column.

Table 14-6   Conditions Column Description

Column	Information Recorded
New	Indicates a new condition.
Date	Date and time of the condition.
Object	TL1 access identifier (AID) for the condition object. For an STSmon or VTmon, the object.
Eqpt Type	Card type in this slot.
Slot	Slot where the condition occurred (appears only in network and node view)
Port	Port where the condition occurred. For STSTerm and VTTerm, the port refers to the upstream card it is partnered with.
Sev[1]	Severity level: CR (critical), MJ (major), MN (minor), NA (not-alarmed), NR (not-reported).
SA[1]	Indicates a service-affecting alarm (when checked).
Cond	The error message/alarm name; these names are alphabetically defined in the "Alarm Troubleshooting" chapter of the *Cisco ONS 15454 Troubleshooting Guide.*

Table 14-6   Conditions Column Description (continued)

Column	Information Recorded
Description	Description of the condition.
Node	Node where the alarm occurred (appears only in network view).

1. All alarms, their severities, and service-affecting statuses are also displayed in the Condition tab unless you choose to filter the alarm from the display using the Filter button.

14.4.6 Viewing History

The History window displays historical alarm data. It also displays conditions, which are not-alarmed activities such as timing changes and threshold crossings. For example, protection-switching events or performance-monitoring threshold crossings appear here. The ONS 15454 can store up to 640 critical alarm messages, 640 major alarm messages, 640 minor alarm messages, and 640 condition messages. When any of these limits is reached, the ONS 15454 discards the oldest events in that category.

Note In the Preference dialog General tab, the Maximum History Entries value only applies to the Session window.

- The History > Session window is shown in network view, node view, and card view. It shows alarms and conditions that occurred during the current user CTC session.
- The History > Node window is only shown in node view. It shows the alarms and conditions that occurred on the node since CTC software was operated on the node.
- The History > Card window is only shown in card view. It shows the alarms and conditions that occurred on the card since CTC software was installed on the node.

Tip Double-click an alarm in the History window to display the corresponding view. For example, double-clicking a card alarm takes you to card view. In network view, double-clicking a node alarm takes you to node view.

14.4.6.1 History Column Descriptions

Table 14-7 lists the History window column headings and the information recorded in each column.

Table 14-7   History Column Description

Column	Information Recorded
Date	Date and time of the condition.
Object	TL1 access identifier (AID) for the condition object. For an STSmon or VTmon, the object.
Sev	Severity level: critical (CR), major (MJ), minor (MN), not-alarmed (NA), not-reported (NR).
Eqpt Type	Card type in this slot (only displays in network view and node view).
ST	Status: raised (R), cleared (C), or transient (T).
Description	Description of the condition.

Table 14-7   History Column Description (continued)

Column	Information Recorded
Port	Port where the condition occurred. For STSTerm and VTTerm, the port refers to the upstream card it is partnered with.
Cond	Condition name.
Slot	Slot where the condition occurred (only displays in network view and node view).
SA	Indicates a service-affecting alarm (when checked).

14.4.6.2 Retrieve and Display Alarm and Condition History

You can retrieve and view the history of alarms and conditions, as well as transients (passing notifications of processes as they occur) in the CTC history window. The information in this window is specific to the view where it is shown (that is, network history in the network view, node history in the node view, and card history in the card view).

The node and card history views are each divided into two tabs. In node view, when you click the Retrieve button, you can see the history of alarms, conditions, and transients that have occurred on the node in the History > Node window, and the history of alarms, conditions, and transients that have occurred on the node during your login session in the History > Session window. In the card-view history window, once you retrieve the card history, you can see the history of alarms, conditions, and transients on the card in the History > Card window, or a history of alarms, conditions, and transients that have occurred during your login session in the History > Session window.

You can also filter the severities and occurrence period in these history windows, but you cannot filter out not-reported conditions or transients.

14.5 Alarm Profiles

The alarm profiles feature allows you to change default alarm severities by creating unique alarm profiles for individual ONS 15454 ports, cards, or nodes. A created alarm profile can be applied to any node on the network. Alarm profiles can be saved to a file and imported elsewhere in the network, but the profile must be stored locally on a node before it can be applied to the node, its cards, or its cards' ports.

CTC can store up to ten active alarm profiles at any time to apply to the node. Custom profiles can take eight of these active profile positions, and two are reserved by CTC. The reserved Default profile contains Telcordia GR-253-CORE severities. The reserved Inherited profile allows port alarm severities to be governed by the card-level severities, or card alarm severities to be determined by the node-level severities.

If one or more alarm profiles have been stored as files from elsewhere in the network onto the local PC or server hard drive where CTC resides, you can utilize as many profiles as you can physically store by deleting and replacing them locally in CTC so that only eight are active at any given time.
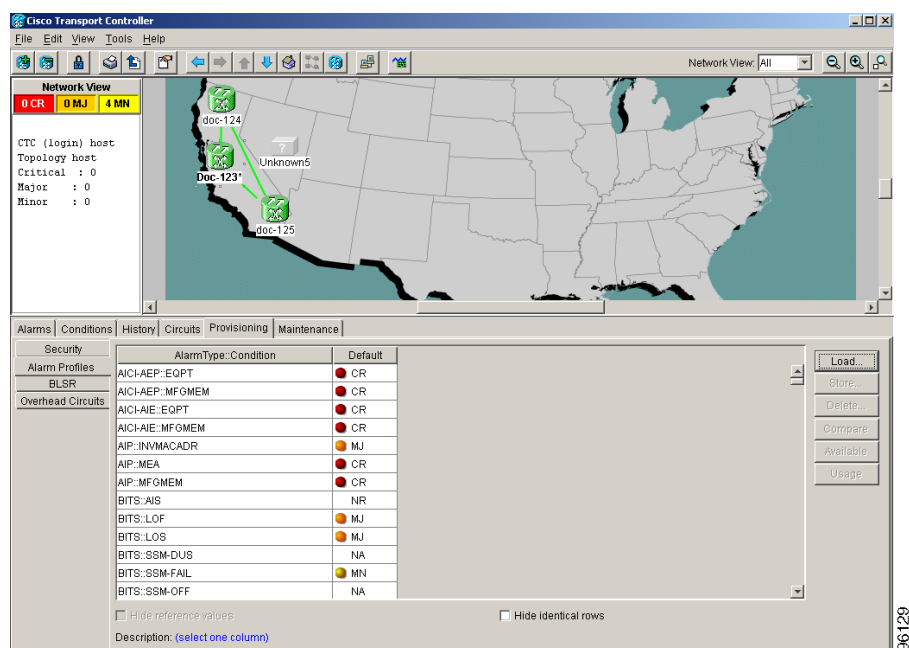
14.5.1 Creating and Modifying Alarm Profiles

Alarm profiles are created in the network view using the Provisioning > Alarm Profiles tabs. Figure 14-4 shows the default list of alarm severities. A default alarm profile (in the Default column) is preprovisioned for every alarm. After loading the default profile on the node, you can use the Clone feature to create profiles based upon the default alarm profile. After the new profile is created, the Alarm Profiles window shows the default profile and the new profile.

Note   The alarm profile list contains a master list of alarms that is used for a mixed node network. Some of these alarms may not be used in all ONS nodes.

Figure 14-4   Network View Alarm Profiles Window

14.5.2 Alarm Profile Buttons

The Alarm Profiles window displays six buttons on the right side. Table 14-8 lists and describes each of the alarm profile buttons and their functions.

Table 14-8   Alarm Profile Buttons

Button	Description
Load	Loads a profile to a node or a file.
Store	Saves profiles on a node (or nodes) or in a file.
Delete	Deletes profiles from a node.

Table 14-8   Alarm Profile Buttons (continued)

Button	Description
Compare	Displays differences between alarm profiles (for example, individual alarms that are not configured equivalently between profiles).
Available	Displays all profiles available on each node.
Usage	Displays all entities (nodes and alarm subjects) present in the network and which profiles contain the alarm. Can be printed.

14.5.3 Alarm Profile Editing

Table 14-9 lists and describes the five profile-editing options available when you right-click an alarm item in the profile column (such as Default).

Table 14-9   Alarm Profile Editing Options

Button	Description
Store	Saves a profile in a node or in a file.
Rename	Changes a profile name.
Clone	Creates a profile that contains the same alarm severity settings as the profile being cloned.
Reset	Restores a profile to its previous state or to the original state (if it has not yet been applied).
Remove	Removes a profile from the table editor.

14.5.4 Alarm Severity Options

To change or assign alarm severity, left-click the alarm severity you want to change in the alarm profile column. Seven severity levels appear for the alarm:

- Not-reported (NR)
- Not-alarmed (NA)
- Minor (MN)
- Major (MJ)
- Critical (CR)
- UNSET: Unset/Unknown (not normally used)
- Transient (T)

Transient and Unset only appear in alarm profiles. They do not appear when you view alarms, history, or conditions.

14.5.5 Row Display Options

In the network view, the Alarm Profiles window displays two check boxes at the bottom of the window:
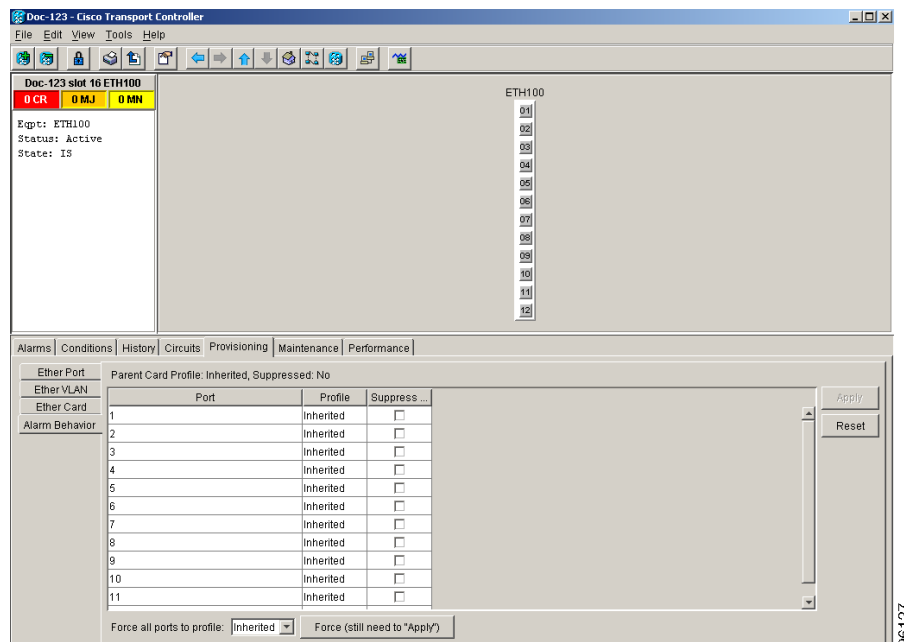
- Hide reference values—Highlights alarms with non-default severities by clearing alarm cells with default severities (currently disabled in Release 4.5).

- Hide identical rows—Hides rows of alarms that contain the same severity for each profile.

14.5.6 Applying Alarm Profiles

In CTC node view, the Alarm Behavior window displays alarm profiles for the node. In card view, the Alarm Behavior window displays the alarm profiles for the selected card. Alarm profiles form a hierarchy. A node-level alarm profile applies to all cards in the node except cards that have their own profiles. A card-level alarm profile applies to all ports on the card except ports that have their own profiles.

At the node level, you can apply profile changes on a card-by-card basis or set a profile for the entire node. At the card-level view, you can apply profile changes on a port-by-port basis or set alarm profiles for all ports on that card. Figure 14-5 shows the E100-2 card view of an alarm profile.

Figure 14-5   Card View of an E100-2 Card Alarm Profile

14.6 Suppressing Alarms

ONS 15454 nodes that support Release 4.1 have alarm suppression options that keep node, slot, chassis, or port alarms from being displayed in the Alarms window. Suppression changes the entity alarm to Not-Reported, so suppressed alarms are shown in the Conditions window. The suppressed alarms are displayed with their other visual characteristics (service-affecting status and color-coding) in the window. These alarms do not appear in the History window or in any other clients.

In node view, you can suppress all alarms for a node, one or more card slots, fan slots, or non-card objects such as the chassis by clicking the Provisioning > Alarm Behavior tabs and clicking the Suppress Alarms check box. In the card view, you can suppress alarms on a port-by-port basis. All alarms for the entity are suppressed. For example, if you click the Suppress Alarms check box in node view, all node alarms appear in the Conditions window rather than the Alarms window. If you suppress alarms for one or more slots or ports, alarms for those entities appear in the Conditions window.

Note   Use alarm suppression with caution. If multiple CTC or TL1 sessions are open, suppressing the alarms in one session suppresses the alarms in all other open sessions.

14.7 Provisioning External Alarms and Controls

External alarm inputs can be provisioned on the AIC or AIC-I cards for external sensors such as an open door and flood sensors, temperature sensors, and other environmental conditions. External control outputs on these two cards allow you to drive external visual or audible devices such as bells and lights. They can control other devices such as generators, heaters, and fans.

You provision external alarms in the AIC card view Provisioning> External Alarms tab and controls in the AIC card view Provisioning > External Controls tab. Up to 4 external alarm inputs and 4 external controls are available with the AIC card. Up to 12 external alarm inputs and 4 external controls are available with the AIC-I card. If you also provision the alarm extension panel (AEP) with the AIC-I, there are 32 inputs and 16 outputs.

14.7.1 External Alarm Input

You can provision each alarm input separately. Provisionable characteristics of external alarm inputs include:

- Alarm type
- Alarm severity (CR, MJ, MN, NA, and NR)
- Alarm-trigger setting (open or closed)
- Virtual wire associated with the alarm
- CTC alarm log description (up to 63 characters)

14.7.2 External Control Output

You can provision each alarm output separately. Provisionable characteristics of alarm outputs include:

- Control type.

Cisco ONS 15454 Reference Manual, R4.1.x and 4.5

- Trigger type (alarm or virtual wire).

- Description for CTC display.

- Closure setting (manually or by trigger). If you provision the output closure to be triggered, the following characteristics can be used as triggers:

  - Local NE alarm severity—A chosen alarm severity (for example, major) and any higher-severity alarm (in this case, critical) causes output closure.

  - Remote NE alarm severity—Similar to local NE alarm severity trigger setting, but applies to remote alarms.

  - Virtual wire entities—You can provision an alarm that is input to a virtual wire to trigger an external control output.

14.8 Audit Trail

The ONS 15454 keeps a human-readable audit trail of all system actions, such as circuit creation or deletion, and security events such as login and log outs. You can archive this log in text form on a PC or network. You can access the log by clicking the Maintenance > Audit tabs. The log capacity is 640 entries; when this limit is reached, the oldest entries are overwritten with new events. When the log is 80% full, an AUD-LOG-LOW condition is raised. When the log is full and entries are being overwritten, an AUD-LOG-LOSS condition occurs.

This window contains the columns listed in Table 14-10.

Table 14-10 Audit Trail Window Columns

Heading	Explanation
Date	Date when the action occurred
Num	Incrementing count of actions
User	User ID that initiated the action
P/F	Pass/Fail (that is, whether the action was or was not executed)
Operation	Action that was taken