
Alarms and Events

The *LookoutDirect* alarm service keeps track of error messages and any process elements you have defined alarm conditions for. You can define alarm conditions for most *LookoutDirect* objects and data members. You can filter, display, log, and print alarms. You can also organize alarms into hierarchal areas to aid in performing the other alarm tasks. All *LookoutDirect* alarms and events are automatically logged to the Citadel database.

When the alarm display window is visible, a pair of thin lines serve as a cursor. You can scroll through the alarms with your keyboard cursor keys, selecting individual alarms with the spacebar.

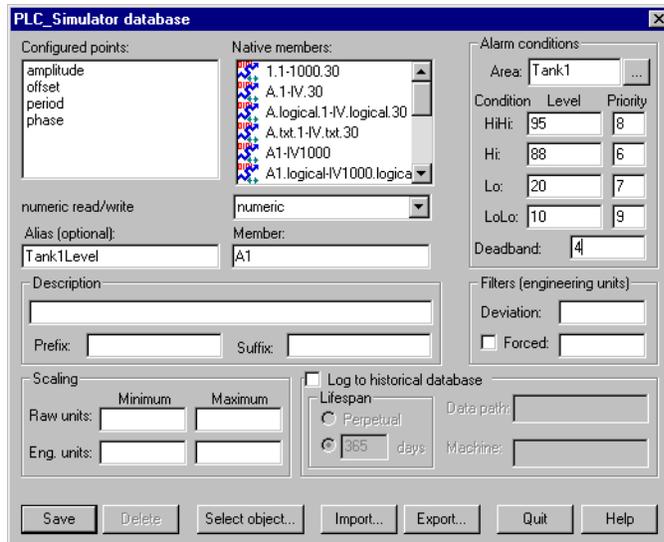
Right-clicking in the alarm window opens the **Alarms** menu, which includes options you can use to acknowledge alarms and access all other alarm properties.

Defining Alarm Conditions

You can create an alarm condition in two ways. First, you can define alarm parameters when modifying an object database (*Database-Generated Alarms*). Second, you can use Alarm objects to define alarm conditions (*Alarm Object* method).

Database-Generated Alarms

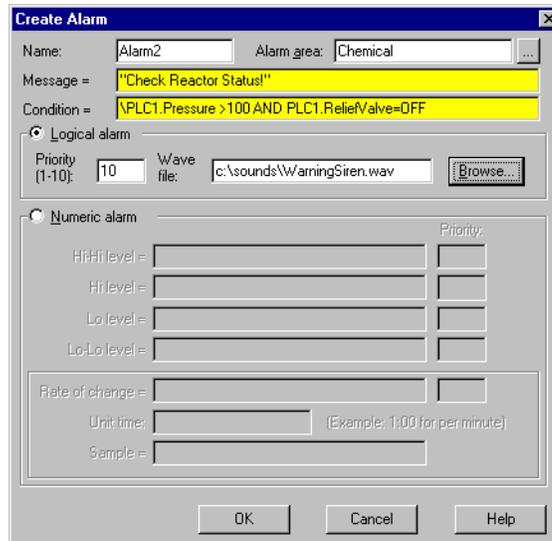
Most objects contain numeric or logical data members. If they exceed specified conditions, you want *LookoutDirect* to generate an alarm. These conditions can include high, low, high-high, and low-low. Select **Object»Edit Database** or right-click on the object in the *LookoutDirect* Object Explorer to modify alarm parameters for an object data member in its database dialog box as illustrated in the following figure. You can browse for an existing alarm area for the alarms, or create a new one.



This method offers the most efficient way to define standard or simple alarm conditions. Furthermore, this method is especially useful when you configure alarms for data that originate from objects with large databases, like Driver objects and DataTable objects.

Alarm Objects

For dedicated Alarm objects, you define and create Alarm objects on an individual basis with the **Object»Create** command, or by right-clicking on a process in the Lookout*Direct* Object Explorer. The **Create Alarms** dialog box appears, as shown in the following illustration.



You can create alarms that are triggered by any event or combination of events you specify in the **Create Alarm** dialog box using as simple or complex an alarm criterion as needed. You do not have to use the traditional set of alarm conditions (that is, High, Low, Rate-of-Change). See the *Alarm* topic in your online help or in the online PDF *LookoutDirect Object Reference Manual* for additional information.

Alarm objects are not the only source of alarm signals. Most object classes generate their own alarm signals—Driver, Spreadsheet, and Expression objects can also generate alarms.

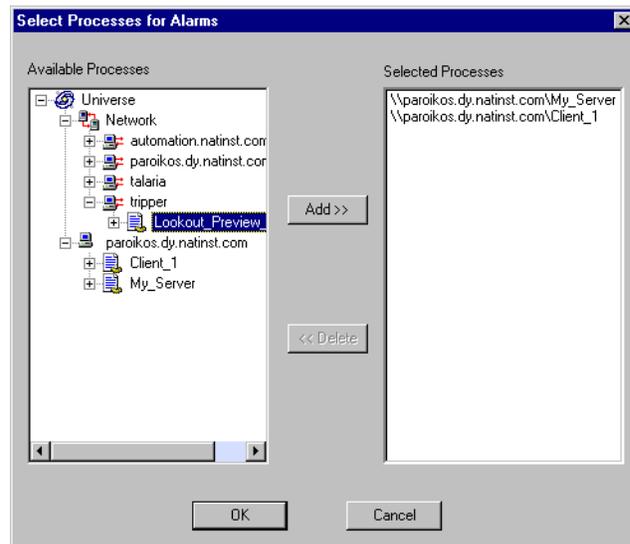
Several object classes generate circular reference alarms. A circular reference alarm defines a condition where the signal generated by an object is sent back to that object as a parameter, either directly or indirectly. Circular references are always priority 10 alarms, and you should correct them during process file testing.

The Alarm Subsystem

You use the alarm subsystem, which is comprised of several components, to control how alarms are displayed, acknowledged, printed, grouped into areas, prioritized, and filtered. Before you implement a structure for your alarming system, you should understand these various components.

Selecting Processes to Monitor for Alarms

Before you can monitor alarms or events running on other computers, you must add the processes those events might rise from to the list of processes your monitoring computer is keeping track of. To select processes to monitor, choose **Alarms»Select Processes**. The following dialog box appears.



Select the processes in the **Available Processes** list that you want to monitor and click the **Add** button. To stop monitoring a process, select the process in the **Selected Processes** list and click the **Delete** button.

Alarm Areas

For organizational purposes, you can classify alarms into areas. Alarm areas allow operators to filter unwanted alarms and acknowledge alarms on an area-by-area basis.

You can create any number of alarm areas and assign any number of alarms to any area. However, you should carefully plan your alarming structure so operators can filter alarms by meaningful categories. With a carefully planned

structure, you can handle specific areas and/or priorities if your system experiences a large number of alarms.



Note One reason to decide on your alarm area arrangement in advance has to do with maintaining alarm data continuity. If you move alarm notification from one area to another, only new notifications will be stored in the new area. To access old alarms, you have to search in the original area.

LookoutDirect has hierarchal organization of alarms based on alarm areas. When you create an alarm area, LookoutDirect creates a folder in the global \$Alarm object to hold those alarms. These folders make browsing for alarm areas when setting filters more convenient.

When you first start LookoutDirect, it has one default alarm area called LookoutDirect. There are also a number of alarm areas built into LookoutDirect that become visible when you create or open a process that uses one of the objects associated with those areas. Table 9-1 lists the various alarm areas.

Table 9-1. LookoutDirect Alarm Areas

Alarm Area	Description
LookoutDirect	LookoutDirect default alarm area. Includes alarms not directed to a specific alarm area.
Serial Ports (comm)	Alarms involving serial ports and serial communication.
Citadel	Alarms concerning the Citadel database.
DDE	Alarms generated by any DDE object or action.
Disk	Disk alarms.
Math	Mathematical errors, such as an attempt to divide by zero.
Print	Printer alarms.

You create your own alarm areas by entering an alarm area name in the **Area** field of the **Alarm conditions** section of the database dialog box or in the **Alarm area** field of the Alarm object.

After you create or activate a LookoutDirect alarm area, that area becomes a part of your Citadel database and appears in the alarm area hierarchy, whether or not the process directing alarms to that area is running.

See the *Alarm* object in the *LookoutDirect* online PDF *Object Reference Manual*.

Alarm Priorities

Assign each alarm a priority level ranging from 1 to 10, where Priority 1 is the lowest priority alarm and Priority 10 is the highest priority alarm.

Priority 1 alarms do not require operator acknowledgment. When they are deactivated, Priority 1 alarms are removed from the alarm window by *LookoutDirect*, regardless of acknowledgment.

You should assign Priority 1 to only minor, inconsequential alarms. Often, priority 1 alarms do not exist in control strategies. If an occurrence is significant enough to be classified as an alarm condition, you should assign a priority level that requires operator acknowledgment.

Priority 2 and higher alarms require operator acknowledgment before they are removed from the alarm list.

The **Data files location** parameter in the **System Options** dialog box specifies the root directory for the Citadel database.

Alarm Window

The **Alarm** window lists all active and unacknowledged alarms. Alarms are listed in chronological order with the most recent alarm at the top of the list. If there are too many alarms to see at once, you can use the scroll bar at the right of the **Alarm** window to scroll through the list.

If you have your Alarm window display options set to minimize the window, you can view the alarm window by pressing <Ctrl-A>, selecting **Alarms»Show**, or clicking on the alarm indicator box on the far right side of the *LookoutDirect* status bar at the bottom of the screen, shown in the following figure.



To quickly identify alarm status, use the *LookoutDirect* **Alarm** window color scheme, as defined in Table 9-2.

Table 9-2. Alarm Colors

Color	Alarm Status
Red	Active
Blue	Unacknowledged, Inactive
Red and Black	Acknowledged, Active (Alarm information, including time, description, priority, and name, appears in black and the area in red).

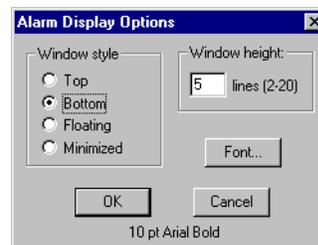
When you acknowledge an inactive alarm or an acknowledged alarm deactivates, *LookoutDirect* removes the alarm from the alarm window. Because a new line is added to the list every time the alarm activates, *LookoutDirect* might list the same alarm condition multiple times in the alarm window.

When you acknowledge an alarm or a block of alarms, *LookoutDirect* prompts you to enter a comment, which is logged to the database along with the acknowledgement time and operator. This comment is optional, and you can omit entering it if there is nothing to make a note of.

To view detailed information about a particular alarm, right-click on the alarm in the alarm window and select **Properties**.

Alarm Display Options

The **Alarm** window displays unacknowledged alarms that meet alarm filter requirements you set with the **Alarm Filter** dialog box. With the **Alarms»Display Options** command, you can change the display style of the **Alarm** window. The **Alarm Display Options** dialog box appears, as shown in the following figure.



The **Window style** determines the position of the alarm window in the *LookoutDirect* workspace. If you select **Floating**, the alarm window appears

as a pop-up style control panel that you can resize and move on the screen. You can minimize a floating alarm window at any time.

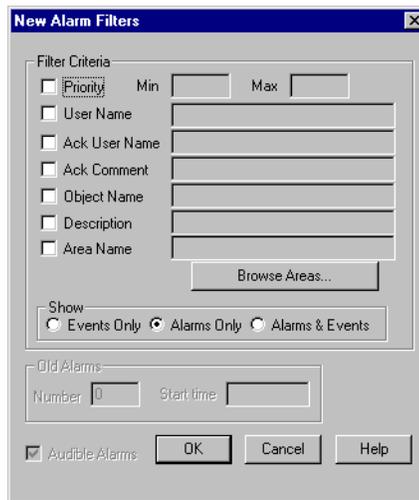
If you use either the **Top** or **Bottom** window type, the **Window height** specifies the number of alarms LookoutDirect can display in the **Alarm** window. The actual height of the **Alarm** window adjusts automatically depending on the selected font and **Window height** setting. You can resize a floating **Alarm** window at any time with the sizing border. If more alarms occur than can be displayed in the **Alarm** window at once, a scroll bar appears along the right side of the window.

The following illustration shows an example of an **Alarm** window with **Window style** set to **Bottom** and **Window height** set to 4.

Time	Process	Area	P..	Object Name	Description
14:20:44.2	\\kali\Saturn_5_Station	Saturn\Station5\Sector3\FuelCells	4	\\kali\Satur...	Temperature on fuel cell 4 exceeds specification.
14:20:44.2	\\kali\Saturn_5_Station	Saturn\Station5\Sector7\Pumps\Gas	7	\\kali\Satur...	Clogged Intake Valve
14:18:16.5	\\kali\Saturn_5_Station	Saturn\Station5\Sector4\Conveyers	9	\\kali\Satur...	Conveyor 9 is jammed

Alarm Filters

To filter the alarms that appear in your alarm window, select **Alarms»Filter Options**, or right-click in the alarm window and select **Filter Options**. The following dialog box appears.



To monitor alarms with specific priorities, set the **Min** and **Max** values of the **Priority** criterion.

Set **User Name** to restrict your alarm monitoring to alarms generated while that particular user is logged on. You can only select one user name at a time, but you can use wild card characters to widen the scope of the alarms reported.

Set **Ack User Name** to restrict your alarm monitoring to alarms acknowledged by that particular user. You can only enter one user name at a time, but you can use wild card characters to widen the scope of the alarms reported.

The **Ack Comment** filter restricts your alarms displayed to those with the specified acknowledgement comment.

Set **Object Name** to restrict your alarm monitoring to alarms involving the name you enter. You can only enter one name at a time, but you can use wild card characters to widen the scope of those objects reported.

Set **Description** to restrict your monitoring alarms that meet your criteria. You can only choose one description category at a time, but you can use wild card characters to widen the scope of the alarms reported. The LookoutDirect categories HiHi, Hi, Lo, or LoLo are added as a prefix to any descriptions and are ignored by description filtering.

Set **Area Name** to restrict your monitoring to the alarm area you choose. You can only enter one alarm area at a time.

Use the **Browse Areas** button to locate and select the alarm area you want to use as a filter.

You can choose to have the LookoutDirect **Alarm** window show alarms only, events only, or both alarms and events by checking the appropriate box in the **Show** section of this dialog box.

Use the parameters in the **Old Alarms** section to display alarms after they have been acknowledged.

Select **Audible Alarms** to enable a sound alert when an alarm takes place. The sound depends on your windows system setting for error sounds.

The **Alarm Alert** box in the right corner of the status bar displays the number of alarms currently visible in the alarm window.

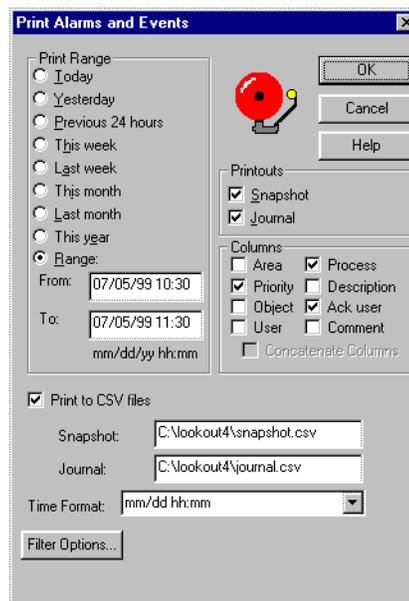


If you are filtering alarms, alarms that do not meet your filter criteria do not show up in this status bar count. To see all alarms, click on the **Display All**

button in the **Alarm Filters** dialog box, then click on **OK**. The alarm window displays all active and unacknowledged alarms. The status bar reflects the change.

Alarm Print

You can print alarms in LookoutDirect, based on your filtering. To print your alarms, select **Alarms»Print**. The following dialog box appears.



Select the time range you want to print alarms and events from with the items in the **Print Range** section of the dialog box. Notice that when you define your own range, you use month, day, and year, followed by hour and minute.

The **Printouts** selections determine the exact alarm information included in your printout. **Snapshot** only prints the status of alarms at the beginning of the specified **Range** but does not indicate what happened during the time span. **Journal** creates a printout of everything that happened during the time span from the beginning of the **Range**.

Specific information about each alarm is presented in columnar format. LookoutDirect prints only the information you designate. Select which columns you want printed in the **Columns** section of the dialog box.

To print to a comma separated file (.CSV), select the **Print to CSV file** option. Enter the file names for your journal and snapshot files, including a complete

path to where you want the file written. If you enter a file name only, LookoutDirect will create the file in the LookoutDirect directory.

Set the format for printing times in the **Time Format** list.

You can adjust your alarm filters for printing by clicking on the **Filter Options** button to access the alarm filter options.



Note You can print alarms as they happen by specifying a printer port in the **Log alarms to** field of the **System Options** dialog box, accessed by selecting **Options»System** from the menu bar. This works well for a printer directly connected to your computer. To print alarms directly to a network computer, you have to capture a port in the network printer driver and link it to your networked printer. Consult your operating system documentation for detailed instructions on how to capture a port for a printer driver.

Alarm Acknowledgment

Before you can acknowledge an alarm, you must select it. To select an alarm, click on the alarm line in the **Alarm** window. Highlighting indicates that the alarm is selected. To deselect an alarm, click on the alarm line. <Ctrl-click> to select multiple individual alarms; <Shift-click> to select blocks.

You can access all the acknowledgement options from the Alarms menu item, or by right-clicking in the **Alarm** window.

Right-click an alarm in the window and choose **Select All** to select all alarms for acknowledgment. You can also select **Acknowledge All**. Because selecting each alarm individually can be very time consuming, either technique can be especially useful if your process is experiencing a high number of alarms.

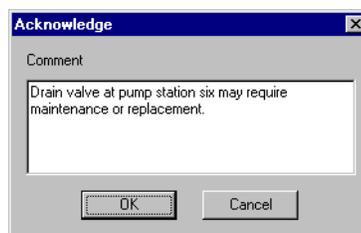
Right-click and select **Deselect All** to deselect all alarms that were previously selected for acknowledgment. If you want to deselect only some of the alarms, <Ctrl-click> on the individual alarms you want deselected.

Selecting **Acknowledge** acknowledges alarms that you have selected for acknowledgment. If you have not selected alarms when you invoke this command, the following message box appears.

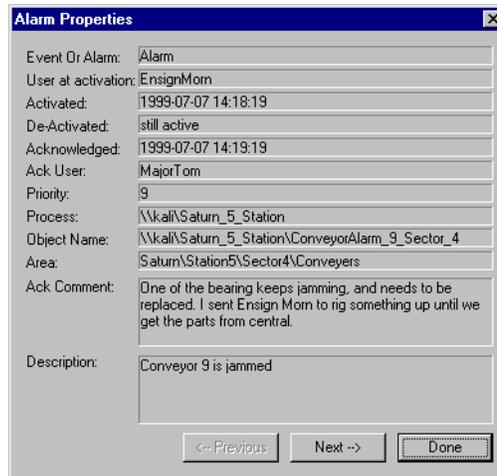


If you select one or more alarms for acknowledgment, a dialog box appears for an operator to enter a comment concerning the alarm. Comments are optional, and you can click on **OK** to finish acknowledging alarms without entering a comment.

You can search the database for alarms or print out the alarms based on comments, so using certain standard comments (in addition to comments on specific circumstances) can make the filtering process easier. You should create your own master list of standard comments if you want your operators to use them.



You might want further information about a specific alarm or event. Right-click on an alarm and select **Properties**. The following dialog box listing specific information about the alarm or event appears.



You can scroll through alarms and events using the **Previous** and **Next** buttons.

Acknowledging Alarms Programatically

By connecting to the appropriate data members of the global `$Alarm` object, you can acknowledge alarms programatically with Pushbuttons or other logical expressions. This way, you can bypass the menu commands, or acknowledge alarms from remote Lookout*Direct* network nodes. For instance, you could create a single Pushbutton that acknowledges all alarms, or you could create multiple Pushbuttons for acknowledging specific areas of alarms.

With the `$Alarm` object, you can access numeric signals that indicate the number of currently active alarms or the number of unacknowledged alarms in a particular area. For more information, refer to `$Alarm` in your online help or in the online PDF Lookout*Direct* *Object Reference Manual*.

