Alarm Handler User's Guide

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Chapter 1: Preface

Purpose of Document

This document presents a description of the functions provided by the Alarm Handler (ALH) and describes its graphical user interface. The purpose of this guide is to explain how to use and configure the Alarm Handler.

Audience

This guide is written for individuals who wish to use and understand the Alarm Handler, namely accelerator operators and accelerator physicists.

Background/Environment

The Alarm Handler is part of the Experimental Physics and Industrial Control System (EPICS) co-developed by Los Alamos National Laboratory and Argonne National Laboratory. EPICS consists of a set of software components and tools with which application developers and designers can create an extremely flexible control system that minimizes the need for custom coding and helps ensure uniform operator interfaces. The Alarm Handler is one of the EPICS control system tools.

EPICS Control System Perspective

The Alarm Handler provides an interface between an operator and the EPICS control system database. The database is the interface between instrumentation hardware and all the EPICS control system software tools. This database is distributed throughout a network on I/O Controllers and contains records that are used to transfer information to and from the attached instrumentation to the Alarm Handler and other EPICS software tools.

Database records are made up of fields of various types. Scan fields specify under what circumstances a record will be processed. Convert fields determine how to convert a raw signal to/from engineering units. Device fields are used to specify the software interface to the device. Operator display fields specify how to display the record value. Processing fields are used by the run-time code for processing the record. There are also alarm fields that are used to specify conditions for alarm and to determine if the record is in an alarm state. Most fields are accessible throughout the network by means of the channel access interface software layer by specifying the record name and the field name. All monitoring and control operations are performed through the database.

Alarm Fields

Each record in the database includes fields for specifying the record’s current alarm condition. There are two parts to this alarm condition: the alarm status and the severity of that alarm status. Alarm status and severity values are set and checked whenever a record is processed. When a new condition is detected, a routine is called to send a message to each process monitoring this record. The Alarm Handler is one of these processes.

Each database record also includes two fields for specifying the record’s current alarm acknowledgment state. The unacknowledged severity field is the highest severity value of unacknowledged alarms, and the acknowledge transients field specifies whether transient alarms need to be acknowledged. A transient alarm is when the record enters alarm state and then returns to normal before the alarm is acknowledged. When any change to these fields is detected, a routine is called to send a message to each process monitoring this record.

The Alarm Handler filters alarm messages and displays alarms to the operator hierarchically. The alarm configuration structure defined in the alarm configuration file is used to determine this hierarchical display. The Alarm Handler brings alarms to the operator's attention, logs the alarms, allows the operator to acknowledge alarms, and gives the operator guidance on handling of specific alarms.

Document Organization

Chapter 1 is this Preface describing the users guide. Chapter 2 is an Introduction to the Alarm Handler and describes the scope of the tool and explains some Alarm Handler terminology. Chapter 3 explains how to invoke the Alarm Handler and describes the command line options. The Main Window is explained in Chapter 4 and Chapter 5 contains a description all Main Window menu functions. The content of an alarm configuration file is described in Chapter 6. An index of terms is available at the end of the document. Using the alarm configuration mode will be explained in Chapter 7 of a future version of this document.

Chapter 2: Introduction

What is the Alarm Handler?

Definition

The Alarm Handler is an interactive graphical application used primarily by accelerator operators and physicists to display and monitor EPICS database alarm states. It serves as an interface between an operator and the EPICS database and it communicates with the database using channel access function calls. The user interface for the Alarm Handler contains a hierarchical display of an alarm configuration structure allowing both high level and detailed views of the alarm configuration structure in one window.

Availability

The alarm handler is a Motif and X11 Window based application written in C language, and it runs on Unix, Linux, and Windows 95/NT hosts. The Alarm Handler source code is available via WWW as an EPICS extension.

Purpose of the Alarm Handler

The Alarm Handler monitors alarm conditions of EPICS database records. The primary responsibilities of the Alarm Handler (ALH) are to:

- Bring alarms to the operator's attention.
- Provide the operator guidance for handling of specific alarms
- Allow the operator to globally acknowledge alarms.
- Provide a graphical view of current database alarms
- Provide for logging alarms and display of the logged alarm history

System Requirements

The Alarm Handler currently requires either an IBM personal computer with Windows 95/NT and Hummingbird's Exceed software or a workstation running a Unix type operating system with X Windows and Motif Version 1.2 or above. The Alarm Handler also requires the global alarm acknowledgment in EPICS base Version 3.11 or above.

Alarm Handler Terminology

Alarm

An unexpected change of state for an EPICS database record. Examples of alarm conditions are:

- Deviations from tolerance band
- Software or Hardware errors
- Loss of communication to hardware or linked records

There are two parts to an alarm: the alarm status and the severity of that alarm status. Alarm status and severity are set and checked whenever a record is processed. When a change is detected, a routine is called which sends a message to each process monitoring this record. The Alarm Handler may be one of these processes.

Alarm Severity

The SEVR alarm field in an EPICS database record specifies the severity of an alarm state. Currently the alarm severity can take one of the following four values:

NO_ALARM, MINOR, MAJOR, INVALID

Alarm Status

Each EPICS database record has a STAT alarm field that specifies the alarm state of the database record. Currently the status field can take one of more than 20 values, some of which are:

READ, WRITE, HIHI, HIGH, LOW, LOLO, STATE, COS, COMM, ...

Alarm Channels

The Alarm Handler displays alarms for an arbitrary set of channels. Each Alarm Channel refers to a specific EPICS database record.

Alarm Groups

The Alarm Handler provides a grouping mechanism so that related channels can be grouped together. An Alarm Group consists of a named set of lower level groups and/or database channels.

Error State

An Alarm Channel will be considered in an error state if there is a loss of communication between the Alarm Handler and the channel or if a channel access exception or other error occurs on the channel.

Local / Global Mode

The alarm handler can execute in either a local or global mode. Global mode means that unacknowledged severity and acknowledge transients states will be determined by the current value of the fields in an EPICS database record. Local mode means that the unacknowledged severity and acknowledge transients states are local alh settings. Command line options determine the execution mode with local mode being the default setting. There is no way to change between local and global mode during execution.

Passive / Active State

The alarm handler can execute in either a passive (monitor) or active (modify) state. Passive state means that the alarm handler does not allow alarm acknowledgment and does not allow changes to acknowledge transients settings. There will be no channel access puts when executing in a passive state. The passive/active execution state is determined by a command line option with active state being the default and there is no way to change the current state during execution.

Alarm Acknowledgment

In Global Mode the Alarm Handler reads all ACKT and ACKS fields of the configured Alarm Channels: the Alarm Handler starts with the complete memory of still unacknowledged alarms. These alarms will have to be acknowledged, even if some may not be active anymore. (If a channel’s ACKT field is set, any transient alarm will be latched and has to be acknowledged later on.) Global Mode also makes the Alarm Handler write alarm acknowledgements into the channels using Channel Access, i.e. all other Alarm Handlers in Global Mode will receive an alarm acknowledgment. Usually, all Alarm Handlers in the Control Room will run in Global Mode, so that any alarm has to be acknowledged only on one of the Alarm Handlers.

In Local Mode, the Alarm Handler starts without reading open acknowledgements from the channels, all alarm acknowledgements made will be valid only for this instance of the Alarm Handler. Usually, Alarm Handlers outside of the Control Room will run in Local Mode to prevent the operator from missing alarms that someone else acknowledged

and the alarm acknowledgment will be logged to the operator modification log file.

Alarm Handler Windows

The Alarm Handler display consists of two types of windows, a runtime window and a Main Window. While the Alarm Handler is executing, the runtime window is always displayed.

Runtime Window

The runtime window is a small icon like window that contains a single button containing the name of the alarm configuration main Alarm Group. The color of this button is used to show the highest alarm severity of any outstanding alarms. Beeping and blinking of the button is used to show the presence of unacknowledged alarms. Pressing the runtime window button will open the Alarm Handler Main Window or, if already open, bring the Main Window to the top of the window stack. The Close or Quit item on the window manager menu allows the user to exit the Alarm Handler.

Main Window

The Alarm Handler Main Window is divided into three parts: a menu bar, an alarm configuration display area, and a message area.

On the menu bar, there are selections for pull-down menu items that perform all the functions of the Alarm Handler.

The alarm configuration display area is divided into two major parts: an alarm configuration tree structure display and an Alarm Group contents display. The current alarm configuration tree structure appears in the first area, and a list of the contents of the currently selected Alarm Group from the alarm configuration tree structure appears in the second area. Color is used to show alarm severity. A single character severity code is also provided for an operator with a monochrome display.

The message area displays the name of the current configuration file and has indicators to show definitions of the summary alarms fields for the currently open alarm configuration file.

Alarm Handler Files

There are three files used by the alarm handler while it is executing. They are the alarm configuration file, the alarm log file, and the operation modification log file.

Alarm Configuration File

The alarm configuration file is the only file used as input to the Alarm Handler. This file defines the Alarm Group structure and takes data in a flexible input format. The alarm configuration file specifies the Alarm Groups, Alarm Channels, channel masks, hierarchy of Alarm Groups, and other configuration information. The format and contents of the alarm configuration file are described in Chapter 6.

The user can specify the desired alarm configuration file using a file selection window at Alarm Handler start-up, or on the command line.

Alarm Log File

The Alarm Log output file contains a log of alarm state changes. For each change of alarm state, channel access connection state, and read/write access state, the date, time, channel name and current state values are recorded. The alarm log file is an ASCII file that can be displayed on any terminal or sent to a printer.

Operation Modification Log File

The Operation Modification Log output file contains a log of alarm acknowledgments and changes the user has made to the current alarm handler configuration. For each operator modification the date, time and description of the operator’s modification are recorded.

Chapter 3: Starting ALH

Path Requirements

Before invoking the Alarm Handler for the first time, the path to the executable and configuration files must be established. Contact your EPICS administrator to find the locations of the Alarm Handler executable ‘ *alh* ', and your site's Alarm Handler configuration input files.

Environment Variable

The optional environment variable *ALARMHANDLER* can be used to point the Alarm Handler to a desired working directory. If *ALARMHANDLER* is not set, the current working directory is assumed. If the alarm configuration file resides on a different directory (e.g. / *home* / *cs* / *appl* / *ah* / *dev*) from the current working directory, under UNIX *ALARMHANDLER* can be set to point to the desired path by issuing the UNIX command:

```
setenv ALARMHANDLER /home/cs/appl/ah/dev
```

The user must have read and write privileges in this directory.

Command Line Syntax

Once the path is properly set, invoke the Alarm Handler by executing the command:

```
alh
```

This command displays a file selection box in which to specify an alarm configuration file name. The default path for files is the directory defined by the ALARMHANDLER environment variable or the current directory and the default alarm handler output file names are *ALH-default.alhAlarm and ALH-default.alhOpmod* . If there is an alarm configuration file in the current directory with the name ALH-default.alhConfig, it will be used as the input configuration file.

The Alarm Handler command has several options and a usage message similar to the table below will be displayed if you enter: "alh -help".

```
alh [OPTIONS] {Xoptions] [configfile]
```

The alarm handler options are:

-a alarmlogfile	Alarm log filename [ALH-default.alhAlarm

-aCM	Alarm log using CMLOG
-B	Message Broadcast System
-c	Alarm Configuration Tool mode
-caputackt	Caput the config file ackt settings to channels (if global and active)
-D	Disable alarm and opMod log output
-debug	Debug output will be sent to stdout
-f filedir	Directory for alarm configuration files [.]
-filter f-opt	Set alarm display filter with f-opt being one of [nau] n[0]: no filter a[ctive]: show only active alarms u[nack]: show only unacknowledged alarms
-global	Global mode (channel ACKS and ACKT fields)
-help	Print usage text to stdout
-L	Locking System
-l logdir	Directory for log files [.]
-m maxrecords	Alarm log file maximum records [2000]
-mainwindow	Start with Main Window
-noerrorpopup	Do not display error popup window (errors are logged)
-O key	Log to database (Oracle)
-o opmodlogfile	Opmod log filename [ALH-default.alhOpmod]
-oCM	OpMod log using CMLOG
-P key	Print to TCP printer
-S	Passive state (no ca_puts to ACKS and ACKT fields and severity PV)
-s	Silent execution (no alarm beeping)

-T	Alarm Log Dated output files
-v, -version	Print version number

Default Settings

The default settings for ALH (Alarm Handler) are as follows:

- Local mode
- Active state
- Alarm log file maximum records 2000
- Directory for files: ALARMHANDLER if defined else current directory
- Alarm Configuration File: ALH-default.alhConfig
- Alarm Log File: ALH-default.alhAlarm
- Operator Modification Log File: ALH-default.opmod
- Save New Configuration File: ALH-new.alhConfig
- Beeping Status: On
- Severity for Beeping: Minor (i.e. any non-zero severity)

Command Line Option Descriptions

Alarm Configuration File

The '*configfile*' option specifies which alarm configuration input file is to be used. The default is no configuration file and a file selection window is displayed.

Alarm Log File

The '*-a alarmlogfile*' option specifies the name of the alarm log file. The default name is ALH-default.alhAlarm.

Log alarms into CMLOG system

The '*-aCM*' option enables alarm logging into a CMLOG system. The default is not to use CMLOG. (Note: This option is only available if the Alarm Handler is compiled with CMLOG support.)

Message Broadcast System

The '*-B*' option enables an operator to send messages using message broadcasting. The default is no message broadcasting. When this option is specified a send message menu item appears on the Main Window menu, and a message input dialog popup appears when the menu item is selected. The operator can then type in a message that will be sent to other alh processes when OK is pressed. A popup dialog box containing a sent message will appear when an Alarm Handler process receives a message.

Configuration Tool Mode

The '*-c* ' option causes the Alarm Handler to enter the Alarm Configuration Tool mode. The default is to bring up Alarm Handler mode. The Alarm Configuration Tool mode is used for creating and editing alarm configuration files. Documentation for this mode will be added to this guide later.

Write Configuration File ACKT Settings on Startup

The ' *-caputcackt* ' option specifies that the Alarm Handler should write the alarm configuration file ACKT values using channel access puts to the EPICS database records when the Alarm Handler reads the configuration file. The default is not to write the alarm configuration file ACKT values.

Disable Writing

The ' *-D* ' option allows running the Alarm Handler without creating and/or modifying the alarm log and alarm opmod files. This is useful if one alh process runs without this option, creating and modifying some fixed named alarm log files and all other alh process specifying the same file names run with the -D option which does not allow them to overwrite the alarm log files.

Debug output

The *'-debug'* option specifies that debugging output should be printed to stdout. The default is not to print debug output.

Directory for All Files

The *'-f filedir '* option specifies the directory for the Alarm Handler input and output files. The default location is the current working directory.

Set Alarm Display Filter

The *'-filter f-opt'* option sets the initial alarm display filter for the Alarm Handler (see ->>Menu Functions->Setup Menu->Display Filter). 'f-opt' may be one of 'n[o]' (for no filter), 'a[ct]' (show active alarms) or 'u[nack]' (show only unacknowledged alarms). Default is 'no', i.e. all Alarm Groups and channels in the current configuration will be displayed. This option is particularly useful in combination with '-mainwindow' to start Alarm Handlers from operator panels.

Global Mode

The *'-global'* options specifies that the alarm handler should run in a global mode which means that an Alarm Channel's unacknowledged severity and it's acknowledge transients state will be determined by the current value of the EPICS database record's ACKS and ACKT field settings. Local mode, the default mode, means that the unacknowledged severity and acknowledge transients settings are local to the alarm handler.

Help

The *'-help'* option will print alh command usage text to stdout.

Locking System

The *'-L'* option activates a file locking system (based on lockf(), i.e. NFS-safe) making sure that only one of multiple Alarm Handlers with enabled log writing has access to the log. If the `master' (i.e. actively logging) process dies, another Alarm Handler will seamlessly take over logging. Default is not to use this locking mechanism.

Directory for Log Files

The ' *-l logdir* ' option specifies the location of the alarm log file and the operation modification log file. The default location is the current working directory.

Maximum Alarm Log Records

The '*-m maxrecords'* option allows the user to specify the maximum number of records that the alarm handler will allow in the alarm log file. If this number of records is reached, new records will overwrite old alarm records. The default number of records is 2000. Specifying zero means the file can have an unlimited number of records.

Start with Main Window

The *'-mainwindow'* option makes the Alarm Handler start with the Main Window instead of the Runtime Window. This is useful in conjunction with the `-filter f-opt' option to start Alarm Handlers from operator panels. The default is to start with the Runtime Window.

Do not use Popup Boxes for Displaying Errors

The *`-noerrorpopup'* option tells the Alarm Handler not to use popup boxes for displaying errors. This is useful for Alarm Handlers running as overhead displays (and no mouse attached to handle popups). The default is to use popups.

Database

The '*-O key'* means that the alarm handler should sent log messages to a database (Oracle).

OpMod Log File

The '*-o opmodlogfile* ' option specifies the location of the operation modification log file. The default location is the current working directory.

Log Operator Modifications into CMLOG system

The *'-oCM'* option enables opmod logging into a CMLOG system. The default is not to use CMLOG. (Note: This option is only available if the Alarm Handler is compiled with CMLOG support.)

TCP Printing

The *'-P '* option allows simultaneously printing of new alarms to the log file and to a TCP printer (socket connection). The user must specify all three printer values: *'Name:port:colorModel '* (where colorModel is mono,hp_color,...). Currently the printing is done asynchronously by adding an additional task "alh_printer". (This option is still under construction and will use pipes in the future)

Silent Mode

The *'-s '* option specifies that alh should start executing in a silent mode with no beeping when alarms are present. Setup menu items can be used to change the startup silence status.

Passive Mode

Specifying this *'-S '* option means that the alh will execute in a passive (monitor) mode. This means that alh can not send channel access acknowledgment of alarms and can not do channel access puts to the acknowledge transients fields and cannot write to the severity process variable. It is useful for a non-operator alh user.

AlarmLogDated

WIth the *'-T '* option, alarmLog file names will have "date" extensions like YYYY-MM-DD, and log files are automatically switched at midnight. For this option, there is a Main Window menu browser that is displayed after pressing View-"Alarm Log File Window". This browser allows searches in the AlarmLogFile and find all alarms inside of [t1,t2]-diapason containing some <String>.

Print Version

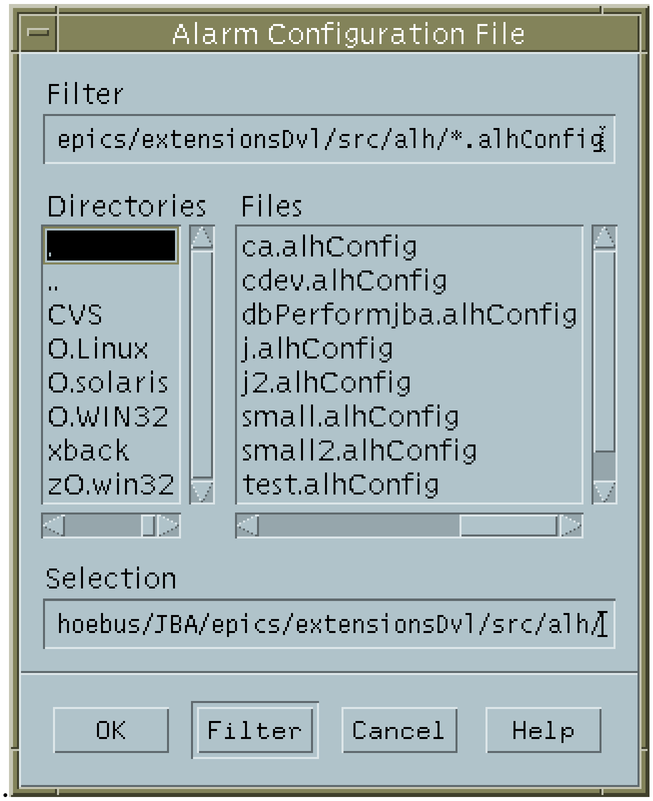
The *'-v'* or *'-version'* option specifies that the Alarm Handler version number should be printed to stdout.

Xoptions

When executing on Unix, the *'alh '* command line accepts all X options such as *'-bg color_name'* and *'-fg color_name'* and *'-geometry geom_spec'*.

Configuration File Selection Window

If the Alarm Configuration file is not specified on the command line, a file selection window is presented so the user can select the desired Alarm Configuration file



.

There are several ways to select the directory using this window:

- *Double-click* on the appropriate *Directories* entry.
- *Type* the directory name in the *Filter* window and click on *Filter* .
- *Type* the directory name in the *Selection* window and *click* on *OK* .

Once in the appropriate directory, there are several ways to select the desired file:

- Double-click on the appropriate *Files* entry.
- Click on the appropriate *Files* entry and click on *OK* .
- Type the file name in the *Selection* window and click on *OK* .

Cancel ends the Alarm Handler session.

Help has not been implemented in this release.

Runtime Window

Once an Alarm Configuration file has been selected, the Runtime window is displayed which appears on the user's screen as a small icon like window. This window contains a button labeled with the name of the Alarm Configuration file's Main Alarm Group.

The color of the button indicates the highest outstanding alarm severity level in the active alarm configuration.:

- White: Invalid Alarm
- Red: Major Alarm
- Yellow: Minor Alarm
- Background color: NO Alarm

There will be beeping and the button will blink to indicate the presence of unacknowledged alarms.

Exiting the Alarm Handler

To exit the Alarm Handler, use the Window Manager Menu on the Runtime Window and choose the *Close* menu item.

This will bring up the Alarm Handler Exit dialog window.

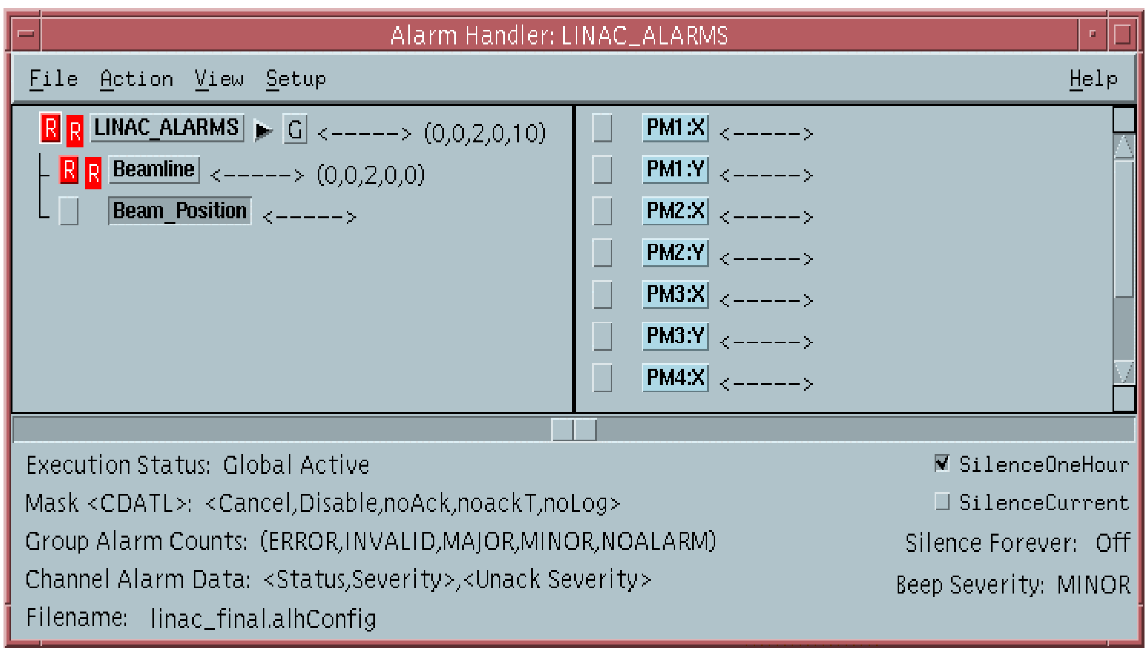
Click on *OK* to exit the Alarm Handler.

Click on *Cancel* to return to the Alarm Handler.

Help has not been implemented in this release.

Displaying the Main Window

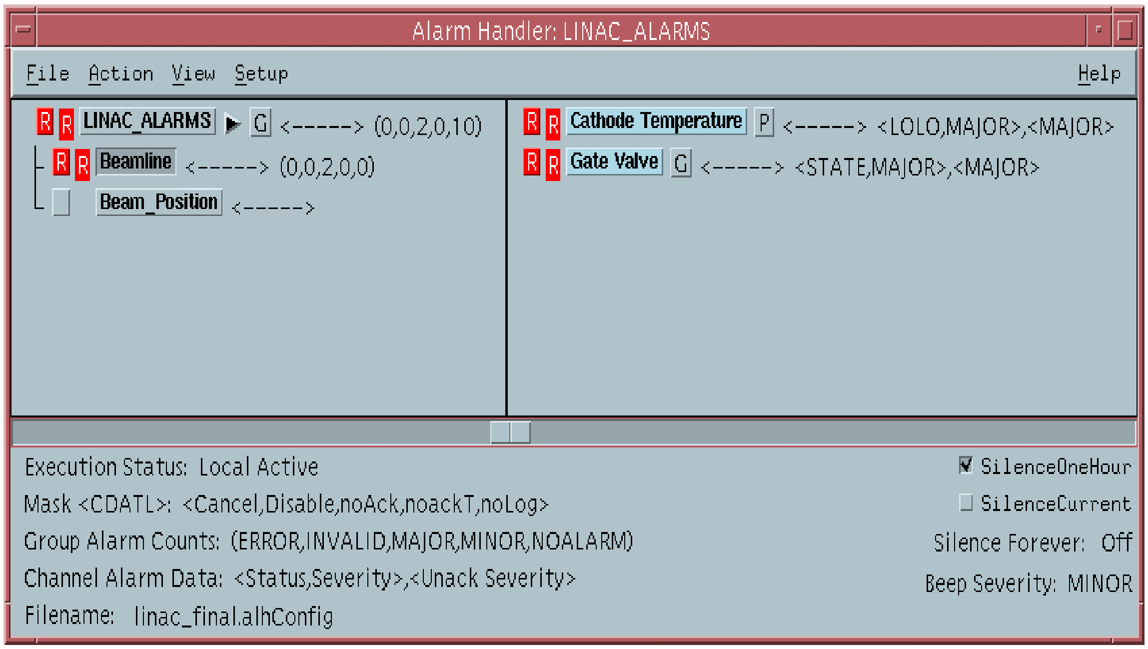
Click the Runtime window button to open the Alarm Handler Main window or, if the Main window is already open, clicking the button will bring the Main window to the top of the window stack. This window contains the hierarchy of Alarm Groups and Alarm Channels (Process Variables) being monitored. The left half of the window contains the tree-structure of the Alarm Group, and the right side contains the contents of the selected Alarm Group. This window will be discussed in detail in the next chapter.



Chapter 4: Main Window

Main Window Description

When the Runtime Window button is clicked, the Main Alarm Handler window. is displayed. The Alarm Handler Main Window is divided into two major parts: an alarm configuration tree structure display and an Alarm Group Contents display. This window also contains a menu bar and a message area.



This window shows the hierarchy of Alarm Groups and Alarm Channels (EPICS database records) being monitored. The left half of the window contains the tree-structure display of Alarm Groups, and the right side displays the contents of the tree-structure display's currently selected Alarm Group.

Menu Bar

The Alarm Window menu bar provides menu selections for all the functions of the alarm handler and also gives users a second way to access some functions.

Alarm Configuration Tree Structure Display

The current alarm configuration tree structure of Alarm Groups is graphically displayed as Group Summary Lines which are described in See Group Summary Line. Buttons on the tree structure display allow the user to expand or deflate the alarm configuration tree structure.

Each group name in the configuration tree structure is displayed on a separate line. The following items appear in each group line of the tree structure display.

- Group summary line. Each group summary line will contain:
- Single character color coded acknowledgment button
- Single character color coded severity code
- Group name selection button
- Optional subgroups arrow button
- Optional guidance button
- Optional related process button
- Current mask summary
- Alarm severity summary

The configuration tree structure display has a scrolling/paging facility and a display resize facility. This allows users to view an alarm configuration tree structure too large to display on one screen.

Alarm Group Contents Display

The user will be able to choose any Alarm Group for display by pressing the Alarm Group name button from the configuration tree structure display. Selecting an Alarm Group will cause the Alarm Group contents display to show one level of the alarm subgroups and the Alarm Channels associated with the selected group.

The Alarm Group contents display for the currently selected Alarm Group contains group summary lines for each alarm subgroup followed by channel status lines for each Alarm Channel in the selected Alarm Group.

Each subgroup or channel name in the summary line is displayed with a color identifier indicating whether the name is an Alarm Group name or a channel name.

The Alarm Group display has a scrolling/paging facility to allow users to view an Alarm Group too large to display in one screen.

- Channel status line. Each channel status line contains:
- Single character color coded acknowledgment button
- Single character color coded severity code
- Channel name selection button
- Optional guidance button

- Optional related process button
- Current mask
- Current status and severity
- Highest unacknowledged severity

Message Area

The message area shows the current execution mode (local or global), the current execution state (passive or active), the name of the current configuration file. It also contains buttons to silence alarms, and explanatory descriptions of the mask abbreviation codes and status data which appear in the group summary and channel status lines.

There are two Silence buttons which toggle beeping on or off. The Silence Current button turns off current alarm beeping until a new alarm occurs. The Silence One Hour button toggles on/off beeping of current and future alarms for one hour. When pushed in, beeping is turned off, when out, beeping is on. Beeping occurs only when there are unacknowledged alarms.

Group Summary Line

This display line summarizes the status of all alarms for the group named in this line and all lower level groups. The group summary display consists of the following items:

Acknowledgment Button

A one-character acknowledgment button. It is activated only if an unacknowledged alarm is present for the group and the alarm handler is executing in active (modify) state. This button is color-coded representing the highest severity unacknowledged alarm as follows:

- White: V - Valid Alarm
- Red: R - Major Alarm
- Yellow: Y - Minor Alarm
- Background color - No Alarm

This button describes the highest severity of unacknowledged alarms for this group and all associated subgroups.

Clicking on this button while alh is executing in active state will send channel access alarm acknowledgments to all Alarm Channels associated with the group. It has the same effect as individually acknowledging each channel in an unacknowledged alarm state.

Single Character Severity Code

A one-character severity display code. It is present only if at least one channel associated with the group is in alarm or in an error state. It is color-coded and represents the highest severity outstanding alarm as follows:

- White: E – Error state
- White: V - Valid Alarm
- Red: R - Major Alarm
- Yellow: Y - Minor Alarm

The code shows the highest severity unacknowledged alarm for this group and all it's subgroups.

Group Name Selection Button

ALH allows the operator to choose any Alarm Group by selecting the Group Name selection button on the group summary line. The result is to display one level of the contents associated with the selected group. This group is also becomes the currently selected group.

Current Mask Summary

The Current Mask Summary Display is a five character mask display. Each character is a"-" or one of the following:

- C: Cancel Alarm
- D: Disable Alarm
- A: NoAck Alarm
- T: NoAck Transient Alarm
- L: NoLog Alarm

Mask values are described in a later chapter. If the current mask for any channel connected with this group or any subgroup has the above mask condition set, the corresponding character is displayed, otherwise the character "-" is displayed. For example the string "--A--" means that at least one channel has the NoAck mask set and that no channels have any other masks set.

Alarm Severity Summary Counts

The alarm summary count display shows the total number of channels in alarm and in an error state for this group and all its subgroups. This summary consists of a set of five fields:

(ERROR, VALID, MAJOR, MINOR, NOALARM)

Each field value indicates the total number of channel alarms with the specified severity in the associated group and all it's subgroups.

Alarm Channel Status Line

The channel status display is a line appearing on an Alarm Group Contents Window containing the following items:

Acknowledgment Button

A one character acknowledgment button. It is activated only if an unacknowledged alarm is present for the channel and the alarm handler is executing in active (modify) state. It is color coded, and represents the highest severity unacknowledged alarm as follows:

- White E - Error state
- White: V - Valid Alarm
- Red: R - Major Alarm
- Yellow: Y - Minor Alarm
- Background color - No Alarm

Clicking on this button while alh is executing in active state will send a channel access alarm acknowledgments to the Alarm Channel. A warning popup dialog with the message that alarm acknowledgment is not allowed in passive state will appear if the alarm handler is executing in passive (monitor) state.

Severity Code

The severity code character is present only if the channel is in alarm or in an error state. In this case, it is a color coded letter which represents the severity of the alarm as follows:

- White: E - Error state
- White: V - Valid Alarm
- Red: R - Major Alarm
- Yellow: Y - Minor Alarm
- Background color - No Alarm

Channel Name Button

This button contains the database record name associated with the channel. The button is color coded in gray so that an operator can easily distinguish channels from groups. Selecting this button makes the channel the currently selected item.

Current Mask

The mask field contains a five-character display showing the settings of the channel's current mask. Each character is either a "-" or one of the following:

- D: Disable Alarm
- A: NoAck Alarm
- T: NoAck Transient Alarm
- L: NoLog Alarm

Masks are described in Chapter 5.

Alarm Status and Severity

Following the current mask characters are the channel's current alarm status and severity and the highest unacknowledged alarm severity. Current status and severity is present only if the channel is in an alarm state. Highest unacknowledged alarm severity is present only if an unacknowledged alarm is present.

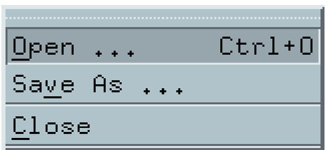
Chapter 5: Menu Functions

Main Window Menu Bar

The Main Window menu bar contains five pull-down menu items: File, Action, View, Setup, and Help.

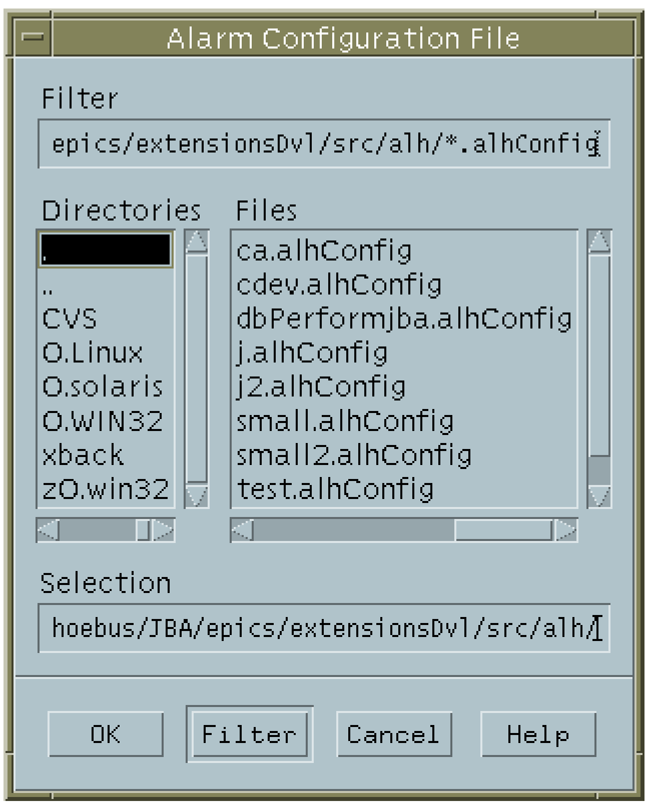
File Menu Commands

The File menu has three command items: Open, Save As, and Close.



Open

To open an existing alh configuration file, use the "File Open" menu item.

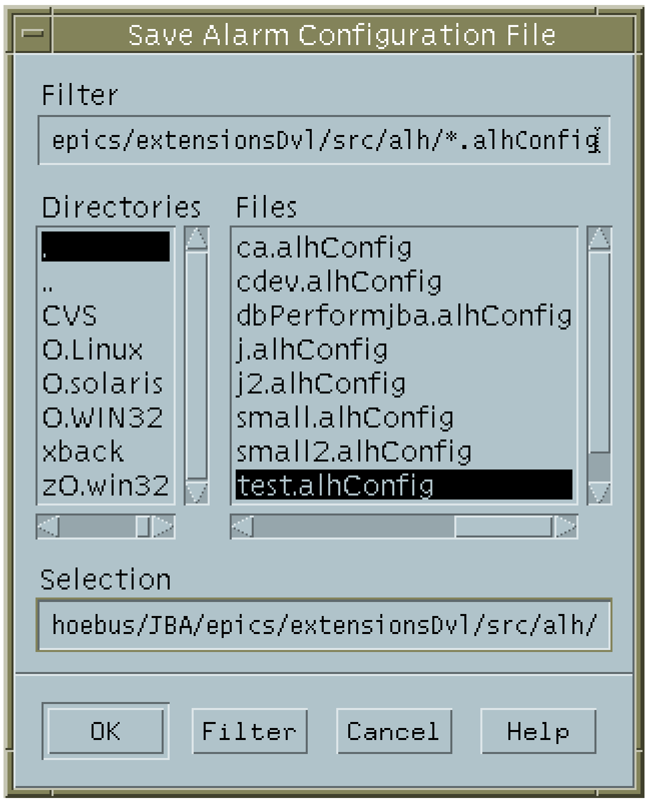


This brings up a standard file selection dialog, which allows the user to move around an existing directory structure to find the file to open.

To aid the user, the file selection box initially displays all files in the directory which end in ".alhConfig".

Save As

The "Save As" menu item, allows the user to save the current alarm configuration structure and current alarm configuration settings to a new or existing file. A dialog appears which prompts the user to supply the name of a file to write to. If the user gives the name of an existing file, another popup dialog will give a warning and ask the user if the existing file can be overwritten.

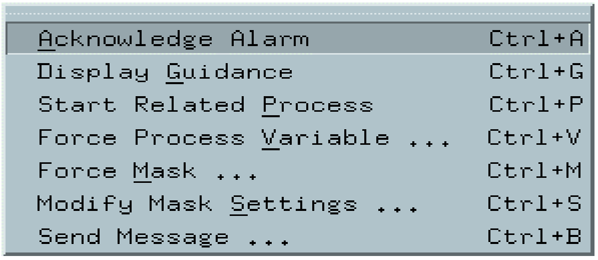


Close

Selecting the Close item on the File menu can close the alh Main Window. This Main Window can be redisplayed again with a mouse click on the runtime window button.

Action Menu Commands

The Action Menu provides selections which affect the currently selected Alarm Group or Channel. The action selections "Acknowledge Alarm", "Display Guidance", and "Start Related Process" can also be accomplished by clicking buttons on the tree structure or group contents display.



Acknowledge Alarm

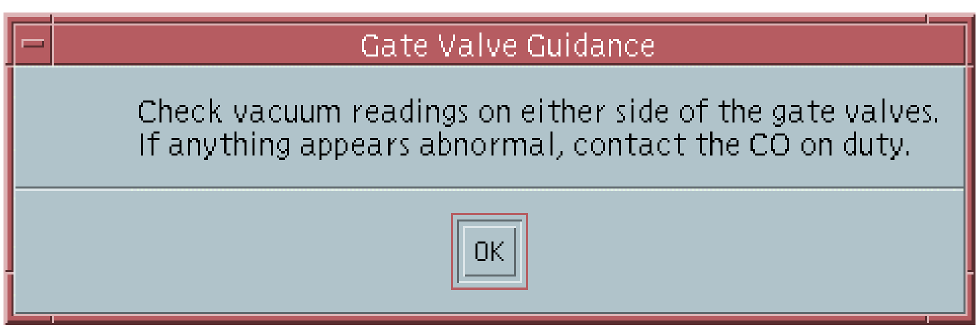
Alarm acknowledgment is only allowed while the alarm handler is executing in active (modify) state. The Alarm Handler user can acknowledge an alarm for the currently selected Alarm Group or Channel by selecting the "Acknowledge Alarm" item on the Action menu. Selecting this item for an Alarm Group acknowledges all Alarm Channels associated with the group. It has the same effect as acknowledging each channel individually.

When executing in global mode the Alarm Handler performs an alarm acknowledgment by sending a channel access alarm acknowledgment command to the channel and logging the alarm acknowledgement to the operator modification log file. The alarm acknowledgment indicators (color, blinking, and beeping) will change only after a channel access alarm event with the modified unacknowledged severity is received. Other executing alarm handler processes and other EPICS tools monitoring alarm events will also receive this alarm event.

When executing in local mode the alarm acknowledgment indicators (color, blinking and beeping) and the local unacknowledged severity level setting will change to reflect a local alarm acknowledgment and the alarm acknowledgement will be logged to the operator modification log file.

Display Guidance

When "Display Guidance" is selected, associated guidance text lines for a selected Alarm Channel or Alarm Group will be displayed. Guidance text is intended to suggest possible reasons why this group or channel might alarm and actions that might remove the alarm condition. This menu item is inactive if guidance information is not available for the currently selected Alarm Group or Alarm Channel.



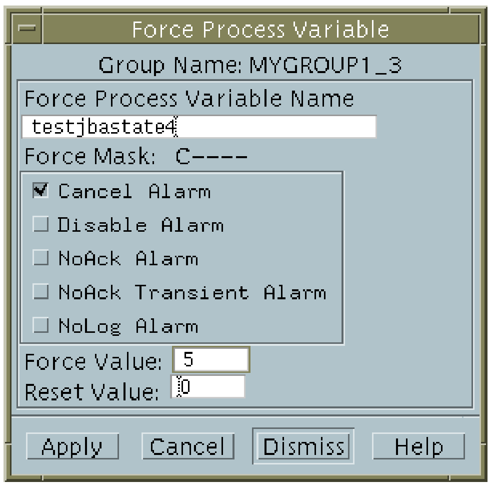
The guidance text display is a popup window displaying lines of ascii text if text was specified in the alarm configuration file. If a URL address was specified in the configuration file, Netscape will be invoked and display the text at the specified URL address.

Start Related Process

Selecting "Start Related Process" will initiate execution of an Alarm Group or Alarm Channel's related process which was specified in the alarm configuration file. This item will be inactive if a related process was not specified for the currently selected Alarm Group or Alarm Channel.

Force Process Variable

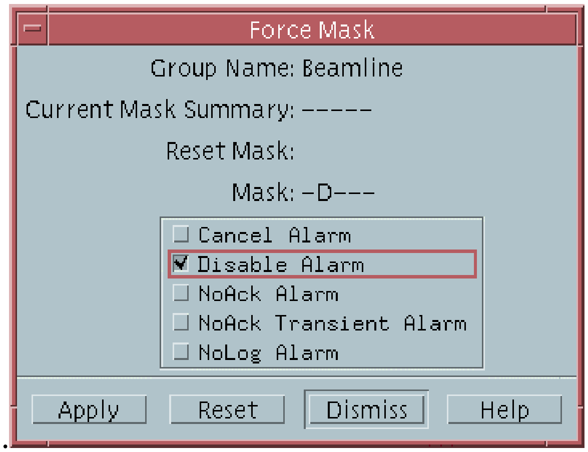
This item displays a dialog box that allows the operator to change values of the Force Process Variable. The Force Process Variable is described in a later chapter. The user can change the name of the Forcc PV, the values of the Force Process Variable which will cause the Alarm Channel masks to be set and reset, and the actual mask the Force Process Variable will force on the group. The force value must be set to a value different than the reset value.



There are four action buttons on this dialog box: Apply, Cancel, Dismiss, and Help. The Apply button will accept and apply the user entered changes. The Cancel button will discard the user entered changes in this dialog box and reset them to the original values. The Dismiss button will close this popup dialog, and the Help button will display a Force PV help information dialog.

Force Mask

Selecting "Force Mask" will popup a dialog box which allows the operator to change the mask for the currently selected group or channel. Changing a group mask will actually change the mask of all Alarm Channels within that group. Three masks are displayed: 1) the current mask, 2) the reset mask, valid for Alarm Channels only, which is the mask specified in the alarm configuration file, and 3) the mask to force, which the user defines by pressing one or more of the 5 state buttons below the mask.



The mask to be used for forcing (5 characters) may be any combination of -,C,D,A,T,L

There are four action buttons on this dialog box: Apply, Reset, Dismiss and Help. The Apply button will set the mask of all the Alarm Channels within this group to the mask as shown in the Mask line. The Reset button will reset the mask of each channel within this group to its own default mask defined in the alarm configuration file. The Dismiss button will cancel the force mask option and close the dialog window. The Help button will give force mask help information.

Modify Mask Settings

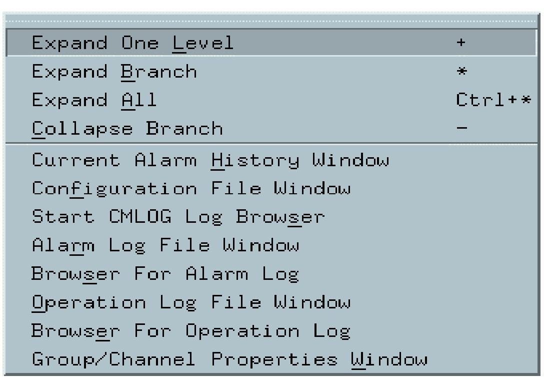
This menu item allows the operator to force or reset a specific bit of the current mask. For example, if the operator chooses "Add" in the "Add/Cancel Alarms" line then the Add/Cancel field of the current mask for all channels in the group are forced into the "Add" event state. Similarly choosing "Cancel" cancels the channel access add event state for all the channels. If "Reset" is chosen, the Add/Cancel field of the current mask for each channel in the group reverts to the default state defined in the active configuration file. Mask values are described in a later chapter.

Message Broadcasting

The "Send Message…" menu item allows alarm handler operators to send and receive messages to other alarm handler operators. A message input dialog popup appears when the "Send Message" menu item is selected. The operator can then type in a message that will be sent to other alh processes when OK is pressed. A popup message dialog containing the sent message will appear on other Alarm Handler processes when they receive the message.

View Menu Commands

The View menu allows the user to change the view of Alarm Groups in the current alarm configuration tree structure display. This menu also provides options for viewing the current working configuration file, alarm log file, and operation modification file in scrolled windows.



The View menu allows viewing of logged events while they take place. A user can simultaneously view both the alarm log file and the operator modification log files. When View is chosen, the sub-menu is presented.

Expand One Level

The user selects this menu item to expand a collapsed the currently selected Alarm Group to graphically display one level of its alarm subgroups on the alarm configuration tree display.

Expand Branch

The user can choose this item to expand the currently selected collapsed Alarm Group in the alarm configuration tree display to graphically show all levels of its subgroups on the alarm configuration tree structure display.

Expend All

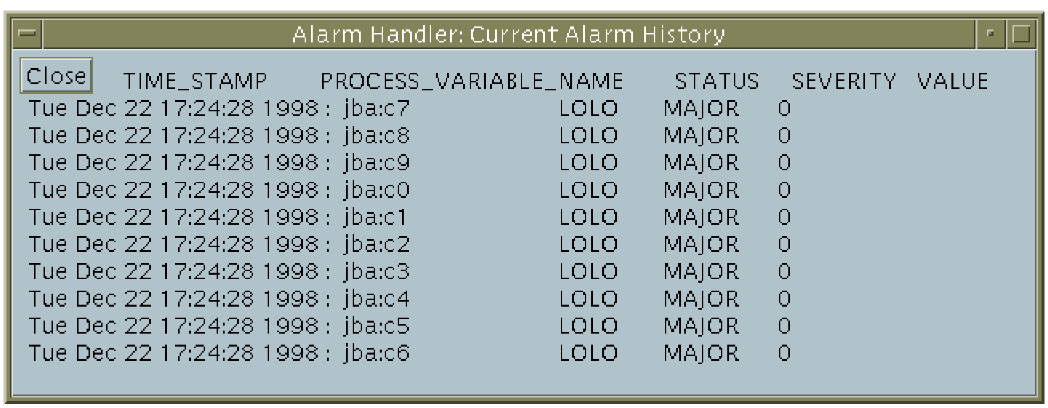
The user uses this menu item to expand all collapsed groups in the configuration tree structure display to graphically show all the groups and subgroups in the current alarm configuration.

Collapse Branch

The operator selects this item to collapse the currently selected expanded group in the alarm configuration tree to remove all its groups and subgroups from the graphical tree display.

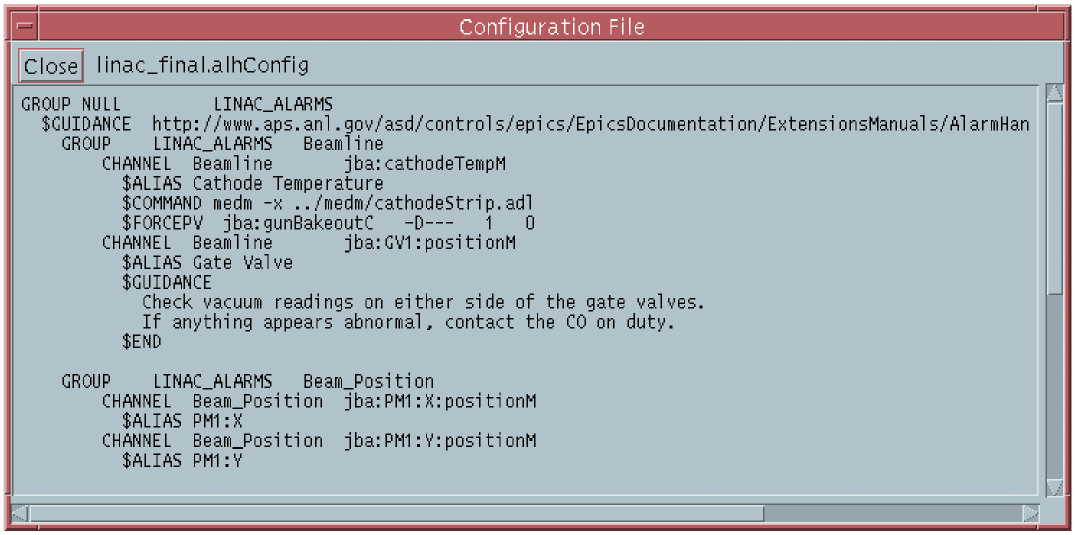
Current Alarm History Window

The operator chooses this menu item to continuously display the current alarm history a display window containing the 10 most recent alarms. This display will be updated as alarms occur.



Configuration File

Selecting "Configuration File" brings up a scrolled window that displays the contents of the current configuration file.

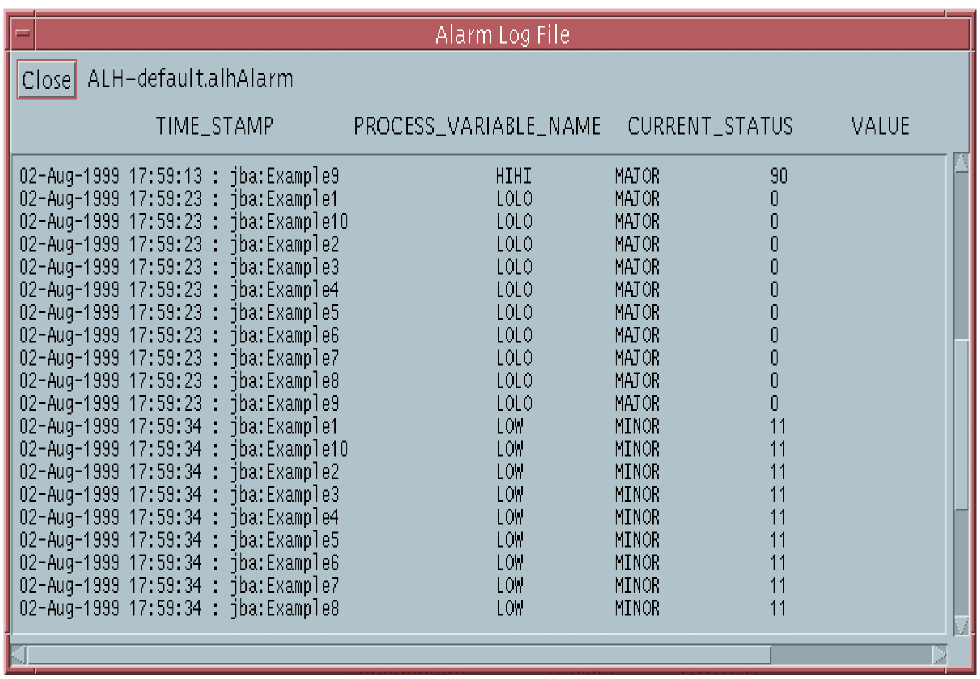


Start CMLOG Log Browser

Selecting this menu item will invoke a separate CMLOG browser process that allows browsing all records logged to the CMLOG system.

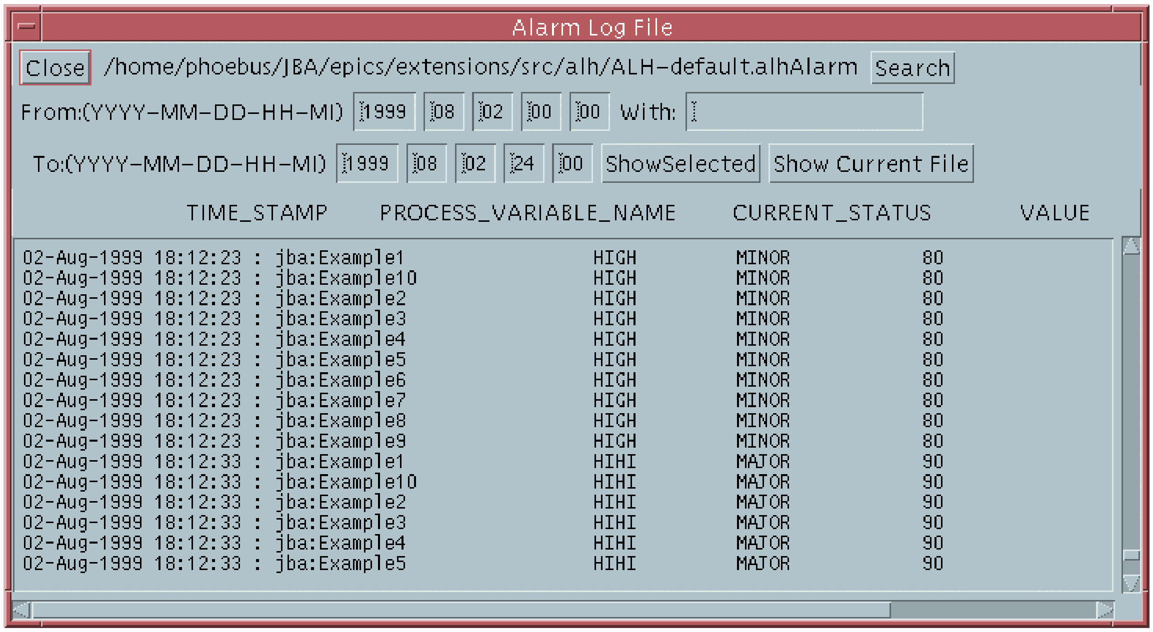
Alarm Log File Window

Selecting "Alarm Log File" brings up a scrolled window displaying time stamped alarm events in the alarm log file. Any new alarms logged into the alarm log file appear simultaneously in this window.



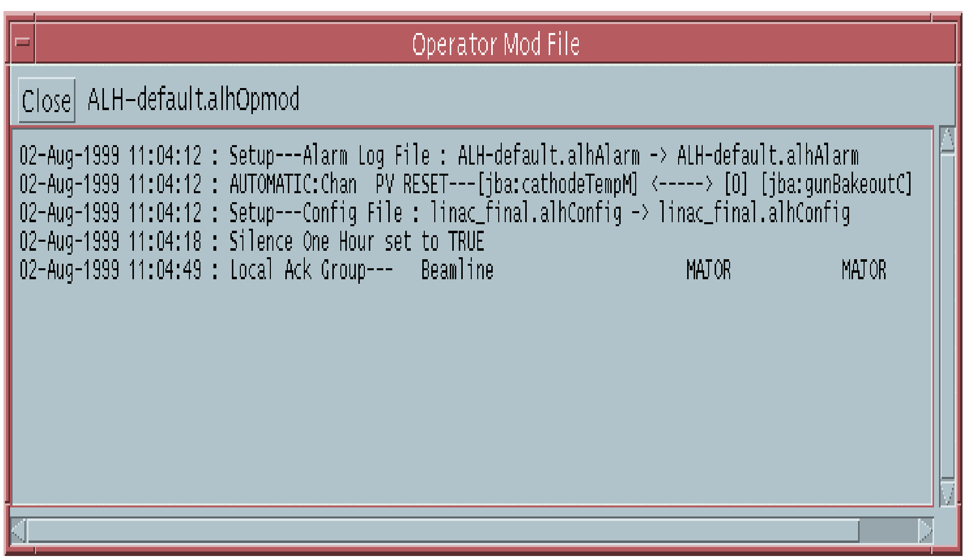
The date and time, Alarm Channel name, alarm status, alarm severity, and channel value are displayed when the Alarm Handler is executing in local mode. The highest unacknowledged severity and the acknowledge transients field values are also logged if the Alarm Handler is executing in global mode.

Browser for Alarm Log



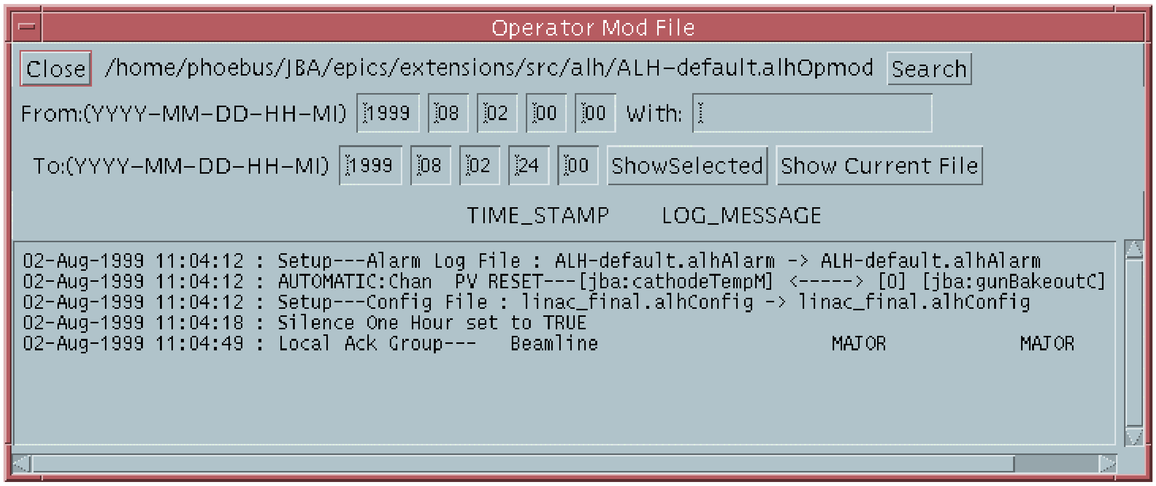
Operation Log File Window

Selecting "Operation Log File" brings up a scrolled window showing the current content of the Operation Modification Log file. This file contains a log of time stamped operator configuration modification events. Any newly logged operation events appear simultaneously in this window.



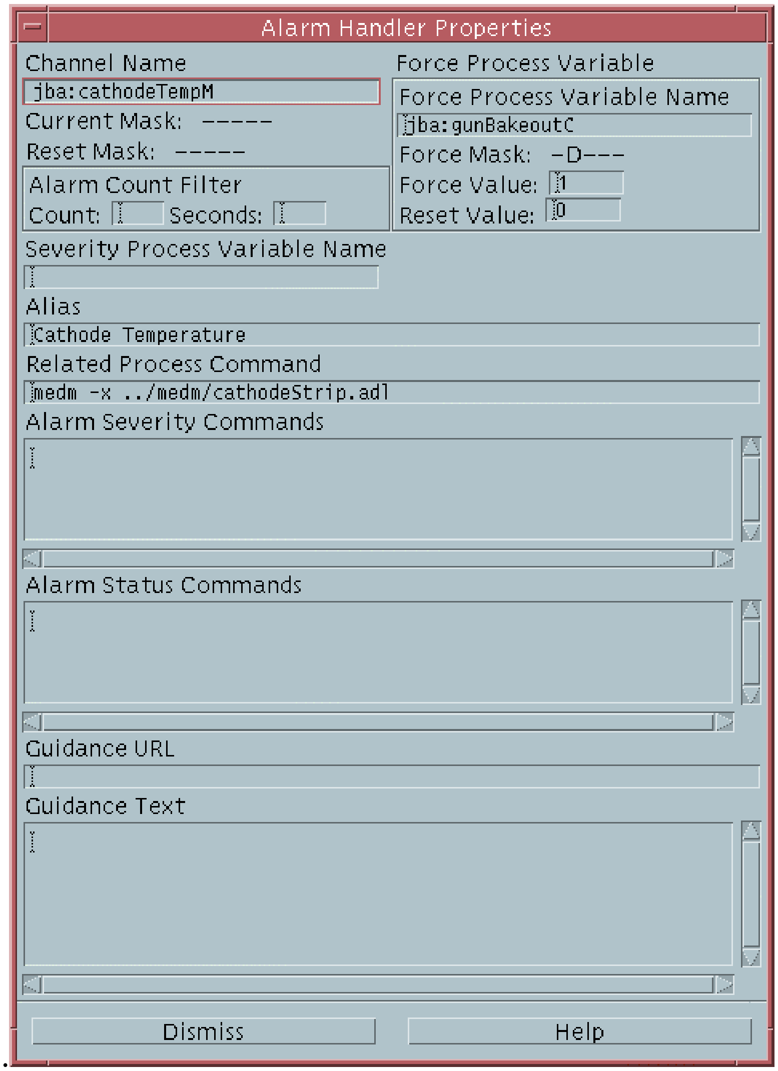
ALH does not allow an operator to view a log file that exceeds 1 Megabyte. When the log file exceeds 1 Megabyte, a new log file must be used in order for an operator to be able to view the log process within the ALH.

Browser for Operation Log



Group/Channel Properties Window

The Alarm Handler allows the operator to display all the current configuration settings for any selected Alarm Group or Alarm Channel.



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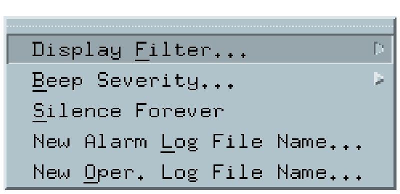
Setup Menu

The Setup menu provides the option of overriding initial settings for the alarm configuration, the alarm log, and the operation modification files.When this menu is selected, the Setup sub-menu, is presented

If one of the file options is chosen, a file selection dialog popup window appears and the operator is allowed to choose a new file. The operation of the file selection box is described in. The file selection changes are always logged in the operation modification file.



Display Filter

The user is allowed to set an alarm filter to display active alarms only. When the filter is set to Active Alarms Only, only those groups or channels with an outstanding alarm will be displayed. When the filter is set to Unacknowldged Alarms Only, only those groups or channels with an outstanding unacknowledged alarm will be displayed. When the selection is set to No Filter, all Alarm Groups and Alarm Channels in the current configuration will be available for display.

Beep Severity

The operator can specify the beep condition. The beep condition is the minimum alarm severity necessary for beeping. The default startup value is MINOR, or a startup severity can be specified in the alarm configuration file. The beep severity can be changed to MINOR, MAJOR, or INVALID. If the beep condition is set to MINOR, MAJOR, INVALID, and ERROR alarms will cause beeping.

New Alarm Log File

The alarm log file contains the log of alarm changes of states. The Alarm Handler allows the operator to specify an alarm log file name that differs from the current setting. If it does not exist, it will be automatically created. All new alarm state changes will be logged to this file.

New Operation Modification Log File

The Alarm Handler allows the operator to specify an operation modification log file that differs from the current setting. If it does not exist, it will be automatically created by ALH. All subsequent operation changes will be logged to this new operation modification file.

Help Menu

The Help menu item will display this "Alarm Handler User Guide" when selected.

When the About menu item is chosen, information about the current version of the alarm handler is displayed.

Chapter 6: Alarm Configuration File

Configuration File Description

The alarm configuration file is the file used as input to the Alarm Handler. This file defines the Alarm Group structure and takes data in a flexible input format. The alarm configuration file, which can be prepared via any text editor, defines a complete Alarm Group structure composed of subgroups and channels. The arrangement of channels and subgroups follow the standard tree structure. The subgroups always terminate at channels. The only input format constraint is that the definitions must be in hierarchical order. That is, after a group is defined in the configuration file as belonging to a parent group, all its subgroups and channels must be defined in the configuration file before a new group belonging to the same parent group can be defined. There can be only one top-level group (main group) and this group must have NULL as the parent group name. For each group or channel, a set of input specifications is used to define special events to be taken care of at start-up time.

File Name

When opening a new configuration file, ".alhConfig" will be used as the default suffix. The default file name for the alarm configuration file is ALH-default.alhConfig.

Input Format

The configuration file statements for a given group or channel takes flexible input format which can consist of the following items:

GROUP parentName GroupName
CHANNEL parentName ChannelName <mask>
INCLUDE parentName fileName
$FORCEPV forcePVName forceMask <forceValue> <resetValue>
$SEVRPV sevrPVName
$GUIDANCE
$END
$GUIDANCE urlAddress
$ALIAS anyValidTextString
$COMMAND anyValidCommand
$SEVRCOMMAND severityChangeValue anyValidCommand
$STATCOMMAND alarmStatusStringValue anyValidCommand
$ALARMCOUNTFILTER inputCount inputSeconds
$BEEPSEVERITY severity

Input syntax notes:

The fields enclosed in <> are optional.

Blanks can be used to separate the fields for improved readability.

The GROUP or CHANNEL line must be first line in a set.

Lines starting with "#" are comments.

Lines starting with "$" are optional.

The [$GUIDANCE ... $END] must be entered as a set if text guidance is present.

Group or Channel

The first line in a group or channel set of lines should be the group or channel definition. It is required input for defining the Alarm Group structure. This line must start with the keyword GROUP or CHANNEL. The ChannelName is the user specified channel name. The GroupName is the name of the Alarm Group. The length of the GroupName or ChannelName must not exceed 28 characters. The ChannelName must be the name of a specific record defined in an EPICS database. The parentName is the name of the parent group. There is no restriction on the number of group definitions.

GROUP parentName GroupName

The channel <mask is optional and defaults to no mask (i.e. -----). It is required only for a channel with a non default mask setting. The detailed description of <mask settings is given in See Alarm Channel Mask in this Chapter.

CHANNEL parentName ChannelName <mask>

Include File

The line starting with INCLUDE allows a user to designate, within his alarm configuration file, the name of another alarm configuration file to be read by the Alarm Handler at runtime. The main Alarm Group of the designated file will become a child group of the parentName group specified on the INCLUDE line.

INCLUDE parentName fileName

Force Process Variable

The line starting with $FORCEPV is optional. It is required only when a user wants to let ALH automate changing mask values by monitoring an EPICS database process variable. This line defines the forcePVName (process variable to be monitored), forceMask, forceValue, and resetValue for a specific group or channel. The forcePVName must be an existing PV in the EPICS database and can be specified as <channel_name.<field_name. Whenever the value of the force process variable changes to be the same as the forceValue, the Alarm Group or Channel mask will be set to the forceMask. For an Alarm Group, this means that masks of all the channels in the group and its subgroups are set to the forceMask. Whenever the value of the force process variable changes to be the same as the resetValue,

these channel masks are set to their default values. The forceValue must be different from the resetValue. The default setting is forceValue = 1, and resetValue = 0.

    $FORCEPV forcePVName forceMask <forceValue <resetValue

Severity Process Variable

The line starting with $SEVRPV is optional. It is required only when a user wants to write the severity value of a group or channel to a process variable. The sevrPVName must be defined in the IOC database and is specified as <channel_name.<field_name. Whenever the group or channel severity changes, the new severity value is written to the severity process variable via a channel access put (ca_put) request.

    $SEVRPV sevrPVName

Guidance

The lines starting with $GUIDANCE are optional. They are required only when a user wants to display alarm guidance information for a group or channel. The $GUIDANCE line may be followed by a set of ascii guidance text lines with an $END line to terminate the guidance text, or alternatively, the $GUIDANCE line may contain a url address.

    $END

or

    $GUIDANCE   urlAddress

Alias

The line starting with $ALIAS is optional. It is required when it is desired that the alarm handler display the specified alias text string in places where it would normally display the Alarm Group or Alarm Channel name.

    $ALIAS   anyValidTextString

Related Command

The line starting with $COMMAND is optional. It is required only when a user wants to provide the feature of starting a related process for this group or channel. The related process will be invoked when the alh operator clicks on the Process button in the alarm handler Main Window display.

$COMMAND anyValidUnixCommanSyntax

Severity Command

The line starting with $SEVRCOMMAND is optional. It is required if a process should be invoked when the alarm severity value for a group or channel changes. A single group or channel may have multiple $SEVRCOMMAND lines. This line defines the change in the severity necessary to start the process and defines the process to be started.

Valid severity change values are -

UP_INVALID, UP_MAJOR, UP_MINOR, UP_ANY, DOWN_MAJOR, DOWN_MINOR, DOWN_NO_ALARM, DOWN_ANY, UP_ALARM

Status Command

The line starting with $STATCOMMAND is optional and valid only for an Alarm Channel. It is required only when the alarm handler should start a process when the channel alarm status becomes a specified value. A single channel may have multiple $STATCOMMAND lines. This line defines the status value necessary to start the process and defines the process to be started. Valid alarm status string values can be found in the EPICS base alarmString.h header file.

Example alarm status string values are -

NO_ALARM, READ, WRITE, HIHI, HIGH, READ_ACCESS, LOLO, LOW, STATE, COS, COMM, WRITE_ACCESS, TIMEOUT, HWLIMIT, CALC, SCAN, LINK, SOFT, BAD_SUB, UDF, DISABLE, SIMM

Alarm Count Filter

The line starting with $ALARMCOUNTFILTER is optional. It is required only when the alarm handler should filter the registration of alarms for a group or channel. This line defines the alarm count and seconds required for alarm registration. To register as an alarm, a channel must remain in an alarm state for more than inputSeconds seconds or the channel must enter into an alarm state from a no-alarm state more than inputCount times within inputSeconds seconds.

$ALARMCOUNTFILTER inputCount inputSeconds

Beep Severity

The line starting with $BEEPSEVERITY is optional. It is required only when the alarm handler should filter the beeping if alarms are present. This line defines the minimum severity level required for beeping. Beeping will not occur when the highest outstanding severity is less than the specified severity.

$BEEPSEVERITY severity

Sample Configuration File

The following listing shows a simple example of an alarm configuration file.

```
GROUP NULL MAIN

   $COMMAND medm /home/phoebos/USER/appl/example.dl
   $GUIDANCE
   Line 1 of guidance information about main group
   Line 2 guidance.
   Line 3 guidance.
   $END
   GROUP MAIN AAA

      $COMMAND xterm -g 80x24
      $SERVPV SEVR:AI
      $FORCEPV FORCE:AI -D---

      CHANNEL AAA rai_2000
      CHANNEL AAA rai_2001

      GROUP MAIN BBB

      CHANNEL BBB rbi_000
      CHANNEL BBB rbi_2000

      GROUP MAIN CCC

      CHANNEL CCC rbo_000

      CHANNEL MAIN rbo_001
```

In this example, the first group is named MAIN. The MAIN group contains three subgroups (AAA, BBB, and CCC) and one channel (rbo-001). The AAA subgroup contains two channels: rai_2000 and rai_2001. The BBB subgroup contains the two channels: rbi_000 and rbi_2000. The CCC subgroup contains only one channel: rbo_000.

In this example the default mask "-----" is used for every channel. That is, no masks are specified on the group and channel lines.

In above example, $COMMAND and $GUIDANCE options are specified for the MAIN group. The $GUIDANCE option allows the user to display guidance text in a popup window when the MAIN group guidance button is pressed. The $COMMAND line option allows a user to start the display manager, medm, by pressing the MAIN group's related proccess button.

In above example, the $COMMAND, $FORCEPV, and $SEVRPV options are specified for the AAA group. This $COMMAND option allows a user to open an xterm window from the start related process button on the AAA group line. The $FORCEPV option tells alh to add an automatic force mask event for group AAA. If the value of process variable FORCE:AI becomes 1, then the mask of all the channels in this group will be set to the forceMask, "-D---". If the value of process variable FORCE:AI becomes 0, then the mask of all the channels in this group will be reset to their default mask values. The $SEVRPV option tells alh to record the alarm severity of group AAA to the process variable SEVR:AI.

Alarm Channel Mask

Associated with each Alarm Channel are two five bit masks (default and current). The current mask can be changed by force commands or by force process variables. The default mask is defined in the alarm configuration file. A reset command forces all associated masks to return to the default values.

The definition for each bit in the mask value follows:

Add/Cancel Alarm

> This mask bit determines if a channel access add event is active. Add/Cancel means that a ca_add_event is/isn't active. If ca_add_event is not active for a channel, the IOC will not send alarm events to the alarm handler for that channel.

" C" means cancel and "-" denotes add.

Enable/Disable Alarm

Alarms aren't/are ignored by the alarm handler. Disabling an alarm has the effect of no display and NoAck. If an alarm is disabled the alarm status and severity are not displayed. Thus, even though a ca_add_event is in effect, the channel always appears to the operator to be in the NO_ALARM state. Alarm change of states will, however, still be logged unless NoLog is in effect.

" D" means alarm disabled.

Ack/NoAck

The operator is/isn't required to acknowledge alarms.

" A" means alarm acknowledgment is not required.

Ack/NoAck Transient Alarms

The operator is/isn't required to acknowledge transient alarms. A transient alarm is one that enters alarm state and then returns to normal before the operator can acknowledge the alarm.

" T" means acknowledgment of transient alarms is not required.

Log/NoLog Alarms

Alarms will/won't be logged.

" L" means no alarm logging .

══════════A══════════ Audience

══════════B══════════ Blinking

══════════C══════════ Display Guidance

══════════E══════════ Expand

══════════F══════════ Force Process Variable

══════════G══════════ Guidance

══════════H══════════ Help Menu

══════════I══════════ Input Format

══════════L══════════ Log

══════════M══════════ message area

══════════O══════════ options