FactoryLink 7

Version 7.0

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Task Configuration Reference Guide

Contents

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Preface

The *Task Configuration Reference Guide (TCR)* presents basic concepts necessary to understand how FactoryLink conversion works. It also provides the technical information to users of FactoryLink systems who need to convert their applications from earlier versions of FactoryLink to 7.0.

AUDIENCE

The major audience of this guide is users of early versions of FactoryLink who need to upgrade their systems to the 7.0 version.

STRUCTURE OF *THE FACTORYLINK TASK CONFIGURATION REFERENCE GUIDE*

This manual contains 30 chapters:

- Chapter 1, “Alarms”
- Chapter 2, “Batch Recipe”
- Chapter 3, “Browsing Databases”
- Chapter 4, “Database Logger”
- Chapter 5, “Configuring Data Point Logging”
- Chapter 6, “Dynamic Data Exchange (DDE) Task Definition”
- Chapter 7, “DDE Client”
- Chapter 8, “File Manager”
- Chapter 9, “FactoryLink Local Area Networking”
- Chapter 10, “Testing the Network Connection”
- Chapter 11, “Naming the Stations and Network Groups”
- Chapter 12, “Sending Element Values to Other Stations”
- Chapter 13, “Receiving Element Values from Remote Stations”
- Chapter 14, “Monitoring Remote Station Communications”
- Chapter 15, “Configuring the System to Work with a Historian”
- Chapter 16, “Configuring Oracle Historians”
- Chapter 17, “Configuring Multi-Instance ODBC Historian”
- Chapter 18, “Configuring Sybase Historian”
- Chapter 19, “Troubleshooting”
- Chapter 20, “Configuring Math and Logic”
- Chapter 21, “Persistence”

- Chapter 22, “Programmable Counters”
- Chapter 23, “Defining the Report Format”
- Chapter 24, “Defining the Reporting Operation”
- Chapter 25, “Scaling and Deadbanding”
- Chapter 26, “Defining Schemas”
- Chapter 27, “Print Spooler”
- Chapter 28, “Event and Interval Timer”
- Chapter 29, “Trending Task”
- Chapter 30, “FactoryLink Utilities”

The following chapters are brand new for 7.0 and all involve the new ActiveX controls:

- Chapter 1, "Alarms"
- Chapter 3, "Browsing Databases"
- Chapter 29, "Trending Task"

How to Use This Guide

The material in this guide is presented in a learning order. We recommend you read the entire guide to familiarize yourself with all the information before you proceed to convert your application.

Getting Help

For help, contact your USDATA Tier One Partner (TOP) or visit the USDATA Web site (www.USDATA.com) to locate a TOP in your region.

Note: The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Chapter 1 . . . .

Alarms

The alarms task is used to define alarms and monitor them throughout an alarm cycle until the tag value no longer meets the alarm criteria.

Alarming interacts with the Historian task to write alarm records to a database. The alarm data is logged to the relational database and/or to a file in a table or text format. The FactoryLink Distributed Alarm Logger performs logging as the status of the alarm changes: as the alarm occurs, when the alarm is acknowledged, or after an alarm has returned to the normal status.

At run time, the alarm task provides the operator the ability to view and manage the alarms which have met the established alarm criteria in the real-time database.

Alarming offers several useful features:

- Custom configuration of the criteria that generates an alarm
- Definition of the requirement of an acknowledgment
- Deadband provision in the alarm criteria
- Saving alarm records to a relational-database or a flat file to preserve the time of alarm and alarm message for historical purposes
- Viewing alarms from multiple servers
- Customized AlarmViewer to manage alarms as they occur, return to a normal status, and are acknowledged.
- Enabling a run-time visual accounting of the alarm and the associated factory process using animations to represent factory subsystems.
- Browsing alarm records previously logged to a database.

This chapter contains five sections:

- “Alarming Operating Principles”
- “Configuring Alarms”
- “Run-Time Alarming”
- “Properties, Methods, and Events”
- “Error Messages”

Alarming Operating Principles

Data collected by FactoryLink is stored in a tag in the real-time database. Each time data is collected, the value stored in the real-time database for the tag is overwritten by the new data.

Using the tables provided to configure the Distributed Alarm Logger task, you can establish the criteria that generates an alarm for any defined data element in the real-time database. If the value for the element meets the criteria established for alarming, an alarm message is displayed on the AlarmViewer for the FactoryLink operator. The operator monitors the alarm instances throughout the alarm cycle in the AlarmViewer until the alarm tag values no longer meet the alarm criteria.

The alarm criteria can be configured to require an acknowledgment from the operator. The acknowledgment ensures the operator knows the alarm has been generated because the alarm does not clear from the viewer until it is acknowledged.

If you want to preserve the times and occurrences of alarms, configure the Distributed Alarm Logger task to send the alarm data to a disk-based relational database using an Historian task.

You can configure the Distributed Alarm Logger task to distribute the alarm messages across a network if you want the alarms to be viewed on more than one workstation. If the alarms are being logged and acknowledged, the node names where they were acknowledged are included in the alarm data sent to the relational database.

This section introduces the operational concepts you use to configure the Distributed Alarm Logger task operations:

- Alarm logging methodology
- Establishing the alarm criteria
- Alarm status
- Alarm categories
- Parent/child relationship
- Hide alarms
- Locally redefined unique alarm ids
- Alarm persistence
- Alarm distribution
- Alarm logging
- Logbook

For information on procedures to configure the alarm logger task, refer to Define Alarm Records on page 58, in the this chapter.

Alarm Logging Methodology

These steps describe how memory-resident real-time data is monitored for alarm conditions and logged to a disk-based relational database:

1. The real-time database receives and stores data from various sources, such as a remote device, user input, or computation results from a FactoryLink task.
2. The Distributed Alarm Logger task reads and compares the values of the data elements stored in the real-time database with criteria defined in tables. These tables contain the configuration information for the Distributed Alarm Logger task.
3. When the value of the data element meets the criteria for an alarm, the Distributed Alarm Logger task sends the alarm to the alarm server for display on the AlarmViewer.
4. Each time the data value changes, the Distributed Alarm Logger task evaluates the element. If the status has changed, the AlarmViewer is updated.
5. When the value of the data element no longer meets the criteria for an alarm, the Distributed Alarm Logger task removes the alarm from the active alarm list. The alarm is cleared from the AlarmViewer. However, if the alarm has been configured to require an acknowledgement from the operator, a status change to the alarm message occurs instead. When acknowledged the alarm is cleared from the list.
6. If the alarms are being logged to a relational database, the Distributed Alarm Logger task sends the alarm data to the relational database using a Historian task each time there is a change in the status of the alarm.

Establishing the Alarm Criteria

When the value of a data element meets the criteria to trigger an alarm, an alarm message is generated on the AlarmViewer for the FactoryLink operator. An example of this is the alarming of the pressure in a fuel tank. A safe pressure is established as a reading of 0-1000:

- If the pressure exceeds 900, a HI alarm is generated to indicate the pending danger.
- If the pressure exceeds 950 which could be critical, the alarm generates a HIHI alarm.

In both cases, the tag condition is greater than (>) but each alarm is different. As the pressure changes, the display is updated to reflect the new readings and messages. When the pressure drops to 800, the danger passes and the alarms are no longer active.

There are three components that the data element value must be checked against to establish this alarm:

- Limit—The limit is the value the condition is checked against. The example establishes the limit as 900.

- Condition—The condition that triggers the alarm. In the example, the condition is greater than.
- Deadband—The deadband is a range above or below the limit. The alarm stays active in this range. The example uses a deadband of 100 (900-100 = 800).

The Limit and the Deadband can both be set with a constant value or the value from another tag. The following valid condition settings generate alarms:

ON An alarm is triggered when the value of the element referenced is ON (1).

OFF An alarm is triggered when the value of the element referenced is OFF (0).

TGL An alarm is triggered when the value of the element referenced changes from ON (1) to OFF (0) and then back to ON (1) or from OFF (0) to ON (1) and then returned to OFF (0).

HI, GT, HIHI or > An alarm is triggered when the value of an analog or floating-point element is greater than the value specified by the Limit.

LO, LT, LOLO or < An alarm is triggered when the value of an analog or floating-point element is less than the value specified by the Limit.

GE or >= An alarm is triggered when the value of an analog or floating-point element is greater than or equal to the value specified by the Limit.

LE or <= An alarm is triggered when the value of an analog or floating-point element is less than or equal to the value specified by the Limit.

EQ or = An alarm is triggered when the value of an analog or floating-point element is equal to the value specified by the Limit.

NE or <> An alarm is triggered when the value of an analog or floating-point element is not equal to the value specified by the Limit.

If a TGL condition is established, the alarm vanishes as soon as it is detected because it immediately returns to normal. If the alarm is configured to require operator acknowledgement, the alarm is visible until it is acknowledged and then clears from the display. Alarms are logged to a relational database regardless of whether the alarm configuration requires acknowledgement.

Not all conditions are valid for all tag types. For the conditions supported by each tag type, refer to Table 1-1.

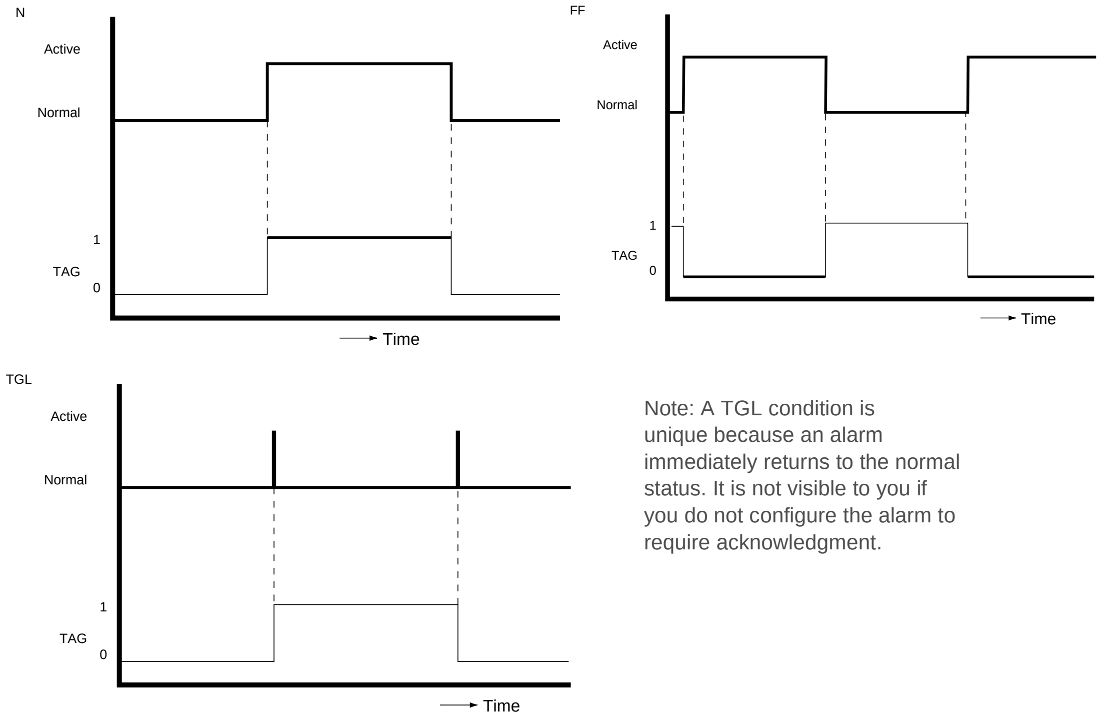
Table 1-1 Supported Conditions for Each Tag Type

Condition	Digital	Analog	Longana	Float	Message	Mailbox
ON	X					
OFF	X					
TGL	X	X	X	X	X	
LOLO LO LT <		X	X	X		
HIHI HI GT >		X	X	X		
LE < =		X	X	X		
GE > =		X	X	X		
EQ =	X	X	X	X	X	
NE < >		X	X	X	X	

Digital Tags

The behavior of a digital alarm with specified limits by tag type is illustrated in Figure 1-1. The diagram represents an alarm status of active and normal based on a value, a limit, and deadband range.

Figure 1-1 Digital Alarm Cycle



Note: A TGL condition is unique because an alarm immediately returns to the normal status. It is not visible to you if you do not configure the alarm to require acknowledgment.

Analog, Long Analog, and Float Tags

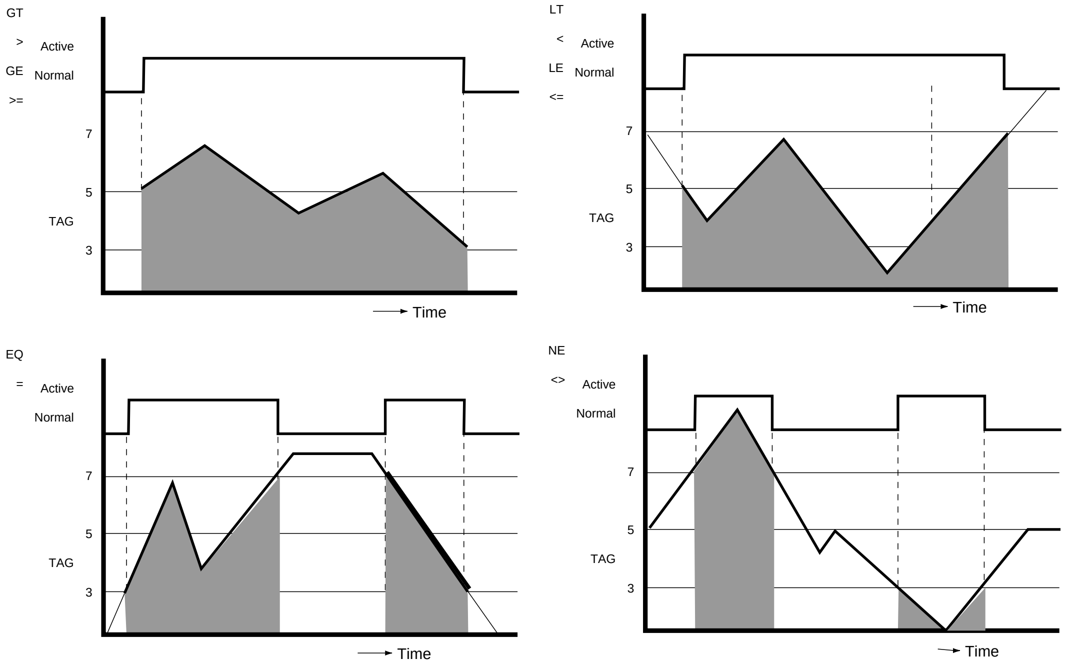
The principle of operations are identical when operating on analog, longana or float tag types. The smallest unit detected is dependent on the type.

The behavior of an analog, longana or float tag types with specified limits is illustrated in Figure 1-1. The diagrams represent an alarm status of active and normal based on the value, limit, and deadband range.

All examples are based on the following parameters:

- Limit: 5
- Deadband: 2

Figure 1-1 Analog and Float Alarm Cycles



Message Tags

When there is a change in the value of a Message tag the value is checked to be equal or not equal to the entire message defined as part of the alarm criteria.

Alarm Status

Every time the value of an alarm element is changed, the new value is evaluated against the alarm criteria:

- If the criteria are not met for an alarm, the value is considered in a normal status.
- If the criteria are met, a new alarm is added to the active alarm list and the alarm is in an active status.
- If the alarm is already active and the value no longer meets the criteria, it returns to the normal status.
- If the criteria are met and the alarm does not require an acknowledgment, it is removed immediately from the list.

- If the criteria are met and the alarm required an acknowledgment and has been acknowledged, it is removed from the list.
- If the criteria are met and the alarm requires an acknowledgment and has not been acknowledged, it remains on the list until acknowledged and then is removed.
- The initialization of an alarm causes the Distributed Alarm Logger task to log the message to the relational database, providing the configuration is set to log alarms.

Interpretation of the status code values is dependent upon the tag type defined in the Status field of the Alarm Definition Information table. For additional information about the Status field, refer to the section Define Alarm Records on page 58. Table 1-2 shows the values for an analog and a digital tag type.

Table 1-2 Run Time Status Values

Status	Definition	Analog Tag	Digital Tag
Initial	An active alarm; an alarm that has its alarm criteria met. The alarm remains in this status until there is operator action.	3	0
Acknowledged*	The alarm status which occurs when the operator performs the acknowledgement function on an active alarm. The alarm remains listed on the AlarmViewer after acknowledgement until the alarm criteria returns to normal.	2	1
Normal and not acknowledged	The criteria that triggered the alarm has been removed but the operator has not performed the acknowledgement function.	1	0
Idle	There is presently no criteria to trigger this alarm and the alarm does not need acknowledgment from prior alarm condition.	0	0

* Only alarms configured to require operator acknowledgement in the Alarm Group Table will remain listed on the AlarmViewer after a return to normal status occurs.

The Distributed Alarm Logger task maintains running counts of the number of alarms in the active queue which are predefined in the Alarm Group Control table. For more information, refer to Set up General Alarm Counters on page 71 in this chapter.

Alarm Categories

Categorizing alarms facilitates administration and analysis. Three methods are provided to show related alarms:

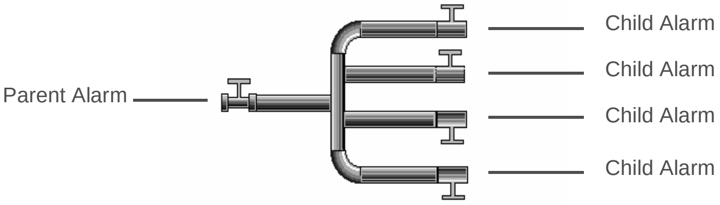
- Group Name—The group name is assigned to a class of alarms. Group names can be identifiers of the severity of the alarm, represent similar types such as pressure gauges, or indicate a combination of any other characteristics.
- Area—The area is assigned to each alarm individually. More than one alarm can reside in an area and alarms from different groups can also reside together. An area can reflect a physical location such as the boiler room or an area of responsibility such as maintenance.
- Priority—The priority is a number hierarchy assigned to each individual alarm. Use a number between 1 (lowest) and 9999 (highest) to set priority. Multiple alarms can be assigned the same priority number and multiple groups and areas can have common priority numbers within them.

At least one Group Name must be established to define any individual alarms: All alarms must belong a to a group. The use of areas and priorities is optional. Categories enable filtering and sorting of alarms on the AlarmViewer.

Parent/Child Relationship

The conditions which cause the generation of one alarm may cause another alarm to be generated. When these relationships exist, you generally do not want to display the additional alarms. An example: if the closing of a valve that feeds four different pipelines generates an alarm, it is a reasonable assumption that the lack of flow in each pipe would generate an alarm based on the value of the flowmeter element as shown in Figure 1-2. These resulting alarms would not be important because you already know the flow has been cut off and why. This relationship between the alarms is identified as a parent/child relationship. In this example the main valve is the parent alarm of each of the flow alarms. The resulting child alarms are not displayed or counted as active alarms because they are a result of the parent alarm.

Figure 1-2 Parent/Child Alarm Relationship



However, if the main valve is open and one of the individual pipeline flowmeters registers an alarm, you would want to be advised. In this case the child is not dependent on the parent because the child alarm initiated on its own. This alarm is displayed and counts as an active alarm.

Each alarm can have multiple parent/child relationships. Alarms defined in a remote group can never act as a child alarm. A parent alarm must have a defined Unique Alarm ID to create the child alarms on the local node.

TGL type is not a recommended type for a parent alarm. When a TGL alarm is initiated, it becomes ACTIVE and immediately returns to NORMAL. Because it never stays in the ACTIVE status, using a TGL alarm as a parent would result in the child alarm never being hidden.

Each alarm is evaluated by the Distributed Alarm Logger task and compared to its parent/child relationship prior to displaying.

- If the alarm is a parent, it is displayed.
- If the alarm is a child and the parent status is not active, the child is displayed.
- If the alarm is a child and the parent status is active, the child alarm is disregarded or displayed based on delay criteria you establish in the relationship.

Within the parent/child relationship two kinds of delays can be specified:

- Child alarm delay
- Child recovery delay

These delays specify the time allowed between the generation or clearing of a parent alarm and the activation of a child alarm unrelated to the parent. For information on how to configure these alarms, refer to Define Parent-Child Relationships on page 66 in this chapter.

Child Alarm Delay

The length of time a child alarm is suppressed after a parent alarm is triggered is the child alarm delay.

The conditions that cause both the parent and child alarms to generate must return to normal to allow the alarm statuses to return to normal. When both have returned to normal, the parent/child relationship is reestablished. At the next invocation of the parent, the timer is started again to inhibit the display of the child alarm for the child alarm delay period. These concepts are shown in Figure 1-3, Figure 1-4, and Figure 1-5.

Figure 1-3 Child Alarm Delay - Child is Suppressed

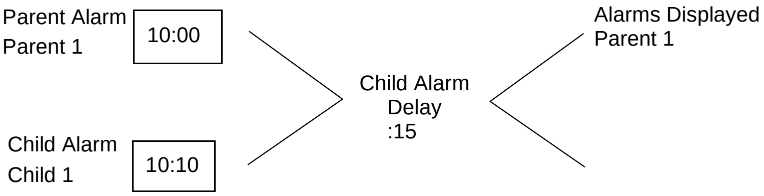


Figure 1-4 Child Alarm Delay - Child is Not Suppressed

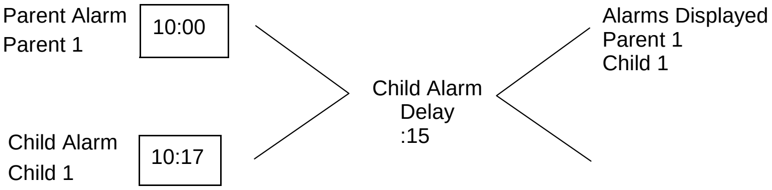
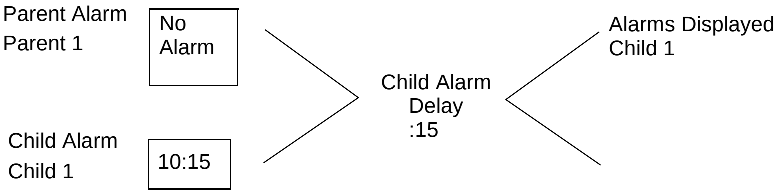


Figure 1-5 Child Alarm Delay - Child Alarm Only



Child Recovery Delay

The length of time a child alarm is provided to return to normal status after a parent alarm has been return to normal status is the child recovery delay.

In the previous example, the main valve causing the generation of the parent alarm was shut off. This generated the four pipeline alarms but they are disregarded because they are redundant. If the main valve is now turned on, the flow should return to all four pipelines. The child recovery delay provides sufficient time for a child alarm status to return to normal. If the child status cannot return to normal in this time period then the child alarm generates an alarm.

After the child status has returned to normal, and the parent has a normal status, the parent/child relationship is reestablished.

For illustrations of these concepts, refer to Figure 1-6 and Figure 1-7.

Figure 1-6 Child Recovery Delay - Child Recovers

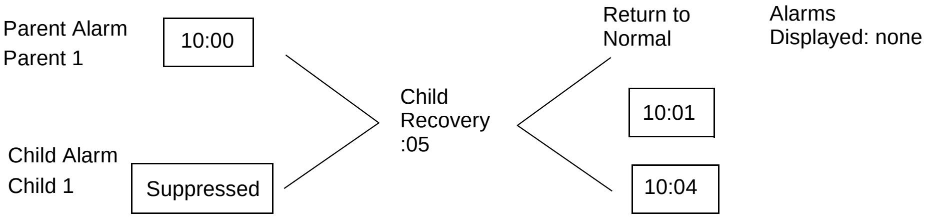
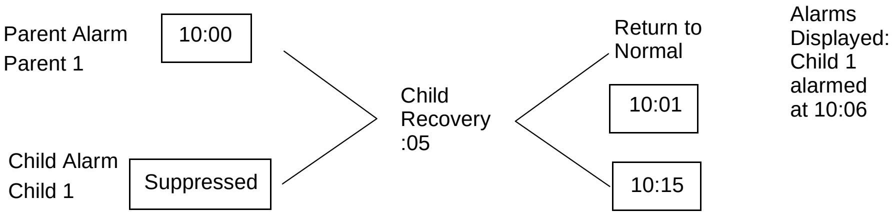


Figure 1-7 Child Recovery Delay - Child Alarms



Hide Alarms

Alarm hiding is done when you do not need to manage a particular set of alarms. Alarm hiding is used in the following common situations:

- Equipment maintenance
- Redundant systems
- Station functionality
- Bad sensor

Alarm hiding should not be confused with filters used with the AlarmViewer. Alarm hiding tells the Distributed Alarm Logger task to disregard the AlarmViewer display associated with a particular set of alarms. Alarm filtering selects specified alarms for viewing and suppresses other alarms from the AlarmViewer. However, the alarms are still being logged and tracked.

Filtering is more common on multiuser or distributed systems. In these architectures, all users have the ability to monitor all alarms. However, certain operators may be responsible for a subset of these alarms. Filters enable operators to view only alarms they are responsible for on the AlarmViewer.

If an alarm is hidden it does not act as a parent in parent/child relationships. To avoid potential problems when the parent alarm is hidden, child alarms also must be hidden. For more information about how to configure alarm hiding, refer to Set up Alarm Groups on page 49.

Global Hide Tag

The Global Hide tag is used most frequently in redundant systems. In redundant systems, one node is the master and all alarms are active for this node (Global Hide tag = 0). The slave node or standby node has the Global Hide tag = 1.

Group Hide Tag

The Group Hide tag is used to hide equipment maintenance alarms. The developer must ensure that alarms are grouped by machine, so when a maintenance cycle begins, those alarms can be hidden.

> **Note:** In addition to the two existing mask settings—Hide (which hides alarm from the AlarmViewer and the output alarm database) and Show (which shows alarms on the AlarmViewer and allows writing to the alarm database), a new setting called Event has been added, which hides alarm from the AlarmViewer, but shows it in the alarm database.

The Group Hide tags are also used to define station functionality. This is a special case because a node may have multiple functional requirements. For example, a node may function as a simple operator station for only one piece of equipment one day. The next day the same node may be the supervisor's station for all of the equipment. Groups are hidden based on the node functionality.

Individual Hide Tag

In some systems, individual alarms may need to be hidden to silence an alarm because of a malfunctioning sensor. When the sensor is repaired, the alarm needs to be monitored again.

Remote Group

There is no hiding function for alarms received from remote groups. Alarms should be hidden at the server node. If you do not want to view the alarms, create a filter in the AlarmViewer so the alarms do not show.

Event Alarms

Event alarms are any alarms that are logged to a database but are not processed for viewing and acknowledgement. This provides the archival of the alarm condition without operator required processing. To configure an event alarm, use the Group Hide Tag or the Alarm Hide tag.

Locally Redefined Unique Alarm IDs

For networked systems, if a local Unique Alarm ID definition can be created and it matches a remote Unique Alarm ID the alarm appears as if it is a local alarm. The Distributed Alarm

Logger task must be running on the remote node. In addition to reporting alarms as if they were local alarms this configuration provides the message text from the remote system to be displayed on the AlarmViewer.

Alarm Persistence

Alarm persistence is the storing of current information about the status of active alarms and the child alarms at user-defined intervals. At startup the information is read preserving important information, for example, initial time and acknowledgment information.

Alarm persistence is activated by placing a -w on the program arguments field of Distributed Alarm Logger task line in the SHARED domain and by configuring and running the SHARED domain persistence task with a trigger in the Timed Save Trigger field, which causes the system to save the alarm persistence information each time the persistence trigger is set. The system then saves the Distributed Alarm Logger task information to the files:

- {FLAPP}/{FLNAME}/shared/al_log.prs
- {FLAPP}/{FLNAME}/shared/al_log.bak

If the *.prs file is not readable at startup, the *.bak file is read.

The al_log.prs file is updated at the time the Distributed Alarm Logger task is shut down, on a Persistence Timed Trigger change. The al_log.bak file is updated on a Persistence Backup Trigger change. For more information about the persistence function, refer to the persistence section of the *FactoryLink 6.6 Configuration Guide*.

Upon restart of the Distributed Alarm Logger task, the al_log.prs or al_log.bak file is read into memory, and all alarms are checked for validity.

The active alarms are stored using their Unique Alarm ID number. If you have not defined a Unique Alarm ID in the alarm definition, one is defined at startup. If the configuration does not change, all alarms receive the same Unique Alarm ID each time at startup. If the configuration changes, however, each Unique Alarm ID could be altered, and the Distributed Alarm Logger task could potentially load persistence information for incorrect alarms or not load persistence information. For more information about alarm definition, refer to the section Define Alarms on page 57.

Alarm Distribution

Alarms can be distributed over the network using the FactoryLink Local Area Network. Each node can share one or more groups of alarms with other nodes. The alarm is originated on the node it is defined on and is seen and acknowledged from other nodes that have been configured to receive information on that particular alarm. When the alarm is acknowledged, either at the source or at the remote, the source node accepts the acknowledgment and updates the new alarm status. All nodes receiving information on the alarm are updated. For additional information on this topic, refer to the *FactoryLink 6.6 Configuration Guide*.

Alarm Logging

If you want to preserve the time of alarm, alarm data, and the node that acknowledged the alarm, you can configure Distributed Alarm Logger task to read data from the elements in the real-time database and send the data to a disk-based relational database or to a text file. Data logged to a relational database is then available for browsing through the FactoryLink Database Browser.

The Distributed Alarm Logger task logs data to a relational database using the same methodology as the FactoryLink Database Logger. The data is logged in a table format using an Historian task. Alarm instances are logged at a status change: as the alarm occurs, when the alarm is acknowledged, or an alarm returns to the normal status. The tables for alarm logging output and their associated schemas have already been defined for the Distributed Alarm Logger task. For more information refer the section Set up Database Archive Requirements on page 67 in this chapter that defines the fields of the Alarm Archive Control table to enable alarm database logging.

If a remote group has logging turned on but no database information is defined on the client node, no information is logged. This condition does not result in the display of an error message.

When a remote node shuts down and restarts or reconnects after a communication failure with the same alarm still active, the logger tries to insert the alarm into the database twice. This condition results in generating a Duplicate Entry error.

The record length is determined by the size specified in the Message Size field of the Alarm Archive Control Information table in the Distributed Alarm Logger Setup table.

For the schema layout used to build the alarm entry table, refer to Table 1-3 and Table 1-4.

Table 1-3 Alarm Entry Table Schema

Column	Type	Array	Description
SEQ	NUMBER	11	Sequence Number of the alarm
AID	NUMBER	11	Alarm ID number
NAME	CHAR	48	Alarm TAG name
GRP	CHAR	16	Group alarm belongs to
AREA	CHAR	16	Area alarm belongs to
PRIO	NUMBER	6	Priority of the alarm
ITIME	CHAR	30	Initial Time (yearmodyhrmisc.mse)
ATIME	CHAR	30	Acknowledge Time (yearmodyhrmisc)
NTIME	CHAR	30	Normal Time (yearmodyhrmisc)
DUR	NUMBER	11	Alarm Duration in seconds
MSG	CHAR	162	Alarm Message
VAR1	CHAR	44	Variable 1 at Initial Status
VAR2	CHAR	44	Variable 2 at Initial Status
VAR3	CHAR	44	Variable 3 at Initial Status
VAR4	CHAR	44	Variable 4 at Initial Status
OPR	CHAR	8	Name of operator who acknowledged the alarm

Table 1-4 Alarm Entry Column Schema

Index	Unique	Column list
1	YES	SEQ + ITIME.

Logbook

Prior to the FactoryLink 7.0 software release, the Distributed Alarm Logger task had provided a logbook entry capability during run time that allowed an operator to annotate an alarm record. These entries were saved in the relational database or a file when the alarms were logged and were also distributed along the network if the alarms were distributed.

The logbook provided the addition of notes to the alarm to document why an alarm occurred, how it was corrected, or what is being done to correct it. If the alarms were being distributed, all operators on the network could add logbook entries to the alarm.

Logbook entries can be added to the alarm records but the legacy alarm viewer must be used. The legacy alarm viewer is launched at FactoryLink startup. For more information about logbook entries, refer to the *FactoryLink 6.6 Configuration Guide*.

Entries to the logbook are indicated by an asterisk in the Logbook field when viewed on the FactoryLink 7.0 Alarm Control Viewer. The logbook data is viewable using the FactoryLink Database Browser. For more information about browsing alarms, refer to the section Browsing Archived Alarms on page 127 in this chapter.

CONFIGURING ALARMS

This section explains how to locate the alarm tables, the definitions of the table fields, and the design of the AlarmViewer that enables managing the active alarms in the run-time mode:

- Navigate Configuration Explorer
- Configure Alarms Sequence
- AlarmViewer Design

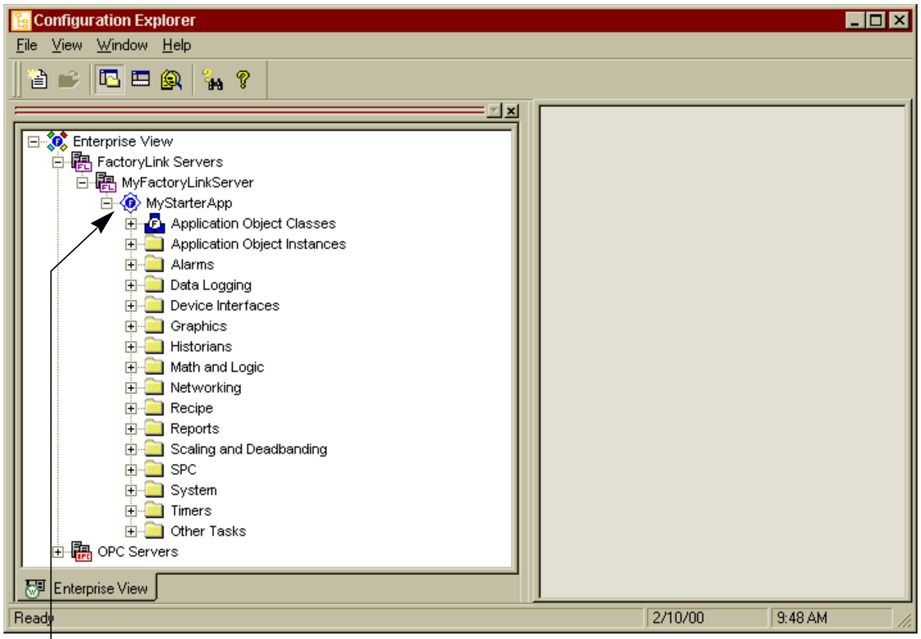
Many of the examples in this section are from the StarterApp (starter application) that is supplied with every installation. The StarterApp provides tables with preconfigured data to illustrate proper configuration of the fields.

Navigate Configuration Explorer

The FactoryLink Server and the FactoryLink Application directory (FLAPP) must be established before configuring the alarm tables. This is accomplished using the Configuration Explorer application. For a complete description on how to configure an application and the Configuration Explorer features and options, refer to the Configuration Explorer User Guide.

To launch Configuration Explorer: click the Configuration Explorer icon displayed on the desktop. Expand the Enterprise View item. Expand FactoryLink Servers. Expand MyFactoryLink Servers to display the defined applications. Expand the MyFactoryLink Servers as shown in Figure 1-8.

Figure 1-8 FLAPP Contents in Configuration Explorer



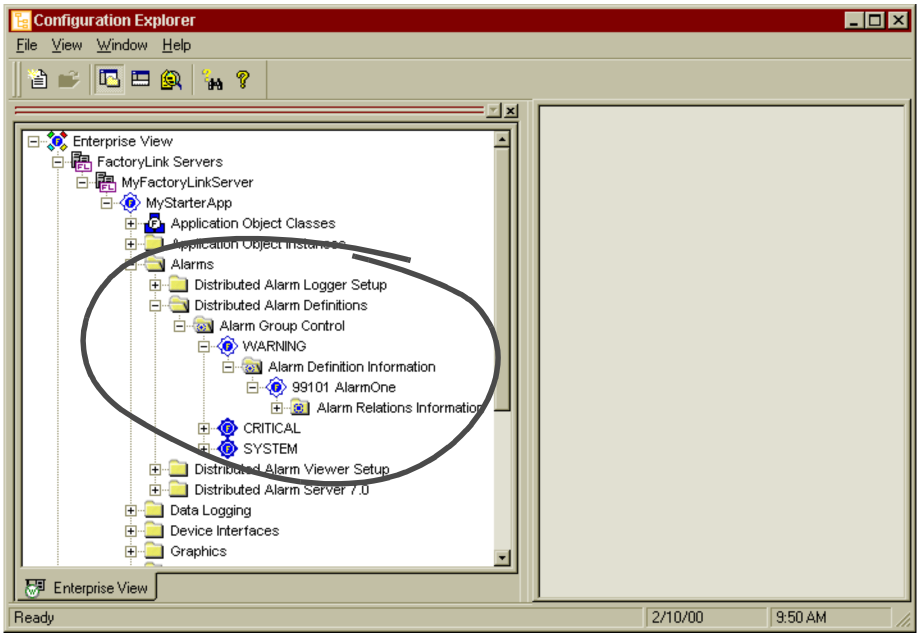
Double-clicking the application name displays the FLAPP contents.

View Alarm Tables

You configure alarm tables from the application tree. All of the configuration tables are available to you in their respective folders.

To view the alarm tables, expand the items in the application tree.The application tree provides selection and configuration of all FactoryLink tables and tasks. Tables are identified in the tree by the FactoryLink icon on the folder icon. Double-click the table name in the tree to open the tables in the workspace.

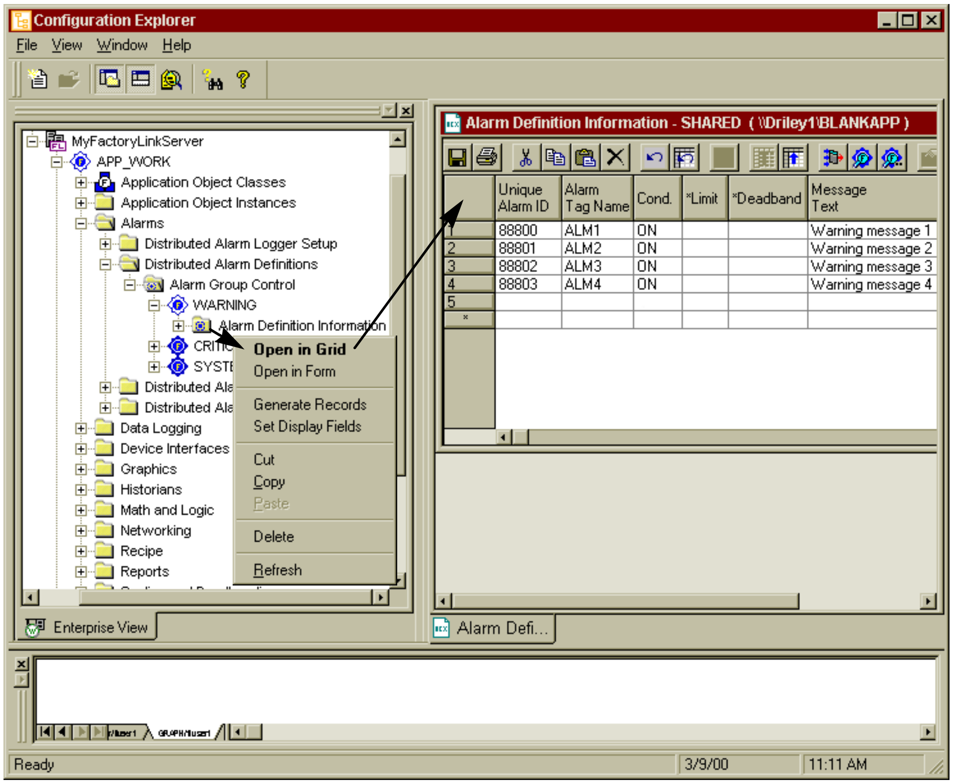
Figure 1-9 Location of Alarm Tables in Configuration Explorer



> **Note:** All configuration for FactoryLink 7.0 is in the SHARED domain. USER domain indicators are provided for upgrade from older FactoryLink versions.

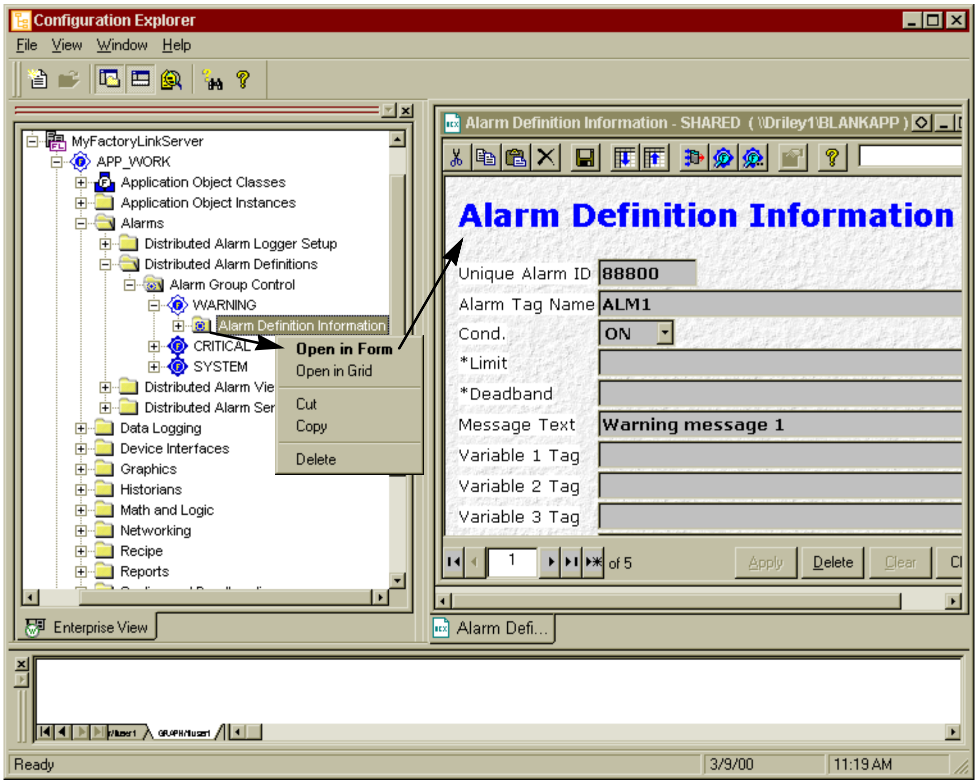
The default view for a table is the Grid View as shown in Figure 1-10. The Form view is the default for single record items. Double-click a table or single record item and the respective view displays in the workspace as shown in Figure 1-11.

Figure 1-10 Configuration Explorer Grid View



	Unique Alarm ID	Alarm Tag Name	Cond.	*Limit	*Deadband	Message Text
1	88800	ALM1	ON			Warning message 1
2	88801	ALM2	ON			Warning message 2
3	88802	ALM3	ON			Warning message 3
4	88803	ALM4	ON			Warning message 4
5						
*						

Figure 1-11 Configuration Explorer Form View



Alarm Definition Information

Unique Alarm ID	88800
Alarm Tag Name	ALM1
Cond.	ON
*Limit	
*Deadband	
Message Text	Warning message 1
Variable 1 Tag	
Variable 2 Tag	
Variable 3 Tag	

Methods to Create or Modify Records

The Configuration Explorer application provides the configuration of alarm records using three different methods:

- Field Level Editing: Recommended for simple, single record editing
- Record Generation Box: Definition of one or many records through the use of the Record Generation dialog box.
- Application Objects: Definition of highly reusable, repeatable creation of record instances using Application Object templates.

The method used to configure the alarms is dependent on the number of alarms needed and user preference. For more detailed instructions, refer to the Configuration Explorer User Guide.

Field Level Editing

Field level editing is recommended for very simple changes that cannot be accomplished with repeatable functions. Records can be duplicated using standard copy and paste functions or added by using the Form view and the Grid view of the tables.

Each field within the table must be accessed and modified individually using this editing method. Alarm records are created one at a time. Drop down menus show acceptable selection values. Tag fields present a drop list of predefined tags if the beginning letters typed match a predefined tag name.

Record Generation Box

The Record Level Generation Box displays many options available for rapid generation of records and tables. These options are configurable on a per field basis. There can be any combination of data origins within the record design:

- Constant values
- Numerical Sequence (simple numbering sequence or array-based)
- Text file input (from an external text file)
- Excel spreadsheet input (from an external EXCEL file)
- Custom Functions (generation of files using output from a VBA-compatible script)
- ODBC (ADO)

Generating records using this method is fast and flexible. However, the process for each session cannot be saved for later reuse as with Application Objects.

Application Objects

Application Objects provide a new dimension in creating alarm records. Application Objects create records with the same origins as the Record Generation process using: constants, text file input, numerical sequencing, Excel spreadsheet lists, custom functions and ODBC. However, once the Application Object is designed, the process is quickly and instantly repeatable.

Using Application Objects also has the additional option of prompting the user for keyboard input. Thus once the Application Object design is complete, the generation of new records can be an interactive task.

The Application Objects are designed by a dragging items from a configuration objects list or templates variable list and dropping them into a new alarm design. This eliminates all the individual repeated steps. For example, an array table, a field constant, a custom message field prompt, and the input location from an Excel spreadsheet can all be dragged and dropped into an Application Object design.

The interactivity provides conformity of the design for consistency and yet enables individual custom needs and requirements. One or many alarm instances can be created repeatedly, with the same design and relationships. For example, different workgroups may require a different level of viewing tables, or there may be different files used to generate the alarm data on different servers. The user can be prompted to enter the specific data for that week, workstation, or viewer level.

The Application Object design process provides testing prior to implementation to ensure accuracy of design, structure and function.

Configure Alarms Sequence

A suggested sequence for configuration of alarms is the following:

- Verify Alarm Server Functions
- Set up Alarm Groups
- Define Alarms
- Set up Archive Database Requirements
- Set up General Alarm Counters

Use Table 1-5 as an overview to navigate through the Configuration Explorer tables and to configure alarms:. Each function is described in more detail in this chapter.

Table 1-5 Recommended Alarm Configuration Sequence (Sheet 1 of 2)

Step	Functions	Description	Related Alarm Tables
1	Verify Alarm Server Functions on page 42		Distributed Alarm Server 7.0 Field Definitions Interval Timer - Poll Trigger Tag Definition Fields
	Verify Alarm Server Task Set up on page 42	The Alarm Server task and the associated executable alarm server file are predetermined in the FactoryLink software.	
	Verify the Distributed Alarm Logger Task on page 44	The Distributed Alarm Logger task name is AL_LOG. It is preconfigured to initiate at run time.	
	Verify the Distributed Alarm Server 7.0 Table on page 47	The mailbox tags to provide communication between the Distributed Alarm Logger task and the Alarm Server are preconfigured.	
	Verify Polling Trigger Timer Setup on page 48	The polling trigger tag is preset in the Polling Trigger Timer Setup table. The polling interval is set to a default of 10 seconds in an Interval Timer table. This may be modified if necessary.	
2	Set up Alarm Groups on page 49	All tables must be part of a group. Groups must be established prior to definition of the member alarms.	Alarm Group Control Fields
3	Define Alarms on page 57		
	Define Alarm Records on page 58	Each alarm is a record in the group table. Single or multiple alarms can be quickly generated.	Alarm Definitions Table Field Definitions
	Define Parent-Child Relationships on page 66	Optional. If more than one alarm is generated because of the same event, these alarms may have a sequential relationship. This relationship can be configured to include a delay to avoid redundant or related alarm messages.	Alarms Relationships Field Definitions

Table 1-5 Recommended Alarm Configuration Sequence (Sheet 2 of 2)

Step	Functions	Description	Related Alarm Tables
4	Set up Database Archive Requirements on page 67	Optional. This table is used to identify the files (the schema) for the external or internal database where alarm information is logged.	Alarm Archive Control Fields
5	Set up General Alarm Counters on page 71	Optional. A table is provided to store counts of the various alarm statuses and the alarms maintained by the Distributed Alarm Logger task.	General Alarm Setup Control Fields

Verify Alarm Server Functions

The alarm server tasks and functions are preconfigured in the FactoryLink software because they do not require any specific customization for individual installations. Most of the default values can be changed as needed.

This section briefly explains the purpose of the functions and how the tables or dialog boxes are accessed. These functions are explained:

- Verify Alarm Server Task Set up
- Verify the Distributed Alarm Logger Task
- Verify the Distributed Alarm Server 7.0 Table
- Verify Polling Trigger Timer Setup

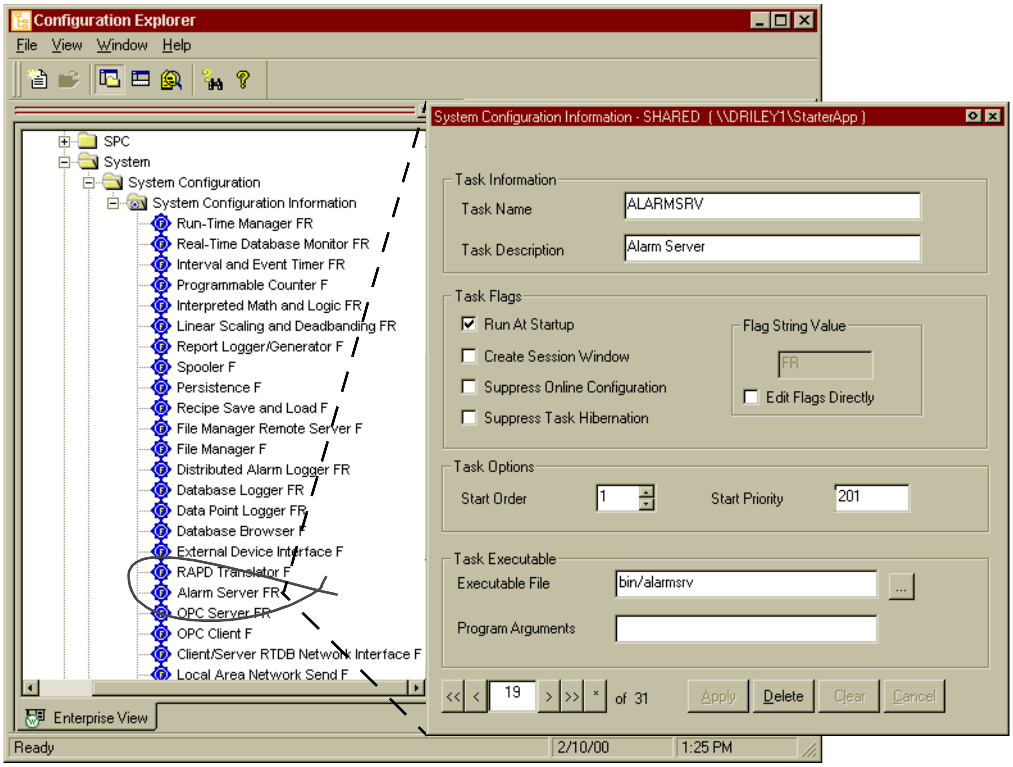
Verify Alarm Server Task Set up

The Alarm Server task and the associated executable alarm server file are predetermined in the FactoryLink software as part of the System Configuration Information.

The Alarm Server manages the alarm output using the Alarm Server task. In response to an alarm condition, the Distributed Alarm Logger task creates a message. The message can be output to the AlarmViewer through the Alarm Server, one or more databases, a text file or a printer.

For the location of the Alarm Server task, refer to Figure 1-12. For the default configuration of the task, refer to Table 1-6.

Figure 1-12 Alarm Server Task Dialog Box



Task Name: ALARMSRV

Task Description: Alarm Server

☑ Run At Startup

□ Create Session Window

□ Suppress Online Configuration

□ Suppress Task Hibernation

Flag String Value: FR

□ Edit Flags Directly

Start Order: 1

Start Priority: 201

Executable File: bin/alarmsrv

Program Arguments:

19 of 31

Table 1-6 Alarm Server Task (Sheet 1 of 2)

Field Name	Definition		Default
Domain	For FactoryLink 7.0 users who are not converting applications from prior versions, SHARED domain is the only option. For legacy domain requirements, refer to the FactoryLink 6.6 system documentation.		Shared
Task Information	Task Name	Predefined name for the task which cannot be changed	ALARMSRV
	Task Description	Optional alphanumeric description	Alarm Server

Table 1-6 Alarm Server Task (Sheet 2 of 2)

Field Name	Definition		Default
Task Flags	Run at Startup	R: Invokes task at FactoryLink startup	Yes
	Create Session Window	S: Provides the process with its own tab window. Output prints to the Configuration Explorer Output window.	Optional
	Suppress Online Configuration	O: Suppress online updates for this process	Optional
	Suppress Task Hibernation	H: Not applicable for alarm functions	Not applicable
Flag String Value	Input box	Displays value code of selected Task Flags F: Foreground Flag. Puts this task in the foreground at startup	Yes
	Edit Flags Directly	If selected, allows user input of string values to input box.	Not selected
Task Options	Start Order	Specifies the run-time rank for invoking the task when FactoryLink is started	1
	Start Priority	Operating system processing priority	201
Task Executable	Executable File	The path and name of the file which executes this task	bin/alarmsvr
	Program Arguments	The codes which add customization to the functions of the task -L: log error messages to a file * -L-V#: log error messages with more information to a file. Verbose level increases from 1 through 9	None

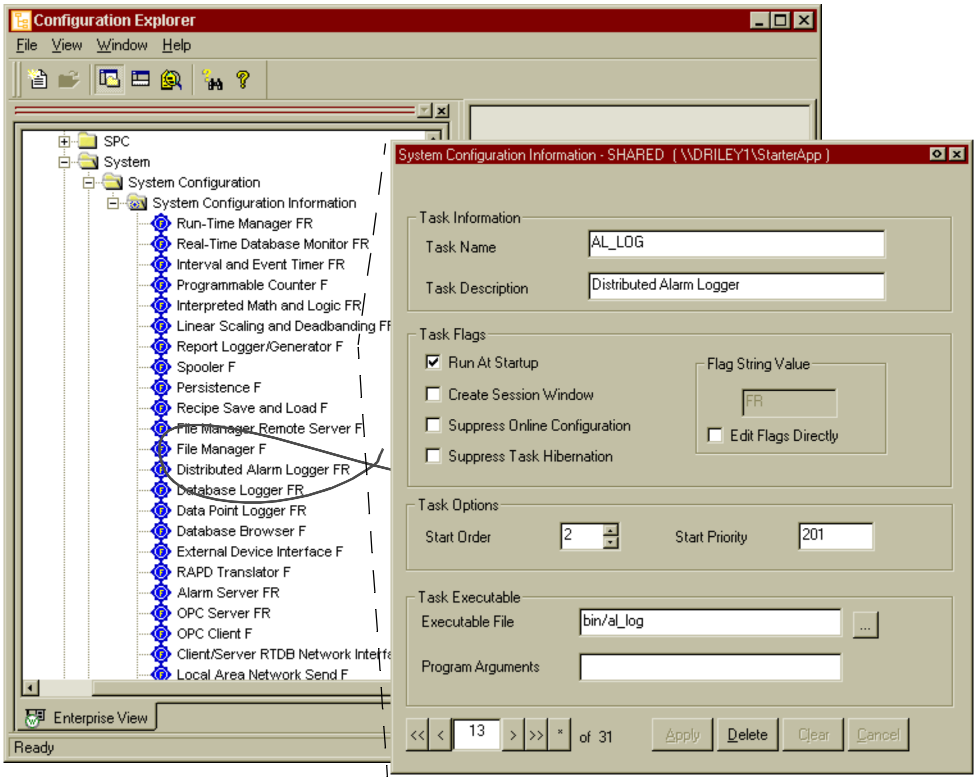
* Default message file location is: {FLAPP}/{FLNAME}/{FLDOMAIN}/log

Verify the Distributed Alarm Logger Task

The default options for the Distributed Alarm Logger task are preconfigured in the FactoryLink software. The task name AL_LOG is standard and cannot be changed. Other options can be modified by the designer.

For the location of the Distributed Alarm Logger task, refer to Figure 1-13. For the default configuration of the task, refer to Table 1-7.

Figure 1-13 Distributed Logger (AL_LOG) Task Dialog Box



System Configuration Information - SHARED (\\DRILEY1\StarterApp)

Task Information

Task Name: AL_LOG

Task Description: Distributed Alarm Logger

Task Flags

☑ Run At Startup

□ Create Session Window

□ Suppress Online Configuration

□ Suppress Task Hibernation

Flag String Value: FR

□ Edit Flags Directly

Task Options

Start Order: 2

Start Priority: 201

Task Executable

Executable File: bin/al_log

Program Arguments:

<< < 13 > >> * of 31

Table 1-7 Distributed Alarm Logger Task Dialog Box Fields (Sheet 1 of 2)

Field Name	Definition		Default
Domain	For FactoryLink 7.0 users who are not converting applications from prior versions, SHARED domain is the only option. For legacy domain requirements, refer to the FactoryLink 6.6 system documentation.		Shared
Task Information	Task Name	Predefined name for the task which cannot be changed.	AL_LOG
	Task Description	Optional alphanumeric description.	Distributed Alarm Logger task

Table 1-7 Distributed Alarm Logger Task Dialog Box Fields (Sheet 2 of 2)

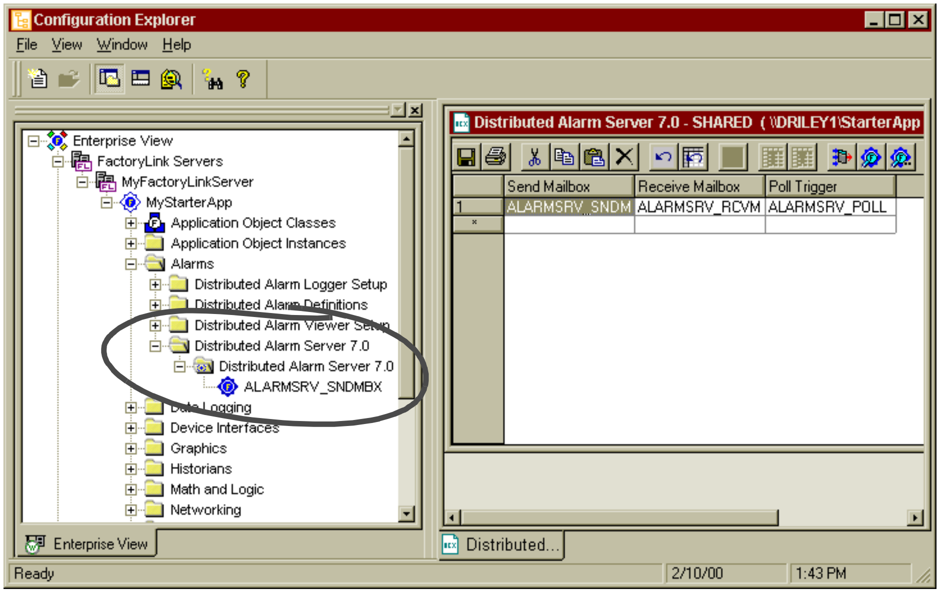
Field Name	Definition		Default
Task Flags	Run at Startup	R: Invokes task at FactoryLink startup.	Yes
	Create Session Window	S: Provides the process with its own tab window. Output prints to the Configuration Explorer Output window.	Optional
	Suppress Online Configuration	O: Suppress online updates for this process.	Optional
	Suppress Task Hibernation	H: Not applicable for alarm functions.	Not applicable
Flag String Value	Input box	Displays value code of selected Task Flags. F: Foreground Flag. Puts this task in the foreground at startup. A: Suppress printing of return-to-normal messages for toggle type fields	FR
	Edit Flags Directly	If selected, allows user input of string values to input box.	Not checked
Task Options	Start Order	Specifies the run-time rank for invoking the task when FactoryLink is started.	2
	Start Priority	Operating system processing priority	201
Task Executable	Executable File	The path and name of the file which executes this task.	bin/al_log
	Program Arguments	The codes which add customization to the functions of the task. -L: log error messages to a file [*] -L-V#: log error messages with more information to a file. Verbose level increases from 1 through 9	None

[*] Default message file location is: {FLAPP}/{FLNAME}/{FLDOMAIN}/log

Verify the Distributed Alarm Server 7.0 Table

The Distributed Alarm Server 7.0 table supplies the mailbox and trigger information for the Alarm Server and the Distributed Alarm Logger tasks to communicate as shown in Figure 1-14.

Figure 1-14 Distributed Alarm Server 7.0 Table



Distributed Alarm Server 7.0 - SHARED (\\DRILEY1\StarterApp

	Send Mailbox	Receive Mailbox	Poll Trigger
1	ALARMSRV_SNDM	ALARMSRV_RCVM	ALARMSRV_POLL
*			

These tags are required for communication. The time interval for the poll trigger tag can be modified using the Interval Timer table. For most fields, Default refers to a preconfigured value that appears when the application is created. The alarm server table tags are:

Send Mailbox Storage of communications retrieved by the Distributed Alarm Logger task

Default Entry: ALARMSRV_SNDMBX

Valid Data Type: Alphanumeric

Valid Entry: Mailbox
1 to 16 characters

Receive Mailbox Storage of communications from the Distributed Alarm Logger task

Default Entry: ALARMSRV_RCVMBX

Valid Data Type: Alphanumeric

Valid Entry: Mailbox
1 to 16 characters

Poll Trigger: Polling frequency of the communications between the Alarms Server and the Distributed Alarm Logger

Default Entry: ALARMSRV_POLL

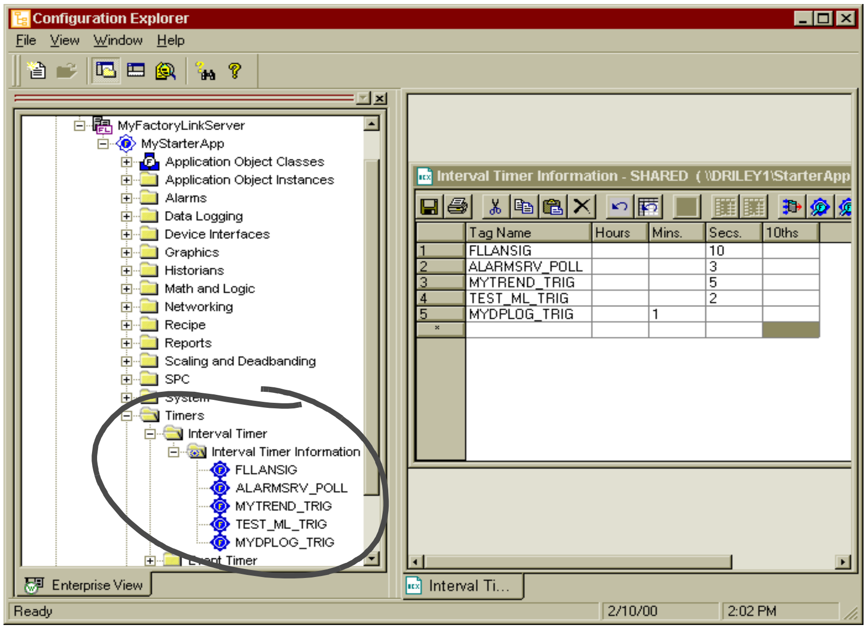
Valid Data Type: Digital

Valid Entry: Standard tag name

Verify Polling Trigger Timer Setup

The polling frequency for the Distributed Alarms Server is preconfigured in the Interval Timer Information table as shown in Figure 1-15). For most fields, Default refers to a preconfigured value that appears when the application is created.

Figure 1-15 Interval Timer Information Table



	Tag Name	Hours	Mins.	Secs.	10ths
1	FLLANSIG			10	
2	ALARMSRV_POLL			3	
3	MYTREND_TRIG			5	
4	TEST_ML_TRIG			2	
5	MYDPLOG_TRIG		1		
*					

Tag Name Name of tag to maintain the trigger value for the timing sequence to occur

Valid Data Type: Digital

Valid Entry: Standard tag name

Default: ALARMSRV_POLL

Hours Time interval for a trigger segmented in hours

Valid Data Type: Analog

Valid Entry: 1 through 99

Default: None

Minutes Time interval for a trigger segmented in minutes

Valid Data Type: Analog

Valid Entry: 1 through 99

Default: None

Seconds Time interval for a trigger segmented in seconds

Valid Data Type: Analog

Valid Entry: 1 through 99

Default: 3

10ths Time interval for a trigger segmented in tenths of seconds

Valid Data Type: Analog

Valid Entry: 1 through 99

Default: None

Set up Alarm Groups

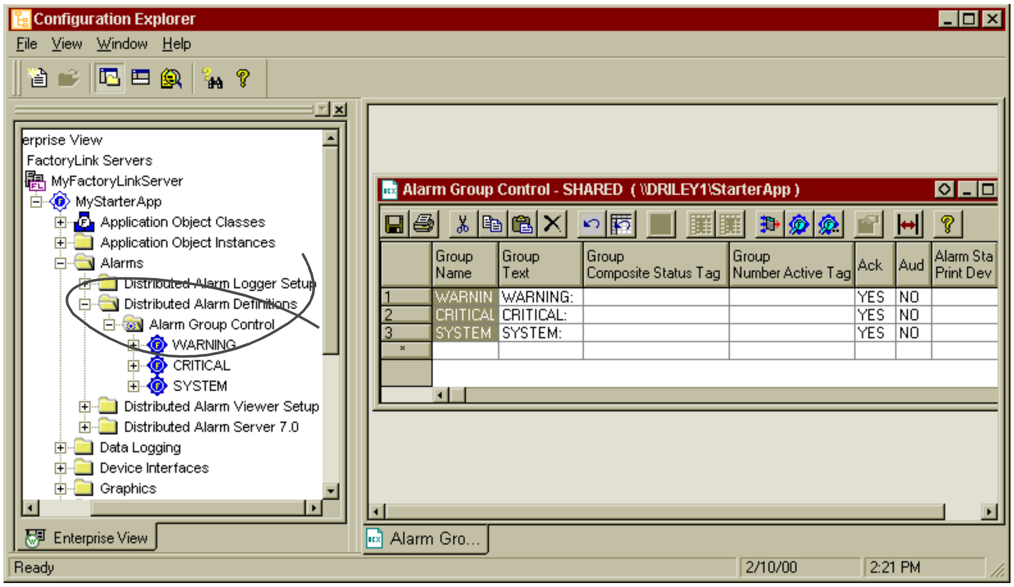
The Alarm Group Control table is used to define the properties assigned to each alarm group. There must be at least one group defined for your installation. All alarms must be a member of a group.

Group functions defined using this table include the following information:

- Group name and group message text
- Group counters for composite status and number of active alarms in the group
- Groups that need to be acknowledged by an operator
- Group hide selection to prohibit alarm messaging in startup or non-error conditions and for event logging.
- Printing to text files or print to database options

For the location of the Alarm Group Control table, refer to Figure 1-16.

Figure 1-16 Alarm Group Control Table



	Group Name	Group Text	Group Composite Status Tag	Group Number Active Tag	Ack	Aud	Alarm Sta Print Dev
1	WARNIN	WARNING:			YES	NO	
2	CRITICAL	CRITICAL:			YES	NO	
3	SYSTEM	SYSTEM:			YES	NO	
*							

In the FactoryLink 7.0 Version release, color and sound information in the Alarm Group control table does not transfer to the Client Builder AlarmViewer. These features are individually configurable in the Client Builder application. See Table 1-8 for a comprehensive list.

Table 1-8 Alarm Group Control Table Valid Fields for Version 7.0 (Sheet 1 of 2)

Field Name	Field Data Passed to Client Builder AlarmViewer
Group Name	Yes
Group Text	Yes
Group Composite Status Tag	No
Group Number Active Tag	No
Ack	Yes
Aud	No
Alarm Stat Print Dev	No
LOG	No
Log Method Tag	No
Initial FG Clr	No

Table 1-8 Alarm Group Control Table Valid Fields for Version 7.0 (Sheet 2 of 2)

Field Name	Field Data Passed to Client Builder AlarmViewer
Initial BG Color	No
Initial Blink	No
ACK FG Color	No
ACK BG Color	No
ACK Blink	No
Normal FG Color	No
Normal BG Color	No
Normal Blink	No
Group Hide Tag	No

There are three groups preconfigured for default purposes: WARNING, CRITICAL, SYSTEM. These can be used or deleted as required. For most fields, Default refers to a preconfigured value that appears when the application is created.

Group Name: A string to identify the Alarm Group (required field).

Valid Data Type: Uppercase alphanumeric string

Valid Entry: 1 to 16 characters
Default: Blank

Group Text: Group message text that can appear with the output of each individual alarm message

An optional field but important to assist determining the alarm group when the message is output to a database or to the AlarmViewer.

Valid Data Type: Alphanumeric string

Valid Entry: 1 to 40 characters
Default: Blank

Group Composite Status Tag: Tag that stores the code number representing the current status of all alarms in a particular alarm group

Valid Data Type: Analog

Valid Entry: Standard Tag name
0: (IDLE) No alarms in the group are active.
1: (NORMAL)At least one alarm in the alarm group is unacknowledged and has returned to normal.
2: (ACK)At least one alarm in the alarm group is active

and has been acknowledged.
3: (ACTIVE)At least one alarm in the alarm group is active and unacknowledged.
11: (NORM/ACK)At least one alarm in the alarm group is unacknowledged and has returned to normal and one other alarm is active and acknowledged.

Default: Blank

Group Number Active Tag: Field that contains a tag that stores the number of active alarms in this group

Valid Data Type: Analog

Valid Entry: Standard tag name
1 through the maximum number of tags allowed.

Default: Blank

ACK: Indicates if the alarms belonging to this group need to be acknowledged

Note: If this field is set to YES or RST, the Unack Alarms Count Tag field in the General Alarm Setup Control table counts the unacknowledged alarms. Ensure that the Unack Alarms Count Tag field contains a tag (a default tag name is provided with FactoryLink.) For more information, refer to Set up General Alarm Counters on page 71 in this chapter.

Valid Data Type: Key

Valid Entry: NO: No acknowledgment required. The alarm disappears from the active list when it returns to normal.
YES: The alarm must be acknowledged.
RST: The alarm must be acknowledged but not until the alarm has returned to normal. This field can be used to reset alarms in the PLC or controller in conjunction with the alarm status.

Default: NO

AUD: Determines if the alarms belonging to this group produce an audible signal when the alarm status is active

Note: If this field is set to YES, the alarms in this group are included in the count maintained by the Audible Alarms Count Tag in the General Alarm Setup Control table.For more information, refer to Set up General Alarm Counters on page 71 in this chapter.

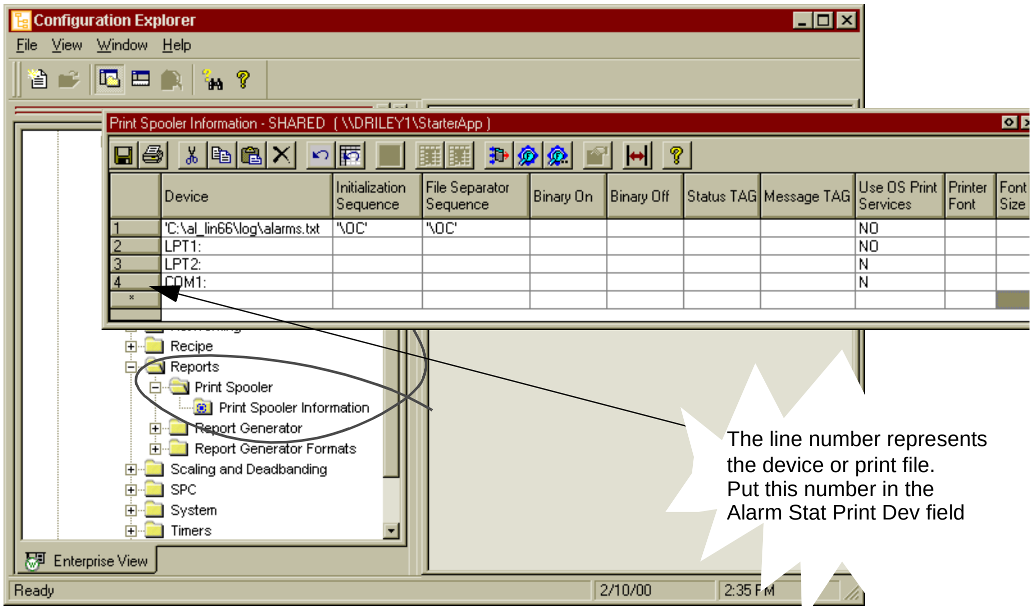
Valid Data Type: Key

Valid Entry: Not applicable for FactoryLink version 7.0

Default: NO

Alarm Stat Print Dev: Print device number that corresponds to the line number of the printer device defined in the Print Spooler Information table (see Figure 1-17).

Figure 1-17 Print Spooler Information Table



	Device	Initialization Sequence	File Separator Sequence	Binary On	Binary Off	Status TAG	Message TAG	Use OS Print Services	Printer Font	Font Size
1	'C:\al_lin66\log\alarms.txt	'\0C'	'\0C'					NO		
2	LPT1:							NO		
3	LPT2:							N		
4	COM1:							N		

The line number represents the device or print file. Put this number in the Alarm Stat Print Dev field

If configured, alarm records are printed when generated or when there is a change in the alarm status (see Message Text, Variables, and Output Formats on page 63 in this chapter).

Valid Data Type: Numeric

Valid Entry: 0: Function disabled
Any other number is the print device number.

Default: Blank, no printing is enabled.

LOG: Specifies if group alarms are logged to a database or to a flat file

Valid Data Type: Key

Valid Entry: NO or N: No logging.
YES or Y: When an alarm is changes status, it is logged to a relational database
FILE or F: When an alarm changes status, it is logged to a text or flat file.

Default: NO

Log Method Tag: Tag that enables a run-time change of the logging method.

When set to the value 1, the alarm records are written to a database unless the database cannot be accessed. If this occurs, the alarm records are automatically written to a file as specified in the Device field of the Print Spooler Information table as shown in Figure 1-17. To return to database logging, the operator must manually reset this field to a value of 1. A run-time change is initiated using an animated graphic in the Client Builder program or using the Run-Time Monitor (RTMON) utility. For more information about the RTMON utility, refer to the Utilities chapter in this guide.

See Set up Database Archive Requirements on page 67.

Valid Data Type: Analog

Valid Entry: Standard tag name
0: Run time change of alarm logging disabled.
1: Alarm logging is enabled to a database historian
2: Alarm logging is enabled to a file.

Default: 0

Initial FG Clr: Indicates the foreground color of an alarm in the initial status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Red

Initial BG Color: Indicates the background color of an alarm in the initial status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Blk

Initial Blink: Indicates whether or not the alarm blinks in the initial status. The speed may be chosen. YES blinks slowly.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: No

ACK FG Color: Indicates the foreground color of an alarm in the acknowledged status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Brn

ACK BG Color: Indicates the background color of an alarm in the acknowledged status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Blk

ACK Blink: Indicates whether or not the alarm blinks in the acknowledged status. The speed may be chosen.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: No

Normal FG Color: Indicates the foreground color of an alarm in the normal status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Yel

Normal BG Color: Indicates the background color of an alarm in the acknowledged status.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: Yel

Normal Blink Indicates whether or not the alarm blinks in the normal status. The speed may be chosen.

Valid Data Type: Key

Valid Entry: Not applicable for Client Builder AlarmViewer use.

Default: No

Group Hide Tag This tag determines if the alarm messages are recorded and output for this group.
At startup some alarms can be generated which do not represent true alarm conditions. To avoid viewing these startup alarms they are not displayed or “hidden”. When startup is complete the operator can select to process all alarms again.

Event alarms are any alarms that are logged to a database but are not processed for viewing and acknowledgement.

Valid Data Type: Digital or analog

Valid Entry: Standard tag name
0: Alarms processed
1: Alarms not processed (hidden)
2: Event alarms

Default: Blank

Printing Alarms

Printing to files, directing output to files and to the printer can be accomplished using five different methods. For an explanation of these methods and the formatting that is associated with each method, refer to Table 1-9. For an example of the Print Spooler Information table, refer to Figure 1-17.

The formats used for printing can be modified. Open the file C:\{FLINK}\msg\{language}\al_fmt.txt with a text editor program (for example, the Microsoft Notepad® editor). Edit this text as indicated in the file to configure the print formats and tokens. The guideline for configuration of each option is included in each section of the file. Concurrent items in Table 1-9, refer to printing options that are compatible with the listed item.

Table 1-9 Printing and Directing Output to Files Using the File Al_Format.txt (Sheet 1 of 2)

No.	Description	Configuration	al_fmt.txt Section	Con-current Items
1	Print to a file using the print spooler	In Alarm Group Control Table set the Alarm Stat Print Dev field equal to a printer line number in the Device field of the Printer Spooler table that must contain the address of a file, e.g., C:\msg\filename.txt	Alarm Print Device Formats	Items 2 or 3 and 4 or 5
2	Print to a printer	In the Alarm Group Control Table set the Alarm Stat Print Dev field equal to a printer line number in the Device field of the Printer Spooler table that must contain the device port, for example, COM1: or LPT2	Alarm Print Device Formats	Items 3 or 4 and 4 or 5
3	Print to a file without using the print spooler	In Alarm Group Control Table set the LOG field to FILE. The file that receives the data is located at the non changeable location of c:\{FLAPP}\log\alarmslog.txt	Alarm ASCII Logfile Formats	Items 1 or 2 and 4 or 5
4	Print to a file without using the print spooler and provide for logging change at run time	In Alarm Group Control Table set the LOG field to FILE. The file that receives the data is located at the nonnegotiable location of c:\{FLAPP}\log\alarmslog.txt Note: This function overrides Item #3.	Alarm ASCII Logfile Formats	Items 1 or 2 and 4 or 5

Table 1-9 Printing and Directing Output to Files Using the File Al_Format.txt (Sheet 2 of 2)

No.	Description	Configuration	al_fmt.txt Section	Con-current Items
5	Print all active alarms to a file	Print Active Alarms Tag field is set to ON. The Active List Print device tag field is set to a printer line number in the Device field of the Printer Spooler table that must contain the address of a file, e.g., C:\msg\filename.txt	Alarm Print Active Formats	Items 1 through 4
6	Print all active alarms to a printer	Print Active Alarms Tag field is set to ON. The Active List Print device tag field is set to a printer line number in the Device field of the Printer Spooler table that must contain the device port, e.g., COM1: or LPT2:	Alarm Print Active Formats	Items 1 through 4
7	Format database time fields	Format itime, atime and ntime fields when written to the database and displayed on the database browser.	Database Date Formats	All

Define Alarms

Set up of the alarm group controls is essential before alarm records can be defined. All alarms must be defined within a group.

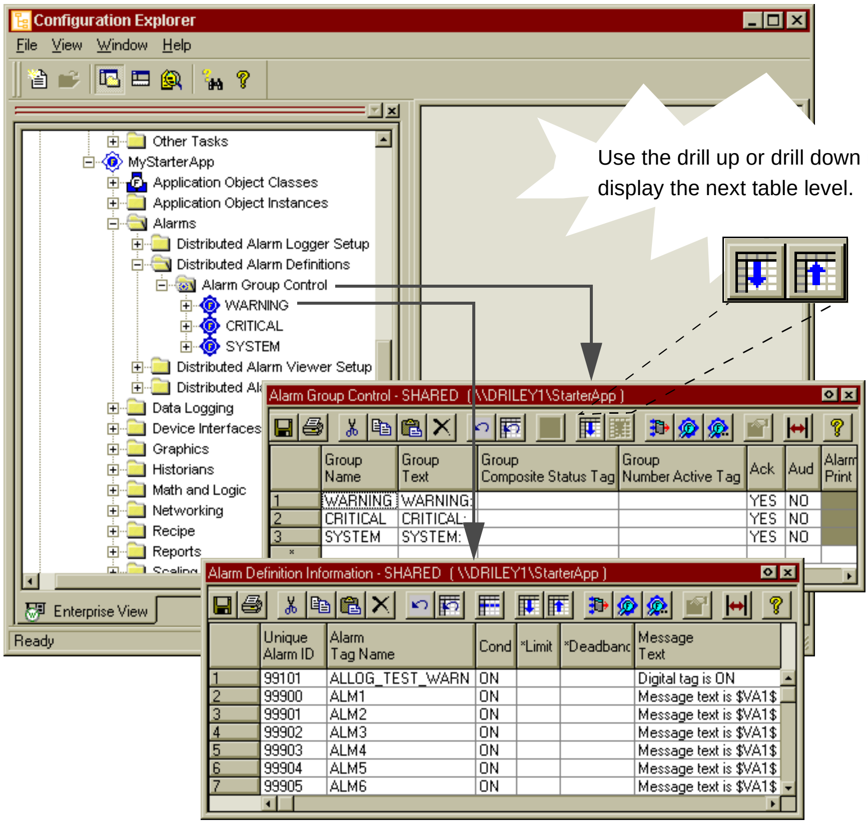
Alarms are defined using two tables: The Alarm Definition Information table identifies the alarms associated with each group and the properties of each individual alarm, and the Alarm Relations Information table identifies the parent/child relationships between the alarms. For more information about the parent/child relationships, refer to Parent/Child Relationship on page 25.

The basic definition of an alarm is setting up a tag name for the alarm identity and establishing the conditions which cause the alarm to be generated.

Define Alarm Records

The Alarm Definition Information table is used to describe the alarms associated with each group and the individual properties of each alarm. Display this table from the group table or select it from the application tree (see Figure 1-18).

Figure 1-18 Selection of Alarm Definition Information Table.



Use the drill up or drill down icons to display the next table level.

Alarm Group Control - SHARED (\\DRILEY1\StarterApp)

	Group Name	Group Text	Group Composite Status Tag	Group Number Active Tag	Ack	Aud	Alarm Print
1	WARNING	WARNING:			YES	NO	
2	CRITICAL	CRITICAL:			YES	NO	
3	SYSTEM	SYSTEM:			YES	NO	
*							

Alarm Definition Information - SHARED (\\DRILEY1\StarterApp)

	Unique Alarm ID	Alarm Tag Name	Cond	*Limit	*Deadbanc	Message Text
1	99101	ALLOG_TEST_WARN	ON			Digital tag is ON
2	99900	ALM1	ON			Message text is $VA1$
3	99901	ALM2	ON			Message text is $VA1$
4	99902	ALM3	ON			Message text is $VA1$
5	99903	ALM4	ON			Message text is $VA1$
6	99904	ALM5	ON			Message text is $VA1$
7	99905	ALM6	ON			Message text is $VA1$

Each alarm is a complete record within the group table. The alarm definition includes the following information:

- Unique alarm ID for setting up parent/child relationships between alarms
- Alarm status
- Time-stamping fields to record when the alarm was triggered
- Conditions to trigger the alarm

- Determine an alarm message which outputs to the AlarmViewer for operator viewing and the alarm database
- Optional individual alarm hiding capabilities for hiding alarms during system startup.

For most fields, Default refers to a preconfigured value that appears when the application is created. The fields in this table have the following definitions:

Unique Alarm ID A number which identifies the alarm record in the network

Each alarm on the network must be identified with a different number. If a number is not defined, a unique number is assigned by the al_log task. The assigned number is an internal number which does not appear in a tag field.

The assigned number changes when the system configuration changes.

This field is required for establishing Parent/Child relationships between alarms. If Parent/Child relationships are needed for **any** alarms **all** alarm records must have a Unique Alarm ID. See Define Parent-Child Relationships on page 66.

Valid Data Type: Numeric

Valid Entry: Any value between 1 and 999999

Default: Blank

Alarm Tag Name Name of the tag evaluated for an alarm condition (required).

Note: If a tag is defined in either the Limit or the Deadband fields, both tags must be the same data type as this alarm tag. If the Deadband tag is not defined, a message type tag can also be defined by the Limit field and this field.

Valid Data Type: Digital, analog, longana, float, message

Valid Entry: Standard tag name
1 to 16 characters

Cond. Determines the status of the alarm for digital alarms or TGL conditions. Also the type of comparison of the alarm Limit value to the Deadband value in respect to current conditions.

Valid Data Type: Key

Valid Entry: OFF: Off status or 0 for a digital tag
ON: On status or 1 for a digital tag
TGL:Changed status
LOLO < LO or LT: Less than the limit
HIHI > HI or GT: Greater than the limit
<= or LE: Less than or Equal to the limit
>= or GE: Greater than or Equal to the limit

= or EQ: Equal to the limit
<> or NE: Not Equal to the limit

Default: Blank

Limit — A value which is used in conjunction with the Cond. and Deadband fields to determine an alarm condition.

Note: If a tag is defined for this field, it must be the same data type as the Alarm Tag Name and the Deadband field. If the Deadband field contains a tag, the message type tag cannot be used.

Valid Data Type: Analog, longana, float, message, digital

Valid Entry: Standard tag name or constant

Default: Blank

Deadband — Value which is above and/or below the Limit value which determines an active alarm status.

The relationship of the Deadband value to the Limit is specified by the setting in the Cond. field. Once the alarm is triggered, it remains active until it moves past by the deadband amount.

If a tag is used, it must be the same data type as the tag in the Alarm Tag Name and the Limit field. See Message Text, Variables, and Output Formats.

Valid Data Type: Analog, longana, float, message, digital

Valid Entry: Standard tag name or constant

Default: Blank

Message Text — Text that can be output to the AlarmViewer, written to the alarm database or output to a graphical animation.

Valid Data Type: Alphanumeric

Valid Entry: 1 to 160 characters

Default: Blank

Variable 1: — Tag used as part of the alarm message when printing to a file or to a database. The value in this field is substituted for the first variable defined in the Message Text field at run time.

Valid Data Type: Analog, longana, float, message, digital

Valid Entry: Standard tag name

Default: Blank

Variable 2: Tag used as part of the alarm message when printing to a file or to a database. This value is substituted for the second variable defined in the Message Text field at run time.

Valid Data Type:	Analog, longana, float, message, digital
Valid Entry:	Standard tag name
Default:	Blank

Variable 3: Tag used as part of the alarm message when printing to a file or to a database. This value is substituted for the third variable defined in the Message Text field at run time.

Valid Data Type:	Analog, longana, float, message, digital
Valid Entry:	Standard tag name
Default:	Blank

Variable 4: Tag used as part of the alarm message when printing to a file or to a database. This value is substituted for the fourth variable defined in the Message Text field at run time.

Valid Data Type:	Analog, longana, float, message, digital
Valid Entry:	Standard tag name
Default:	Blank

Priority Specifies the priority of the alarm for filtering and sorting purposes.

Valid Data Type:	Numeric
Valid Entry:	1 through 9999
Default:	1

Area Name Tag that provides an additional key for filtering and sorting purposes.

Valid Data Type:	Alphanumeric string
Valid Entry:	1 through 16 characters
Default:	Blank

Time-stamp Tag Message tag to specify the exact time an alarm status changed as a result of an operator process, for example, acknowledgement.

If no tag is defined, time-stamping is determined when the change is detected by the Distributed Alarm Logger task.

Valid Data Type:	Message
Valid Entry:	Standard Tag name
Default:	Blank

Time-stamp Format Sets the format for the Time-stamping Input field.

Valid Data Type: Key

Valid Entry: NULL: No formatting
USA: USA time format (FYMMDDHHMMSS
EUROPE: European time format (DDMMYYHHMMSS)
USA_HS US: A time format with 1/1000 sec.
EUR_HS: European time format with 1/1000 sec.
USA_L: Long USA time format
EUROPE_L: Long European time format
USA_HSL: Long USA time format with 1/1000 sec.
EUR_HSL: Long European time format with 1/1000 sec.

Default: Blank

Use Global Hide Field used only when Global Hide Tag is set to ON (see Set up Alarm Groups on page 49).

When an alarm is generated and the Global Hide Tag is set to 1 (ON), the alarm is not displayed. When an alarm is generated and the Global Hide Tag is set to 0 (OFF), the alarm is displayed.

If this field is set to YES, the Global Hide Tag field in the General Alarm Setup Control table must not be blank for this feature to work.

See Alarm Group Control Table.

Valid Data Type: Key

Valid Entry: Y or YES: Do not show alarm
N or NO:When an alarm is generated the alarm is displayed.

Default: Blank

Alarm Hide Tag Tag provides hiding of an individual alarm. Event alarms can be defined to log for tracking purposes but do not require viewing and acknowledging. Individual tags defined using this method require operator change to each record to allow processing.

Valid Data Type: Digital, analog

Valid Entry: Standard tag name
Blank: Not hidden
1: The alarm is not hidden.
0: The alarm is hidden.

Default: Blank

Status Tag stores the current value of this alarm in the active alarm list. See Table 1-2 for code definitions.

Valid Data Type: Digital or analog

Valid Entry: Standard tag name

Default: Blank

Message Text, Variables, and Output Formats

Four different variable specifiers are initiated at run time with information from the tags defined in the Variable fields (Variable 1, Variable 2, Variable 3, and Variable 4). The Message Text field can include more than one of these variables, but there are constraints on the run-time display as shown in Table 1-10.

Table 1-10 Variable Specifier Lengths in the Message Text Field

If the number of different VAn specifiers is...	The maximum number of characters displayed per specifier is ...
4	11
3	14
2	22
1	44

Message text exceeding the maximum allowable number of characters per variable is truncated on the display.

Embed the individual format variables ($VA1$, $VA2$, $VA3$, and/or $VA4$) in the text included in the Message Text field. For example, the Message Text field can contain the string: “The current status is $VA1$.” The tag in the Variable 1 field is Status tag. When the alarm is generated the current value of the tag in the Variable field, in this case the Variable 1 field, replaces the specifier when it appears on the AlarmViewer. This value remains the same while the alarm instance is displayed on the AlarmViewer.

To designate a variable that can be monitored for changing values, use format specifiers in the Message Text field instead of the VAn specifiers. Variable specifiers can consist of two types:

- Ordinary characters, which are copied literally to the output stream
- Format specifiers, which indicate the format in which variable information will be displayed

Format specifiers use the following form:

% [flags][width][.prec] type

where

% Always precedes a format specifier.

flags Controls the format of the output. This can be one of the following.

- Left-justified within the field. If you do not specify this flag, the field is right-justified.

0 Fills the spaces to the left of the value with zeros until it reaches the specified width.

width Specifies minimum field width, in decimal. This field is not valid for floating point notations. Floating point fields are always padded with spaces.

.prec Controls the precision of the numeric field. What precision defines depends on the format type specified by the *type* variable.

For exponential (type e) or floating point (type f) notations, specify the number of digits to be printed after the decimal point.

For short version of exponential or floating point notations (type g), specify the maximum number of significant digits.

For all other types, specify the minimum number of digits to print. Leading 0s are added to make up the necessary width.

type Specifies the character or numeric type for the value. This can be one of the following values:

d = decimal

s = string

ld = long decimal

e = exponential notation of the following form

[-]m.nnnnnnE[+-]xx

f = floating-point notation of the following form

[-]mmmm.nnnnnn

g= use shorter of e or f

u = unsigned decimal

o = unsigned octal

x = unsigned hexadecimal using a - f

X = unsigned hexadecimal using A - F

Examples of valid format specifiers for each FactoryLink data type are displayed in the Figure 1-10. For additional information about format specifiers, see any ANSI-C reference guide.

Table 1-11 Format Specifiers (Sheet 1 of 2)

Type of Element	Default Type	Valid Types	Description	Sample Output
Analog	d	d, u, o, x, X	%04d specifies a right-justified decimal value with a minimum field width of four digits. The 0 specifies the value is padded with zeros.	0005 0015 0150 2400
			%3u specifies a right-justified unsigned decimal value with a minimum field width of 3 digits. The value is padded with spaces.	5 15 150 2400
			%-3u specifies the same as the example above, except the hyphen (-) before the width specifies the value is left-justified.	5 15 150 2400
Long Analog	ld	d, ld, u, o, x, X	%-7ld specifies a left-justified long decimal value with a minimum field width of seven digits. The value is padded to the right with spaces.	5 15 2400 20000 1000000
			%05ld specifies a right-justified long decimal value with a minimum field width of five. A zero before the width specifies the value is padded with zeros.	00005 00015 02400 20000 1000000
Floating-point	f	e, f, g	%6.2f specifies a right-justified floating-point value with a minimum total field width of 6 digits. (The decimal point counts as 1 digit.) This means two digits are displayed after the decimal point and at least three digits are displayed before the decimal point. The value is padded with spaces.	5.51 150.08 24000.65

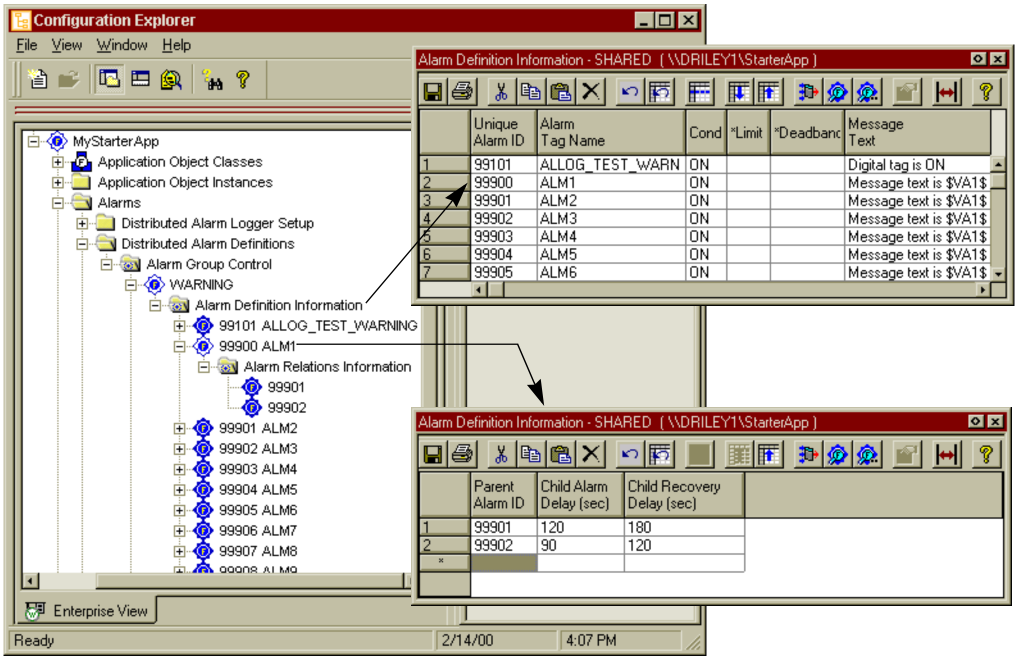
Table 1-11 Format Specifiers (Sheet 2 of 2)

Type of Element	Default Type	Valid Types	Description	Sample Output
Message	s	s	%5s specifies a right-justified message string with a minimum field width of five characters. The value is padded with spaces.	on off alarm
			%-5s is the same as the example above, except the hyphen (-) before the width specifies the value is left-justified.	on off alarm
Digital	b	b	For example, %b specifies the output OFF if the value is zero or the output ON if the value is zero.	on off

Define Parent-Child Relationships

The Alarm Relations Information table establishes a hierarchical relationship between alarms with related functionality as shown in Table 1-23.

Figure 1-19 Parent-Child Relationship Tables



Alarm Definition Information - SHARED (\\DRILEY1\StarterApp)

	Unique Alarm ID	Alarm Tag Name	Cond	*Limit	*Deadbanc	Message Text
1	99101	ALLOG_TEST_WARN	ON			Digital tag is ON
2	99900	ALM1	ON			Message text is $VA1$
3	99901	ALM2	ON			Message text is $VA1$
4	99902	ALM3	ON			Message text is $VA1$
5	99903	ALM4	ON			Message text is $VA1$
6	99904	ALM5	ON			Message text is $VA1$
7	99905	ALM6	ON			Message text is $VA1$

Alarm Definition Information - SHARED (\\DRILEY1\StarterApp)

	Parent Alarm ID	Child Alarm Delay (sec)	Child Recovery Delay (sec)
1	99901	120	180
2	99902	90	120
*			

Parent-child alarm relationships are based on the parent alarm status. When a child alarm is initiated within the defined child alarm delay, it is hidden if the parent alarm is in the ACTIVE status. The child alarm is activated when the parent alarm returns to NORMAL. If the parent alarm is already in the NORMAL status, the child alarm is activated immediately.

TGL type alarms should not be configured as parent alarms. When a TGL alarm is generated it becomes ACTIVE and immediately returns to NORMAL. A TGL alarm never remains in the ACTIVE status. Using a TGL alarm as a parent would result in the child alarm never being hidden. For more information on this subject, refer to the section Parent/Child Relationship on page 25 in this chapter. An alarm can be a child to more than one parent alarm.

For most fields, Default refers to a preconfigured value that appears when the application is created.

Parent Alarm ID

Unique Alarm ID of the parent alarm. An entry is required for each additional parent if the child is subordinate to more than one alarm.

Valid Data Type: Numeric

Valid Entry: The parent Unique Alarm ID, 1 through 999999

Default: Blank

Child Alarm Delay

Delay between the activation of the parent alarm and the activation of the child alarm. The parent always hides the child alarm if no delay time is entered. The child alarm is not displayed if a time is entered and the child alarm is activated within that period. The child alarm displays if a time is entered and the child is activated after that period.

Valid Data Type: Numeric

Valid Entry: 1 through 30000 (seconds)

Default: Blank

Child Recovery Delay

Delay between the return to normal of the parent and child alarms. A child alarm is not displayed if the parent and child return to normal within the delay period. The child alarm is generated if the parent returns to normal and the child does not within that period.

Valid Data Type: Numeric

Valid Entry: 1 through to 30000 (seconds)

Default: Blank

Set up Database Archive Requirements

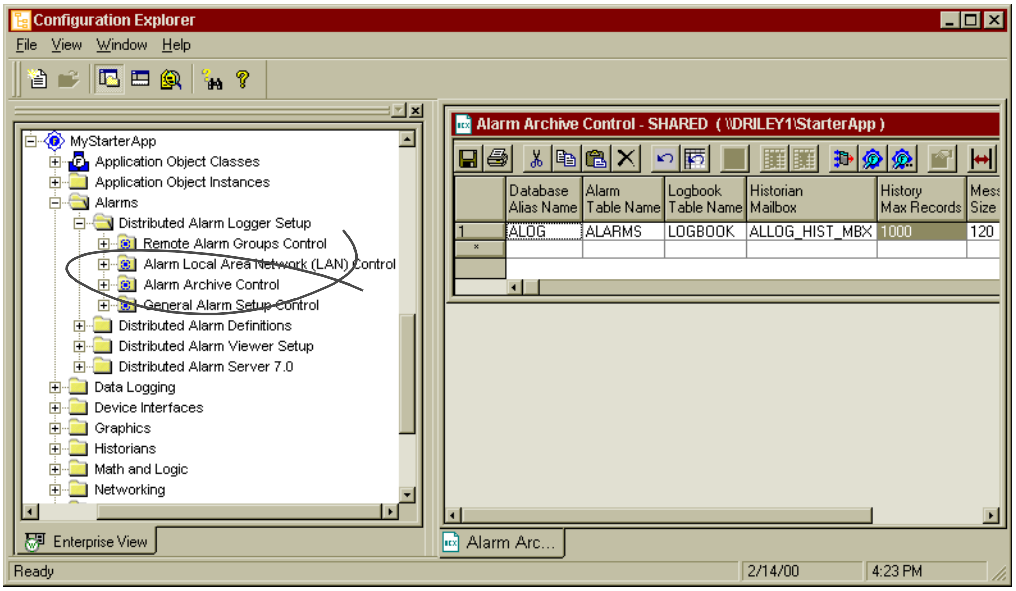
The Alarm Archive Control table is used to identify the database file information or the flat file where the alarm data is stored (see Figure 1-20). Any relational database supported by FactoryLink can be used to log alarms. Default field names are provided to set up default writing to the internal dBASE IV in a new application and in the StarterApp. However, in a new application, the dBASE IV task must be set to start the alarm logging. For more information, refer to Browsing Archived Alarms on page 127 in this chapter.

The internal database creates the files using the dBase IV file structure or the SQL structure depending on the selection made at FactoryLink Installation. The database is written to and read from only by the FactoryLink tasks. However, the file contents can be viewed using SQL statements from a BH_SQL utility initiated in a Command Prompt window. For more information about the BH_SQL utility, refer to the *FactoryLink 6.6 Configuration Guide*.

Alarms are logged as soon as they are generated. The Distributed Alarm Logger task, AL_LOG, performs and controls all alarm logging.

To configure logging to a text file and archiving the text files, configure the Log File Trigger and Log File Directory files on this table and either the Log field or the Log Method Tag field on the Alarm Group Control table. Also, the Database Alias Name from the Alarm Archival Control table must be entered in the Database Alias Name field on the appropriate Historian Information table if alarm data is logged to a relational database.

Figure 1-20 Alarm Archive Control Table


Configuration Explorer
File
View
Window
Help
MyStarterApp
Application Object Classes
Application Object Instances
Alarms
Distributed Alarm Logger Setup
Remote Alarm Groups Control
Alarm Local Area Network (LAN) Control
Alarm Archive Control
General Alarm Setup Control
Distributed Alarm Definitions
Distributed Alarm Viewer Setup
Distributed Alarm Server 7.0
Data Logging
Device Interfaces
Graphics
Historians
Math and Logic
Networking
Enterprise View
Alarm Archive Control - SHARED (\\DRILEY1\StarterApp)
Alarm Arc...
Ready
2/14/00
4:23 PM

	Database Alias Name	Alarm Table Name	Logbook Table Name	Historian Mailbox	History Max Records	Mess Size
1	ALOG	ALARMS	LOGBOOK	ALLOG_HIST_MBX	1000	120
*						

For most fields, Default refers to a preconfigured value that appears when the application is created.

Database Alias Name — Field contains an alias for the path and folder (directory) location of the relational database that stores the alarm data. The path for the alias is defined in the Historian Information table. For more information about the Historian, refer to the *FactoryLink 6.6 Configuration Guide*.

Valid Data Type: Alphanumeric

Valid Entry: Constant
1 to 16 characters

Default: ALOG

Alarm Table Name

Table name in the relational database that stores the alarm data. This name becomes a table name with the format of eight characters for the name and three characters for an extension. For example, the name ALARMS becomes a table name of ALARMS.dbf

Valid Data Type: Alphanumeric

Valid Entry: Constant
1 to 16 characters

Default: ALARMS

Logbook Table Name

Table name in the relational database that stores the alarm logbook data.

Note: Writing to the logbook table is not available in the AlarmViewer in FL release version 7.0.

Valid Data Type: Alphanumeric

Valid Entry: Constant
1 to 16 characters

Default: LOGBOOK

Historian Mailbox

Tag that stores each alarm message.
If multiple messages are received they are queued until they are written to the database.

This tag name must also be entered in the Historian Mailbox field in the Historian Mailbox Information table for the selected database.

Valid Data Type: Alphanumeric

Valid Entry: Mailbox tag:
1 to 16 characters

Default: ALLOG_HIST_MBX

History Max Records

Maximum number of records in a dBASE IV Historian database.

The oldest record is overwritten when the maximum number specified is reached.

Note: If a number is not specified, the records will continue to be written to the storage media until it is filled to capacity.

Valid Data Type: Numeric

Valid Entry: 1 through 1000

Default: 1000

Message Size

Size of the message column when it is saved into the alarm in the relational database.

If the message size is changed after tables have been generated, the existing tables require alteration or dropping from the database to prevent an error condition.

Valid Data Type: Numeric

Valid Entry: 1 through 128

Default: 80

Log File Trigger

Tag that initiates saving the currently queued alarms to a backup alarms text file. This tag is initiated using a graphical representation of the field which receives the trigger input. All the associated fields to save alarms to a file must be configured.

Valid Data Type: Numeric

Valid Entry: Digital
0: OFF, do not save
1: ON, save current information to a permanent alarm text file

Default: Blank

Log File Directory

Path used to save the backup alarm text file almmddyy.nnn.

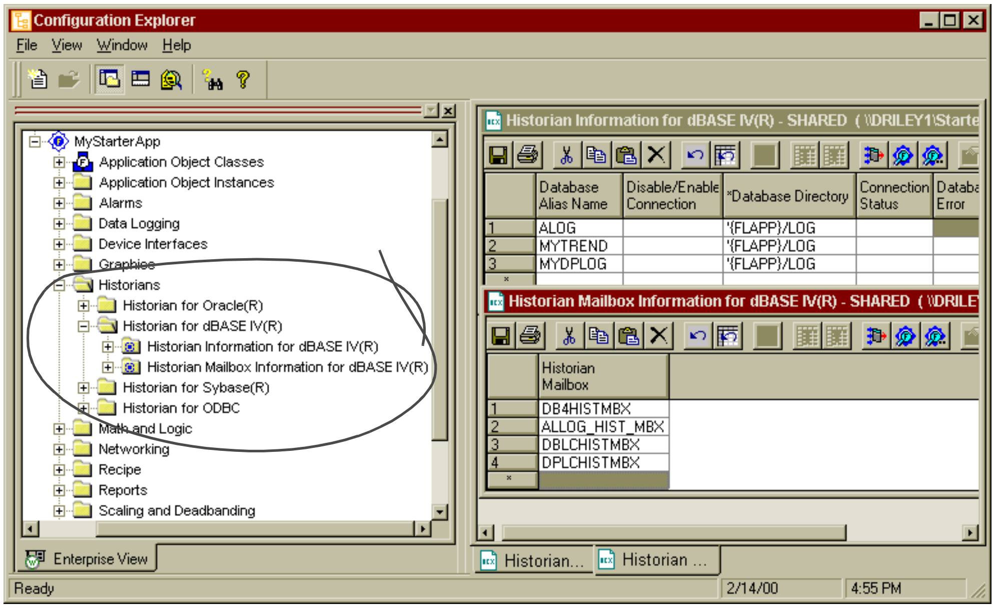
Valid Data Type: Alphanumeric

Valid Entry: Valid path name

Default: ‘{FLAPP}\{FLNAME}\{FLDOMAIN}

You configure the Historian database tables to select the task which corresponds to the type of database you want to use to log alarm records (see Figure 1-21).

Figure 1-21 Historian Information and Mailbox Tables



Historian Information for dBASE IV(R) - SHARED (\\DRILEY1\Starte

	Database Alias Name	Disable/Enable Connection	*Database Directory	Connection Status	Databa Error
1	ALOG		'{FLAPP}/LOG		
2	MYTREND		'{FLAPP}/LOG		
3	MYDPLOG		'{FLAPP}/LOG		
*					

Historian Mailbox Information for dBASE IV(R) - SHARED (\\DRILE

	Historian Mailbox
1	DB4HISTMBX
2	ALLOG_HIST_MBX
3	DBLCHISTMBX
4	DPLCHISTMBX
*	

The Historian tables specify the location of the database(s) used to store information for various tasks. One database can be selected to store information for alarms or other purposes. For more detailed information about the Historian task, refer to the *FactoryLink 6.6 Configuration Guide*.

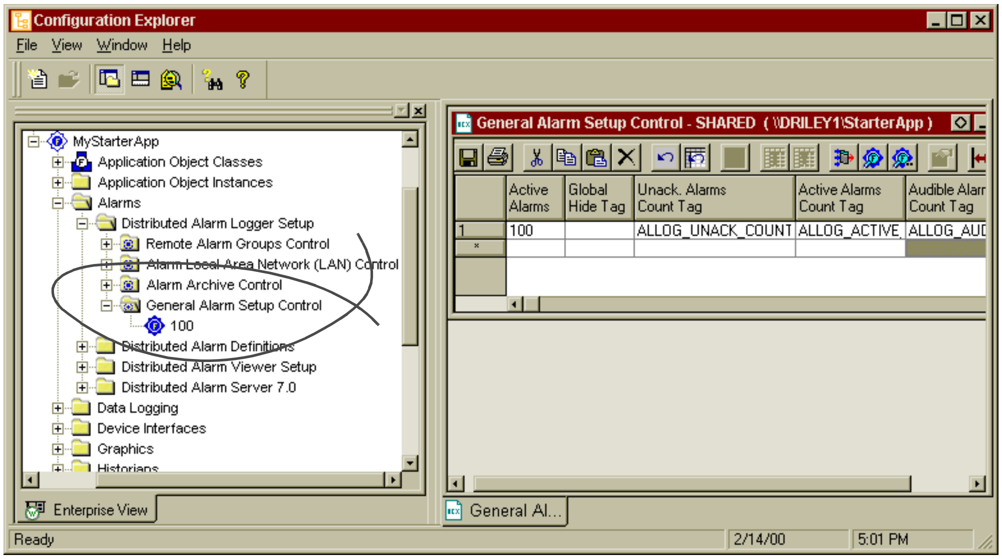
The Historian task is the communicator between the selected database(s) and the FactoryLink client tasks. The historian task must be configured for database usage. For information about configuring the historian tasks, refer to the Historian chapter in the *FactoryLink 6.6 Configuration Guide*.

Set up General Alarm Counters

The General Alarm Setup Control table as shown in Figure 1-22 is used to configure the tags that maintain counts of the alarms in the various states and the counts maintained by the Distributed Alarm Logger task. Default tag names are preconfigured for the user.

The values of these tags can be monitored from a graphical representation of the factory system using Client Builder.

Figure 1-22 General Alarm Setup Control Table


Configuration Explorer
File View Window Help
MyStarterApp
Application Object Classes
Application Object Instances
Alarms
Distributed Alarm Logger Setup
Remote Alarm Groups Control
Alarm Local Area Network (LAN) Control
Alarm Archive Control
General Alarm Setup Control
100
Distributed Alarm Definitions
Distributed Alarm Viewer Setup
Distributed Alarm Server 7.0
Data Logging
Device Interfaces
Graphics
Historians
Enterprise View
General Al...
Ready
2/14/00
5:01 PM

General Alarm Setup Control - SHARED (\\DRILEY1\StarterApp)

	Active Alarms	Global Hide Tag	Unack. Alarms Count Tag	Active Alarms Count Tag	Audible Alarr Count Tag
1	100		ALLOG_UNACK_COUNT	ALLOG_ACTIVE_	ALLOG_AUD
*					

For most fields, Default refers to a preconfigured value that appears when the application is created.

Active Alarms

Maximum number of active alarms allowed. If more alarms are active than specified, an error message is displayed and the lowest priority alarm with the oldest time is removed from the list.

Valid Data Type: Numeric

Valid Entry: 1 through 721

Default: 100

Global Hide Tag

Tag that hides alarms.

This tag works in conjunction with the Use Global Hide field in the Alarm Definitions table. Any alarm with the Use Global Hide field set to YES is hidden when this field is set to 1.

This field is used in conditions when reported alarms are not significant, for example, at startup time when alarms are reported because the application is not fully initialized. Alarms can be hidden until operations are stabilized.

Global hide cannot be activated if this field is blank.

Valid Data Type: Digital

Valid Entry: Standard tag name
0: Show and process alarms

1: Do not show or process alarms
2: Event alarms

Default: Blank

Unack. Alarms Count Tag

Tag updated to count the number of alarms in the current unacknowledged status.

This field is required for alarm acknowledgement. If the ACK field of the Alarm Group Control table is set to YES or RST, a tag name in this field must be maintained.

Valid Data Type: Analog

Valid Entry: Standard tag name

Default: ALLOG_UNACK_COUNT

Active Alarms Count Tag

Tag updated to count the number of current active alarms.

Valid Data Type: Analog

Valid Entry: Standard tag name

Default: ALLOG_ACTIVE_COUNT

Audible Alarms Count Tag

Tag that records the number of unacknowledged alarms that have the audible flag set to YES.

If the AUD field of the Alarm Group Control table is set to YES, a tag name in this field must be maintained.

Valid Data Type: Analog

Valid Entry: Standard tag name

Default: ALLOG_AUDIBLE_COUNT

Print Active Alarms Tag

Run-time tag that triggers the Distributed Alarm Logger task to update the file {FLAPP}/alarms.txt and print a list of all active alarms.

Note: Alarms.txt is a default file name. Any name can be used.

Valid Data Type: Digital

Valid Entry: Standard tag name
0: OFF
1: ON, print list

Default: ALLOG_PRINT_TRIGGER

Active List Print Device

Field designates the print device or print file where the active alarm output messages are routed. This number in this field corresponds to the line number of the print device identified in the Print Spooler Information table (For additional information, refer to Printing Alarms on page 56. Select the table line number corresponding to the correct print device for the Alarm

Stat Print Dev field in the Alarm Group Control table. An option to print to a file can also be selected using the same method. When printing to a file, the pathname of the file is defined in the device field instead of the device name.).

Valid Data Type:	Numeric
Valid Entry:	0: disables printing Any other number is the line number of the print device.
Default:	0

AlarmViewer Design

The AlarmViewer is an alarm management tool that provides a visual display of run-time alarms in active states:

- Initial
- Acknowledged
- Normal and not acknowledged

The AlarmViewer is a customized ActiveX control that interfaces with the FactoryLink alarm server. It is accessed using Client Builder. The type, sorting, fonts, colors, blinking background or text, fields, field sequence and filtering of the displayed alarms are designed according to user preferences. Each client workstation can maintain a separate design scheme for viewing alarms. Or, once an AlarmViewer is configured, the design can be shared among other workstations.

Client Builder provides an integrated design and run time environment. The alarm viewer configuration can be modified in design mode and the changes observed immediately in the run-time mode. The designer can return to the design mode, make adjustments as needed, and repeat this process to complete the design. After design is complete, certain features or options can be locked from operator changes at run time. Also, the viewer display environment can be enhanced using the extensive Client Builder graphics.

In addition to the AlarmViewer, an Alarm Band Viewer is configurable from the same ActiveX control. The Alarm Band Viewer provides a focus on a subset of the AlarmViewer features. The AlarmViewer is designed to display any number of active alarms limited only by the size of the window. However, the Alarm Band Viewer displays one to three alarms. Because of its smaller size, the Alarm Band Viewer is easily positioned on various factory subsystem graphics developed in Client Builder. Depending on the design, the Alarm Band Viewer shows the operator the most critical or newest alarms.

As the basic structure of the AlarmViewer and the Alarm Band Viewer is the same both viewers are designed essentially using the same steps. In the following instructions, any exceptions are noted.

The process of designing the viewers is as follows:

- Predesign Set-up
- Viewer Design

Predesign Set-Up

FactoryLink must be running for AlarmViewer design as some of the information you need resides on the alarm server. This also enables you to take advantage of the integrated design and run-time environment.

The predesign set up of the Client Builder program includes the following functions:

- Launch client builder and project set up
- Server set up
- Connection of the alarm ActiveX control to the Alarm Server
- Establishing the alarm ActiveX control in a container window.

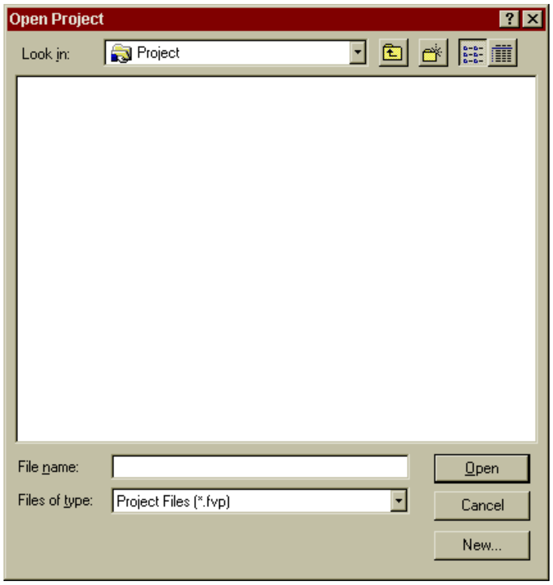
All the tools needed to design the AlarmViewer are available in the Client Builder workspace.

Launch Client Builder and Project Set-Up

Ensure that FactoryLink is running before starting the design session. For more information about how to launch FactoryLink, refer to the Configuration Explorer User Guide.

To start Client Builder, double-click the Client Builder icon on your desktop and the Open Project Window appears as shown in Figure 1-23.

Figure 1-23 Open Project Window



Look in: Project

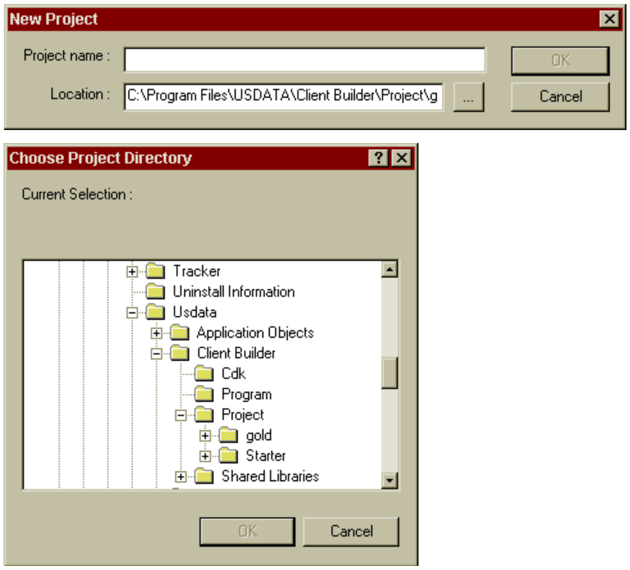
File name:

Files of type: Project Files (*.fvp)

Click the New Button. The New Project dialog box appears (see Figure 1-24). This dialog box is used to create new or open existing projects.

Note: If the StarterApp was installed the Starter project appears in the Open Project Window. Use the Starter Project to view a predesigned alarm control and become more familiar with Client Builder.

Figure 1-24 New Project Dialog Box



Project name :

Location : C:\Program Files\USDATA\Client Builder\Project\g

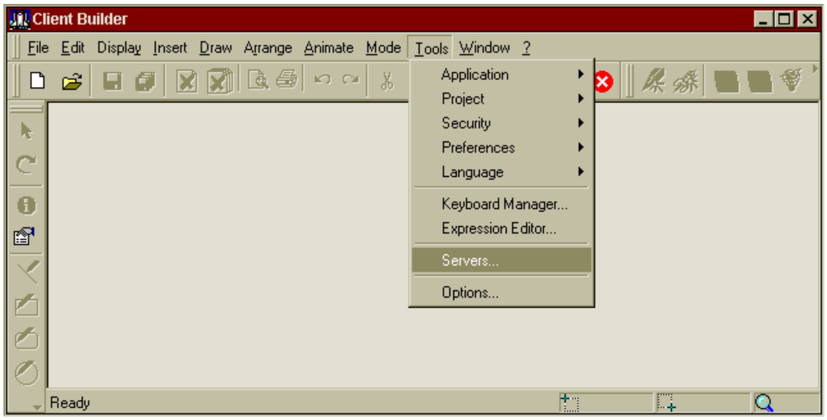
Current Selection :

Type a name for the new project in the Project Name field. Click the Browse button to select a different project directory or click the Save button to accept the default location.The Client Builder program workspace appears.

Server Set-Up

In the Client Builder workspace, click the Tools pull down menu (see Figure 1-25) and select Servers.

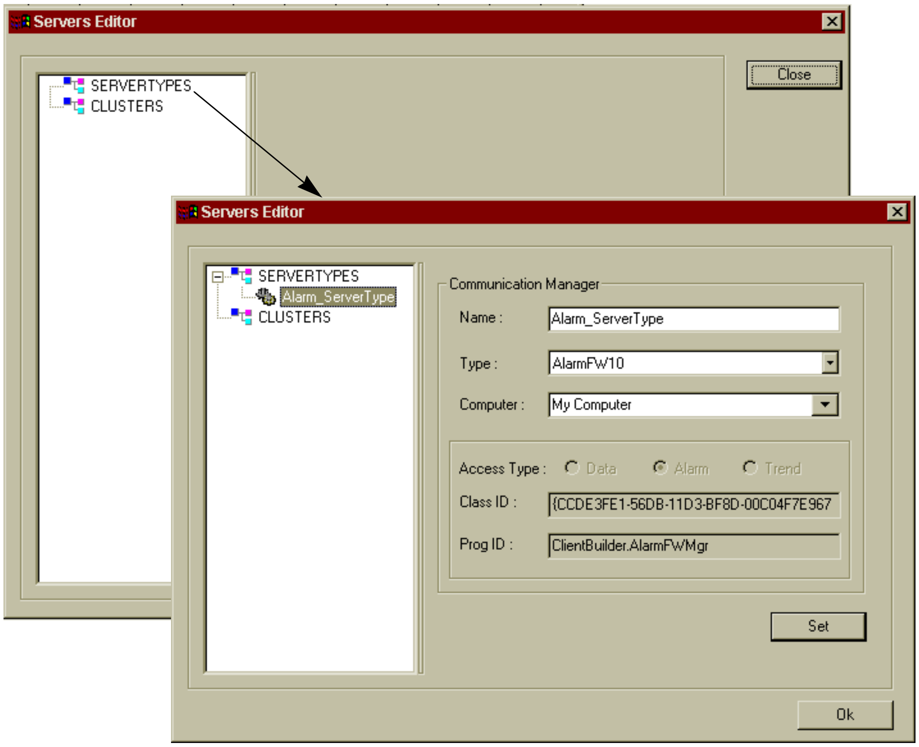
Figure 1-25 The Client Builder Tools Menu Showing Servers Selection



The Servers Editor dialog box appears.

Right-click SERVERTYPES in the tree list. A menu appears. Click New on the menu to display the Communications Manager dialog box. Figure 1-26 shows the Communication Manager dialog box completed with default field input.

Figure 1-26 The Servers Editor and Communications Manager Dialog Boxes



Name : Alarm_ServerType

Type : AlarmFW10

Computer : My Computer

Access Type : ○ Data ● Alarm ○ Trend

Class ID : {CCDE3FE1-56DB-11D3-BF8D-00C04F7E967

Prog ID : ClientBuilder.AlarmFWMgr

See Table 1-13 to set up the current workstation. The configuration sequence requires following the table instructions from the top to the bottom of the table.

Table 1-12 Communications Manager Dialog Box (Sheet 1 of 2) (Sheet 1 of 2)

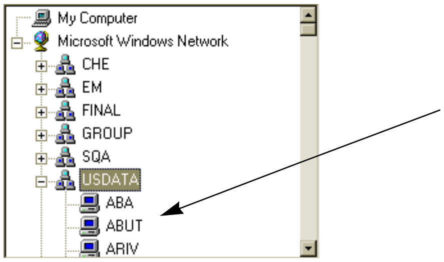
Field/ Section	Description	Action
Access Type	Type of access to connect to FactoryLink	Select the Radio Button: Alarm.
Type	Name of the type of communications manager that is used	Default is AlarmFW10 Accept the default.
Name	Name used to identify the communications manager. This field is populated with a default name when the Access Type is selected.	Default: Alarm ServerType Type a new name if desired.
Computer	Name of the server workstation that is designated as the communications manager.	Default: My Computer Accept the default for local server workstations. Remote server: Click the down arrow. Expand the network listings as needed. Select the name of your remote server workstation.  My Computer Microsoft Windows Network CHE EM FINAL GROUP SQA USDATA ABA ABUT ARIV

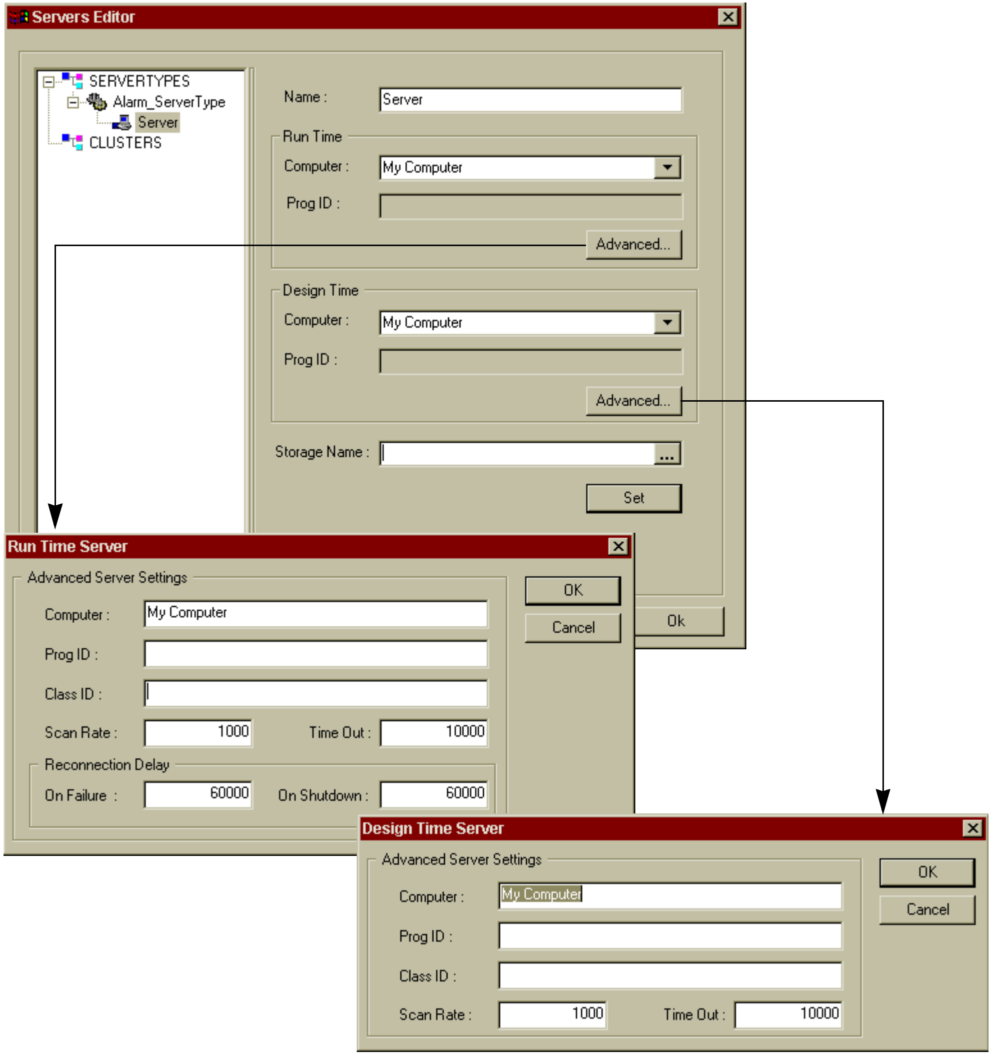
Table 1-12 Communications Manager Dialog Box (Sheet 2 of 2) (Sheet 2 of 2)

Field/ Section	Description	Action
Class ID	The Class ID is preconfigured for all installations providing that this communications manager configuration is for the local workstation. This field is populated when the Type field is set to AlarmFW10.	Default: {CCDE3FE1-56DB-11D3-BF8D-00C04F7E967} Note: Braces are included as part of the number. Accept the default.
Prog ID	The Prog ID is preconfigured for all installations providing that this communications manager configuration is for the local workstation. This field is populated when the Type field is set to AlarmFW10.	Default: ClientBuilder.AlarmFWMgr Accept the default.

To complete the configuration, click the SET button. The new Alarm Server type name appears under SERVERTYPES in the tree. The default name is Alarm_ServerType.

Right-click this new Alarm Server type name below SERVERTYPES to display a menu. Click Add Server on the menu. The server name defaults to Server and appears under the new Alarm Server type name. A server dialog box displays as shown in Figure 1-27.

Figure 1-27 Configure the Server



Servers Editor

SERVERTYPES
Alarm_ServerType
Server
CLUSTERS

Name : Server

Run Time
Computer : My Computer
Prog ID :

Design Time
Computer : My Computer
Prog ID :

Storage Name :

Run Time Server

Advanced Server Settings
Computer : My Computer
Prog ID :
Class ID :
Scan Rate : 1000 Time Out : 10000

Reconnection Delay
On Failure : 60000 On Shutdown : 60000

Design Time Server

Advanced Server Settings
Computer : My Computer
Prog ID :
Class ID :
Scan Rate : 1000 Time Out : 10000

Use Table 1-13 to set up the current workstation for run-time use. If design functions are performed on this workstation, the design section must also be configured.

Table 1-13 Server Dialog Box (Sheet 1 of 2)

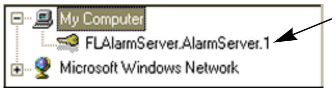
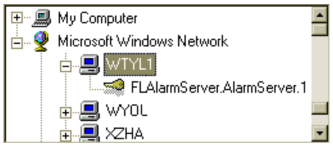
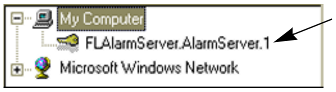
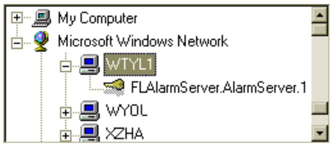
Field/Section	Description	Action
Name	The user determines a name for this field. This name displays in the server tree.	Default: Server Type a new name for the server or accept the default.
Run Time	This section is used to establish this workstation as a FactoryLink client.	Completing this section is required.
Computer	The default is My Computer. Use the default if you are configuring your local computer or select a remote computer from the network list.	Click the down arrow. Expand the name of computer to be configured.  My Computer FLAlarmServer.AlarmServer.1 Microsoft Windows Network Double-click the Program ID. Or for a remote server workstation, locate the workstation name, expand it and double-click the Program ID.  My Computer Microsoft Windows Network WTYL1 FLAlarmServer.AlarmServer.1 WYOL XZHA
ProgID	The Prog ID is preconfigured for all installations: FLAlarmServer.AlarmServer.1	This field is populated when the Computer field is configured (see above).

Table 1-13 Server Dialog Box (Sheet 2 of 2)

Field/Section	Description	Action
Design Time	This section is used to establish this workstation with Client Builder design privileges.	No action is needed if you are not enabling a design functions.
Computer	The default is My Computer. Use the default if you are configuring your local computer or select a remote computer from the network list.	Click the down arrow. Expand the name of computer to be configured.  My Computer FLAlarmServer.AlarmServer.1 Microsoft Windows Network Double-click the Program ID. Or, for a remote server workstation, locate the workstation name, expand it and double-click the Program ID.  My Computer Microsoft Windows Network WTYL1 FLAlarmServer.AlarmServer.1 WYOL XZHA
ProgID	The Prog ID is preconfigured for all installations: FLAlarmServer.AlarmServer.1	This field is populated when the Computer field is configured (see above).
Storage Name	Not used at this time.	No action is needed.

The Advanced buttons display the Run Time Server and the Design Time Server dialog boxes. The run time server is the server where the FactoryLink Alarm Server is located. The design time server is the server location designated for the designer to create the AlarmViewer. Both of these servers default to the local server workstation. These dialog boxes do not require configuration if the default prepopulated values are accepted. Table 1-14 and Table 1-15 describe the fields and their configuration respectively.

Table 1-14 Run Time Server (Advanced) Dialog Box (Sheet 1 of 2)

Field/Section	Description	Action
Name	The user determines a name for this field. The default is Server.	Configured in Server dialog box (Table 1-13).
Computer	The default is My Computer. Use the default if you are configuring your local computer or select a remote computer from the network list.	Configured in Server dialog box (Table 1-13).
ProgID	The Prog ID is preconfigured for all installations: FLAlarmServer.AlarmServer.1	This field is populated when the Computer field is configured (see Table 1-13).
Class ID	The Class ID is preconfigured for all installations: {5AEC3E98-CFB3-11D2-A597-00C04F7D7A54} Note: Braces are included with the number.	This field is populated when the Computer field is configured (see Table 1-13).
Scan Rate	Rate in milliseconds that determines how often the server will update the client. This value can be changed at run time and overrides this setting.	Default is: 1000 Accept default or type a new rate is needed.
Time Out	Rate in milliseconds that determines delay between the reconnection attempts when the server is shutdown and informs the control that it was shutting down.	Default is: 10000 Accept default or type a new rate is needed.

Table 1-14 Run Time Server (Advanced) Dialog Box (Sheet 2 of 2)

Field/Section	Description	Action
Reconnection Delay		
On Failure	Rate in milliseconds that determines the delay between subsequent reconnection attempts when the Alarm Server crashes.	Default is: 60000 Accept default.
On Shutdown	Rate in milliseconds that determines delay between the reconnection attempts when the server shutdown and informed the alarm control that it was shutting down.	Default is: 60000 Accept default.

When the entries to the Run Time Server dialog box are complete, click the SET button. To configure the Design Time Server settings: Click the Advanced button in that section and follow the instructions in Table 1-15 or proceed to the next instructions.

Table 1-15 Design Time Server (Advanced) Dialog Box

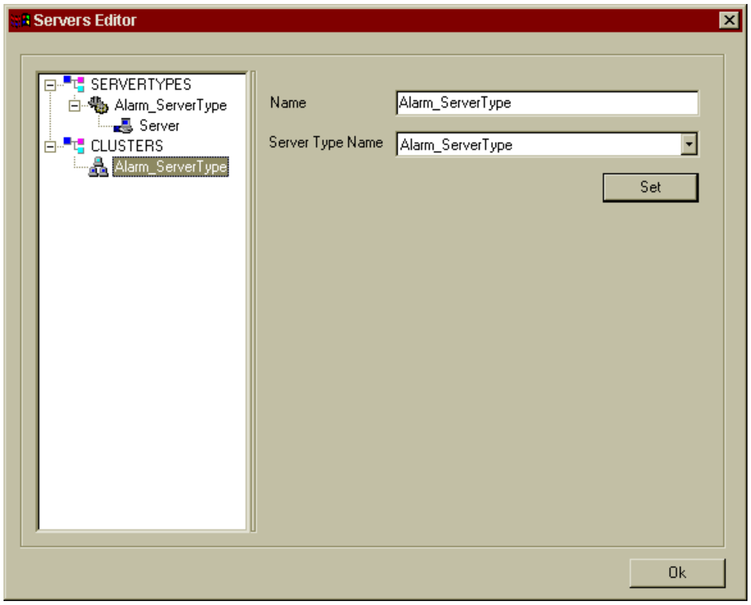
Field/Section	Description	Action
Name	The user determines a name for this field. The default is Server.	Configured in Server dialog box (Table 1-13).
Computer	The default is My Computer. Use the default if you are configuring your local computer or select a remote computer from the network list.	Configured in Server dialog box (Table 1-13).
ProgID	The Prog ID is preconfigured for all installations: FLAlarmServer.AlarmServer.1	This field is populated when the Computer field is configured (see Table 1-13).
Class ID	The Class ID is preconfigured for all installations: {5AEC3E98-CFB3-11D2-A597-00C04F7D7A54} Note: Braces are included with the number.	This field is populated when the Computer field is configured (see Table 1-13).
Reconnection Delay		
Scan Rate	Not used in alarm subsystem	Default is: 1000
Time Out	Not used in alarm subsystem	Default is: 10000

When the entries to the Design Time Server dialog box are complete, click the SET button.

Set up an Alarm Cluster

Right-click the CLUSTERS listing in the server tree. Click New on the menu. The cluster dialog box displays as shown in Figure 1-28.

Figure 1-28 Cluster Configuration in The Servers Editor



Name: Alarm_ServerType

Server Type Name: Alarm_ServerType

The default new alarm cluster name appears under CLUSTERS in the tree. This name can be modified by typing a new name in the Name field or accept the default. The Server Type name cannot be modified as it matches the alarm server type name in the tree below the item SERVERTYPES.

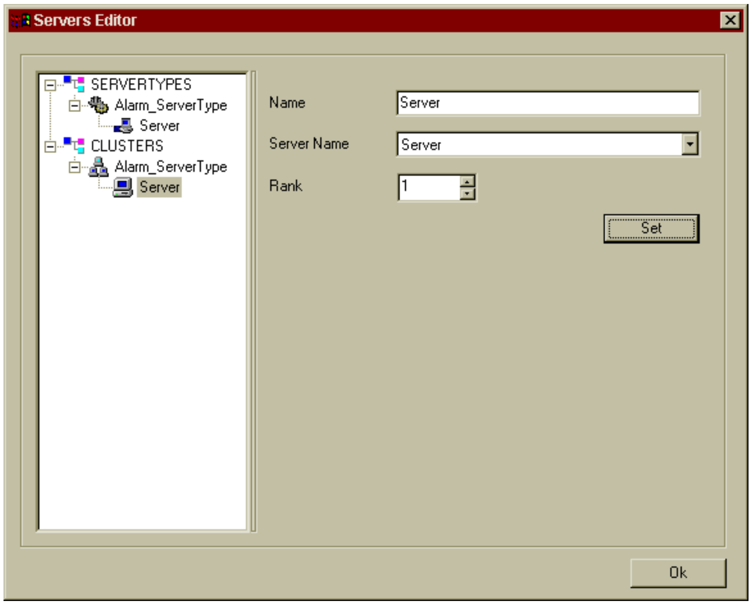
Click the Set button to accept the field data.

An alarm member must now be established. Right-click the new alarm cluster name to display a menu. Select Add Member from the menu. The cluster dialog box appears.

The default new alarm server name appears under CLUSTERS in the tree. This name can be modified by typing a new name in the Name field or accept the default. The Server Name field cannot be modified as must match an the alarm server name in the tree below the item SERVERTYPES.

The Rank field is not operational at this time.

Figure 1-29 Set up the Cluster Server



Name: Server
Server Name: Server
Rank: 1

Click the Set button to accept the settings for the Alarm ServerType server.

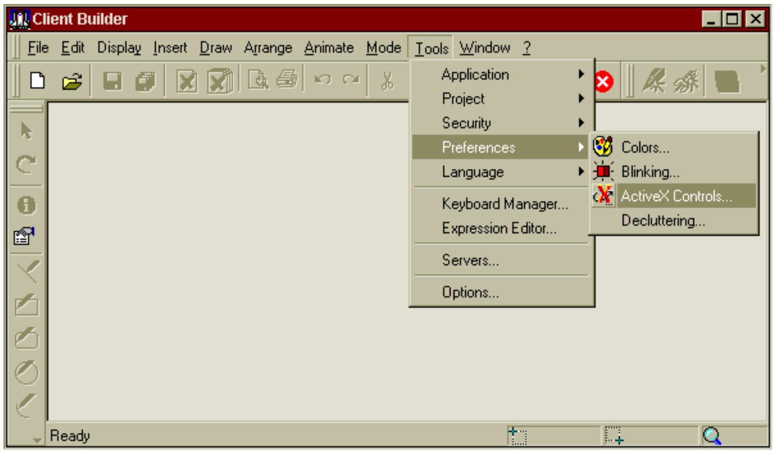
The Alarm Server and alarm cluster set-up functions are complete. Pick the OK button to close the Servers Editor dialog box.

ActiveX Control Selection

An the ActiveX control is needed to view and manage the current alarm list in Client Builder. An alarm ActiveX control is predefined to interface with the FactoryLink design information.

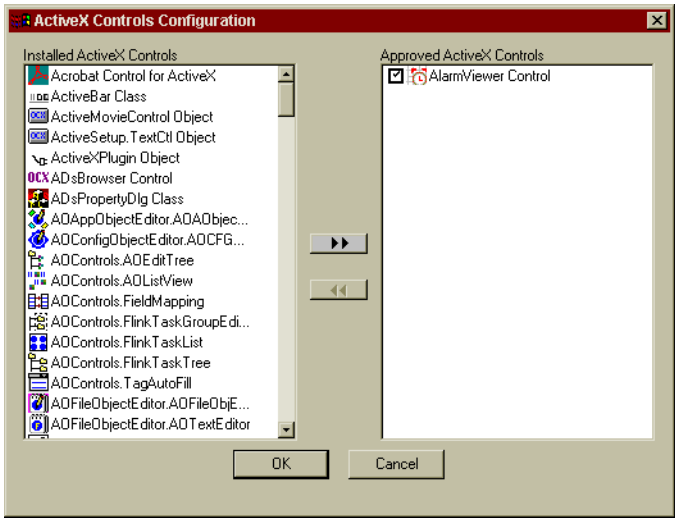
In the Client Builder workspace, click the Tools pull down menu. Select the Preferences listing and then the ActiveX Controls item (see Figure 1-30).

Figure 1-30 Select ActiveX Control from the Tool Menu



The ActiveX Controls Configuration box appears (see Figure 1-31).

Figure 1-31 ActiveX Controls Configuration Dialog Box


ActiveX Controls Configuration
Installed ActiveX Controls
Acrobat Control for ActiveX
ActiveBar Class
ActiveMovieControl Object
ActiveSetup.TextCtl Object
ActiveXPlugin Object
ADsBrowser Control
ADsPropertyDlg Class
AOAppObjectEditor.AOAObjec...
AOConfigObjectEditor.AOCFG...
AOControls.AOEditTree
AOControls.AOListView
AOControls.FieldMapping
AOControls.FlinkTaskGroupEdi...
AOControls.FlinkTaskList
AOControls.FlinkTaskTree
AOControls.TagAutoFill
AOFileObjectEditor.AOFileObjE...
AOFileObjectEditor.AOTextEditor
Approved ActiveX Controls
☑ AlarmViewer Control
OK
Cancel

The left side of the box shows all of the Installed ActiveX Controls and the right side shows the Approved ActiveX Controls available to the designer. Double-click the AlarmViewer control in the left side to move the item to the right side.

Other ActiveX controls can be added at this time. These additional controls are not necessary for viewing alarms.

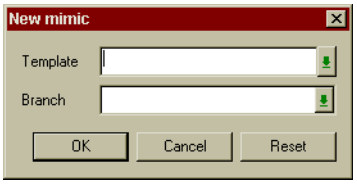
The AlarmViewer control is now listed on the right side. The selected check box indicates that this control will be listed in the list of control favorites on the pull-down menu.

Configure the Alarm ActiveX Control

During the Client Builder project session, a set of properties regarding the workspace, ActiveX control, the Mimic window that contains the alarm ActiveX control, and the system interfaces are configured and saved. The project can be stored and used at other FactoryLink client workstations. The Mimic window design is saved as a separate file and is stored under the project name. Multiple projects can be created and multiple Mimic windows created for each project. The files are located at C:\USDATA\Program Files\Client Builder\{project name}\{Mimic name}.

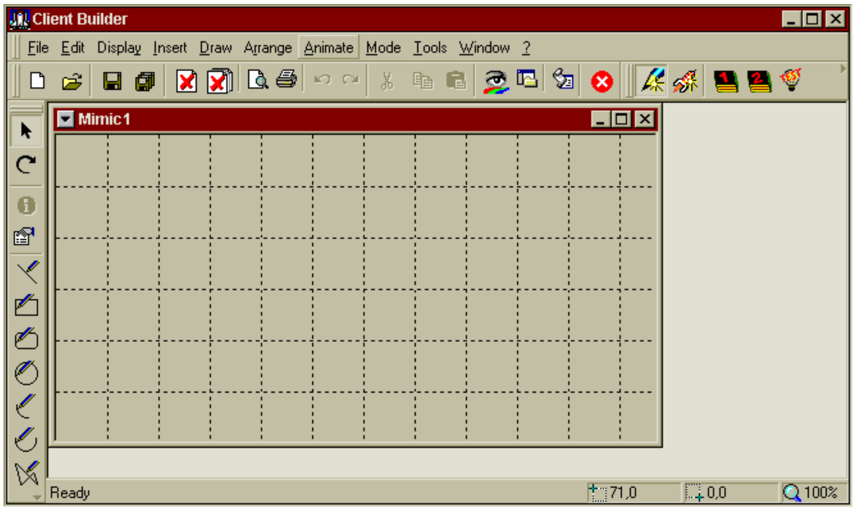
To place a window on the Client Builder workspace, click the File pull down menu. Click the New listing to display the New Mimic dialog box. The branch field is not used at this time. If there are no predefined templates, no selection is needed in this dialog box. Click the OK button.

Figure 1-32 New Mimic Dialog Box



The Client Builder window appears in the workspace (see Figure 1-33).

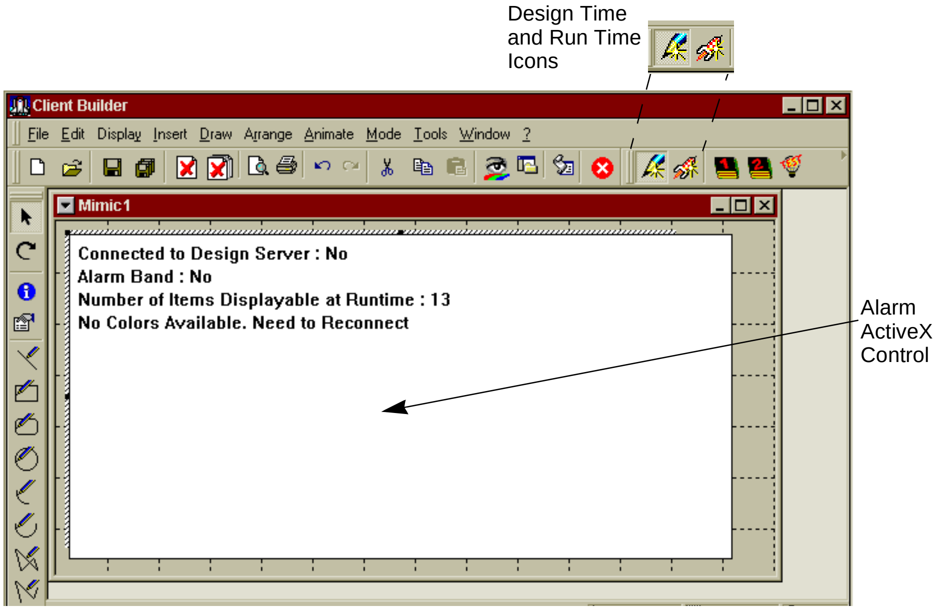
Figure 1-33 A Client Builder Window


Client Builder
File Edit Display Insert Draw Arrange Animate Mode Tools Window ?
Mimic1
Ready
71,0
0,0
100%

This Mimic window can be moved or resized as needed in the design mode.

To place the alarm ActiveX Control in the window, click the Insert pull down menu. Select the Favorite ActiveX Controls listing and then the AlarmViewer Control. The AlarmViewer appears on the window in design time mode. After configuration, the AlarmViewer always appears in the run-time mode first after Client Builder startup.

Figure 1-34 Client Builder Window with an Alarm ActiveX Control.



Design Time and Run Time Icons
Client Builder
File Edit Display Insert Draw Arrange Animate Mode Tools Window ?
Mimic1
Alarm ActiveX Control

Connected to Design Server : No
Alarm Band : No
Number of Items Displayable at Runtime : 13
No Colors Available. Need to Reconnect

This alarm ActiveX control can also be resized within the window as needed. Click the alarm ActiveX control to activate it and adjust the size by dragging a corner or a side midpoint.

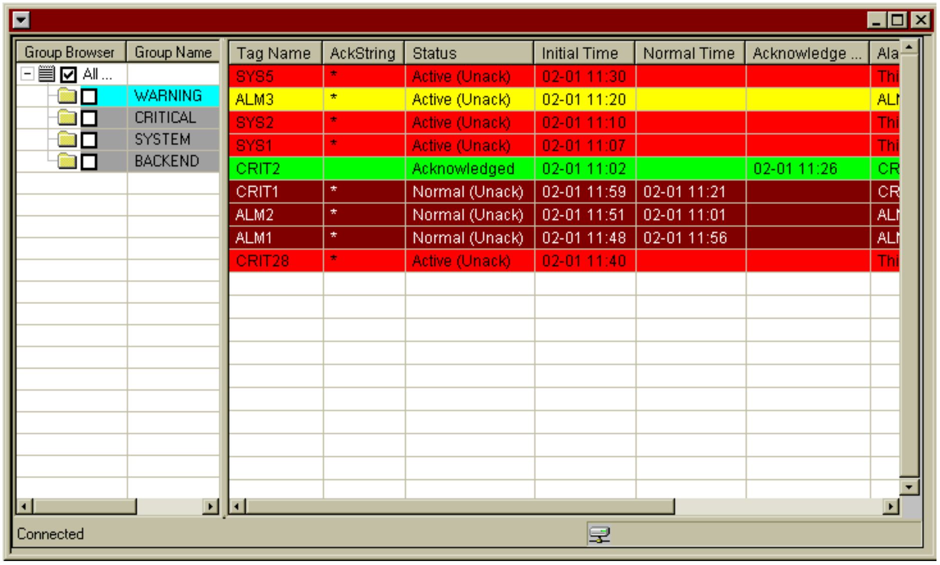
The design time alarm control information is as follows:

- Connected to Design Server: This defaults to No for first time access.
- Alarm Band: This defaults to No for first time access.
- Number of Items Displayable at Runtime: This is the number of alarm records that can physically display in the alarm control. The number is dependent on the size of the alarm control box and the size and weight of the font used to display the alarm records.
- No Colors Available: Color definitions are available after the alarm control is connected to the Alarm Server. The range of available colors is determined by the server.

At any time during the design session, the mode can be changed from the design time mode to the run time mode and back again. This feature enables immediate feedback of the design selections. Use the icons at the top of the dialog box to change the view mode.

If the run-time icon is selected now the run-time format of AlarmViewer appears. However no alarm records can appear regardless if there are triggered alarms in the system or not. This is because the AlarmViewer has not been configured. For an example of a configured AlarmViewer, refer to Figure 1-35. For an example of a configured Alarm Band Viewer with the option of three records selected, refer to Figure 1-36. The group browser is not available for the Alarm Band Viewer.

Figure 1-35 Example of a Configured AlarmViewer at Run Time

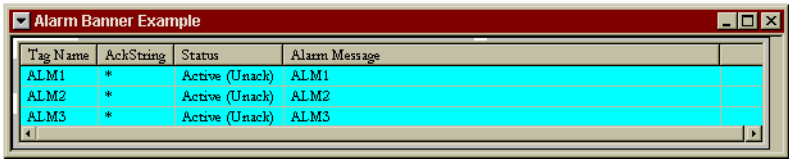


Group Browser	Group Name
☑ All ...	
□	WARNING
□	CRITICAL
□	SYSTEM
□	BACKEND

Tag Name	AckString	Status	Initial Time	Normal Time	Acknowledge ...	Ala
SYS5	*	Active (Unack)	02-01 11:30			Thi
ALM3	*	Active (Unack)	02-01 11:20			AL
SYS2	*	Active (Unack)	02-01 11:10			Thi
SYS1	*	Active (Unack)	02-01 11:07			Thi
CRIT2		Acknowledged	02-01 11:02		02-01 11:26	CR
CRIT1	*	Normal (Unack)	02-01 11:59	02-01 11:21		CR
ALM2	*	Normal (Unack)	02-01 11:51	02-01 11:01		AL
ALM1	*	Normal (Unack)	02-01 11:48	02-01 11:56		AL
CRIT28	*	Active (Unack)	02-01 11:40			Thi

Connected

Figure 1-36 Example of an Alarm Band Viewer at Run Time



Alarm Banner Example

Tag Name	AckString	Status	Alarm Message
ALM1	*	Active (Unack)	ALM1
ALM2	*	Active (Unack)	ALM2
ALM3	*	Active (Unack)	ALM3

For more information about the run-time viewers, refer to the sections in this chapter: AlarmViewer Format at Run Time on page 117 and Alarm Band Viewer Format at Run Time on page 119.

Additional Mimic windows can be added to the project and additional alarm ActiveX controls can be added to the current Mimic window or a new Mimic window. You can add Mimic windows and alarm ActiveX controls at this time or skip to Viewer Design on page 97.

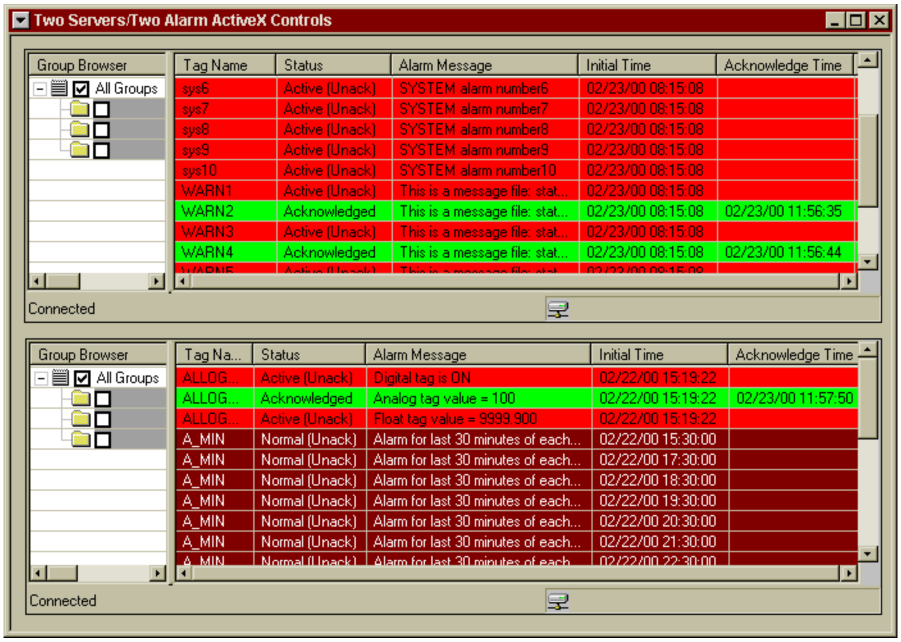
Adding Mimic Windows and Controls

Add alarm ActiveX controls to a Mimic window using one of two methods:

- Inserting a new control (Insert> Favorite ActiveX Controls> AlarmViewer Control)
- Copy and paste the existing ActiveX control

The second method copies any of the initial properties configured in the first window. However, once created, each control in the Mimic window maintains its own set of properties. The second or subsequent controls can be connected to other servers in your FactoryLink system. Figure 1-37 shows a Mimic window with two alarm ActiveX controls connected to different alarm servers.

Figure 1-37 Two AlarmViewers Controls in One Client Builder Window



Tag Name	Status	Alarm Message	Initial Time	Acknowledge Time
sys6	Active (Unack)	SYSTEM alarm number6	02/23/00 08:15:08	
sys7	Active (Unack)	SYSTEM alarm number7	02/23/00 08:15:08	
sys8	Active (Unack)	SYSTEM alarm number8	02/23/00 08:15:08	
sys9	Active (Unack)	SYSTEM alarm number9	02/23/00 08:15:08	
sys10	Active (Unack)	SYSTEM alarm number10	02/23/00 08:15:08	
WARN1	Active (Unack)	This is a message file: stat...	02/23/00 08:15:08	
WARN2	Acknowledged	This is a message file: stat...	02/23/00 08:15:08	02/23/00 11:56:35
WARN3	Active (Unack)	This is a message file: stat...	02/23/00 08:15:08	
WARN4	Acknowledged	This is a message file: stat...	02/23/00 08:15:08	02/23/00 11:56:44
WARN5	Active (Unack)	This is a message file: stat...	02/23/00 08:15:08	

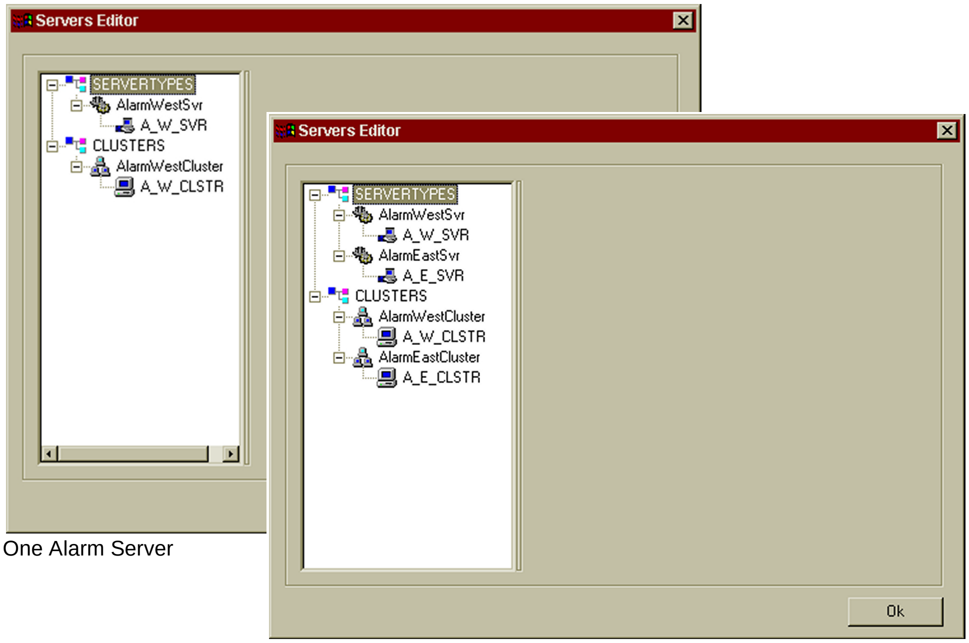
Connected

Tag Na...	Status	Alarm Message	Initial Time	Acknowledge Time
ALLOG...	Active (Unack)	Digital tag is ON	02/22/00 15:19:22	
ALLOG...	Acknowledged	Analog tag value = 100	02/22/00 15:19:22	02/23/00 11:57:50
ALLOG...	Active (Unack)	Float tag value = 9999.900	02/22/00 15:19:22	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 15:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 17:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 18:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 19:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 20:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each...	02/22/00 21:30:00	
A_MIN	Normal (Unack)	Alarm for last 30 minutes of each	02/22/00 22:30:00	

Connected

The configuration of two alarm servers for a project is shown in Figure 1-38. Use the same steps followed to create the first server to add an additional server.

Figure 1-38 Server and Cluster Information for a Two Server System View



One Alarm Server

Two Alarm Servers

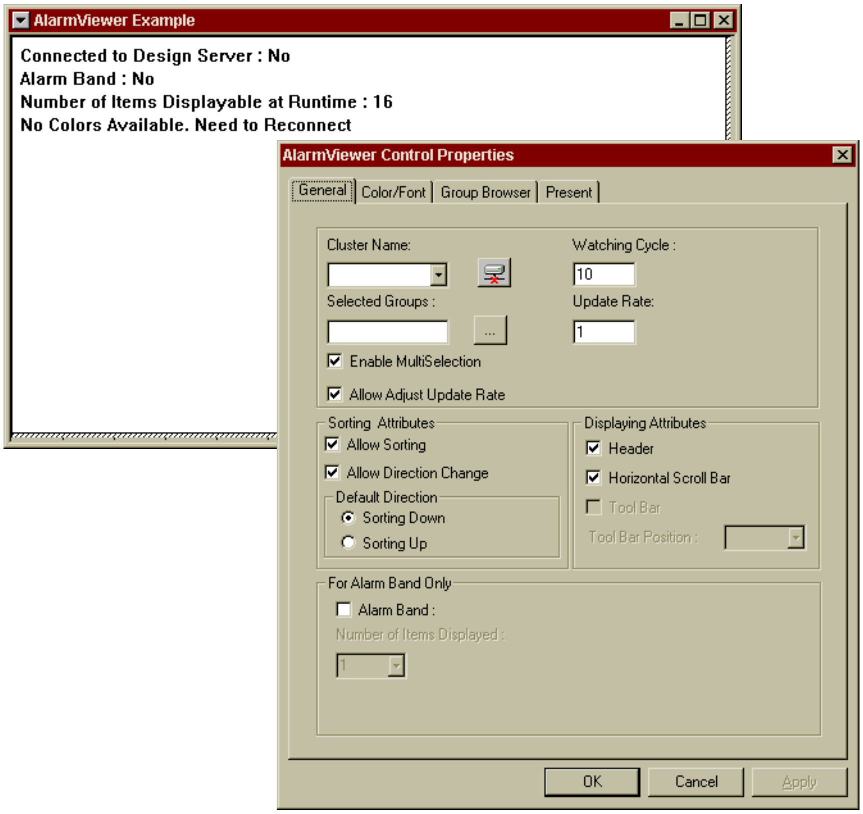
Run time and design time is determined on a Mimic window basis. Thus to view two controls but restrict the design and run time, add an additional Mimic window and place the second control in the new window.

The predesign session set-up is complete. The Alarm ActiveX Control properties must now be configured.

Viewer Design

With the alarm ActiveX control displayed in the design time mode, double-click in the ActiveX control area. The AlarmViewer Control Properties window appears (see Figure 1-39).

Figure 1-39 The AlarmViewer Control Properties Dialog Box



Connected to Design Server : No
Alarm Band : No
Number of Items Displayable at Runtime : 16
No Colors Available. Need to Reconnect

Cluster Name:
Watching Cycle : 10
Selected Groups :
Update Rate: 1
☑ Enable MultiSelection
☑ Allow Adjust Update Rate

Sorting Attributes
☑ Allow Sorting
☑ Allow Direction Change
Default Direction
● Sorting Down
○ Sorting Up

Displaying Attributes
☑ Header
☑ Horizontal Scroll Bar
□ Tool Bar
Tool Bar Position :

For Alarm Band Only
□ Alarm Band :
Number of Items Displayed : 1

This dialog box is organized by selectable tabs. The tabs are in an ordered sequence to follow a logical progression in the design process. To access any tab, click the tab name:

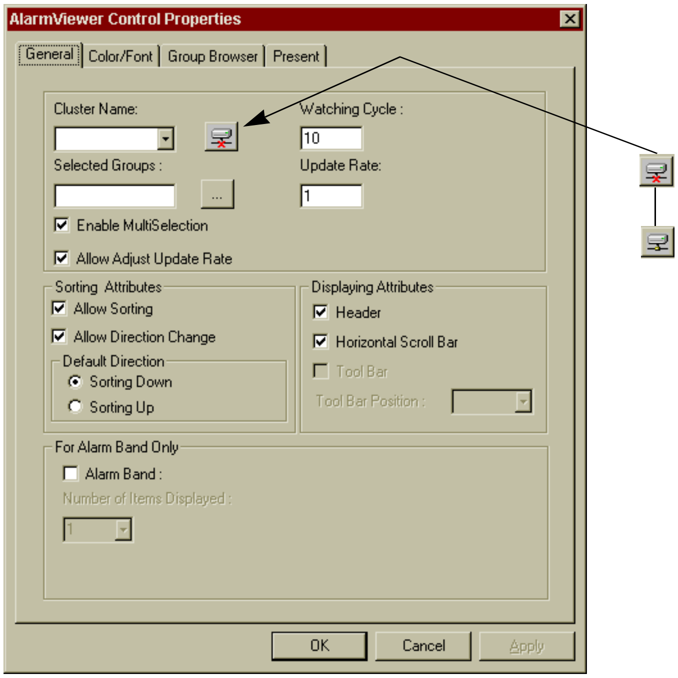
- General—Connect to a server cluster, specify connection cycles, sort defaults, and display attributes. Also, the Alarm Band Viewer is selected here.
- Colors and Fonts—Choose the font type, field blinking and colors for all alarms by Group Name.

- Group Browser—Select the group fields, field attributes and field sequence to display. Enable group field resizing at run time and select the relative size of the group display.
- Present —Select the fields, field size, and the field sequence to display. Also determine to display the vertical scroll bar, format the date fields, sort keys and filtering options.

General Tab

The General Tab is the first step of configuration where the essential connection to the Alarm Server is accomplished as shown in Figure 1-40).

Figure 1-40 General Tab



AlarmViewer Control Properties

General | Color/Font | Group Browser | Present

Cluster Name:
Watching Cycle : 10
Selected Groups :
Update Rate: 1
☑ Enable MultiSelection
☑ Allow Adjust Update Rate

Sorting Attributes
☑ Allow Sorting
☑ Allow Direction Change
Default Direction
● Sorting Down
○ Sorting Up

Displaying Attributes
☑ Header
☑ Horizontal Scroll Bar
□ Tool Bar
Tool Bar Position :

For Alarm Band Only
□ Alarm Band :
Number of Items Displayed : 1

Not connected to alarm server (a red X appears on the icon)

Connected to alarm server (red X disappears)

Cluster Name Name of the server connection

Select the name of the server connection from the Cluster Name scroll menu. To activate connection to the cluster, click the Connection button to the right.
The red portion of the button disappears when the connection is successful. Connection to the server is essential for design.

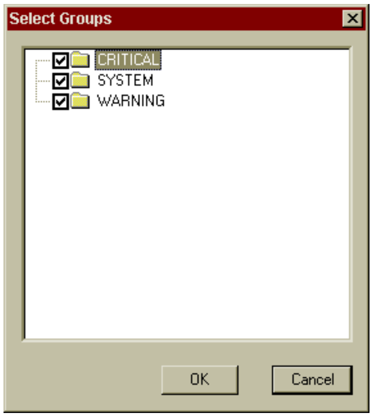
Default Entry: None

Selected Groups

All predefined alarm groups are listed. Select the groups to appear in the group browser. The group browser is not available for the Alarm Band Viewer.

Click the ellipsis button ... and the Select Groups Dialog box appears (see Figure 1-41).

Figure 1-41 Select Groups Dialog Box



Select the check boxes next to the groups to include them in the group browser display. Click the OK button.

Default Entry: All groups are selected

Watching Cycle

Time interval, measured in seconds, for Client Builder to verify the FactoryLink program is still running. Type the appropriate rate or accept the default.

Default Entry: 10 seconds

Update Rate

Rate that Client Builder retrieves messages from the Alarm Server task. Type a new rate or accept the default. The update rate can be modified at run time (For more information, refer to Filter and Sort Alarms at Run Time on page 121 in this guide). The option is available on the Configure Filter/Sort dialog box).

Default Entry: 1 second

Enable Multiselection

Enable/disable multiselection of displayed alarms for acknowledgement and/or removable from the AlarmViewer

Default Entry: Selected

Allow Adjust Update Rate Enable/disable update rate at run time

Default Entry: Selected

Sorting Attributes Sorting options at run time for the AlarmViewer.
Use these options to control operator sorting of the alarm messages at run time. Sorting is selectable for ascending or descending order. Not all headings enable sorting. The Display Attributes' Header box must be selected to enable input to these options. See Table 1-25 for a comparison of run time and design time sorting.
Use Table 1-16 to select the sorting options for your AlarmViewer.

Table 1-16 Sorting Attribute Options for the AlarmViewer

Option		Selected check box/ radio box	Clear check box	Default
Allow Sorting		Using select field names in the header of the AlarmViewer, the operator can sort the alarms.	No sorting is allowed. The other options in this section are unavailable.	Selected
Allow Sort Direction Change		Using select field names in the header, the operator can sort the alarms in descending or ascending order.	No operator change of default settings is allowed.	Selected
Default Direction	Sorting Up	Selecting the Sorting Up check box provides this as a default for the operator.	No sorting is provided [or Sorting Up is the default].	Selected
	Sorting Down	Selecting the Sorting Down check box provides this as a default for the operator.	No sorting is provided [or Sorting Down is the default].	Not selected

Displaying Attributes — Header and the horizontal scroll bar in the AlarmViewer. Select/deselect these options.

Default Entry: The header and horizontal scroll bar are selected for the AlarmViewer.

Table 1-17 Displaying Attributes Options for the Alarm List Component

Option	Selected check box	Clear check box	Default
Header	A header row appears at the top of the alarm messages to indicate the field name for each column.	No sorting can be done at run time. The Sorting Attributes box is unavailable.	Selected
Horizontal Scroll Bar	A Horizontal Scroll Bar appears at the bottom of the list when the window is sized smaller than the data list width.	At run time, no horizontal scroll bar is available. Fields must be sized at design time to create a total width no greater than the alarm control size to ensure all fields are visible. Fields are not resizeable at run time if not selected. Not available for Alarm Band Viewer.	Selected
Tool Bar	The Tool Bar function is unavailable at this time.	The Tool Bar function is unavailable at this time.	Not available
Tool Bar Position	The Tool Bar function is unavailable at this time.	The Tool Bar Position function is unavailable at this time.	Not available

Alarm Band — Selects the viewer with limited features known as the Alarm Band Viewer. This viewer can be used to focus on the most severe or the most recent alarms. The Horizontal Scroll Bar and the Vertical Scroll Bar (on the Present tab) are not available for the Alarm Band Viewer.

Default Entry: Not selected

Number of Items Displayed — The number of alarm messages to appear in the Alarm Band Viewer. The acceptable values are 1, 2, or 3.

Default Entry: 1

Note: This control is unavailable if the Alarm Band check box is not selected.

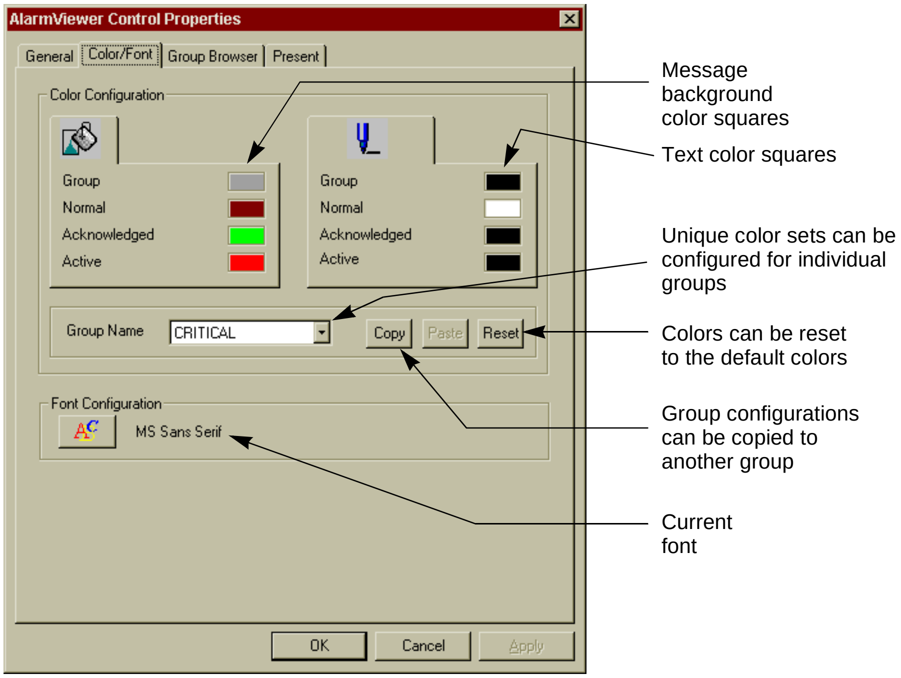
Colors/Fonts Tab

This tab provides the configuration colors, blinking, and font specifications for each group’s alarm record text and message backgrounds (see Figure 1-42). The color and blink settings are individually configurable for both the text and the background. The font style, type and size are selected for the entire AlarmViewer control.

Each alarm group is configured separately. As each group is selected using the Group Name drop down box the related colors populate the background and text status color squares. The configuration for an alarm group can be copied and pasted to another group.

Note: The set of all possible colors is determined by the Alarm Server.

Figure 1-42 Color/Font Tab



Group	⬜
Normal	🟥
Acknowledged	🟩
Active	🟥

Group	⬛
Normal	⬜
Acknowledged	⬛
Active	⬛

Group Name: CRITICAL

MS Sans Serif

Message background color squares

Text color squares

Unique color sets can be configured for individual groups

Colors can be reset to the default colors

Group configurations can be copied to another group

Current font

Color Configuration — Group color for the group browser and alarm messages
Each status is configurable by text color and/or blinking plus message background color and/or blinking.

For the definition of the configurable alarm status options, refer to Table 1-18.

Table 1-18 Group Color and Configurable Status Options

Option	Status	Definition
Group	---	Group color in the group browser
Normal	Normal (Unack)	Alarm is not active but is waiting to be acknowledged
Acknowledged	Acknowledged	Alarm is no longer active but is acknowledged
Active	Active (Unack)	Alarm is active and not acknowledged

Each text and message square is individually configured. For instructions on how to configure these options, refer to Table 1-19. For instructions on how to use additional color and blink options, refer to the following sections: The Color Dialog Box on page 104 and The Color Palette Dialog Box on page 105.

Table 1-19 Color Square Configuration

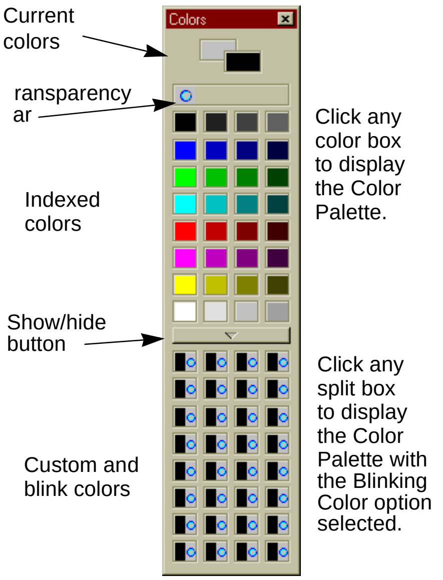
Change the text or message background…	Click…	And on the Color dialog box…
color	the square	click the replacement color
to the blink feature using the mouse	the square	left-click the first selected color and right click the second
to the blink feature using the Color dialog box	the square	click a split color square in the Indexed or Custom section
to a newly defined color	The new color must first be defined in the Color Dialog box before it can be assigned to a status square:, refer to The Color Palette Dialog Box on page 105.	

The Color Dialog Box

The Color dialog box provides indexed (static), custom (globally changeable) colors and the blink colors used to configure each status within the group alarms.

Click any color square on the Color/Font tab and the Color dialog box appears. For the description of the functions that can be performed, refer to Table 1-20.

Table 1-20 Color Dialog Box Options and Functions

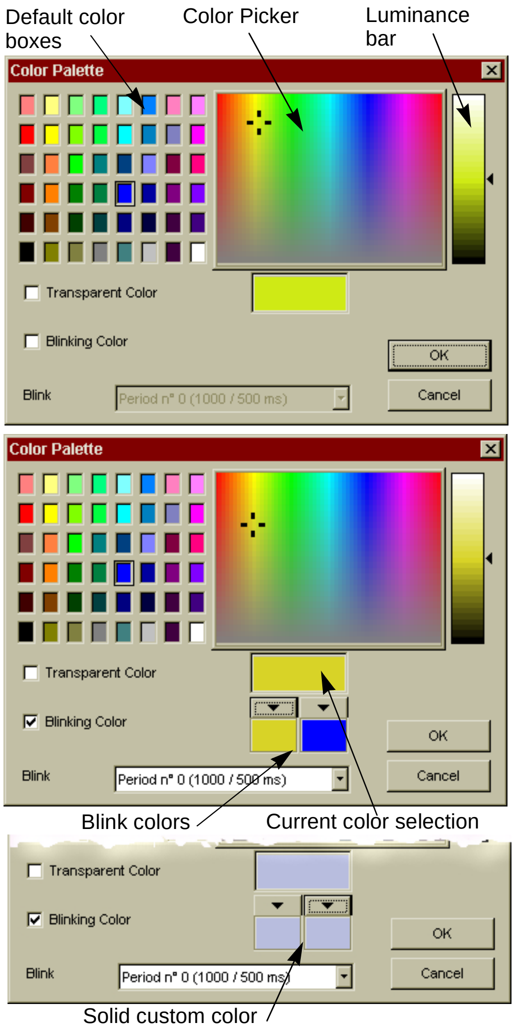
Option/ Function	Description	Example
Current colors	Indicates the currently selected color for text or background	 Colors Current colors ransparency ar Indexed colors Show/hide button Custom and blink colors Click any color box to display the Color Palette. Click any split box to display the Color Palette with the Blinking Color option selected.
Transparency button	When selected, the default is the color black. Not supported for alarms	
Indexed colors	These colors, once assigned to text or background, remain static regardless if the color square is reconfigured in this dialog box. These color squares can be configured as two color boxes used for blink colors.	
Show/Hide button	Displays or hides the custom colors	
Custom and blink colors	Use these squares to configure globally changeable colors. When a custom color is changed, any text or background configured with this color square also changes.	

To change or add new colors to the Color dialog box, refer to The Color Palette Dialog Box on page 105.

The Color Palette Dialog Box

The Color Palette Dialog box provides selection of new colors, and configuration of the blink feature. For features and options, refer to Table 1-21.

Table 1-21 Color Palette Dialog Box Options and Functions

Option/ Function	Description	Example
Default color squares	Select colors from these preset squares	 Default color boxes Color Picker Luminance bar Color Palette Transparent Color Blinking Color OK Cancel Blink Period n° 0 (1000 / 500 ms) Color Palette Transparent Color Blinking Color OK Cancel Blink Period n° 0 (1000 / 500 ms) Blink colors Current color selection Transparent Color Blinking Color OK Cancel Blink Period n° 0 (1000 / 500 ms) Solid custom color
Color picker	Click in this square to select a new color.	
Luminance bar	Use this bar to modify the brightness (amount of black or white) of the selected color.	
Transparent Color checkbox	Not supported. Defaults to black.	
Blinking Color checkbox	Select this checkbox to configure the blink colors or a solid reference color.	
Current color selection	Indicates color of last click	
Blink colors	Select the two colors for blinking text or blinking background.	
Solid custom color	Select a color and click both down arrows. Blinking will be ignored.	
Blink (rate)	Select the rate from the list menu.	

Double-click any color square on the Color dialog box and the Color Palette dialog box appears. For a list of Color Palette functions and how to perform them, refer to Table 1-22.

Table 1-22 Color Dialog Box Configuration

Change a Color dialog square…	Click…	On the Color Palette Dialog box…
to a new index color	any index color square to select it	click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the OK button.
to a new custom color	any custom color square to select it	click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the OK button.
to new custom blink colors	any custom color square to select it	select the Blinking color checkbox. For the first color: click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the **left** down arrow. For the second color: click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the **right** down arrow. Click the OK button.
to new index blink colors	any index color square to select it	select the Blinking color checkbox. For the first color: click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the **left** down arrow. For the second color: click a replacement color square, **or** click the Color Picker **or** click the Luminance bar. Click the **right** down arrow. Click the OK button.

Group Name

This field lists all the names of the defined alarm groups. The colors for alarm status in each group can be different to provide a quick indicator of the group and alarm status.

Copy: Click the Copy button to save the current group name settings to the clipboard.

Paste: Click the Paste button to change the current group name settings to the settings saved to the clipboard.

Reset: Click the Reset button to return the current group name settings to the default colors.

Default Entry: The alarm group listed first in the Alarm Group Control table (For definition of the Alarm Group table refer Table 1-8).

Font Configuration

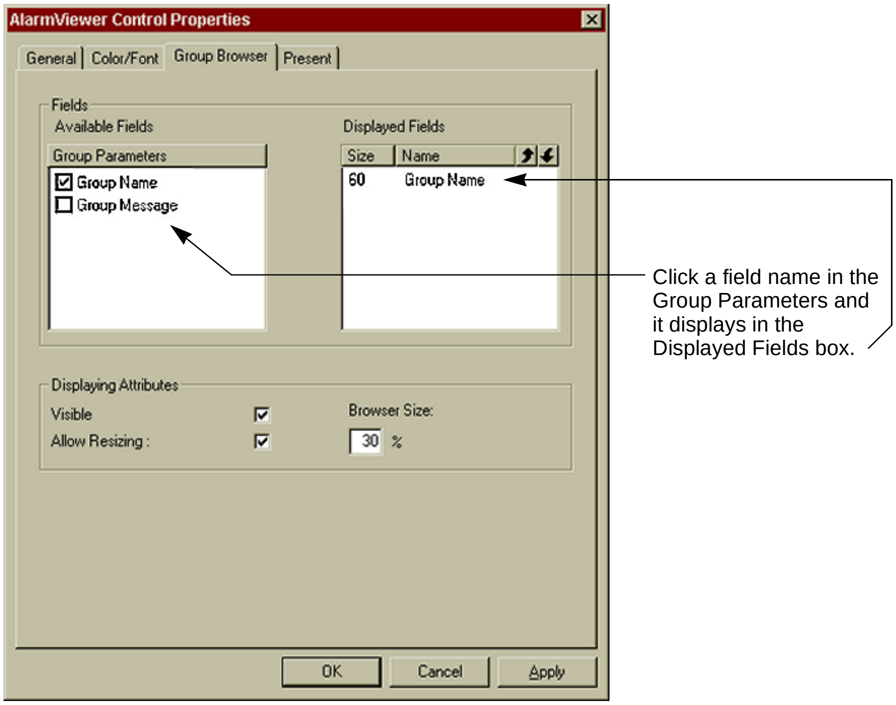
Click this button to display a standard Windows® Font dialog box. Select the font, font style and font size for the AlarmViewer.

Default Entry: System default for your workstation

Group Browser

Use this tab to configure the properties of the Group Browser for the AlarmViewer. This feature is not available for the Alarm Band Viewer. Figure 1-43 is an example of the Group Browser with a field selected for display in the AlarmViewer.

Figure 1-43 Group Browser Tab



Group Parameters

☑ Group Name
□ Group Message

Size	Name
60	Group Name

Visible ☑
Allow Resizing : ☑
Browser Size: 30 %

Click a field name in the Group Parameters and it displays in the Displayed Fields box.

Available Fields All available group fields that can be displayed in the AlarmViewer. Click the check box to display the field in the Displayed Fields box.

Default Entry: None

Displayed Fields The fields that are selected in the Available Fields list

The list represents the sequence they appear at run time.

Size: Size of the field is modifiable: Click the size field to activate it. Type the new pixel size.

Sequence: The up and down arrow buttons ↑↓ provide positioning of the fields. Select the field to be positioned and click the appropriate arrow to move the field up or down the list.

Default Entry: The fields list in the Displayed Fields in the sequence these boxes are selected and have a default size of 60 pixels.

Displaying Attributes Enables/disables the group browser plus provides run time resizing. Size is relative to the size of the group browser.

Visible: Enables/disables the group browser at run time.

Allow Resizing: Enables/disables the ability for the operator to change the size of the group browser at run time.

Default Entry: Both are selected

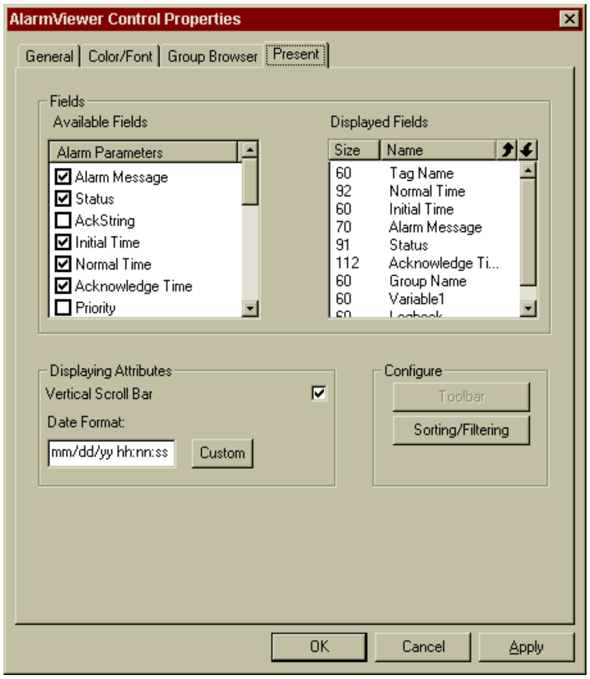
Size of the browser Number in this box sizes the Group Browser as a percentage of the total size of the AlarmViewer display.

Default Entry: 30%

Present Tab

The Present tab provides the selection and the sequence of the fields to display in the AlarmViewers. Date format and the sort/filter options are also set here. For an example of the Preset tab with the display fields selected, see Figure 1-44.

Figure 1-44 Present Tab



Alarm Parameters

- ☑ Alarm Message
- ☑ Status
- □ AckString
- ☑ Initial Time
- ☑ Normal Time
- ☑ Acknowledge Time
- □ Priority

Size	Name
60	Tag Name
92	Normal Time
60	Initial Time
70	Alarm Message
91	Status
112	Acknowledge Ti...
60	Group Name
60	Variable1
60	Logbook

Vertical Scroll Bar ☑

Date Format: mm/dd/yy hh:nn:ss

Available Fields A select group of alarm fields that can be displayed in AlarmViewers. Click a field check box and the field name appears in Displayed Fields list. Use Table 1-23 for definitions of these fields.

Default Entry: None

Table 1-23 Present Tab Fields (Sheet 1 of 2)

Field Name	Definition	Information Source
Alarm Message	Message to further define the reason or location of the alarm	Alarm Definition Information table: Message Text field
Status	Current state of the alarm.	Alarm Definition Information table: Status Tag field
AckString	An asterisk in this field indicates the alarm needs to be acknowledged.	Alarm Group Control table: Ack field
Initial Time	Actual time that the alarm was triggered by the alarm condition	Computed at run time
Normal Time	Time that the alarm was returned to normal	Computed at run time
Acknowledgement Time	Time that the alarm was acknowledged	Computed at run time
Priority	A number which indicates the rank of importance for processing filtering and sorting processes	Alarm Definition Information table: Priority field
Tag Name	Name used to identify the alarm	Alarm Definition Information table: Alarm Tag Name field
AID	Alarm ID is a unique number used to identify the alarm in the network and to describe parent/child relationships	Alarm Definition Information table: Unique Alarm ID field
Group Name	Identifies a unit of related alarms	Alarm Group Control table: Group Name field
Area Name	An additional key for filtering and sorting purposes	Alarm Definition Information table: Area field

Table 1-23 Present Tab Fields (Sheet 2 of 2)

Field Name	Definition	Information Source
Variable 1	Variable used to embed tag information in the Message Text field to display in the Alarm Message field of the AlarmViewer	Alarm Definition Information table: Variable 1 Tag field
Variable 2	Variable used to embed tag information in the Message Text field to display in the Alarm Message field of the AlarmViewer	Alarm Definition Information table: Variable 2 Tag field
Variable 3	Variable used to embed tag information in the Message Text field to display in the Alarm Message field of the AlarmViewer	Alarm Definition Information table: Variable 3 Tag field
Variable 4	Variable used to embed tag information in the Message Text field to display in the Alarm Message field of the AlarmViewer	Alarm Definition Information table: Variable 4 Tag field
Group Message	Text describing the alarm group	Alarm Group Control table: Group Text field
Lan ID	Identification number used to specify the source (node) of an alarm when alarm information is shared among servers.	Alarm Local Area Network table: Source Node ID field
Logbook	An asterisk in this field indicates that there was a message appended to this record.	FactoryLink Configuration Manager FLCM utility (For instructions to add a logbook message, refer to FactoryLink 6.6 documentation).

Displayed Fields All the fields that have been selected from the Available Fields list.

The list represents the sequence the fields appear at run time.

Size: Size of the field is modifiable: Click the size field to activate it. Type the new pixel size.

Sequence: The up and down arrow buttons ↑↓ provide positioning of the fields. Select the field to be positioned and click the appropriate arrow to move the field up or down the list.

Default Entry: All the fields list in the Displayed Fields in the sequence these boxes are selected and all have a default size of 60 pixels.

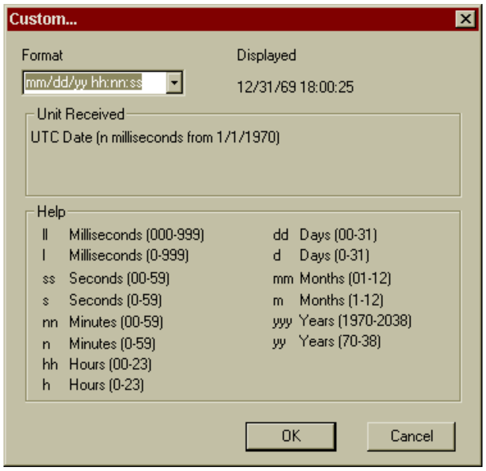
Vertical Scroll Bar Vertical scroll bar at the right side of the AlarmViewer. This control is deselected and unavailable if the Alarm Band Viewer check box is checked on the General tab. When deselecting the vertical scroll bar, ensure that configured sorting and filtering attributes correspond with the AlarmViewer limitations.

Default Entry: The check box is selected.

Date Format Provides custom formatting of the date fields.

Click the Custom button and the Custom dialog box appears (see Figure 1-45).

Figure 1-45 Custom Dialog Box used for Date Format



Custom...

Format: mm/dd/yy hh:nn:ss

Displayed: 12/31/69 18:00:25

Unit Received
UTC Date (n milliseconds from 1/1/1970)

Help

ll	Milliseconds (000-999)	dd	Days (00-31)
l	Milliseconds (0-999)	d	Days (0-31)
ss	Seconds (00-59)	mm	Months (01-12)
s	Seconds (0-59)	m	Months (1-12)
nn	Minutes (00-59)	yyy	Years (1970-2038)
n	Minutes (0-59)	yy	Years (70-38)
hh	Hours (00-23)		
h	Hours (0-23)		

Select a format from the Format drop down box or type the format using the Help information as a guide.

Unit Received: UTC Date (n milliseconds from 1/1/1970) is the methodology used to interpret the date

Displayed: Output example

Default Entry: mm/dd/yy hh:mm:ss

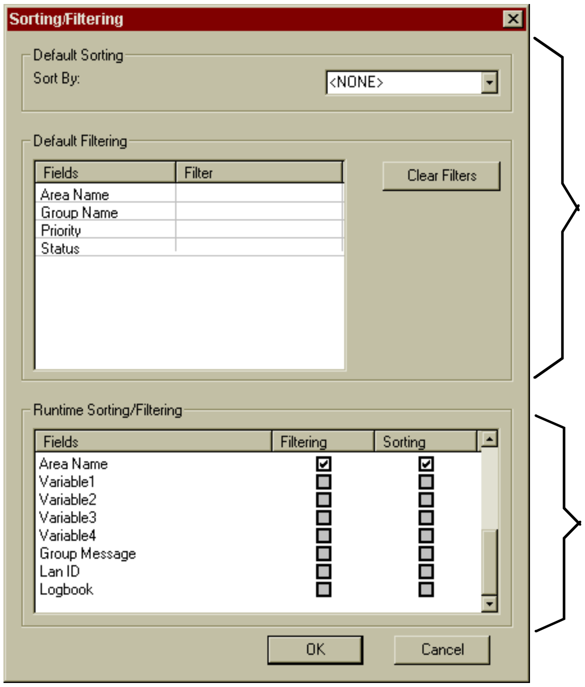
Configure Toolbar Not available at this time

Default Entry: None.

Sorting/Filtering Provides startup and run time options for AlarmViewer field sorting and filtering.

Click this button to display the Sorting/Filtering dialog box (see Figure 1-46).

Figure 1-46 Configure Alarm Filtering/Sorting Dialog Box



Sort By: <NONE>

Fields	Filter
Area Name	
Group Name	
Priority	
Status	

Fields	Filtering	Sorting
Area Name	☑	☑
Variable1	☐	☐
Variable2	☐	☐
Variable3	☐	☐
Variable4	☐	☐
Group Message	☐	☐
Lan ID	☐	☐
Logbook	☐	☐

Set default sorting and filtering options here

Determines if sorting and filtering are changeable at run-time

Freezes defaults selected above

Configured sort and filter options are initiated at start up. The operator can change any of the configurations at run time unless they are frozen in the Run time Sorting/Filtering box. Deselecting the filtering box or the sorting box freezes the field from a run time change for that function.

For a comparison of design time and run time functionality, refer to Table 1-25.

Use Table 1-24 to design the initial and run-time filtering and sorting options for your AlarmViewer. After selections are completed, click the OK button to return to the Present Tab.

Table 1-24 Sorting/Filtering Dialog Box Options

<table>
<tr><th>Section</th><th>Definition</th><th colspan="2">Action</th><th>Default</th></tr>
<tr><td>Default Sorting</td><td>Startup sorting of the alarm records using one of the following options:
NONE
Area Name
Group Name
AID
Tag Name
Priority
Acknowledgment Time
Normal Time
Initial Time
Status</td><td colspan="2">Using the Sort by: pull down menu, select an initial (or permanent, if frozen) sort field.</td><td><None></td></tr>
<tr><td rowspan="2">Default Filtering</td><td rowspan="2">Startup filtering of the alarm records. Valid comparison operators are:
= equals
> greater than
>= greater than or equal to
< less than
<= less than or equal to
with one or more of the following options:</td><td colspan="2">Click the Filter box next to the field to filter. Type: operator, **space,** field alpha/numeric field data to compare.
Example: = WARNING
The space character is required.
Field data is case sensitive:</td><td rowspan="2">None</td></tr>
<tr><td>Area Name
Group Name
Priority
*Status</td><td>Existing name
Existing name
Existing number
1 = Normal
2 = Acknowledged
3 = Active (Unacknowledged)</td></tr>
<tr><td>Runtime Sorting/ Filtering</td><td>A list of all the fields that are selectable for run time filtering and sorting. These selections cannot be changed in the run-time mode. Deselection of a field here freezes the associated configuration designated above. Options listed that are greyed out are not available at this time.</td><td colspan="2">Select/deselect the available check boxes:
Status: Both
Initial Time: Sort only
Normal Time: Sort only
Ack. Time: Sort only
Priority: Both
Tag Name: Sort only
AID: Sort only
Group Name: Both
Area Name: Both</td><td>All selectable fields are checked</td></tr>
</table>

After all the tabs have been configured for the AlarmViewer or the Alarm Band Viewer alarms can be observed during run time. For instructions on the run-time viewers, refer to the next section.

Run-Time Alarming

As alarms are generated, the information is displayed on the run time AlarmViewer or Alarm Band Viewer. These alarms remain on the display until the alarm criteria no longer meets the defined alarm conditions. If an alarm is defined as an alarm that must be acknowledged, the alarm output remains listed even after the alarm condition is removed. The operator must manually acknowledge the alarm.

The run time viewers provide highly flexible methods for the operator to select, observe and react to alarm information.

During the design process, the AlarmViewer can be switched from the run time mode to the design time mode using the design time and the run-time icons pictured to the left. After design is completed, some design time functions can be locked from any run time changes.

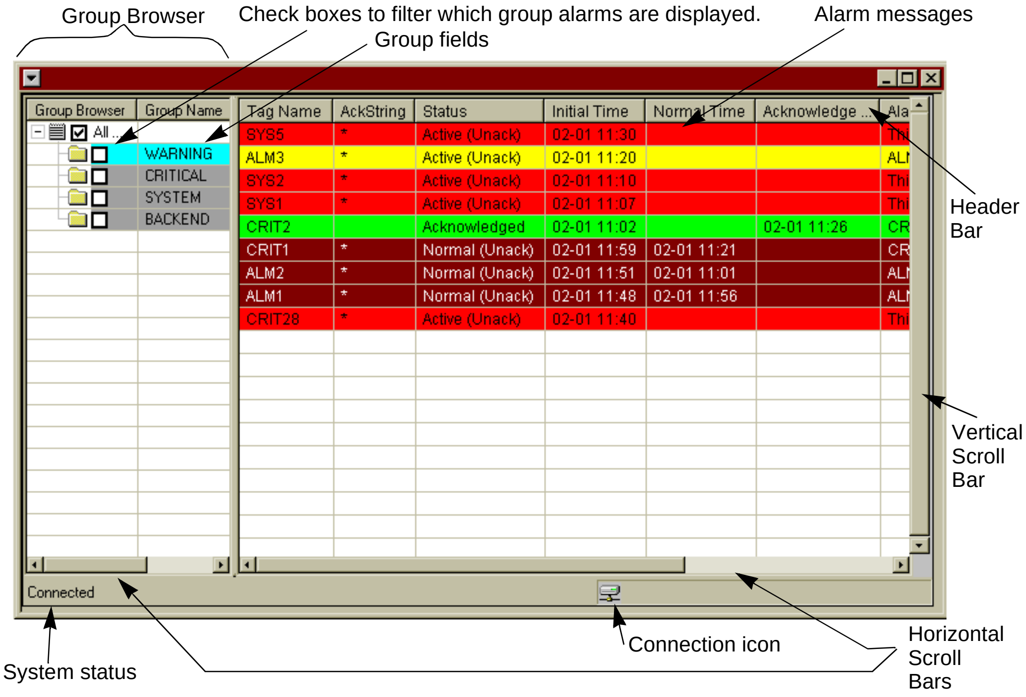
Select the run-time icon and the AlarmViewer or Alarm Band Viewer appear with the configuration options you have selected.

AlarmViewer Format at Run Time

The size of the AlarmViewer and Alarm Band Viewer is determined at design time. However, at run time, fields can be resized by dragging the field header column border to the right or the left. A design-optional horizontal scroll bar permits viewing alarm columns no longer visible because of resizing. Other run-time features are available: sort, filter, acknowledgement of alarms, and printing. This section explains these functions.

Figure 1-47 is an example of a run time AlarmViewer with all of the basic features selected.

Figure 1-47 Parts of the AlarmViewer at Run Time



Group Browser	Group Name
− ▤ ☑ All ...	
□	WARNING
□	CRITICAL
□	SYSTEM
□	BACKEND

Tag Name	AckString	Status	Initial Time	Normal Time	Acknowledge ...	Ala
SYS5	*	Active (Unack)	02-01 11:30			Thi
ALM3	*	Active (Unack)	02-01 11:20			ALI
SYS2	*	Active (Unack)	02-01 11:10			Thi
SYS1	*	Active (Unack)	02-01 11:07			Thi
CRIT2		Acknowledged	02-01 11:02		02-01 11:26	CR
CRIT1	*	Normal (Unack)	02-01 11:59	02-01 11:21		CR
ALM2	*	Normal (Unack)	02-01 11:51	02-01 11:01		ALI
ALM1	*	Normal (Unack)	02-01 11:48	02-01 11:56		ALI
CRIT28	*	Active (Unack)	02-01 11:40			Thi

Many of the AlarmViewer parts and their functions are configurable:

- Group Browser: This is an optional part of the AlarmViewer which enables quick filtering of the displayed messages by group. If configured, shows Group Name and Group Message fields.
- Header Bar: A header bar with the tag names of the alarm fields displays at the top of the list.
- Vertical and horizontal scroll bars: These scroll bars, at the right side and the bottom of the viewer, are optional. Without a horizontal scroll bar:
  - the total widths of the fields can not exceed the width of the display window or all the fields are not visible
  - the fields are not resizeable at run time.

  If the vertical scroll bar is not configured the filter and sorting attributes must complement the limited display area.

- System status: The system status, displayed on the lower left corner of the AlarmViewer, indicates if the ActiveX control is connected or ready to connect to the FactoryLink Alarm Server.

  Disconnected: No connection achieved at run time. System may be down.

  Connected: Connected achieved to Alarm Server.

  Server Failure... : The alarm ActiveX control has detected that the server has failed.

  Connecting ...please wait...: The alarm ActiveX control is connecting to the Alarm Server (usually followed by a Connected message).

  Unable to connect to the server. Retrying...: The control tried to connect, failed, and is now retrying.

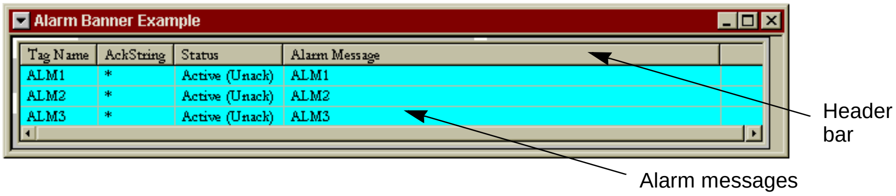
  Server shuts down ... Please Wait ...: The server has informed the control that it is shutting down.
- Connection icon: Indicates if the alarm ActiveX control is connected to the Alarm Server. When not connected, a red X appears at the base of the icon.
- Alarm Messages: Alarm messages which represent instances of alarm events configured to display related fields, for example, status, alarm group or category and time.

Fonts and background colors are configurable during the design process. Text, backgrounds or both can be set to blink according to configurable frequencies. The field order is determined during design. The width of the fields, sorting and filtering can be done at design time or run-time. However, all can be locked from operator changes.

Alarm Band Viewer Format at Run Time

The Alarm Band Viewer is similar to the AlarmViewer with limited but focused capacity. The layout format basically differs from the AlarmViewer in that is no vertical scroll bar and there is no group browser. There is a maximum of three alarm messages in the Alarm Band Viewer.

Figure 1-48 Example of an Alarm Band Viewer at Run Time



Alarm Banner Example

Tag Name	AckString	Status	Alarm Message
ALM1	*	Active (Unack)	ALM1
ALM2	*	Active (Unack)	ALM2
ALM3	*	Active (Unack)	ALM3

The Alarm Band Viewer can be used to focus on a specific type of alarm, for example, the most critical alarms. Or it provides a focus of the most current alarms. The use of this viewer is flexible to allow users to configure it according to their needs.

The parts of the Alarm Band Viewer are similar to the AlarmViewer:

- Header Bar: A header bar with the tag names of the alarm fields displays at the top of the list. The header bar is optional but without the header bar there is no run-time sorting.
- Horizontal scroll bar: The scroll bar at the bottom of the viewer is required.
- Alarm Messages: Alarm messages which represent instances of alarm events configured to display related field information, for example, status, alarm group or category and time.

Fonts and background colors are configurable during the design process. Text, backgrounds or both can be set to blink according to configurable frequencies. The field order is determined during design. The width of the fields, sorting and filtering can be done at design time or run-time. Certain fields can be locked from operator changes.

Acknowledgement of Alarms

Alarms are acknowledged in the run-time mode. What happens when the alarms are acknowledged depends on the status of the alarm:

- If the alarm status was NORMAL (Unack), the condition generating the alarm has been corrected. The acknowledgement causes the alarm instance to be removed from the list.
- If the alarm status is ACTIVE (Unack), the alarm condition is still present. The alarm status changes to ACKNOWLEDGED but remains listed until the alarm condition is resolved.

Status changes can be emphasized by a new font or message background color and/or the blinking feature depending on the AlarmViewer design.

There are two methods to acknowledge alarms. The first method is individual alarm acknowledgement. The second method enables the selection of multiple alarms for acknowledgement. How alarms are acknowledged is determined at design time. For multiple alarm acknowledgement, ensure that the Enable MultiSelection check box is selected on the General Tab (refer to General Tab on page 98 in this chapter). Deselecting this checkbox enables single alarm selection.

To acknowledge an individual alarm: Position the cursor over the alarm to be acknowledged and double-click the alarm. The status changes, the alarm is removed from the list or redisplays indicating the new status.

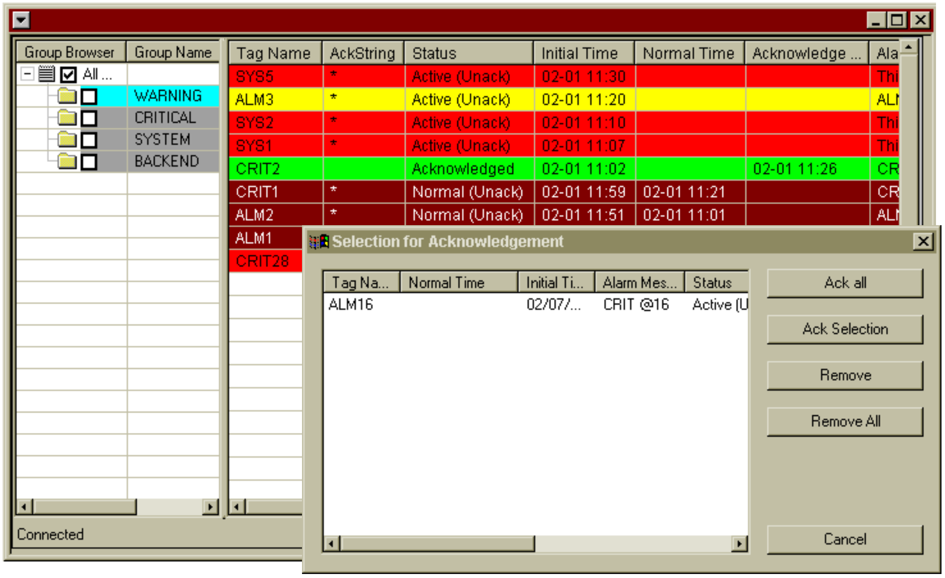
To acknowledge multiple alarms: For multiselection acknowledgement, ensure that this option is checked. Position the cursor over the listed alarms and double-click (see Figure 1-49). The Selection for Acknowledgement Dialog Box appears. Continue to click alarms on the viewer until all the alarms to be acknowledged are in the dialog box. In the dialog box:

- To acknowledge all the alarms in the dialog box: Click the Ack All button.

- To acknowledge one or more of the alarms in the dialog box, select one or more individual alarms using a click, control-click or for adjacent alarms use the shift-click. Click the Ack Selection button.
- To remove one or more of the alarms in the dialog box: Select one or more individual alarms using a click, control-click or for adjacent alarms use shift-click. Click the Remove button.
- To remove all the alarms in the dialog box: Click the Remove All button.

To close the Selection for Acknowledgement Dialog Box, click the Cancel button or the X box in the top right hand corner of the dialog box.

Figure 1-49 Selection for Acknowledgement Dialog Box



Group Browser	Group Name
☑ All ...	
□	WARNING
□	CRITICAL
□	SYSTEM
□	BACKEND

Tag Name	AckString	Status	Initial Time	Normal Time	Acknowledge ...	Ala
SYS5	*	Active (Unack)	02-01 11:30			Thi
ALM3	*	Active (Unack)	02-01 11:20			ALI
SYS2	*	Active (Unack)	02-01 11:10			Thi
SYS1	*	Active (Unack)	02-01 11:07			Thi
CRIT2		Acknowledged	02-01 11:02		02-01 11:26	CR
CRIT1	*	Normal (Unack)	02-01 11:59	02-01 11:21		CR
ALM2	*	Normal (Unack)	02-01 11:51	02-01 11:01		ALI
ALM1						
CRIT28						

Connected

Selection for Acknowledgement

Tag Na...	Normal Time	Initial Ti...	Alarm Mes...	Status
ALM16		02/07/...	CRIT @16	Active (U

Multiple Instances of an Alarm

Multiple instances of a defined alarm can appear in the AlarmViewer or the Alarm Band Viewer. Multiple instances occur when an alarm instance is returned to normal, acknowledgement is required but has not occurred and the alarm condition is met again. These instances are differentiated by the Normal, Acknowledge and Initial Time fields.

Filter and Sort Alarms at Run Time

Filtering and sorting of alarms at run time depends initially on the settings that were configured for the AlarmViewer at design time. There are three types of restrictions:

- Restrict any sort initiated by a click on the header bar (see Table 1-16)
- Restrict sort direction for all sorts (see Table 1-16)
- Restrict certain fields from sort or filter (see Table 1-24)

Table 1-25 shows the options for design time and run time filters and sorting. Startup options are the initial filter and sort that is present when the AlarmViewer or Alarm Band are first connected to the Alarm Server. All startup options are changeable at run time. However, design time restrictions override any options at run time.

Table 1-25 Comparison of Run-time and Design Time Filter and Sort Options

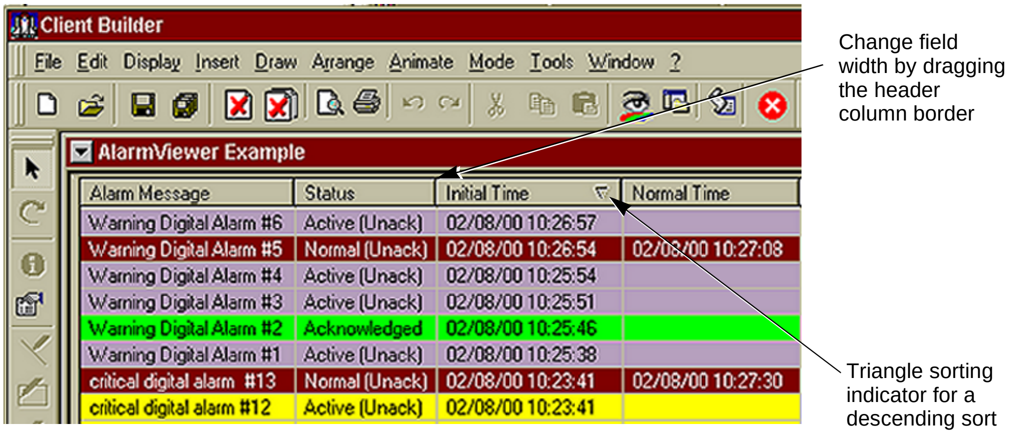
Field	Design Time				Run Time		
	Default		Restrictions		Sort	Filter	Header Sort
	Sort	Filter	Sort	Filter			
Status	x	x	x	x	x	x	x
Initial Time	x		x		x		x
Normal Time	x		x		x		x
Acknowledgment Time	x		x		x		x
Priority	x	x	x	x	x	x	x
Tag Name	x		x		x		x
AID	x		x		x		x
Group Name	x	x	x	x	x	x	x
Area Name	x	x	x	x	x	x	x

To sort alarms using the header bar in the list perform the following instructions:

- Click a field name in the viewer header bar. If sorting is provided for this field, a triangle appears to the right of the field name. All alarms are sorted by this field. If the triangle is a down-triangle the sorting is in descending order.
- Click the same field name again to sort all listed alarms in the reverse order. The triangle redisplays in the reverse manner.

For an example of the sort triangle in the header bar, refer to Figure 1-50.

Figure 1-50 Sort Triangle in the Header Bar


Client Builder
File Edit Display Insert Draw Arrange Animate Mode Tools Window ?
AlarmViewer Example

Alarm Message	Status	Initial Time ▽	Normal Time
Warning Digital Alarm #6	Active (Unack)	02/08/00 10:26:57	
Warning Digital Alarm #5	Normal (Unack)	02/08/00 10:26:54	02/08/00 10:27:08
Warning Digital Alarm #4	Active (Unack)	02/08/00 10:25:54	
Warning Digital Alarm #3	Active (Unack)	02/08/00 10:25:51	
Warning Digital Alarm #2	Acknowledged	02/08/00 10:25:46	
Warning Digital Alarm #1	Active (Unack)	02/08/00 10:25:38	
critical digital alarm #13	Normal (Unack)	02/08/00 10:23:41	02/08/00 10:27:30
critical digital alarm #12	Active (Unack)	02/08/00 10:23:41	

Change field width by dragging the header column border

Triangle sorting indicator for a descending sort

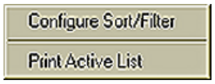
Filters limit the number of alarms on the AlarmViewer or Alarm Band Viewer to those alarms that contain a matching value in the filter field.

Filters and the second method of sorting are accomplished using the same dialog box.

To filter and/or sort a viewer perform the following instructions:

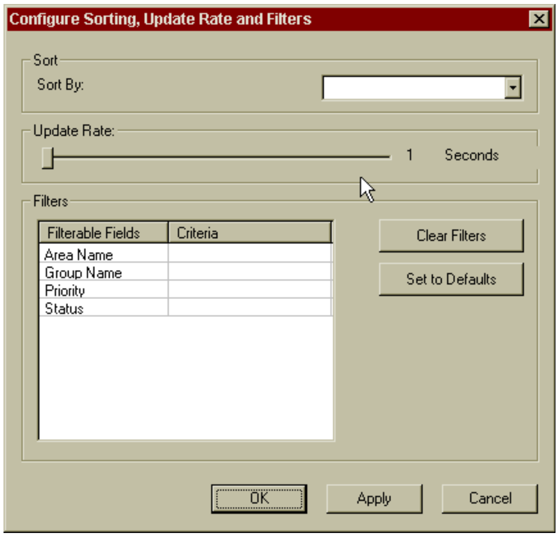
Position the cursor over the viewer. Right-click to display the context box. Click the Configure Sort/Filter item on context box (see Figure 1-51).

Figure 1-51 The Context Box - Filter and Sort



The Configure Sorting, Update Rate and Filters dialog box appears (see Figure 1-52). This dialog box provides run-time change of the update rate and any sorting or filtering parameters that were not frozen in the design time configuration.

Figure 1-52 The Configure Sorting, Update Rate and Filters Dialog Box



Update Rate: 1 Seconds

Filterable Fields	Criteria
Area Name	
Group Name	
Priority	
Status	

Use Table 1-26 to configure filter and sort options or to change the Update Rate for your viewer.

Table 1-26 Sorting/Filtering Dialog Box Options (Sheet 1 of 2)

Section	Definition	Action	Default
Sort	Sorting of the alarm records using one of the following fields:	Using the Sort By: drop down menu, select one sort field: Area Name Group Name AID Tag Name Priority Acknowledgment Time Normal Time Initial Time Status	Tag Name or design time selection, if any.
Update Rate	Rate that Client Builder retrieves messages from the Alarm Server task. Type the appropriate rate or accept the default.	Using the mouse or the directional arrow keys, move the slide bar to the right to slow the update rate. The number of seconds displays to the right of the slide bar.	Default is set at design time on the General Tab on page 98.

Table 1-26 Sorting/Filtering Dialog Box Options (Sheet 2 of 2)

Section	Definition	Action	Default
Filters	Filterable Fields list: The filters that are not prohibited from changes in design time display in this box. Thus a blank box means no filtering is allowed.	None	All filters list that have not been frozen in design time configuration
	Criteria Box: Valid operator comparators are: = equals > greater than >= greater than or equal to < less than <= less than or equal to with one or more of the following field options:	Click the Filters, Criteria box next to the field to use as a filter. Type: operator comparator, **space,** field alpha/numeric field data to compare. Example: = WARNING The space character is required. Field data is case sensitive. *Status: 1 = Normal 2 = Acknowledged 3 = Active (Unacknowledged) Priority: Existing number Group Name: Existing name Area Name: Existing number	None. However, any design time options appear here.
	Clear Filters button	Click the Clear Filters button to clear the design and run time filter settings.	None
	Set to Defaults button	Click the Set to Defaults button to retrieve the design time filter settings.	None

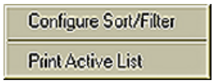
When all selections are complete, click the Apply button and then the OK button.

Printing from the Viewers

The current alarms on the viewers can be printed to your locally configured printer.

To print the alarms, position the mouse over the viewer and right-click. The context menu appears (see Figure 1-53).

Figure 1-53 The Context Box - Printing

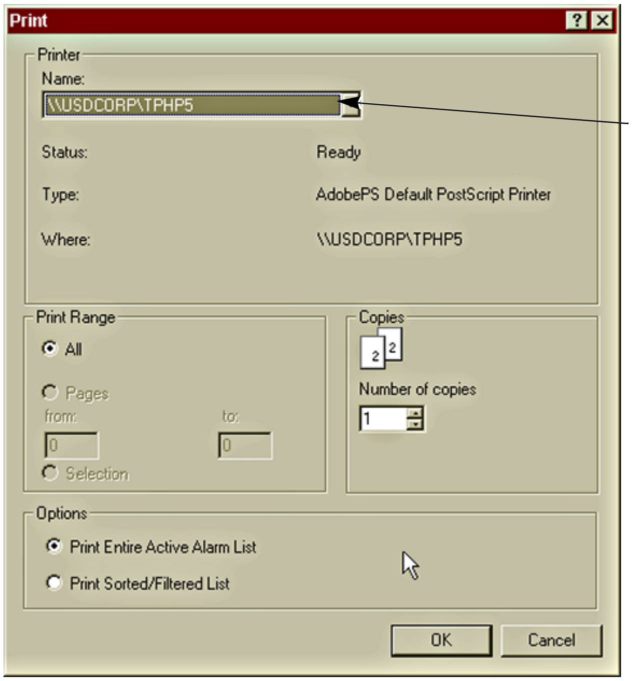


Click the Print Active List. The Print dialog box displays (see Figure 1-54) with your local printer listed. If this is not the correct printer, correct the printer name. Printing defaults to the landscape mode.

There are two types of print lists that can be printed:

- Print entire active Alarm List
- Print Sorted/Filtered List.

Figure 1-54 Print Dialog Box



Print

Printer

Name: \\USDCORP\TPHP5

Status: Ready

Type: AdobePS Default PostScript Printer

Where: \\USDCORP\TPHP5

Print Range

● All

○ Pages from: 0 to: 0

○ Selection

Copies

Number of copies: 1

Options

● Print Entire Active Alarm List

○ Print Sorted/Filtered List

This box is set to your default printer.

Select the radio button for the type of list you need to print and click the OK button.

Browsing Archived Alarms

The Client Builder browser feature enables browsing historical alarms that were logged to a database or a file.

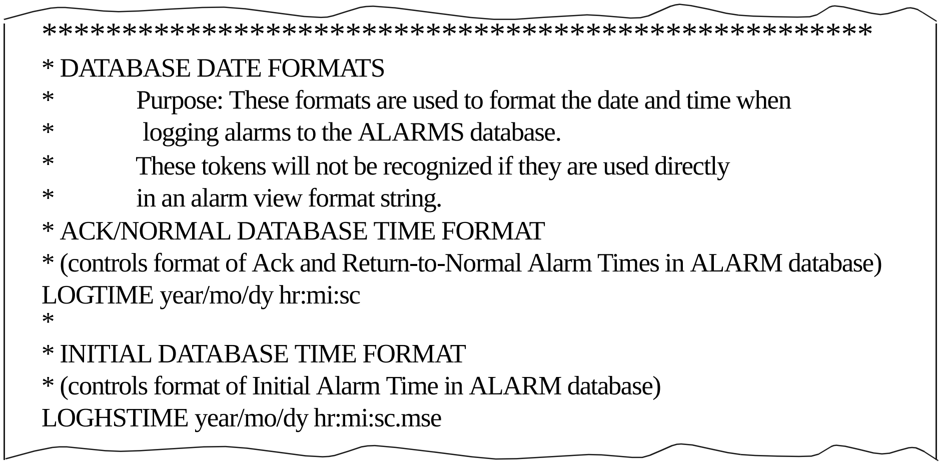
Preconfiguration is required before using the Client Builder browser:

- Ensure that the historian selected for your system database is configured
- Ensure that the alarm archive tables are configured (see Set up Database Archive Requirements on page 67).
- Verify system DSN is established for the database server
- Set up and configure the browser control in Client Builder.

When using the StarterApp the default address location of the database files is the {FLAPP}\log directory. The default filename is MyAlarms.txt.

Format of the dates printed to the database is configured using the al_fmt.txt file as shown in Figure 1-55.

Figure 1-55 al_format.txt File -- Section Used to Format Database Dates



```
*****************************************************
* DATABASE DATE FORMATS
*            Purpose: These formats are used to format the date and time when
*             logging alarms to the ALARMS database.
*            These tokens will not be recognized if they are used directly
*            in an alarm view format string.
* ACK/NORMAL DATABASE TIME FORMAT
* (controls format of Ack and Return-to-Normal Alarm Times in ALARM database)
LOGTIME year/mo/dy hr:mi:sc
*
* INITIAL DATABASE TIME FORMAT
* (controls format of Initial Alarm Time in ALARM database)
LOGHSTIME year/mo/dy hr:mi:sc.mse
```

For detailed information about using the Database Browser and other database severs, refer to the Database Browser chapter in this guide.

PROPERTIES, METHODS, AND EVENTS

There are unique properties, method and events to interface with the alarm ActiveX control. To enable using these items their definitions have been provided.

Properties

Properties are used according to these examples:

- To assign an alarm property use this format:
  AlarmViewerName.MyProperty = newValue
- To obtain the value of the property use this format:
  theValue = AlarmViewerName.MyProperty

For the definitions of the alarm ActiveX control properties, refer to Table 1-27.

Table 1-27 Alarm ActiveX Control Properties (Sheet 1 of 2)

Property Name	Property Type	Description	Edit able
BrowserSize	boolean	Set/get (in % of the Alarm ActiveX Window) the size of the Group Browser	Y
AllowBrowserResize	boolean	Set/get if the Group Browser can be Resized or not	N
ItemsNumber	short	Get the number of items displayed in the Alarm Band	N
BandSelected	boolean	Get if the Band is selected	N
SortingDirection	short	Set/get the default sorting direction (0 is up or 1 is down)	Y
AllowSortDirectionChanged	boolean	Set/get if the user can change the default direction of sorting	N
AllowSorting	boolean	Set/get if the user can sort the columns	N
ClusterName	BSTR	Get/set the cluster name where the control can connect to the servers	Y
PrinterName	BSTR	Get/set the printer name (UNC)	Y
Header	boolean	Get/set if the header of the list is visible	N
UpdateRate	short	Get/set the pool frequency of update	Y

Table 1-27 Alarm ActiveX Control Properties (Sheet 2 of 2)

Property Name	Property Type	Description	Edit able
WatchingCycle	short	Get/set the frequency of the heartbeat	Y
MultiSelection	boolean	Get/set the multiselection	Y
EditFormat	BSTR	Get/set the Date format	Y
ListFieldCount	short	Get the number of fields in the list	N
ListLineCount	short	Get the number of items displayable in RT	N
ListItemCount	short	Get the number of items displayed	N
ListSelectionCount	short	Get the number of items selected in the multiselection DialogBox	N
HorizontalScroll	boolean	Get/set if the horizontal scroll bar is visible	Y
VerticalScroll	boolean	Get/set if the vertical scroll bar is visible	Y

Methods

Unique methods are provided to manipulate the options of the Alarm ActiveX control (see Table 1-28).

Table 1-28 Methods Used with the Alarm ActiveX Control (Sheet 1 of 4)

Method Name	Arguments		Method Return Type	Description
ResetFilters			boolean	Method that clears all filters currently being exercised by the control. Returns true if succeeded, false otherwise.
	short	listType		listType must always equal 1
ApplyFilters			boolean	Method that applies the filters set using SetStringFilters method. This is the equivalent of pressing the Apply button on the set filter dialog box. Returns true if succeeded, false otherwise.
	short	listType		listType must always equal 1
SetStringFilter			boolean	Method that sets the filter criteria. This is the equivalent of setting it in the filter dialog box. Returns true if succeeded, false otherwise.
	short	listType		listType must always equal 1
	BSTR	propName		Property name used as filter key (Group Name, Area, Status, or Priority)
	BSTR	filterString		Filter string to be applied. Ensure that there is a space between ’=’ and the value.
SetNumFilter			boolean	Not available at this time.
	short	listType		
	BSTR	propName		
	long	filterNum		

Table 1-28 Methods Used with the Alarm ActiveX Control (Sheet 2 of 4)

Method Name	Arguments		Method Return Type	Description
SetNumMinMaxFilter			boolean	Not available at this time.
	short	listType		
	BSTR	propName		
	long	long min		
	long	long max		
SetGroups			boolean	Method that filters using a specified group name. This is equivalent to checking the group in the group browser at run time. Returns true if succeeded, false otherwise.
	BSTR	groupNames		Name of the group to use to filter
ServerPrint			boolean	The method will request the server to print the entire active alarm list. Returns true if succeeded, false otherwise.
	short	listType		listType must always equal 1
SetSorting			boolean	This method sorts in the given direction by the given property name. Returns true if succeeded, false otherwise
	short	listType		listType must always equal 1
	BSTR	propName		the name of the property you wish to sort by
	boolean	upDirection		is true for sorting up, false for sorting down
AckGroup	None		boolean	Not available at this time.
AckPage	None		boolean	The method acknowledges all alarms displayed in the list. Returns true if succeeded, false otherwise

Table 1-28 Methods Used with the Alarm ActiveX Control (Sheet 3 of 4)

Method Name	Arguments		Method Return Type	Description
AckSelection	None		boolean	Method that acknowledges all alarms currently selected. Returns true if succeeded, false otherwise.
ListFieldNames			BSTR	Method that returns the name of the field at location specified by the index below
	short	Index		Index value (0-based) of the field name in the alarm list you want to retrieve
ListFieldIDs			long	Gets the DispID of the field at the index below
	short	Index		Index value (0-based) of the field name in the alarm list you want to retrieve
ListCellData			BSTR	Method that returns the data out of the cell indexed by these two values in the alarm parameters list
	short	lineIndex		Line number of the cell from which you want the data
	short	fieldIndex		Field index value of the field of the cell you want the data from
ListSelectionCellData			BSTR	Method that returns data from the cell indexed by the following two values in the multi-select dialog box
	short	lineIndex		Line number of the cell from which you want the data
	short	fieldIndex		Field index value of the cell field from which you want to retrieve data
ScrollListLineDown	None		void	Scrolls down by one line
ScrollListLineUp	None		void	Scrolls down by one line
ScrollListPageDown	None		void	Scrolls down by one page

Table 1-28 Methods Used with the Alarm ActiveX Control (Sheet 4 of 4)

Method Name	Arguments		Method Return Type	Description
ScrollListPageUp	None		void	Scrolls up by one page
SetLocale			boolean	Not available at this time.
	short	LocaleID		
AboutBox	None		void	Displays an about box

Events

The alarm control sends two events to the container:

void AlarmViewerStart(): to notify the container that the Alarm Control is started
void AlarmViewerStop(): to notify the container that the Alarm Control is stopped

ERROR MESSAGES

If the Distributed Alarm Logger task encounters any problems during run time, an error message is written to a log file located in the directory:

{FLAPP}/{FLNAME}/{FLDOMAIN}/log

This section lists all messages that can occur during the Distributed Alarm Logger task run time, describes their causes, and provides corrective actions.

Alarm Logging Messages

Deadband tag has a different type at Unique Alarm ID number

Cause: Alarm tag and limit tag are different types.

Action: Correct the type of the alarm tag or limit tag. They must agree.

Duplicate Unique Alarm ID *number* used in CT file

Cause: The program detected a duplicate Alarm ID number in the software. This check is only performed when a -d or -l parameter is specified in the program arguments.

Action: Remove the duplicate from the Alarm Logging definition.

Error (%d) on set change flag

Cause: An internal call to set a change flag on a tag has failed.

Action: Report the error to Customer Support.

Empty CT file...

Cause: No tables are found in the CT file.

Action: The configuration is probably invalid. Fill in the information and define an alarm.

Error locating a child with Unique Alarm ID *number*

Cause: The program is not able to find an Alarm ID number used to define a child. This normally means a corrupted CT file.

Action: Run ctgen -r.

Error locating a parent *Unique Alarm ID* for alarm *’tag name*’

Cause: The program is not able to find an Alarm ID number used to define a parent.

Action: Correct the Parent Alarm ID number for the listed child.

Error locating group ‘%s’

Cause: The Alarm Logging task failed while reading CT files.

Action: Ensure the application is restored properly and converted (if necessary). Report the error to Customer Support.

Error on change read

Cause: The kernel returned an error when reading a message from a mailbox.

Action: Check the CT files or run ctgen -r.

Error reading *type* tag

Cause: The kernel returned an error while reading a tag.

Action: Check the CT files or run ctgen -r.

Error reading CT index

Cause: An error occurred while reading the CT index.

Action: Run ctgen -r and check the al_log.ctg file for corruption.

Error reading from CT *table* table

Cause: An error occurred on reading the CT record.

Action: Run ctgen -r and check the al_log.ctg file for corruption.

Error retrieving message from *type* mailbox

Cause: The kernel returned an error upon retrieving a message from a mailbox.

Action: Check the CT files or run ctgen -r.

LAN send Mailbox is not empty. Please check FLLAN.

Cause: The FLLAN task did not read messages from the mailbox.

Action: Check the Run-Time Manager screen to ensure that FLLANSND and FLLANRCV are running.

Limit tag has a different type at Unique Alarm ID *number*

Cause: Alarm tag and limit tag are different types.

Action: Correct the type of the alarm tag or limit tag. They must agree.

More *object* than configured!

Cause: More Alarms, Children, or Logbook entries exist than the number specified in the Distributed Alarm Logger Setup table.

Action: Increase maximum active alarms in general set up control for al_log.

No CT file found...

Cause: The al_log.ct file was not present.

Action: Check the tables for the domain selection and the ctlist file for typing errors.

No database information for logging...

Cause: Logging is requested for *xxx* group, but no set up information is entered.

Action: Fill out the Alarm Archive Control table.

No Setup information specified

Cause: Parts of the Distributed Alarm Logger Setup table, which are necessary for startup to occur, are not configured.

Action: Complete the general set up.

Not enough memory

Cause: The software was not able to allocate sufficient memory to load all data into memory.

Action: You have insufficient memory in your system and must add more memory in order for the program to run.

No valid printer device on ’Print Active List’

Cause: The software is not able to print the active alarm list because no valid device was entered in the Distributed Alarm Logger Setup table.

Action: Verify printer device is defined in printer spooler. Consult the printer troubleshooting manual if trouble persists.

Programming Error *number.* Contact Customer Support!

Cause: This error should not occur.

Action: Contact Customer Support and report the error code.

Received less bytes than expected

Cause: The FLLAN task is not able to transmit the entire message.

Action: Increase the MAXLEN parameter in the local group file.

Sequence error in receiving %s from node %d

Cause: The Alarm Logging task received an inappropriate message.

Action: Ensure the physical network connections are correct. Report the error to Customer Support.

Severe error: No memory available for *action*

Cause: The software is not able to allocate sufficient memory during run time.

Action: You have insufficient memory in your system and must add more in order for the program to run.

SQL Error *number, 'message'*

Cause: Historian returned an error and message on an action from the Distributed Alarm Logger task.

Action: Refer to the Historian part on the error codes.

Timer task is not running!

Cause: The Timer task was not running before the Logging task was started. All internal time-stampings are retrieved from the Timer.

Action: Start the Timer task or, if it is already running, change the sequence to ensure the Timer starts before Alarm Logging.

Unable to insert DTP handler for %s tag

Cause: An internal tag processing call failed.

Action: Report the error to Customer Support.

Unable to open file for active list

Cause: The software is not able to open and write to the file called {FLAPP}/alarms.txt. It is possible the file already exists and is opened by another application or you have insufficient rights to open the file.

Action: May not have sufficient rights or enough disk space. Run a CHKDSK command to ensure enough disk space is available.

Unable to open Persistence file '%s'

Cause: The Alarm Logging task is unable to open the alarm persistence file to save data.

Action: Check the drive the application is on to ensure enough space is available. Ensure information can be written to the drive. If disk space is low, make space available.

Unable to restore Persistent Alarms

Cause: The Alarm Logging task is unable to open the alarm persistence file or its backup.

Action: Check the drive the application is on to ensure enough space is available. Ensure information can be written to the drive. If disk space is low, make space available.

Unable to write to Persistence file '%s'

Cause: The Alarm Logging task is unable to write record(s) to the opened alarm persistence file.

Action: Check the drive the application is on to ensure enough space is available. Ensure information can be written to the drive. If disk space is low, make space available.

Warning: More than one line of *table* information

Cause: On tables where only one line is read, more lines are detected. The program will continue but could work on the wrong parameters.

Action: Remove the additional lines.

AlarmViewer Messages

CT file *ctname* not found

Cause: The al_view.ct file was not present.

Action: Check the tables for the domain selection and the ctlist file for typing errors.

Dimensions of array too short, view window *number*

Cause: The array dimensions and the number of lines do not match. The array is too small.

Action: Correct the number of lines or redefine the array.

Duplicate Unique Alarm ID *number* used in CT file

Cause: The program detected a duplicate Alarm ID number in the software. This check is only performed when a -d or -l parameter is specified in the program arguments.

Action: Remove the duplicate Alarm ID.

Error clearing chg flag *type error*

Cause: The kernel returned an error while clearing a change flag.

Action: Check CT files or run ctgen -r.

Empty CT file table *’ctname’*

Cause: No tables are found in the CT file.

Action: Check Alarm Logging set up for table names.

Error *error* on change read

Cause: The kernel returned an error while reading a changed tag.

Action: Check CT files or run ctgen -r.

Error *operation* on *operation* mbx *number*

Cause: The kernel returned an error on a mailbox operation.

Action: Check the CT files or run ctgen -r.

Error reading CT index...

Cause: An error occurred on reading the CT index.

Action: Run ctgen -r and check the al_view.ctg file for corruption.

Error reading from CT file.

Cause: An error occurred on reading the CT record.

Action: Run ctgen -r and check the al_view.ctg file for corruption.

Error reading type *tag error*

Cause: The kernel returned an error while reading a tag.

Action: Check CT files or run ctgen -r.

Error writing type *tag error*

Cause: The kernel returned an error while writing a tag.

Action: Check CT files or run ctgen -r.

Method data for filtering does not exist

Cause: The user-defined data does not match any of the available alarms or groups.

Action: You are trying to filter or sort a group that is not present. Adjust your sort method.

No Setup information specified

Cause: Parts of the AlarmViewer table necessary to operate are not configured.

Action: Complete the parts of the AlarmViewer table.

Not enough memory

Cause: The software is not able to allocate sufficient memory to load all data into memory.

Action: Your system has insufficient memory to run the program. Add more memory.

Severe error, no memory available for *action*

Cause: The software is not able to allocate sufficient memory during run time.

Action: Add more memory.

Unable to load key file

Cause: One of the key files used for translation is missing.

Action: Reinstall FactoryLink.

Unknown alarm group *group*

Cause: The program is not able to find the Alarm ID number used to define a child.

Action: Check to see if your CT file is corrupted.

Unknown CT type...

Cause: An unknown type of CT in the CT file is displayed.

Action: Run ctgen -r and check the al_view.ctg and al_info.ctg files for corruption.

Warning: More than one line of *table* information

Cause: On tables where only one line is read, more lines are detected. The program will continue but could work on the wrong parameters.

Action: Remove the additional lines.

Wrong mailbox message type received *number*

Cause: This error should not occur.

Action: Contact Customer Support and report the error code.

Chapter 2 . . . .

Batch Recipe

The FactoryLink Batch Recipe task transfers sets of predefined values, sometimes called recipes, between binary disk files and selected elements and between the real-time database and an external device. In the real-time database, a batch recipe is a collection of elements grouped together for some purpose. These elements can contain internally-generated or operator-entered values.

This chapter covers the following topics:

- Principles of Operation
- Recipe Control Panel
- Recipe Information Panel
- Completing a Protocol Module Read/Write Table
- Sample Batch Recipe
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Principles of Operation

A batch recipe is a collection of elements in the real-time database grouped together for some purpose. These elements can contain internally-generated or operator-entered values.

You can perform the following functions with Batch Recipe:

- Define up to 8,000 different recipe templates, each associated with a virtually unlimited number of files
- Store batch recipes in disk files so the total number of different recipes stored on a system is limited only by available disk space
- Store each batch recipe file under a standard file name
- Specify up to 8,000 elements for one batch recipe template
- Use with any of the five FactoryLink data types: digital, analog, long analog, floating-point, and message

You can configure Batch Recipe for use in many diverse applications. For example, a program can use a graphic display for the entry of application values and write these values to an external device using the FactoryLink EDI task. Batch Recipe can save these element values in a recipe so the program can then read the values from the batch recipe file.

Sample applications that use a single batch recipe template include:

- Producing a particular line of paint. You can use multiple files using the same recipe template to set various hues or colors of the paint being produced.
- Setting up various external devices with different files for days of the week, end of the month, and other schedules.
- Setting up an environment for a testing procedure with various files to establish different sets of testing parameters.

You can use batch recipes in conjunction any FactoryLink task because each FactoryLink task communicates with other tasks through the real-time database.

Batch Recipe executes as a background task. The task does not require operator intervention at run time unless you design the application to require it.

You can configure Batch Recipe to be triggered by events, timers, or operator commands, such as:

- An external device read operation
- A Math & Logic calculation, either Interpreted or Compiled
- An activity from another station on a network
- Input from the operator using a keyboard or pointing device

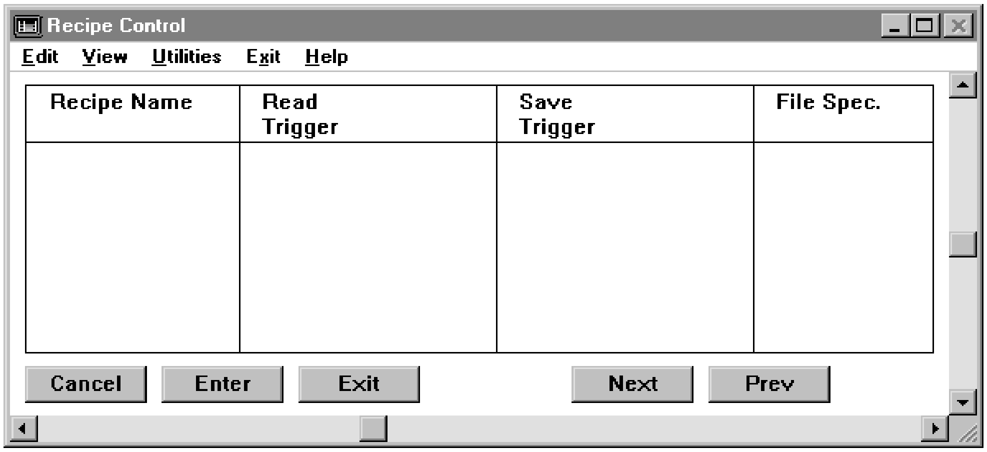
Monitor the Run-Time Manager screen to determine the status of Batch Recipe at run time.

When performing a platform-dependent FLSAVE, FactoryLink saves recipe files; however, when performing a platform-independent or multiplatform FLSAVE, FactoryLink does not save recipe files.

Recipe Control Panel

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Double-click Recipe on the Configuration Manager Main Menu to display the Recipe Control panel. Specify element names for the recipe template name and read and save triggers you defined in the Application Editor.



Recipe Name	Read Trigger	Save Trigger	File Spec.

Specify the following information for this panel:

Recipe Name
Alphanumeric string of 1 to 16 characters that specifies the unique name of the recipe template to be defined or modified. Use the Search option from the View menu to display the recipe to see the existing recipe template.

Valid Entry: alphanumeric string of up to 16 characters

Read Trigger
Name of an element that initiates a read operation. When Recipe detects this element has been forced to 1 (ON), the task reads the binary values from the disk file specified in the File Spec. and File Spec. Variable fields and transfers them to the elements specified in the Recipe Information panel.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined with a tag type of digital in the Type field. Accept this default.

Valid Entry: standard tag name
Valid Data Type: digital, analog, longana, float, message

Save Trigger

Name of a digital element that initiates a write operation. When the value of this element changes to 1 (ON), Recipe collects the current values of the elements specified in the Recipe Information panel and writes them to the binary disk file specified in the File Spec. and File Spec. Variable fields.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

File Spec.

Variable specifier that uses the value of the File Spec. Variable element as the variable.

Sample Path—if you specify the Path File Name DISK:/RECIPE/PAINT%03d.RCP, and define the File Spec. Variable element as an analog data type, value 23, the system generates the following filename:

```
DISK:/recipe/paint023.rcp
```

Because the default path is /FLAPP/FLNAME/FLDOMAIN/FLUSER/RCP, the File Spec. of PAINT/%s.RCP and the File Spec. Variable containing a message data type value of red generate the following filename:

```
/FLAPP/FLNAME/FLDOMAIN/FLUSER/rcp/paint/red.rcp
```

If the File Spec. Variable is absent, the filename is generated from the File Spec. and/or the default path name (/FLAPP/FLNAME/FLDOMAIN/FLUSER/RCP). If the File Spec. is absent, it defaults to %s,%d,%1d, or %-8.3f as appropriate for the File Spec. Variable data type.

File Spec. Variable

Name of an element whose value is used with the entry in the File Spec. field to form the file/path name for a binary disk file that contains a specific recipe.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined with a tag type of digital, analog, longana, float, or message in the Type field. Accept this default.

Valid Entry:	standard tag name

Max. Msg. Length

Enter a number between 1 and 255 that specifies the maximum number of characters in a message.

Valid Entry: numeric value of up to 255

Forced Write

Indicator of whether all change-status flags are to be set to 1 (ON) when a read operation occurs. Because of this option Batch Recipe can set change-status flags in a read operation for all elements specified in a recipe rather than only for those elements whose values have changed since the last read operation. This can be one of the following:

YES	Sets change-status flags for all elements in a read operation.
NO	Causes change-status flags to be set only for elements whose values have changed since the last read operation. This is the default.

Completion Trigger

Name of an element whose value is forced to 1 (ON) by the Recipe task when a read or write operation is completed. The value of the Completion Trigger element is 0 (OFF) when the program begins loading a new Batch Recipe file from the specified drive to the real-time database, and is 1 (ON) (becomes a 1 and has its change-status flag set to 1) when the file finishes loading. Completion Triggers are used in multiple operations.

For example, the Completion Trigger can initiate a write of a recipe to an external device or it can initiate a message to the operator on a graphics screen stating an operation has been performed. The Math & Logic task can check the trigger to determine successful reading or writing of the recipe.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined with a tag type of digital in the Type field. Accept this default.

Valid Entry: standard tag name

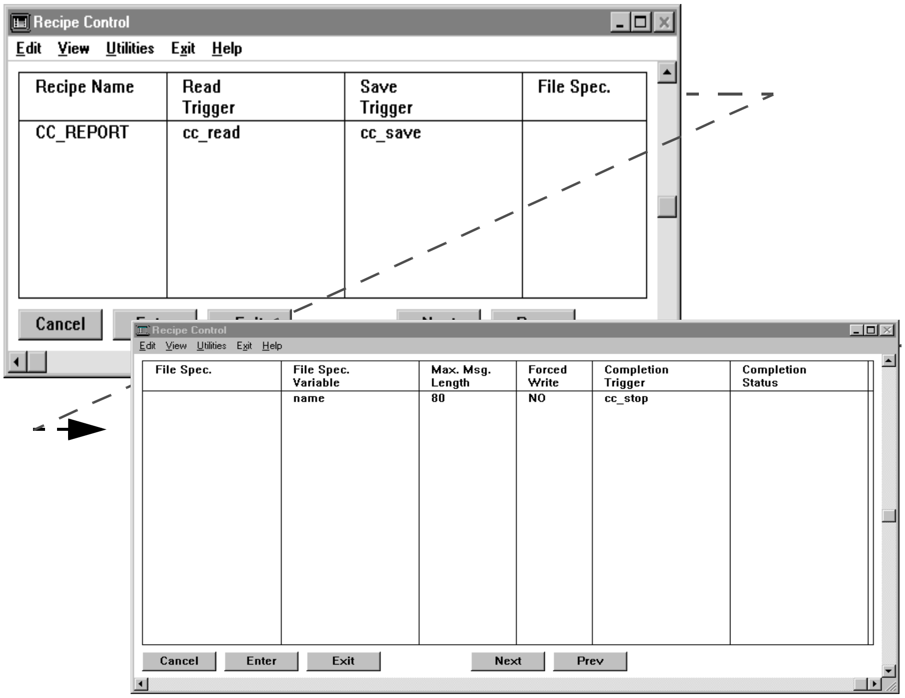
Completion Status

Name of an element set to 0 (OFF) when the last recipe read or write is completed without an error or set to 1 (ON) when the last recipe read or write is completed with an error.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital or analog in the Type field. Accept this default.

Valid Entry: standard tag name

The panel resembles the following one when the information is complete.



Recipe Name	Read Trigger	Save Trigger	File Spec.
CC_REPORT	cc_read	cc_save	

File Spec.	File Spec. Variable	Max. Msg. Length	Forced Write	Completion Trigger	Completion Status
	name	80	NO	cc_stop	

In this example, the recipe template CC_REPORT contains information for producing a report. Write operations are normal because the entry in the Forced Write field is NO; change-status flags are set only for elements whose values changed since the last write.

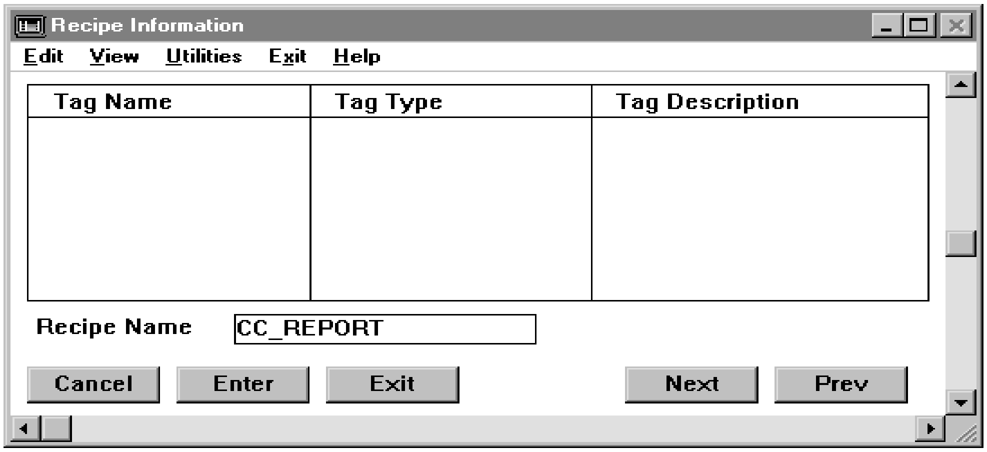
Message elements associated with this recipe template can contain messages of up to 80 characters. The path format defaults to the appropriate format for the data type of rname because no File Spec. is specified.

When the value of cc_write changes to 1 (ON), Batch Recipe collects the values of the elements specified in the Recipe Information panel and writes them to the binary disk file specified by the combination indicated by rname and the File Spec. field. When the value of cc_read changes to 1 (ON), Batch Recipe reads the binary values from this file and transfers them to the elements specified in the Recipe Information panel. The value of cc_stop is changed to 1 (ON) when a write operation is complete.

Recipe Information Panel

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Double-click Recipe on the Main Menu to display the Recipe Information panel. Specify element names for the recipe template name and read and save triggers you defined in the Application Editor.



Tag Name	Tag Type	Tag Description

Recipe Name: CC_REPORT

Specify the following information for this panel:

Tag Name

Name of each element to be read or written.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined with a tag type of digital, analog, longana, float, or message in the Type field. Accept this default.

Valid Entry: standard tag name

Tag Type

Data type of the element specified in the Tag Name field. The data type is displayed automatically after you select a data type from the Tag Definition dialog and click Enter.

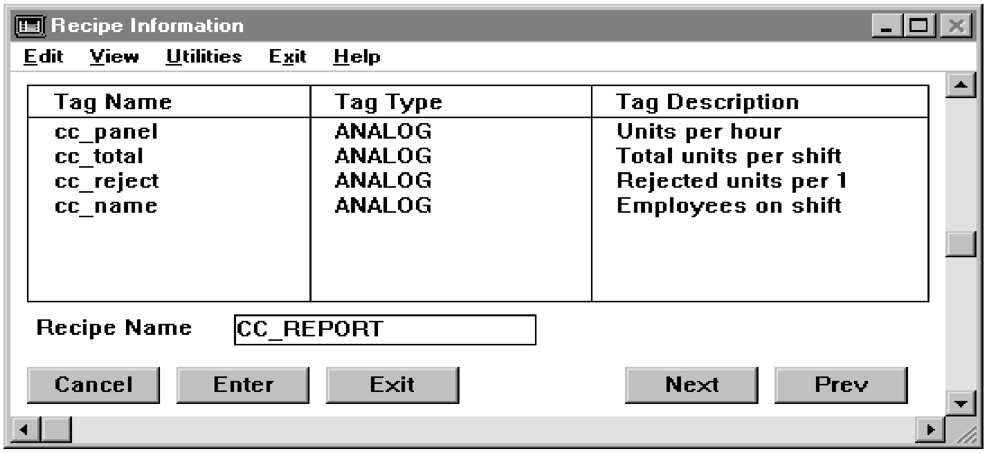
Valid Entry: data type

Tag Description

Description of the element specified in the Tag Name field. The description is displayed automatically if you enter a description in the Tag Definition dialog and click Enter.

Valid Entry: element description

The panel resembles the following when complete.



Tag Name	Tag Type	Tag Description
cc_panel	ANALOG	Units per hour
cc_total	ANALOG	Total units per shift
cc_reject	ANALOG	Rejected units per 1
cc_name	ANALOG	Employees on shift

Recipe Name CC_REPORT

The elements cc_unit, cc_total, cc_reject, and cc_name contain information about a process. Batch Recipe includes this information in the report identified by the recipe template CC_REPORT.

Completing a Protocol Module Read/Write Table

Complete a protocol module Read/Write table to link the input values of the recipe to the registers in the external device if you want the operator to be able to change the settings in an external device.

Sample Batch Recipe

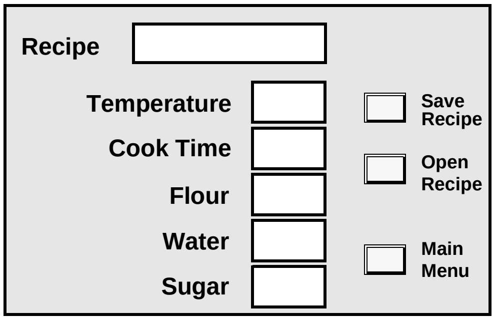
This section demonstrates how to configure Batch Recipe for the production of cookies and cereal after the application is complete. You create a recipe at run time by entering values for temperature, cook time, flour, water, and sugar on a graphics display on the computer. Batch Recipe accesses these values for communication to an external device that controls production. You can also create other recipes from the same recipe template.

Perform the following steps to configure this sample recipe template:

1. Draw and animate a graphics display.
2. Configure a batch recipe template.
3. Link recipe input values to an external device.

Drawing and Animating a Graphics Display

Draw and animate a display called RECIPE using the Application Editor.



You create a recipe the first time you open this display by entering a Recipe name and entering values for Temperature, Cook Time, Flour, Water, and Sugar. To save the recipe to a binary disk file, the operator clicks Save Recipe. When you click Save Recipe, Batch Recipe:

- Writes the values you just entered to the elements cc_temp, cc_cook_time, cc_flour, cc_water, and cc_sugar you defined in the Recipe Information panel when you configured the task.
- Creates a recipe file (with a .RCP extension) and writes the values of these elements in binary form to this file.

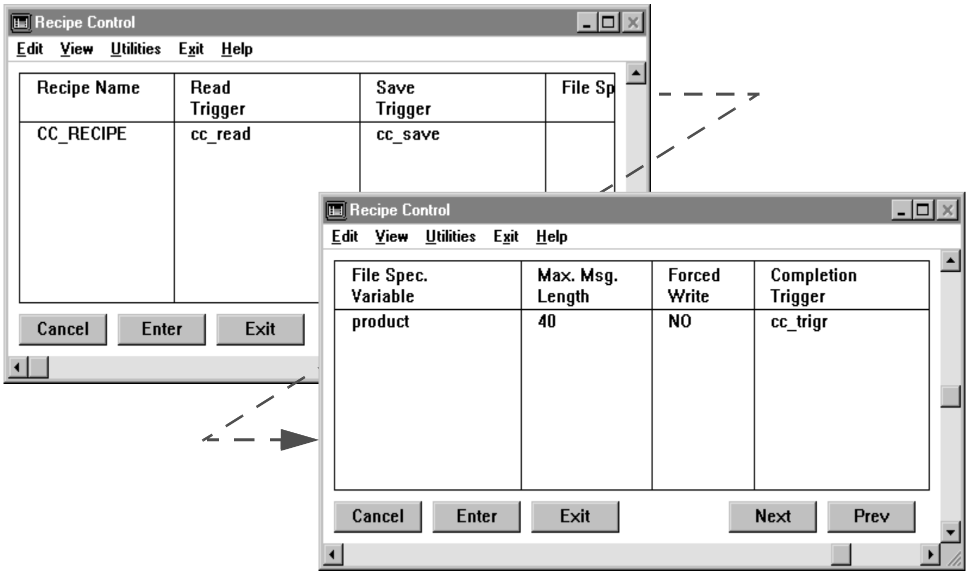
When you wish to retrieve the recipe later for display on the screen, open the RECIPE display, type the recipe name, and click Open Recipe. Batch Recipe collects the binary values from the disk file, writes them to the elements, and the Graphics task displays them on the screen.

Configuring a Batch Recipe Template

Next, you configure a batch recipe template to create multiple batch recipes without completing a new recipe table for each recipe. In this sample application, the template creates a new recipe and opens an existing one.

Perform the following steps to complete the Recipe panel:

1 Choose Recipe from the Main Menu to display the Recipe Control panel.

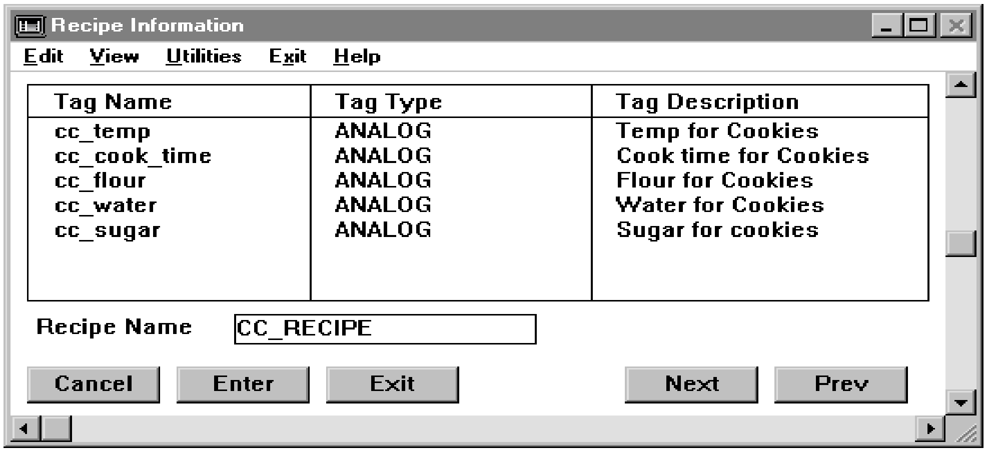


Recipe Name	Read Trigger	Save Trigger	File Sp
CC_RECIPE	cc_read	cc_save	

File Spec. Variable	Max. Msg. Length	Forced Write	Completion Trigger
product	40	NO	cc_trigr

Perform the following steps to define an element for the Completion Status:

1 Click Enter to save the information when the Recipe Control panel is complete; then, click Next to open the Recipe Information panel.



Tag Name	Tag Type	Tag Description
cc_temp	ANALOG	Temp for Cookies
cc_cook_time	ANALOG	Cook time for Cookies
cc_flour	ANALOG	Flour for Cookies
cc_water	ANALOG	Water for Cookies
cc_sugar	ANALOG	Sugar for cookies

Recipe Name CC_RECIPE

The entries in this panel specify the elements (cc_temp, cc_cook_time, cc_flour, cc_water, and cc_sugar) whose values you enter on the RECIPE display at run time.

2 Click Enter to save the information.

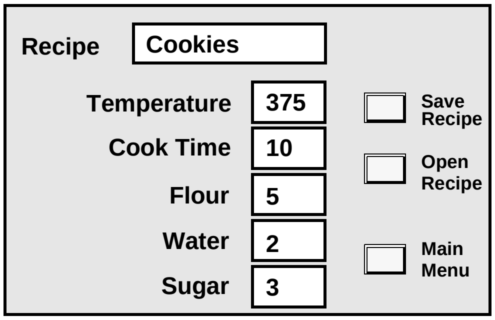
3 Click Exit to return to the Main Menu.

Perform the following steps using this template to create new batch recipes at run time:

1 Select the RECIPE display.

2 Type the name of the recipe, Cookies, in the Recipe field.

3 Type the following values for Temperature, Cook Time, Flour, Water, and Sugar. Click Enter after each entry to write the values to the associated elements.



Recipe: Cookies

Temperature: 375

Cook Time: 10

Flour: 5

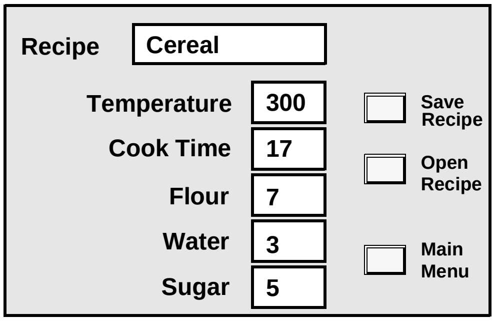
Water: 2

Sugar: 3

4 Click Save Recipe to write these values to the elements specified and store the recipe under the file name you entered in the Recipe Name field.

5 Type Cookies in the Recipe Name field and click Open Recipe to recall the recipe for cookies. Batch Recipe reads the values for each of the variables from the binary disk file, deposits them in the real-time database, and displays them on the screen.

6 Create a recipe for making cereal. Type Cereal in the Recipe Name field and enter the following values for each variable.



Recipe: Cereal

Temperature: 300

Cook Time: 17

Flour: 7

Water: 3

Sugar: 5

7 Click Save Recipe. Batch Recipe writes the values for the cereal recipe to the specified elements in the real-time database and stores them on disk in the binary file named CEREAL.RCP.

Linking Recipe Input Values to an External Device

You must link the values to registers in the external device if you want the input values of the recipes to change the settings in an external device; otherwise, the external device cannot change and monitor the settings necessary to go from producing cookies to producing cereal, and vice versa.

Perform the following steps to link recipe input values to an external device:

1 Complete a protocol module Read/Write table for the external device to link the recipe input values to the appropriate external device. This table is a generic protocol module read/write table. The element cc_trigr specified for the Completion Trigger in the Recipe Control panel triggers the write to the external devices. For information about specific read/write configuration tables, refer to the *FactoryLink ECS Device Interface Guide*.

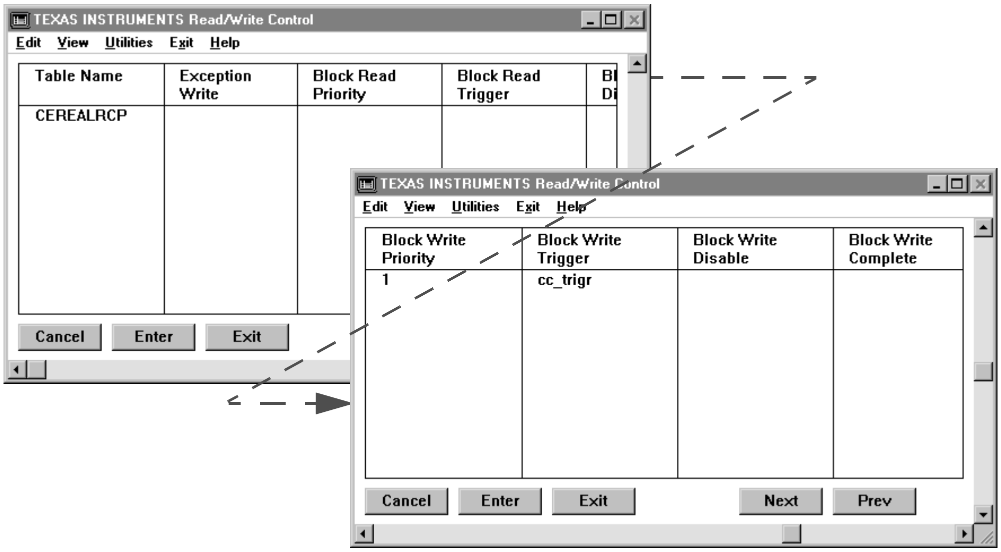

TEXAS INSTRUMENTS Read/Write Control
Edit View Utilities Exit Help
Cancel
Enter
Exit
TEXAS INSTRUMENTS Read/Write Control
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

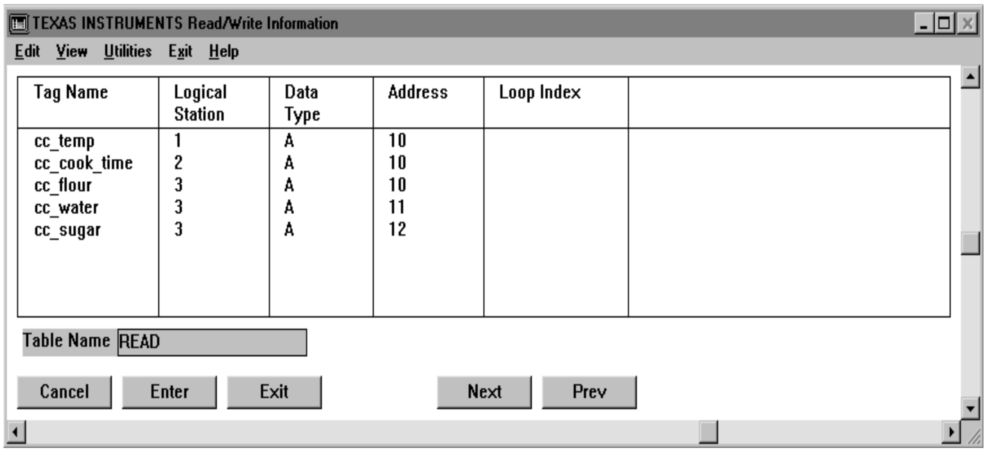
Table Name	Exception Write	Block Read Priority	Block Read Trigger	Bl Di
CEREALRCP				

Block Write Priority	Block Write Trigger	Block Write Disable	Block Write Complete
1	cc_trigr		

2 Click Enter to save the information.

3 Click Next to open and complete the Read/Write Information panel.

The following Read/Write Information panel indicates this application uses three external devices:


TEXAS INSTRUMENTS Read/Write Information
Edit View Utilities Exit Help
Cancel Enter Exit Next Prev

Tag Name	Logical Station	Data Type	Address	Loop Index	
cc_temp	1	A	10		
cc_cook_time	2	A	10		
cc_flour	3	A	10		
cc_water	3	A	11		
cc_sugar	3	A	12		

Table Name READ

BATCH RECIPE ERROR MESSAGES

The following status and error messages can occur during Batch Recipe run time. Causes and corrective actions are listed for each error message.

Can't create recipe file *recipe filename*

Cause: The file name or pathname may be invalid or the disk may be full.

Action: Specify the Path File Name correctly. If the Path File Name is correct, ensure the directory exists. Run CHKDSK, fsck, ANALYZE, or any disk diagnostic program to determine whether the disk is full. Delete unnecessary files if the disk is full or nearly full.

Can't find recipe *recipe filename*

Cause: The task cannot locate the specified recipe file.

Action: Either the recipe file does not exist or the name of the file was entered incorrectly.

Error reading CT header

Cause: Either the file /CT/RECIPE.CT is corrupt or the .CT script file (/FLINK/CTG/RECIPE.CTG) and the FactoryLink Run-Time version are not the same version.

Action: Delete the file /FLAPP/CT/RECIPE.CT. Restart the application to rebuild the file, or execute CTGEN RECIPE.CT -V3.

In Windows NT and Windows 95, choose Start>Run and type CTGEN -ac:\FLAPP RECIPE.CT -V3 at the command line. This sets the FLAPP and executes CTGEN.

Error reading CT index

Cause: The file /CT/RECIPE.CT has been damaged.

Action: Delete the file /FLAPP/CT/RECIPE.CT. Restart the application to rebuild the file, or execute CTGEN RECIPE.CT -V3.

In Windows NT and Windows 95, choose Start>Run and type CTGEN -ac:\FLAPP RECIPE.CT -V3 at the command line. This sets the FLAPP and executes CTGEN.

Error reading CT record

Cause: Either the file /CT/RECIPE.CT is corrupt, or the .CT script file (/FLINK/CTG/RECIPE.CTG) and the FactoryLink Run-Time version are not the same version.

Action: Delete the file /FLAPP/CT/RECIPE.CT. Restart the application to rebuild the file, or execute CTGEN RECIPE.CT -V3.

In Windows NT and Windows 95, choose Start>Run and type CTGEN -ac:\FLAPP RECIPE.CT -V3 at the command line. This sets the FLAPP and executes CTGEN.

Error reading recipe *filename*

Cause: Either the file is corrupt or the disk is damaged.

Action: Inspect the file and

In Windows NT and Windows 95, run the disk diagnostic program CHKDSK to determine if the disk is corrupt. If it is, recreate the file from scratch or from the backup disk or tape.

If the corruption is not on the root drive, inform your system administrator of the corruption as fsck will not be able to repair it.

Error writing recipe *filename*

Cause: The specified device is either full or corrupt.

Action: Run CHKDSK, fsck, ANALYZE, or any disk diagnostic program to determine whether the disk is full. Delete unnecessary files if the disk is full or almost full.

Invalid CT header size

Cause: Either the file /CT/RECIPE.CT is corrupt or the .CT script file (/FLINK/CTG/RECIPE.CTG) and the FactoryLink Run-Time version are not the same version.

Action: Delete the file /FLAPP/CT/RECIPE.CT. Restart the application to rebuild the file, or execute CTGEN RECIPE.CT -V3.

In Windows NT and Windows 95, choose Start>Run and type CTGEN

-ac:\FLAPP RECIPE.CT -V3 at the command line. This sets the FLAPP and executes CTGEN.

Invalid CT record size

Cause: Either the file /CT/RECIPE.CT is corrupt, or the .CT script file (/FLINK/CTG/RECIPE.CTG) and the FactoryLink Run-Time Manager are not the same version.

Action: Delete the file /FLAPP/CT/RECIPE.CT. Restart the application to rebuild the file, or execute CTGEN RECIPE.CT -V3.

In Windows NT and Windows 95, choose Start>Run and type CTGEN -ac:\FLAPP RECIPE.CT -V3 at the command line. This sets the FLAPP and executes CTGEN.

Invalid tag

Cause: The program detects an invalid element or the element does not exist in the real-time database. Either data in the real-time database is corrupt or the Run-Time Manager was started without having run CTGEN.

Action: Run CTGEN.

No recipes defined

Cause: No recipes are defined in the Recipe Information panel.

Action: Define at least one recipe in the Recipe Information panel.

No tables configured for this task

Cause: Either you did not configure the Recipe Table or the following files could be missing or damaged:
- RECIPE.CDB database
- RECIPE.MDX database
- /FLAPP/CT/RECIPE.CT
- .CT script /FLINK/CTGEN/RECIPE.CTG
FLNEW or CTGEN may not have run correctly.

Action: Delete the .CT file. Run CTGEN and try again.

No triggers configured for this task

Cause: No read or write triggers are defined in the Recipe Table.

Action: Define read and write triggers in the Recipe Table.

Not enough RAM to load CTs

Cause: The task does not have enough RAM allocated to load the configuration tables.

Action: Shut down any unnecessary tasks. Increase the system RAM size if this does not help.

Recipe doesn’t match CT *filename*

Cause: The specified recipe file does not match the Recipe Configuration Table. The number of element names for each data type and the maximum string space may not match.

Action: Reenter the recipe file. If the file is correctly specified, inspect the recipe file in the configuration table.

Recipe is too big

Cause: The total elements in a recipe will not fit in a 10000-byte buffer.

Action: Create a smaller recipe, decrease the size of the message strings, or switch from longana to analog data type.

Task initialization failed

Cause: Either a key is not installed, the wrong key is installed, or you are not authorized to have the key.

Action: Ensure the proper key is installed if you are authorized to have the key.

Chapter 3

Browsing Databases

This chapter provides a review of the Database Browser function in FactoryLink 7.0. The Database Browser Control, an ActiveX® control, allows the operator to view, add, modify, and delete database records from any database with an OLE DB provider.

Database Browser lets an operator perform multiple operations in real time:

- Add, delete, or modify external database information from FactoryLink
- Send and retrieve data directly to and from all FactoryLink-supported external databases
- Define elements individually or in record sets
- Search the database using modified SQL commands

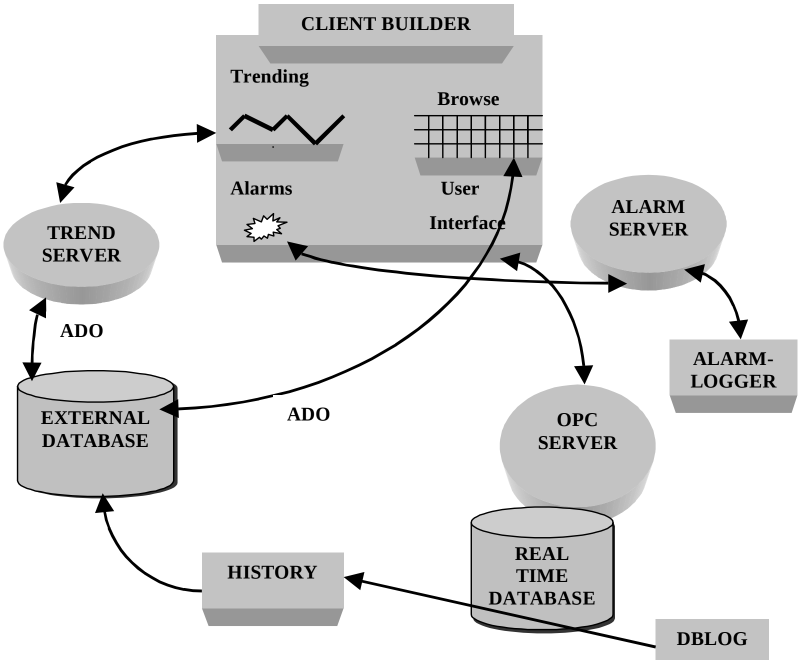
This chapter contains three sections:

- Browser Operating Principles"
- "Configuring the Database Browser Control Environment"
- "Run-Time Browsing"

Browser Operating Principles

The client area of the frame contains an ActiveX control grid that displays the database information. A diagram detailing FactoryLink controls is displayed as follows:

Figure 3-1 FactoryLink Controls



About ActiveX Controls

ActiveX is the name Microsoft has given to a set of strategic object-oriented program technologies and tools. The ActiveX environment creates a *component*, a self-sufficient program, that can be run anywhere in your ActiveX network.

Setting Up ActiveX Controls for the First Time

The ActiveX Controls Confirguration menu displays a list of installed ActiveX Controls available for selection. There are four default approved control settings that display on the list of approved ActiveX Controls:

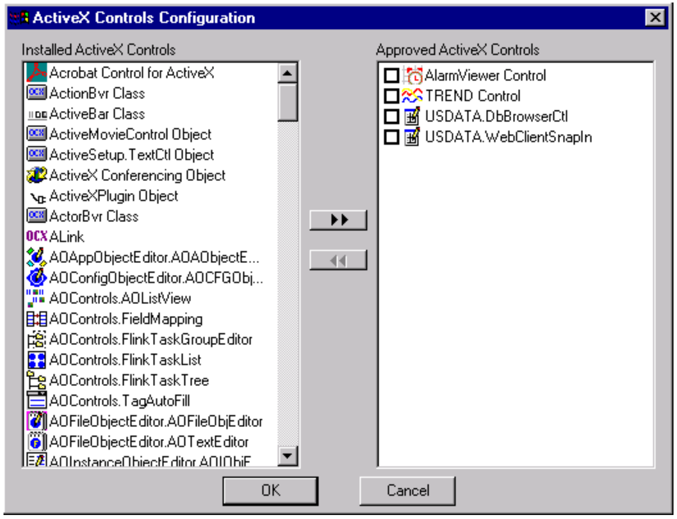
- AlarmViewer Control
- Trend Control
- USDATA.Database BrowserControl
- USDATA.WebClientSnapIn

To set up ActiveX controls for the first time within Database Browser, perform the following steps:

1. Choose your preference of controls by selecting Tools>Preferences>ActiveX Controls.

   The ActiveX Controls Configuration window displays as shown in Figure 3-2.

Figure 3-2 Active X Controls Configuration


ActiveX Controls Configuration
Installed ActiveX Controls
Acrobat Control for ActiveX
ActionBvr Class
ActiveBar Class
ActiveMovieControl Object
ActiveSetup.TextCtl Object
ActiveX Conferencing Object
ActiveXPlugin Object
ActorBvr Class
ALink
AOAppObjectEditor.AOAObjectE...
AOConfigObjectEditor.AOCFGObj...
AOControls.AOListView
AOControls.FieldMapping
AOControls.FlinkTaskGroupEditor
AOControls.FlinkTaskList
AOControls.FlinkTaskTree
AOControls.TagAutoFill
AOFileObjectEditor.AOFileObjEditor
AOFileObjectEditor.AOTextEditor
AOInstanceObjectEditor.AOIObjE
Approved ActiveX Controls
□ AlarmViewer Control
□ TREND Control
□ USDATA.DbBrowserCtl
□ USDATA.WebClientSnapIn
OK
Cancel

2. Select the controls from the Installed ActiveX Controls list displayed on the left. In this case, if it is not already displayed on the right, select USDATA.Database Browser Control. With the controls highlighted, click the >> symbol to move the controls to the Approved ActiveX Controls list on the right.
3. Insert a DataBaseBrowserCtl ActiveX control by selecting the ActiveX control icon and selecting the USDATA.Database Browser Control from the list of favorites.

For detailed operating instructions, see "Run-Time Browsing" in this chapter.

Configuring the Database Browser Control Environment

The primary interfaces within the Database Browser Control Environment are *projects*, *workspaces* and *mimics*.

A *project* is the file that contains all of the application screens created during a user session.

A *workspace* is the main drawing area that occupies most of the screen on the monitor. The workspace displays all the tools necessary to develop the application screens.

A *mimic* is the application screen, or window, that makes up the user interface. Mimics are created by ClientBuilder during the user session.

Within the Database Browser Control environment, a user opens a new or existing project and displays a mimic on the ClientBuilder workspace.

Design Mode and Run Mode

Design mode is the basic equivalent of a draft format of operation. In ClientBuilder design mode, the properties of a mimic's drawing element do not update in real time. Design mode is the mode of operation used when developing a mimic. In *run mode,* the animated properties of a mimic's drawing elements are updated in real time. In run mode, you cannot change a mimic's properties or any drawing element.

> **Note:** All configuration work within the Database Browser Control Environment must be done in *design mode*.

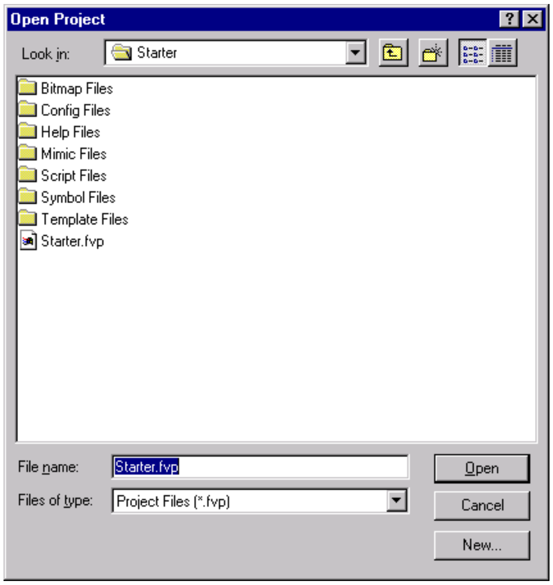
Opening a New Project

To open a new project within the Database Browser, perform the following steps:

1. Double-click the Client Builder desktop icon to open the application.

   The Open Project dialog box displays as shown in Figure 3-5.

Figure 3-3 pen Project Dialog Box

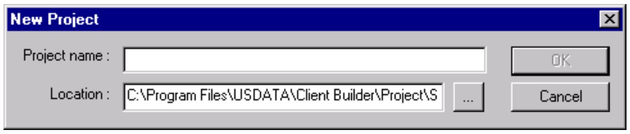


File name: Starter.fvp

Files of type: Project Files (*.fvp)

1. Click the New button. The New Project dialog box shown in Figure 3-4 displays.

Figure 3-4 New Project Dialog Box



Project name :

Location : C:\Program Files\USDATA\Client Builder\Project\S

2. Enter the new project name and click the OK button.

> **Note:** ClientBuilder automatically places the new file in the Projects subdirectory.

The ClientBuilder Project workspace opens.

3. Click on the File pulldown menu. Select New to create a new mimic or Open to select from a library of existing mimics.

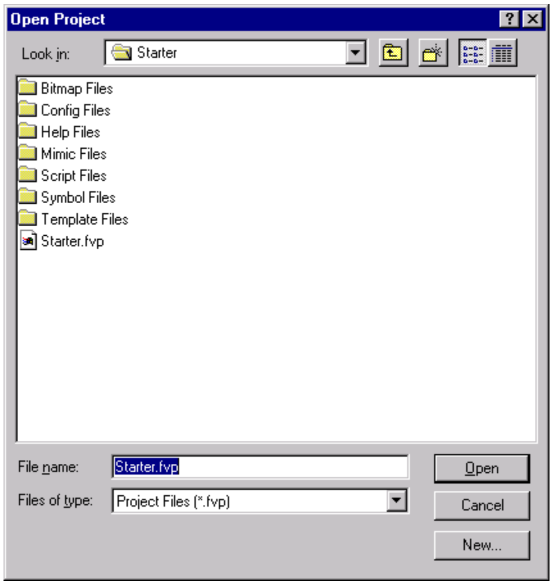
Opening an Existing Project

To open an existing project within from Client Builder, perform the following steps:

1. Double-click the Client Builder desktop icon to open the application.

   The Open Project dialog box displays as shown in Figure 3-5.

Figure 3-5 Open Project Dialog Box



Look in: Starter

File name: Starter.fvp

Files of type: Project Files (*.fvp)

Note: The default project, named Starter.fvp, appears in the File Name Field.

2. Click the Open button.

The FactoryLink Client Graphics window opens.

Opening Mimics

1. Open a mimic from the File menu. Select Open for an existing window or click the [...] button to browse the directories for an existing project (.fvp extension).

2. After selecting the file project, select OK.

3. Select USDATA Data Browser Control from the Insert pulldown menu.

   An empty browser grid displays. To expand the grid, select the corner, hold the mouse button down and drag to the desired size.

Configuring the USDATADbBrowseCtl Properties Window

To view and configure the Properties window, perform the following steps:

1. Right click anywhere in the browser grid, and select Properties from the pulldown menu.
2. Select a properties category by left clicking the desired tab.

The USDATADbBrowseCtl Properties window displays as shown in Figure 3-6 (with the General Properties tab selected). Each tab on the window displays configurable fields that define the data that will be retrieved at run time and format of the data presentation.

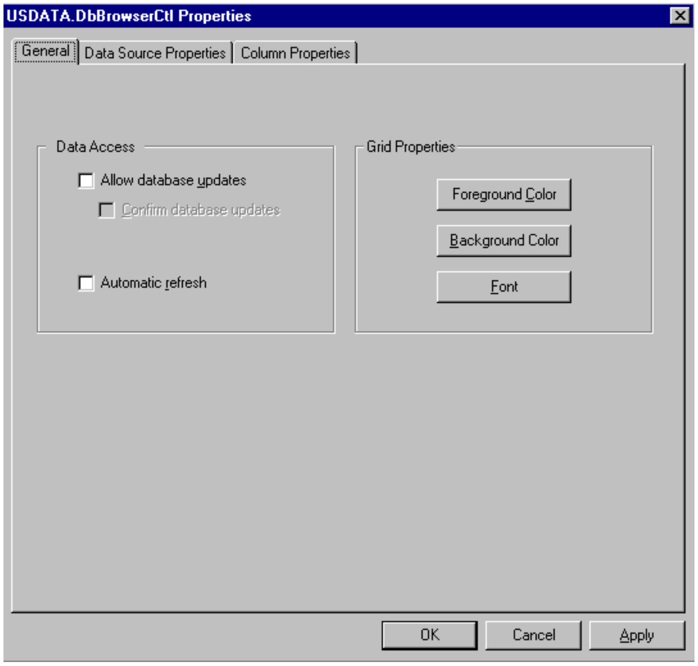
There are three tabs that display on the USDATA DbBrowserCtl Properties window:

- **General Properties.** Controls data access abilities, and grid appearance.
- **Data Source Properties.** Allows the user access to and configuration of the database and table browsed through the entry of a DSN.
- **Column Properties.** Allows the user to customize the appearance, availability, and content of column data.

The General Properties tab

The General Properties tab shown in Figure 3-6 displays two option areas: Data Access and Grid Properties.

Figure 3-6 USDATA DbBrowserCtl Properties window (General tab shown))



☐ Allow database updates

☐ Confirm database updates

☐ Automatic refresh

Configuring the General Tab

To configure the General Properties tab actions, perform the following steps:

1. From the USDATA DbBrowserCtl Properties window, select the General tab.
2. Click the appropriate check boxes to select the options appropriate for your environment.

3. After selecting the options, click Apply to execute the changes.
4. Click Cancel to abort any unapplied changes and close the dialog box.
5. Click OK to execute the changes and close the dialog box.

Table 3-1 General Properties Definitions

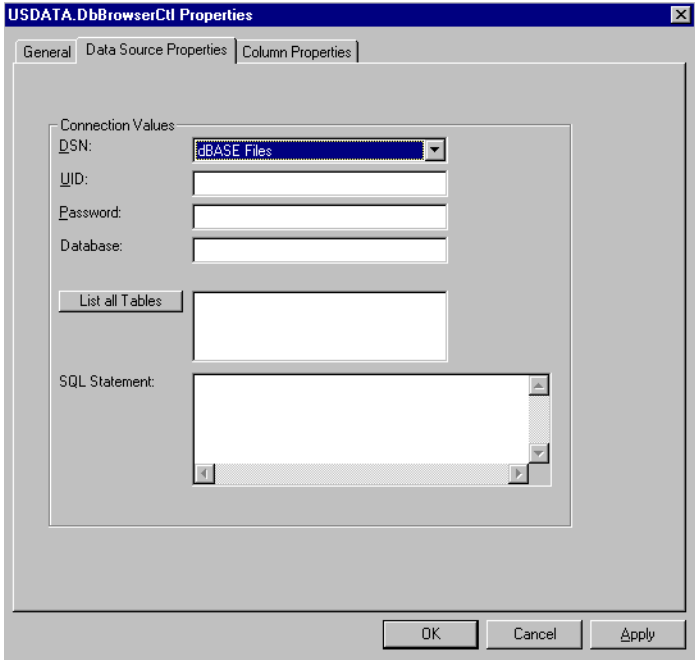
Parameter	Definition
Allow database updates (Checkbox)	Allows or disallows users to update database records
Allow database deletions (Button)	Allows or disallows users to delete database records
Allow database inserts (Button)	Allows or disallows users to make inserts to database records
Automatic refresh (Checkbox)	Allows or disallows the grid to be updated (automatically or periodically) from the data in the database. When you select this option you may specify how often the grid refreshes in the Interval field (seconds).
Font Color (Button)	Defines the font color to be used within the grid
Background Color (Button)	Defines the background color to be used within the grid
Font (Button)	Defines the text font to be used within the grid

Configuring the Data Source Properties Tab

The Data Source Properties tab displays the dialog box shown in Figure 3-7 that allows the user to specify the database and table to browse**.**

Definitions for these properties are in Table 3-2.

Figure 3-7 Data Source Properties



DSN: dBASE Files

To configure the Data Source Properties tab, perform the following steps:

1. From the USDATA DbBrowserCtl Properties window, select the Data Source Properties tab.
2. Click the Data Source Name (DSN**)** drop-down list and choose the appropriate DSN. The DSN points to the data source you are to browse.
3. If required for your database, enter a UserID (UID) and Password if required.
4. Select List of Tables to display the tables available for the DSN selected.
5. After selecting the options, click Apply to execute the changes, *or*

click Cancel to abort any unapplied changes and close the dialog, *or*

click OK to execute the changes and close the dialog box.

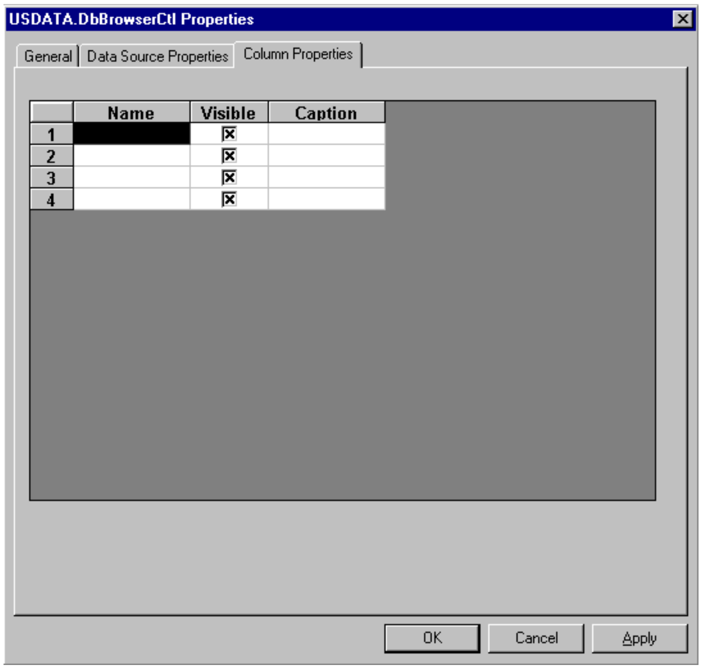
Table 3-2 Data Source Property Definitions

Property	Definition
DSN (drop down list)	Defines the name of the data source pointing to a database **Note:** The default data source is dBase files.
UID (Field)	Specifies the user identification if required by the database server
Password (Field)	Specifies the user password if required by the database server
Database (Field)	Identifies the name of the database
List All Tables (Button)	Identifies the number of tables displayed from the database
SQL Statement (Field)	Identifies the SQL statement used to browse the database

Configuring the Column Properties Tab

The Column Properties tab shown as Figure 3-8 allows you to customize the appearance, availability, and content of column data. The property definitions are in Table 3-3.

Figure 3-8 Column Properties



	Name	Visible	Caption
1		☒	
2		☒	
3		☒	
4		☒	

To configure the Column Properties tab, perform the following steps:

1. From the USDATA DbBrowserCtl Properties window, select the Column Properties tab.
2. Click the cell to be modified in the dialog box.
3. Click the Width field to change the display width of that column name.
4. Click Apply to change the size of the tagname column width and to view it on the grid.
5. Select or clear the Visible check box to specify whether the column data should be visible to users.
6. Click the Caption check box to change the caption for the column that is displayed. The change is automatically visible to the user on the grid.
7. After selecting the options, click Apply to execute the changes, *or*

click Cancel to abort any unapplied changes and close the dialog, *or* click OK to execute the changes and close the dialog box.

Table 3-3 Column Property Definitions

Property	Definition
Name (Field)	Specifies the name of the column (Cannot be changed)
Visible (Field)	Determines whether the column can be viewed on the grid
Caption (Field)	Determines what caption will display

Run-Time Browsing

When you complete the configuration, you can view databases with the browser. The windows in this section are examples from the FactoryLink Starter Application.

> **Note:** Before attempting to use the browser, complete the configuration sequence detailed in the "Configuring the Database Browser Control Environment" section of this chapter.

Setting Up Control

To set up Control, perform the following steps:

1. Double click on the Client Builder icon to launch the application.

   The Open Project dialog box displays (See Figure 3-5).

2. Select the appropriate project (.fvp file) and double-click or highlight the file name and select Open. If you are creating a new project, click the new icon or select File>>New from the menu bar.

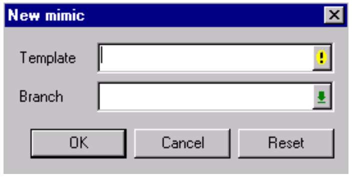
3. Open a mimic or create a new mimic to display your Database Browser.

   To open an existing window, select Open from the File pulldown menu.

   Select the mimic or type type the name of the mimic in the Choose Mimic window or highlight the window name and click OK.

   To create a new mimic, select Open from the File pulldown menu. The New mimic dialog box shown in Figure 3-9 displays.

Figure 3-9 New Window Dialog Box



4. Set up the ActiveX control.

Chapter 4 . . . .

Database Logger

Data is logged using logging operations. Each logging operation defines what data to log when the operation executes. The operations and the data for logging with each operation are defined in the two-panel Database Logging Configuration table:

- Database Logging Control panel—Defines the operations that log data.
- Database Logging Information panel—Defines what data to log with each operation.

This chapter provides a field-by-filed description of the two configuration panels and lists the programs arguments for the Database Logger.

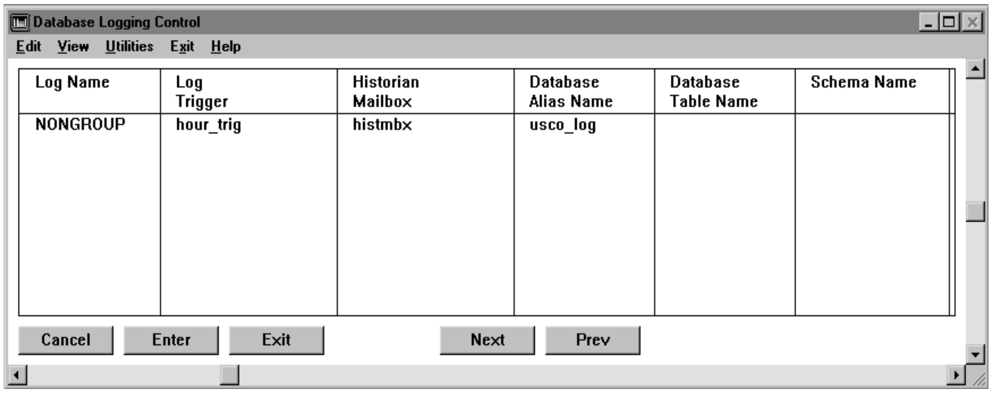
> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

DATABASE CONTROL PANEL

The Database Logging Control panel sets up the mailbox the Logger uses to communicate to the Historian as well as the database alias and table information that Logger needs to pass to Historian.

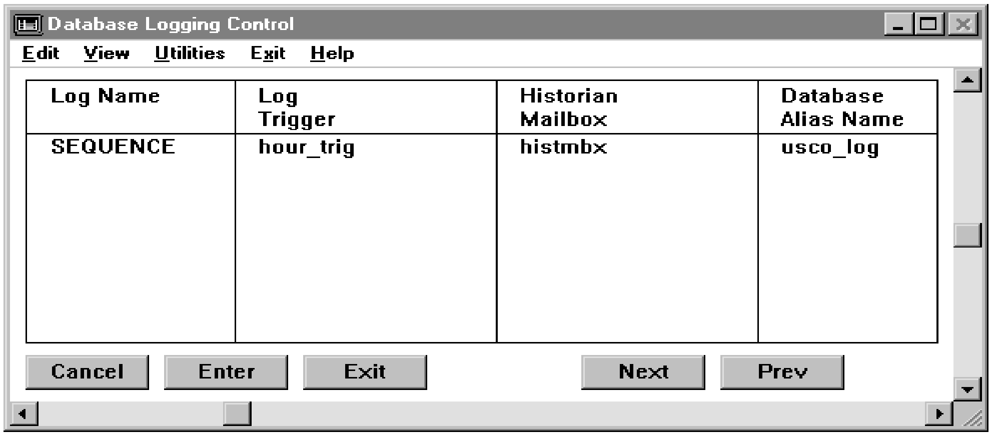
The sample panels on the following pages are used with the discussion of the panel information.

Nongrouped/Nonsequenced Data



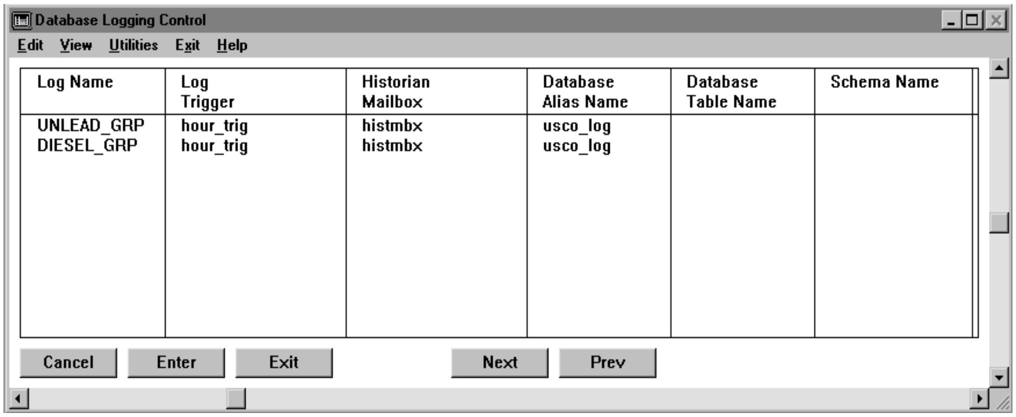
Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
NONGROUP	hour_trig	histmbx	usco_log		

Nongrouped/Sequenced Data



Log Name	Log Trigger	Historian Mailbox	Database Alias Name
SEQUENCE	hour_trig	histmbx	usco_log

Grouped and/or Subgrouped Data



Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
UNLEAD_GRP	hour_trig	histmbx	usco_log		
DIESEL_GRP	hour_trig	histmbx	usco_log		

Choose Database Logging from the Configuration Manager Main Menu and specify the following information for each logging operation:

Log Name Alphanumeric name of up to 16 characters to reference the logging operation.

If using nongrouped/nonsequenced data, this example defines one logging operation named NONGROUP that logs nongrouped tank data for the unleaded fuel storage tank.

If using nongrouped/sequenced data, this example defines one logging operation named SEQUENCE that logs the total gallons of unleaded and diesel gas sold each hour.

If using grouped and/or subgrouped data, this example defines two logging operations: one named UNLEAD_GRP that logs total gas pumped each hour for unleaded gas and DIESEL_GRP that logs total gas pumped each hour for diesel gas.

Valid Entry: alphanumeric name of up to 16 characters

Log Trigger Tag name that triggers the logging operation. If you leave this field blank, the logging operation activates with the Log-On Change field in the Database Logging Information Panel.

If using nongrouped/nonsequenced data, the NONGROUP operation executes when the hour_trig tag is set.

If using nongrouped/sequenced data, the SEQUENCE operation executes when the hour_trig tag is set.

If using grouped and/or subgroup data, both operations execute when the hour_trig tag is set.

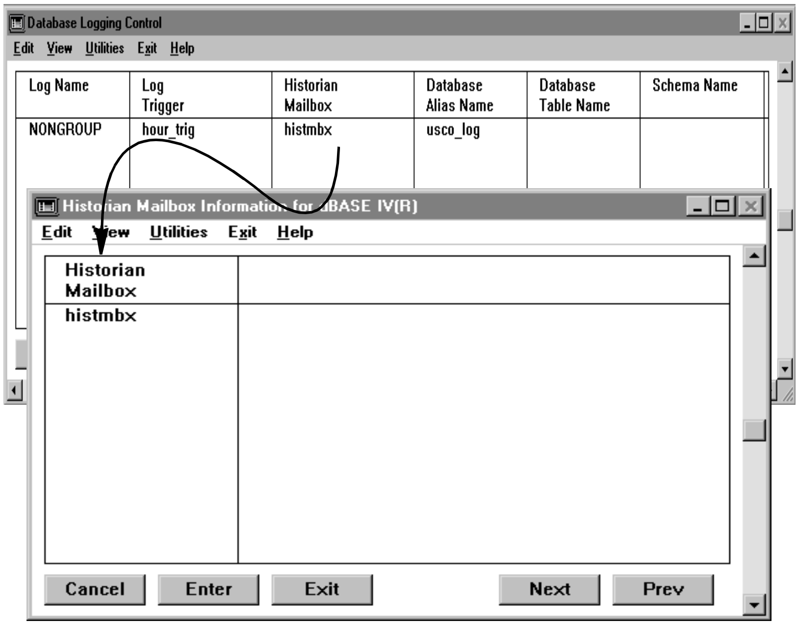
Specify both a field trigger and a log-on change in the Log On Change field of the Database Logging Information panel to enable the same operation. The operation executes each time the trigger is set and each time the tag value changes.

Valid Entry:	standard tag name (default = digital)
Valid Data Type:	digital, analog, longana, float, message

Historian Mailbox

Mailbox tag name the Historian uses to transfer data. You must define the connection for this mailbox in the Historian table.

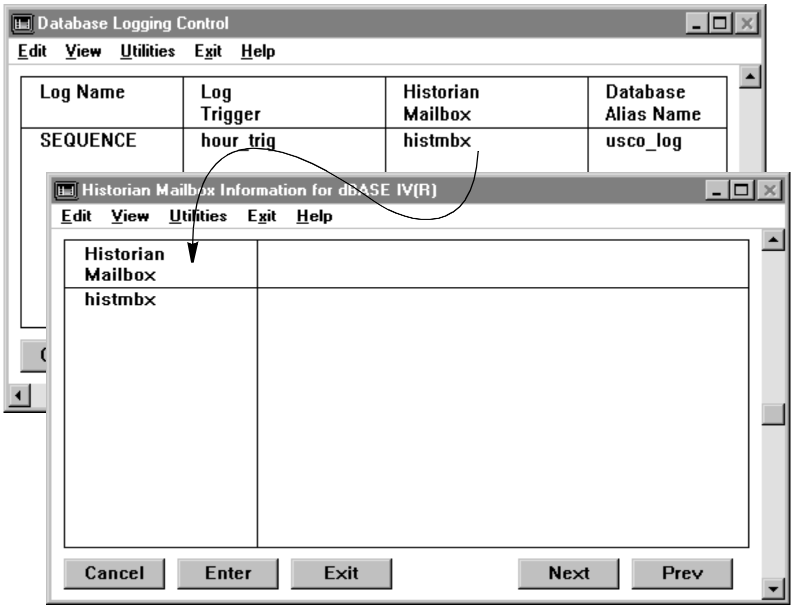
Nongrouped/Nonsequenced Data


Database Logging Control
Edit View Utilities Exit Help
Historian Mailbox Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
NONGROUP	hour_trig	histmbx	usco_log		

Historian Mailbox	
histmbx	

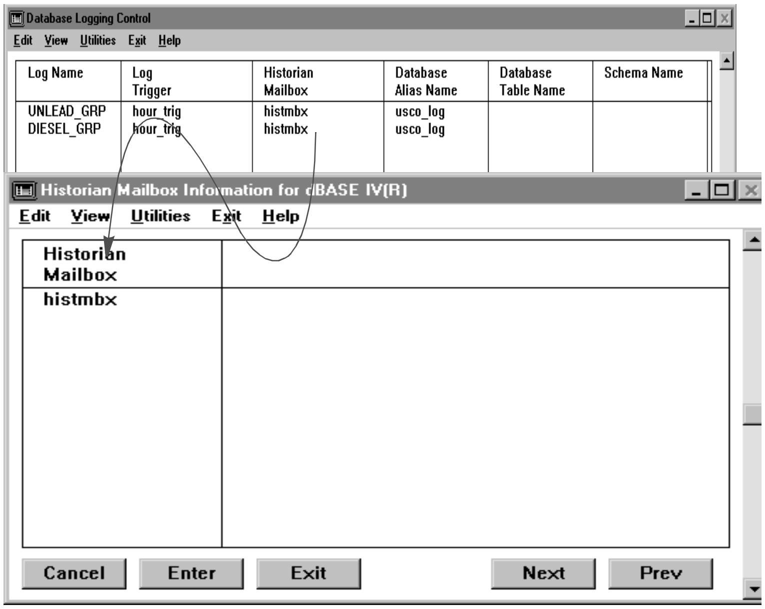
Nongrouped/Sequenced Data


Database Logging Control
Edit View Utilities Exit Help
Historian Mailbox Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name
SEQUENCE	hour_trig	histmbx	usco_log

Historian Mailbox	
histmbx	

Grouped and/or Subgrouped Data


Database Logging Control
Edit View Utilities Exit Help
Historian Mailbox Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
UNLEAD_GRP	hour_trig	histmbx	usco_log		
DIESEL_GRP	hour_trig	histmbx	usco_log		

Historian Mailbox	
histmbx	

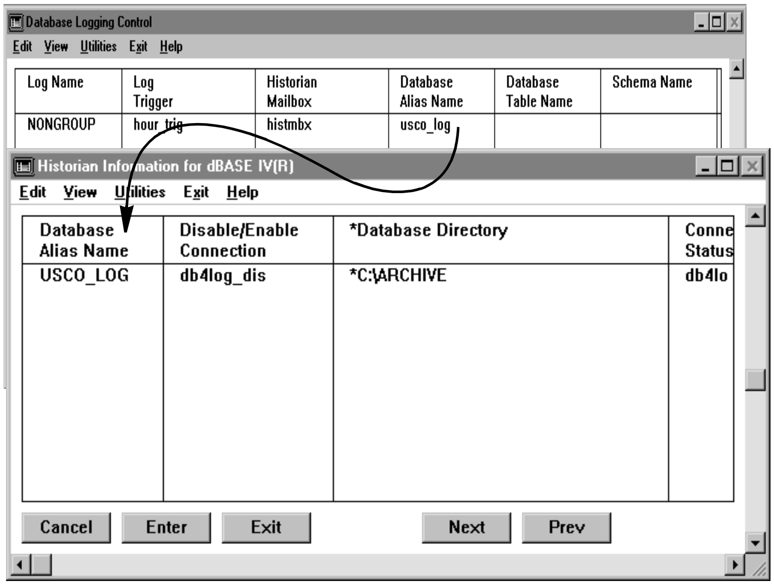
For more information on the strategy for defining Historian mailboxes, refer to the dBASE IV chapter in this guide.

Valid Entry: mailbox tag name

Database Alias Name — Database alias name that references the database where Historian sends the data. You must define the same alias name in the Historian table when defining the mailbox connection. In the examples, the data is logged to the USCO_LOG database, which is an alias for referencing the USCO database.

Valid Entry: database alias name

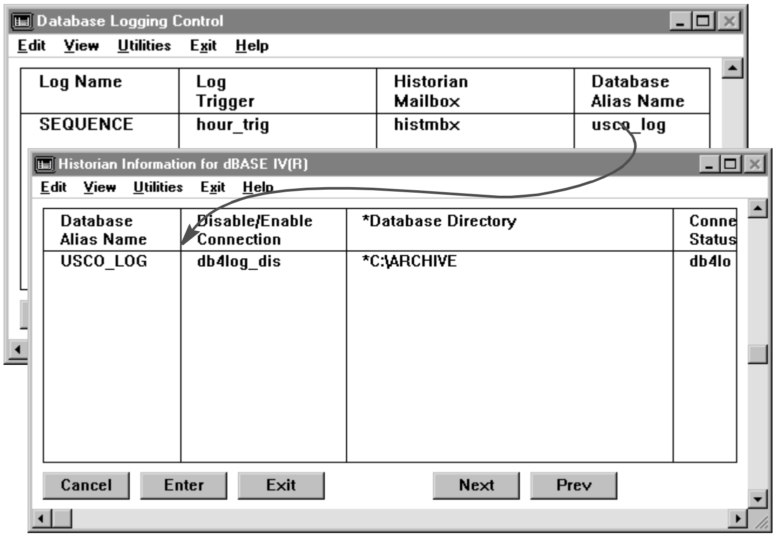
Nongrouped/Nonsequenced Data


Database Logging Control
Edit View Utilities Exit Help
Historian Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
NONGROUP	hour_trig	histmbx	usco_log		

Database Alias Name	Disable/Enable Connection	*Database Directory	Conne Status
USCO_LOG	db4log_dis	*C:\ARCHIVE	db4lo

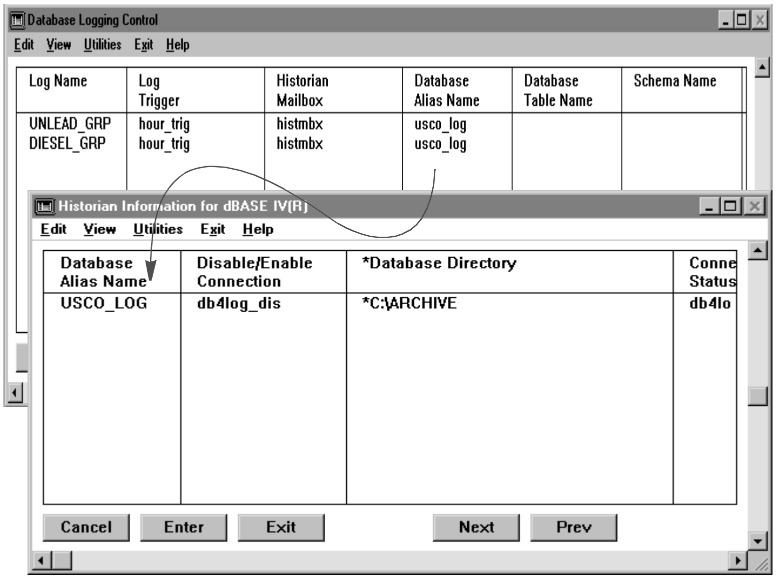
Nongrouped/Sequenced Data


Database Logging Control
Edit View Utilities Exit Help
Historian Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name
SEQUENCE	hour_trig	histmbx	usco_log

Database Alias Name	Disable/Enable Connection	*Database Directory	Conne Status
USCO_LOG	db4log_dis	*C:\ARCHIVE	db4lo

Grouped/Subgrouped Data


Database Logging Control
Edit View Utilities Exit Help
Historian Information for dBASE IV(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
UNLEAD_GRP	hour_trig	histmbx	usco_log		
DIESEL_GRP	hour_trig	histmbx	usco_log		

Database Alias Name	Disable/Enable Connection	*Database Directory	Conne Status
USCO_LOG	db4log_dis	*C:\ARCHIVE	db4lo

Database Table Name

Unique name of up to 31 characters to reference the table in the relational database that receives the data. If this table does not already exist in the relational database when data is logged to it, it is created using the schema defined in the Schema Name field.

If using nongrouped/nonsequenced data, data is logged to the database table named nongrp_table.

If using nongrouped/sequenced data, data is logged to the database table named seq_table.

If using grouped and/or subgrouped data, data is logged to the database table named grpsub_table.

Valid Entry: unique name of up to 31 characters

Schema Name

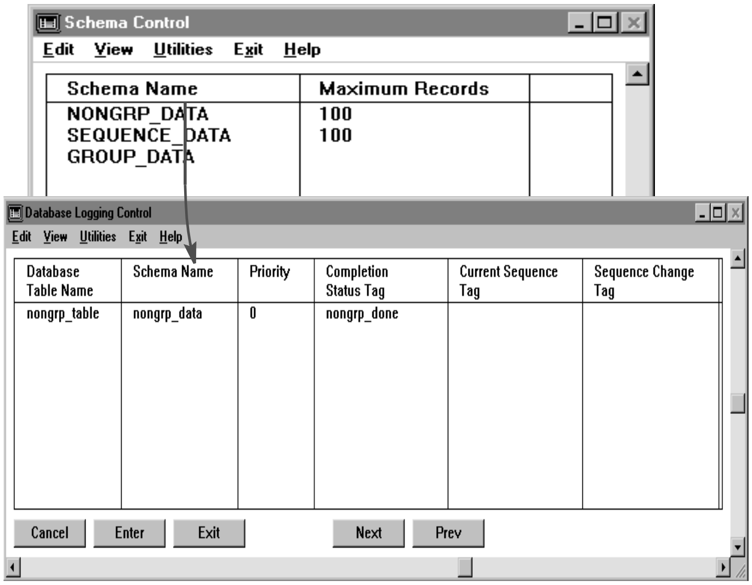
Name that defines the relational database table structure that receives the data. If the table specified in the Database Table Name field of this panel does not already exist in the relational database when data is logged to it, it is created using the schema defined in this field.

If you enter a name in this field, it must match the name defined in the Schema Name field on the Schema Control panel. If it does not match a defined schema name, it is as if you left this field blank

A table is not created and data is not logged if you leave this field blank and if a table with the name defined in the Database Table Name field on this panel does not exist in the relational database.

Valid Entry: schema name

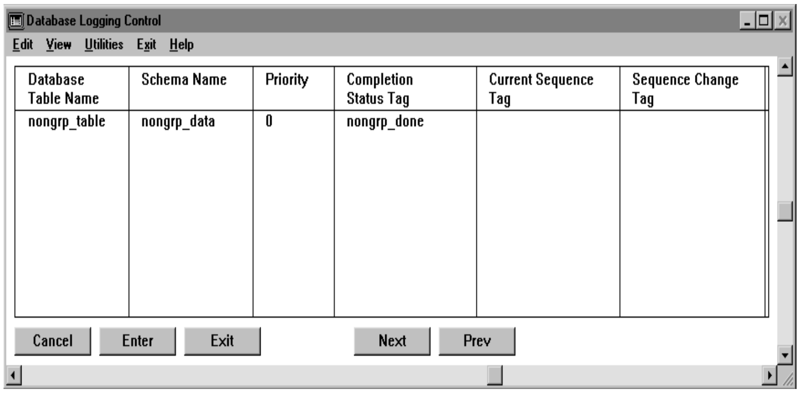
Nongrouped/Nonsequenced Data



Schema Name	Maximum Records
NONGRP_DATA	100
SEQUENCE_DATA	100
GROUP_DATA	

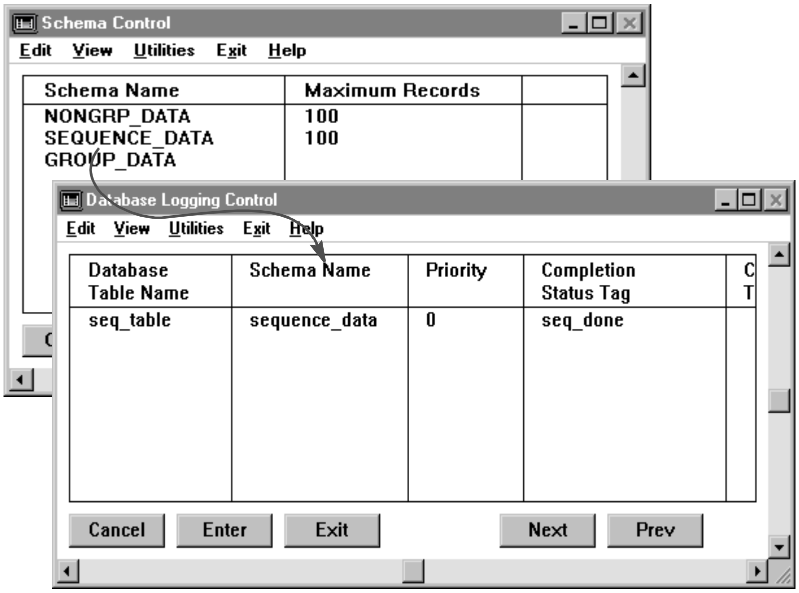
Database Table Name	Schema Name	Priority	Completion Status Tag	Current Sequence Tag	Sequence Change Tag
nongrp_table	nongrp_data	0	nongrp_done		

In this example, the nongrp_data schema is used.



Database Table Name	Schema Name	Priority	Completion Status Tag	Current Sequence Tag	Sequence Change Tag
nongrp_table	nongrp_data	0	nongrp_done		

Nongrouped/Sequenced Data

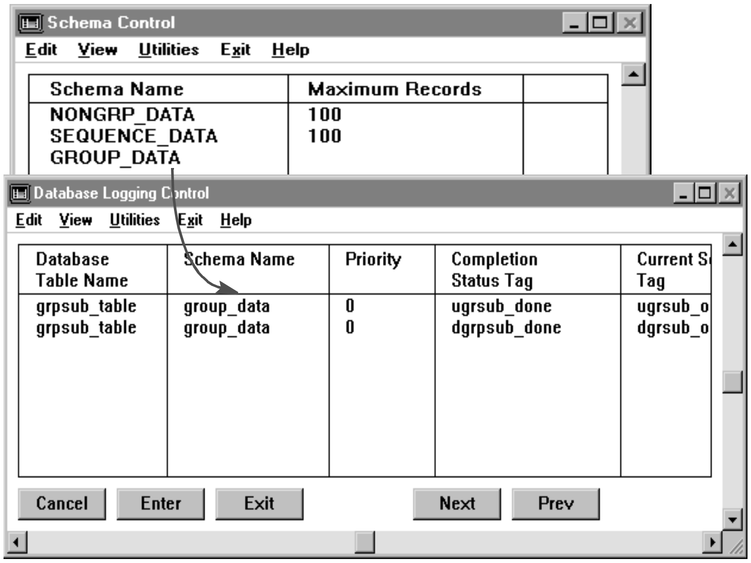


Schema Name	Maximum Records
NONGRP_DATA	100
SEQUENCE_DATA	100
GROUP_DATA	

Database Table Name	Schema Name	Priority	Completion Status Tag	C T
seq_table	sequence_data	0	seq_done	

In this example, the sequence_data schema is used.

Grouped and/or Subgrouped Data



Schema Name	Maximum Records	
NONGRP_DATA	100	
SEQUENCE_DATA	100	
GROUP_DATA		

Database Table Name	Schema Name	Priority	Completion Status Tag	Current S Tag
grpsub_table	group_data	0	ugrsub_done	ugrsub_o
grpsub_table	group_data	0	dgrpsub_done	dgrsub_o

In this example, the group_data schema is used.

Continue completing the remaining fields on the Database Logging Control panel.

Priority

Enter a number between 0 and 9 that controls the order Database Logging handles the queueing of logging operations in. This is a relative priority to other logging operations. For example, if Database Logging receives two requests at the same time from two different operations, it processes the request with the highest priority (lowest number) first.

Valid Entry:	numeric value of between 0 to 9 (default = 0)

Completion Status Tag

Tag name that indicates the completion of this logging operation. A 1 is written to this tag after data is logged to the Historian mailbox. Do not specify a tag name if you do not want to track the completion of this logging operation.

This field is typically used for coordinating activities between tasks. That is, you can use the completion of this logging operation to trigger another task or operation.

Valid Entry:	standard tag name (default = digital)
Valid Data Type:	digital, analog, longana, float

If using nongrouped/nonsequenced data, leave the remaining fields blank. They are not needed for nongrouped/nonsequenced data. Go To Step 4.

If using nongrouped/sequenced data or group and/or sequence data, complete the following two fields only if you are using an integer sequence number to order the logged data.

Current Sequence Tag

Tag name that stores the current sequence number for this logging operation. The next time a logging operation occurs, the value stored in this tag is incremented by one and the new value is assigned to the row of data.

The Current Sequence Tag value is saved in a file when FactoryLink is not running and updated to this field when FactoryLink is restarted, so interrupts do not cause problems with duplicate records in the relational database table.

Valid Entry:	standard tag name (default = longana)
Valid Data Type:	analog, longana, float

Sequence Change Tag

Tag name used to adjust the numbering sequence during run time when ordering data by integer. This field provides the ability to manually create gaps in the numbering sequence of ordered data.

If you leave this field blank, you can never manually adjust the numbering sequence of ordered data.

When a value is force written to the tag specified in this field, the value written is used to adjust the Current Sequence Tag value. For example, if the Current Sequence Tag value is 5 and you force write a value of 5 to this tag, the Current Sequence Tag changes to 10.

If the tag type is digital, increment the Current Sequence Tag by 1 by force writing a 1 to the Sequence Change Tag.

If the tag type is analog, long analog, or float, force write any whole positive or negative number to the Sequence Change Tag. If you write a positive number, the value of the Current Sequence Tag increments by the specified number. If you write a negative number, the value of the Current Sequence Tag decrements by the specified number.

Be careful when adjusting the Current Sequence Tag by a negative number as this can cause two rows of data to have the same sequence number. If the sequence number is part of a unique index, duplicate record values are not permitted in the column. If an attempt is made to log a duplicate value, FactoryLink displays an error message and the data is not logged.

Valid Entry:	standard tag name (default = digital)
Valid Data Type:	digital, analog, longana, float

If using nongrouped/sequenced data, leave the remaining fields blank. They are not needed for nongrouped/sequenced data. Go To Step 4.

If using grouped and/or subgrouped data, complete the following fields only if you are using an integer sequence number to order the logged data.

Group Delete Tag

Tag name that contains the group name to delete when the Group Delete Trigger tag executes. When group deletion is triggered, all group data is deleted. If the group contains subgroups, all subgroups and their data are deleted.

If you do not specify a tag in this field, you can never delete data by specifying a *groupname*.

If you do not specify a tag in this field but do specify a Group Delete Trigger, all nongrouped data sequenced by integer and all subgroups without a *groupname* association are deleted from the table when the trigger executes.

If *groupname* is numeric, valid types are digital, analog, longana or float.

If *groupname* is made up of characters, valid type is message.

Enter the name of the group to delete in the Value field of the Tag Definition dialog.

Valid Entry:	standard tag name (default = message)

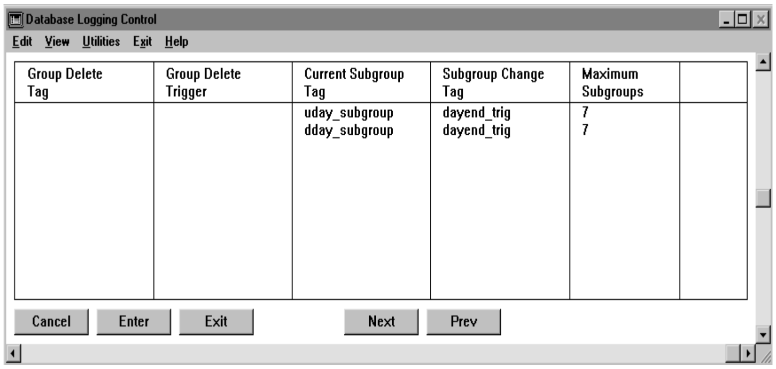
Group Delete Trigger

Tag name that triggers the deletion if you want to delete data by group based on an event. When this trigger is set, the data for the group specified in the Group Delete Tag field on this panel is deleted.

If you leave this field blank, deletion of group data is never triggered.

Leave the Group Delete Tag and Group Delete Trigger fields blank if you are subgrouping data without a group association. If you wish to delete subgroup data without a group association, use the subgroup rollover feature to delete nongrouped data sequenced by integer.

The following panel shows the fields in the Database Logging Control panel displayed after the Group Delete Trigger field. Leave the fields blank if you are not using subgrouping.



Group Delete Tag	Group Delete Trigger	Current Subgroup Tag	Subgroup Change Tag	Maximum Subgroups	
		uday_subgroup	dayend_trig	7	
		dday_subgroup	dayend_trig	7	

Valid Entry: standard tag name (default = digital)
Valid Data Type: digital, analog, longana, float

Note: Misleading Error When Doing GROUP DELETE:

A SERIAL table is not created if DBLOG is configured to log GROUP data without using a sequence column. However, when the DBLOG trigger for GROUP DELETE is activated, an attempt is made to delete the appropriate entry from the SERIAL table for this group. This attempt produces the error, because it tried to access a non-existent table. The data is correctly deleted from the database table, and the error has no effect on the Historian and/or Database Logger operations that follow.

Current Subgroup Tag

Tag name that stores the current subgroup number for this group.

The next time a new subgroup is created for this group, the value stored in this tag is adjusted by the amount defined in the Subgroup Change Tag field on this panel and assigned to the new subgroup.

If this field is left blank, subgroups are not supported for this group and no subgroups are created for this group.

The value of this tag is set to 0 at group delete and 1 at subgroup rollover.

The Current Subgroup Tag value is saved in a file when FactoryLink is not running and updated to this field when FactoryLink is restarted so interrupts do not cause problems with duplicate records in the relational database.

Valid Entry:	standard tag name (default = longana)
Valid Data Type:	analog, longana, float

Subgroup Change Tag

Tag name that triggers a subgroup change. When the tag value changes, a new subgroup is created. The value to assign to the new subgroup is calculated by adjusting the value in the Current Subgroup Tag by the value in the Subgroup Change Tag. This field provides the ability to manually set or change the subgroup numbering sequence.

If you enter a tag name in this field, a tag must also be defined in the Current Subgroup Tag field. Leave this field blank if you are not using subgrouping.

If the tag type is digital, the Current Subgroup Tag increments by 1 when 1 is force written to this tag.

If the tag type is analog, long analog, or float, force write any whole positive or negative number to this tag. If it contains a positive number, the value in the Current Subgroup Tag increments by the specified number. If it contains a negative number, the value of the Current Subgroup Tag decrements by the specified number.

Be careful when adjusting the Current Subgroup Tag by a negative number. This can cause two subgroups to have the same number. If the group ID is part of a unique index, duplicate record values are not permitted in the column. If an attempt is made to log a duplicate value, FactoryLink displays an error message and the data is not logged.

Leave this field blank to use the same subgroup number each time this trigger executes.

Valid Entry:	standard tag name (default = digital)
Valid Data Type:	digital, analog, longana, float

Maximum Subgroups

Number to indicate the maximum number of subgroups allowed before subgroup rollover occurs. If you leave this field blank but have specified a subgroup tag, Database Logging continues to increment the subgroup number indefinitely until the disk is full.

You must define a tag in the Current Subgroup Tag field for subgroup rollover to occur.

Valid Entry: numeric value

Click Next to go on to the Database Logging Information panel.

Database Logging Information Panel

The data to log with each operation is defined in the Database Logging Information panel. This panel also maps the data to specific columns in the relational database table receiving the data. This section describes how to complete the Database Logging Information panel to log data for the sample application. The example data in this procedure logs data to one of the following tables.

Nongrouped/Nonsequenced Data

gallons	pressure	temp

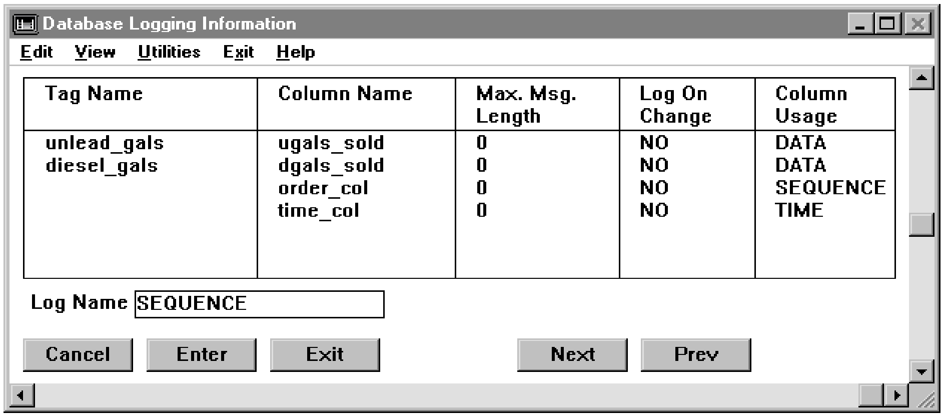
Nongrouped/Sequenced Data

Order_col	Time_col	Ugal_sold	Dgal_sold

Grouped and/or Subgrouped Data

group_ID	order_col	gals_sold

Nongrouped/Nonsequenced Data

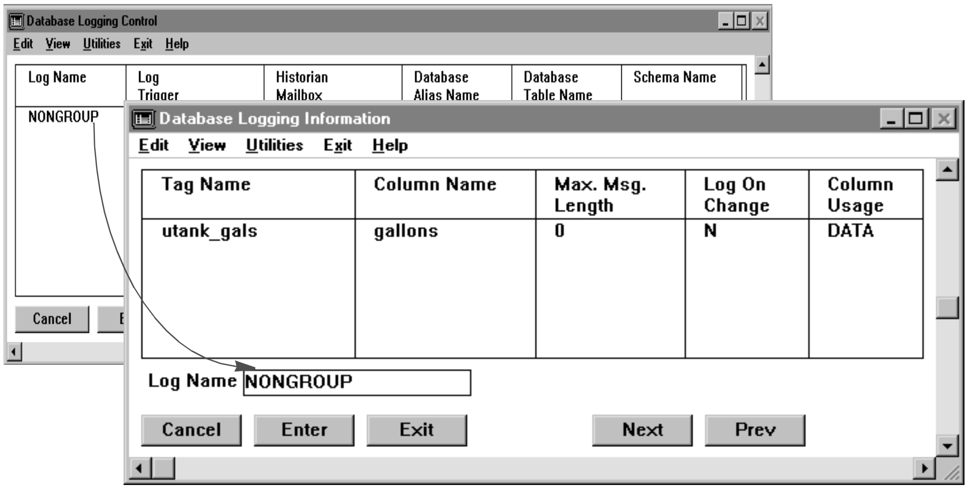


Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	ugals_sold	0	NO	DATA
diesel_gals	dgals_sold	0	NO	DATA
	order_col	0	NO	SEQUENCE
	time_col	0	NO	TIME

Log Name SEQUENCE

Name of the logging operation you are defining

In this example, there are three columns: gallons, pressure, and temp.

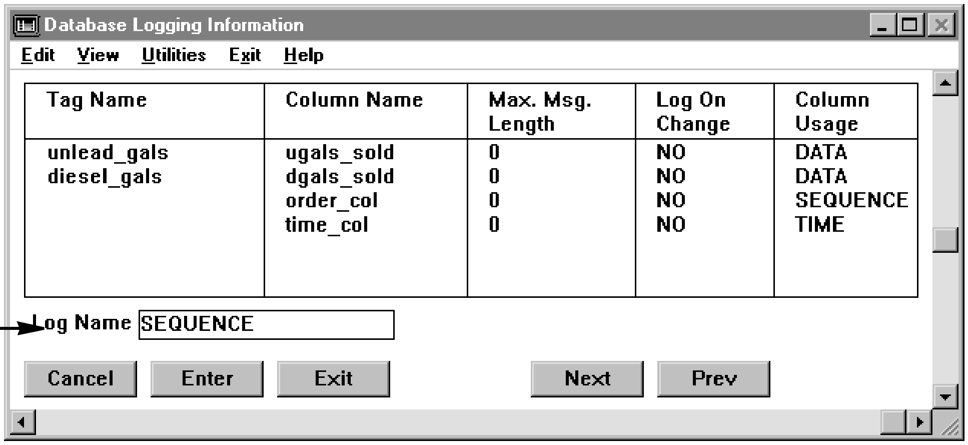

Database Logging Control
Edit View Utilities Exit Help
Cancel
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
NONGROUP					

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
utank_gals	gallons	0	N	DATA

Log Name NONGROUP

Nongrouped/Sequenced Data

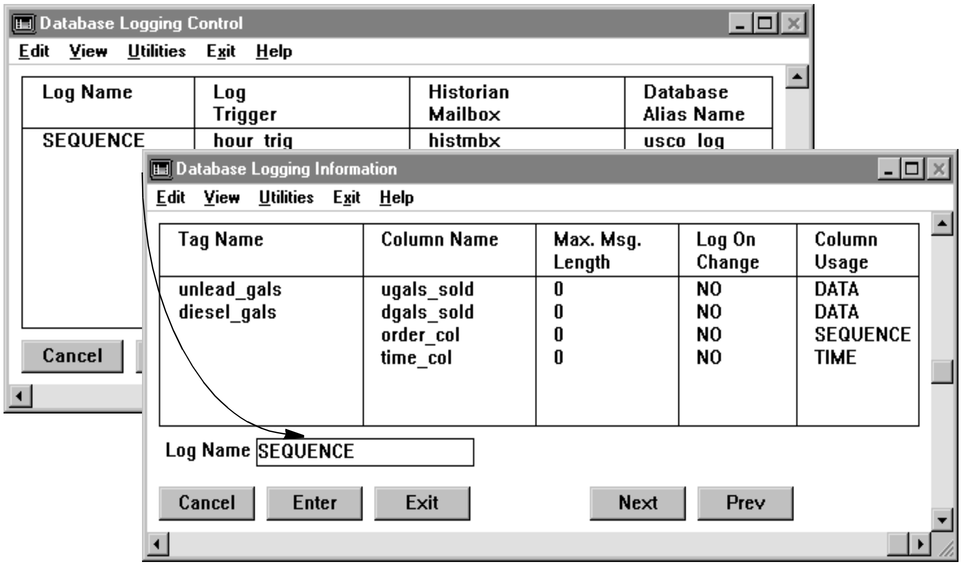


Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	ugals_sold	0	NO	DATA
diesel_gals	dgals_sold	0	NO	DATA
	order_col	0	NO	SEQUENCE
	time_col	0	NO	TIME

Log Name SEQUENCE

Name of the logging operation you are defining

In this example, there are four columns: order_col, time_col, ugal_sold, and dgal_sold.

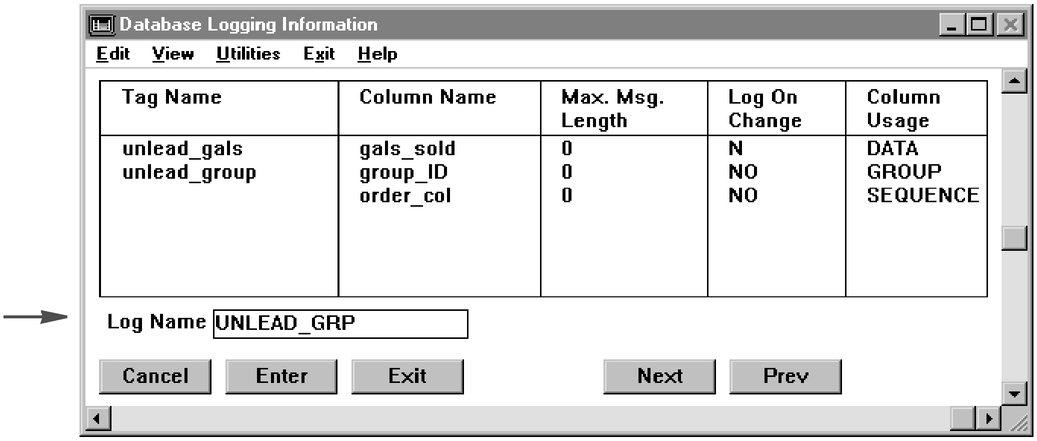

Database Logging Control
Edit View Utilities Exit Help
Cancel
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Log Name	Log Trigger	Historian Mailbox	Database Alias Name
SEQUENCE	hour_trig	histmbx	usco_log

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	ugals_sold	0	NO	DATA
diesel_gals	dgals_sold	0	NO	DATA
	order_col	0	NO	SEQUENCE
	time_col	0	NO	TIME

Log Name SEQUENCE

Grouped and/or Subgrouped Data

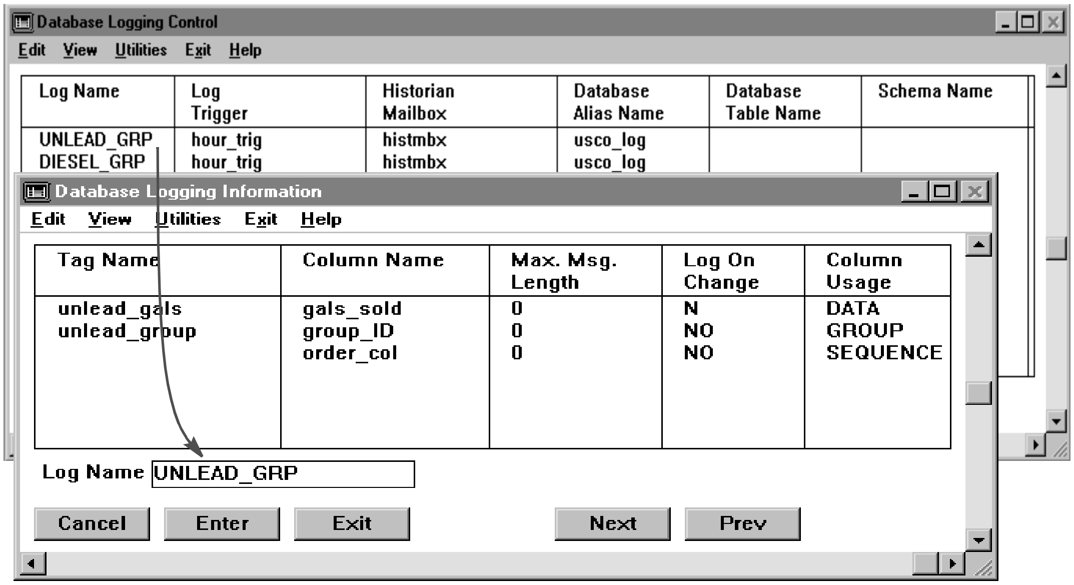


Database Logging Information

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	gals_sold	0	N	DATA
unlead_group	group_ID	0	NO	GROUP
	order_col	0	NO	SEQUENCE

Log Name UNLEAD_GRP

In this example, there are three columns: gals_sold, group_ID, and order_col.



Database Logging Control

Log Name	Log Trigger	Historian Mailbox	Database Alias Name	Database Table Name	Schema Name
UNLEAD_GRP	hour_trig	histmbx	usco_log		
DIESEL_GRP	hour_trig	histmbx	usco_log		

Database Logging Information

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	gals_sold	0	N	DATA
unlead_group	group_ID	0	NO	GROUP
	order_col	0	NO	SEQUENCE

Log Name UNLEAD_GRP

Specify the following information for this panel:

If using nongrouped/nonsequenced data:

Tag Name Tag name that references the real-time data element to log in the column this entry represents.

Valid Data Type: standard tag name (default = digital)

Valid Data Type: digital, analog, longana, float, message

If using nongrouped/sequenced data:

Tag Name What you enter in this field depends on the usage of the column that receives the logged data. The options are described in the following table.

Column Use	Tag Name Field Value
data	Tag name that references the real-time data element to log in the column represented by this entry.
sequence	If you want to manually set the sequence number to use for the next logging operation, specify the tag name that contains the absolute number you want to use. If you never want to manually set the sequence number, leave this field blank. If this tag value is any number except 0, that number is assigned as the sequence number for the next row of data logged. Then this tag value is reset to 0. If a record with that sequence number already exists and the sequence number is part of a unique index, data is not logged. If this tag value is 0, the next sequence number assigned to a row of data logged is the value in the Current Sequence Tag field after it is incremented by one. This operation does not update the Current Sequence Tag field. The next sequence number assigned continues from the number in the Current Sequence Tag field.
time	Do not specify a tag name. SECTIME is always used.

The data type of the tag defined depends on the column usage. The options are described in the following table:

Column Usage	Valid Tag Types
data	digital, analog, longana, float, message.

Column Usage	Valid Tag Types
sequence	analog, longana, float.
time	The global tag SECTIME is already defined. You do not have to specify a type.

If using grouped and/or subgrouped data:

Tag Name What you enter in this field depends on the usage of the column that receives the logged data. The options are described in the following table.

Column Use	Tag Name Field Value
data	Tag name that references the real-time data element to log in the column represented by this entry.
group	Tag name that contains the name of the group associated with this operation.
time	Do not specify a tag name. SECTIME is used.
sequence	If you want to manually set the sequence number to use for the next logging operation, specify the tag name that contains the absolute number you want to use. If you never want to manually set the sequence number, leave this field blank. If this tag value is any number except 0, that number is assigned as the sequence number for the next row of data logged. Then this tag value is reset to 0. If a record with that sequence number already exists and the sequence number is part of a unique index, data is not logged. If this tag value is 0, the next sequence number assigned to a row of data logged is the value in the Current Sequence Tag field after it is incremented by one. This operation does not update the Current Sequence Tag field. The next sequence number assigned continues from the number in the Current Sequence Tag field.

The data type of the tag defined depends on the column usage. The options are described in the following table:

Column Use	Valid Tag Types
data	digital, analog, longana, float, message.
sequence	analog, longana, or float.
time	The global tag SECTIME is already defined. You do not have to specify a type.
group	If groupname is numeric, use digital, analog, longana or float. If groupname is made up of characters, use message.

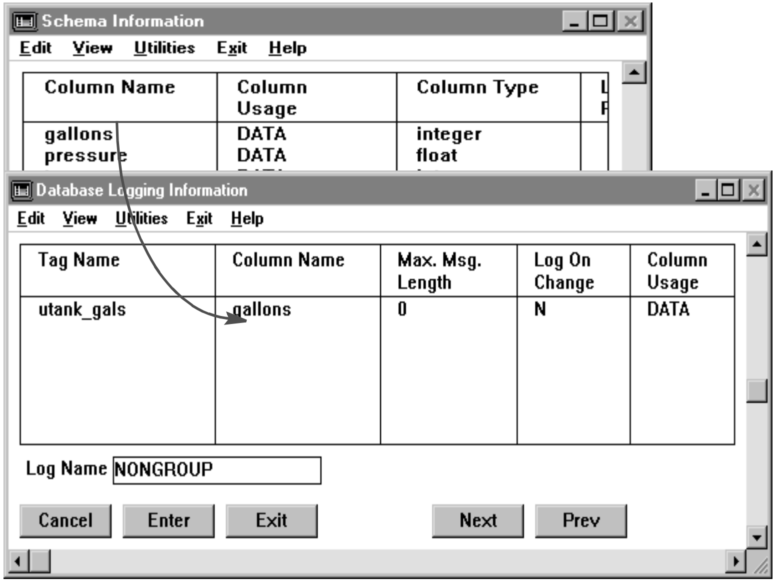
Column Name Name of the column to receive the data specified in the Tag Name field.

If the table structure is defined through the relational database software, the name must match one of the columns defined for the table.

If the table structure is defined through FactoryLink, the name must match one of the column names defined in the Column Name field on the Schema Information panel. This relationship is shown in the following graphics.

Valid Entry: column name

Nongrouped/Nonsequenced Data

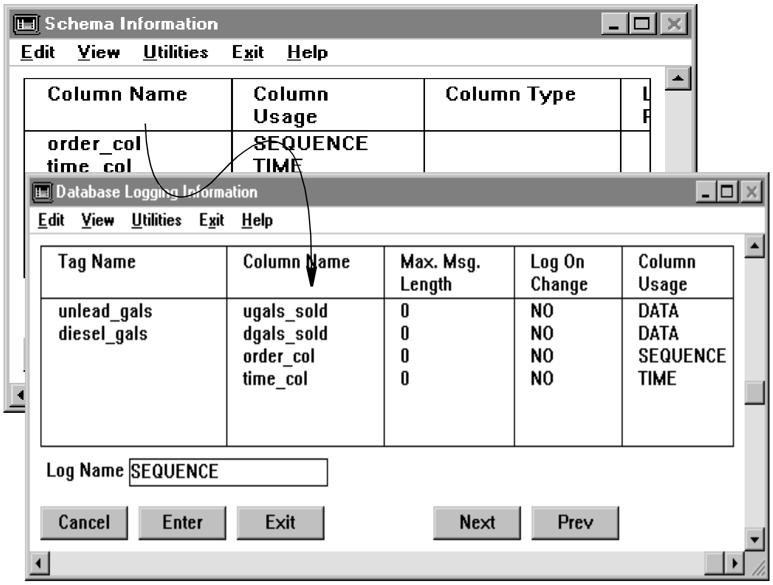

Schema Information
Edit View Utilities Exit Help
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Column Name	Column Usage	Column Type
gallons	DATA	integer
pressure	DATA	float

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
utank_gals	gallons	0	N	DATA

Log Name NONGROUP

Nongrouped/Sequenced Data

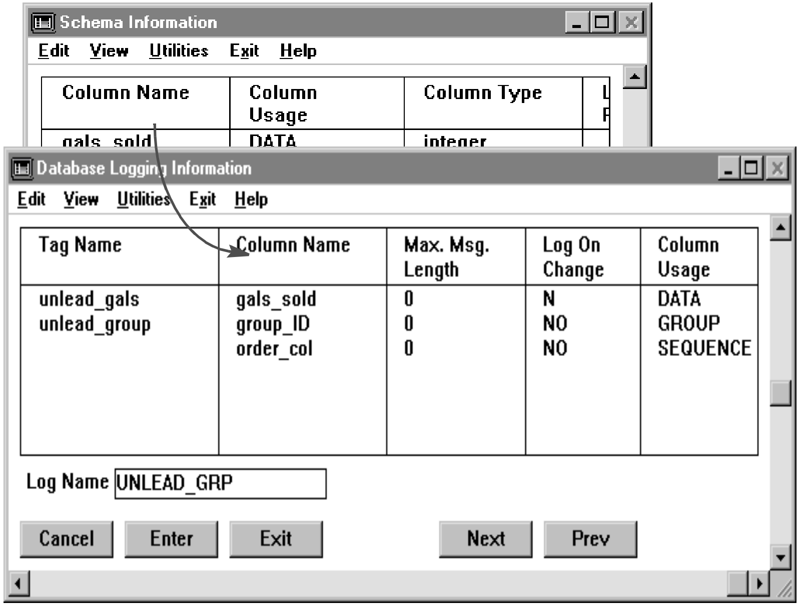

Schema Information
Edit View Utilities Exit Help
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Column Name	Column Usage	Column Type
order_col	SEQUENCE	
time_col	TIME	

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	ugals_sold	0	NO	DATA
diesel_gals	dgals_sold	0	NO	DATA
	order_col	0	NO	SEQUENCE
	time_col	0	NO	TIME

Log Name SEQUENCE

Grouped and/or Subgrouped Data


Schema Information
Edit View Utilities Exit Help
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Column Name	Column Usage	Column Type
gals_sold	DATA	integer

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	gals_sold	0	N	DATA
unlead_group	group_ID	0	NO	GROUP
	order_col	0	NO	SEQUENCE

Log Name UNLEAD_GRP

Max. Msg. Length

Number between 1 and 999 if the data logged to this column is a message tag type to specify the maximum number of characters allowed in this column. If you leave this field blank when the tag type is message, a default of 80 is assumed. The value specified in this field should always be equal to or less than the value specified in the Length or Precision field on the Schema Information panel.

Leave this field blank to assume a default of 0 for tags defined with a tag type other than message, which indicates this field is not used.

Valid Entry: numeric value of between 1 and 999 (if message) (default = 80)

Log On Change

Specify whether or not the logging operation is triggered if the specified Tag Name field value changes. This can be one of the following:

YES When the tag value changes, the log operation occurs. If you leave the Log Trigger field blank on the Database Logging Control panel, you must indicate YES in this field for at least one tag on this panel to activate the logging operation.

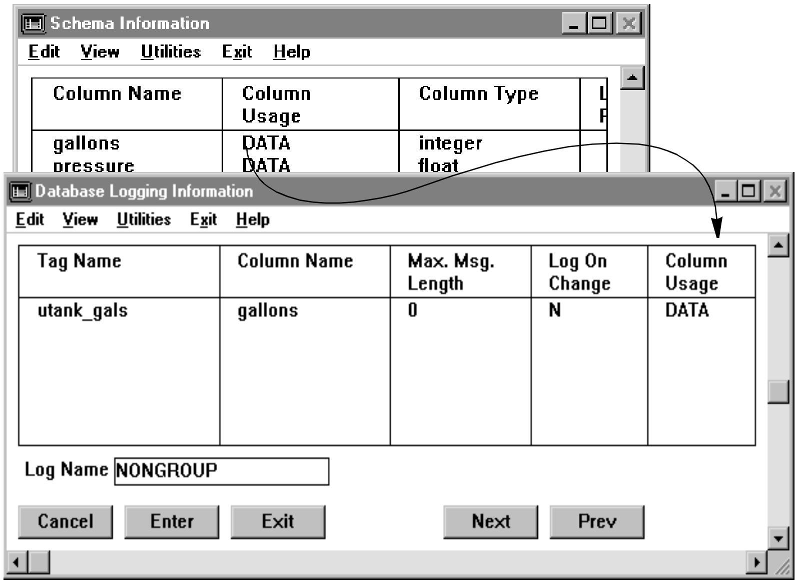
NO When the tag value changes, the log operation does not occur.

Specify both a trigger in the Log Trigger field of the Database Logging Control panel and a login change in this field for the same operation. The operation executes each time the trigger is set and each time the value specified changes.

Column Usage Kind of information sent to the column.

If using nongrouped/nonsequenced data, this is data for each column in a table logging nongrouped/nonsequenced data.

.


Schema Information
Edit View Utilities Exit Help
Database Logging Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Column Name	Column Usage	Column Type	L P
gallons	DATA	integer	
pressure	DATA	float	

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
utank_gals	gallons	0	N	DATA

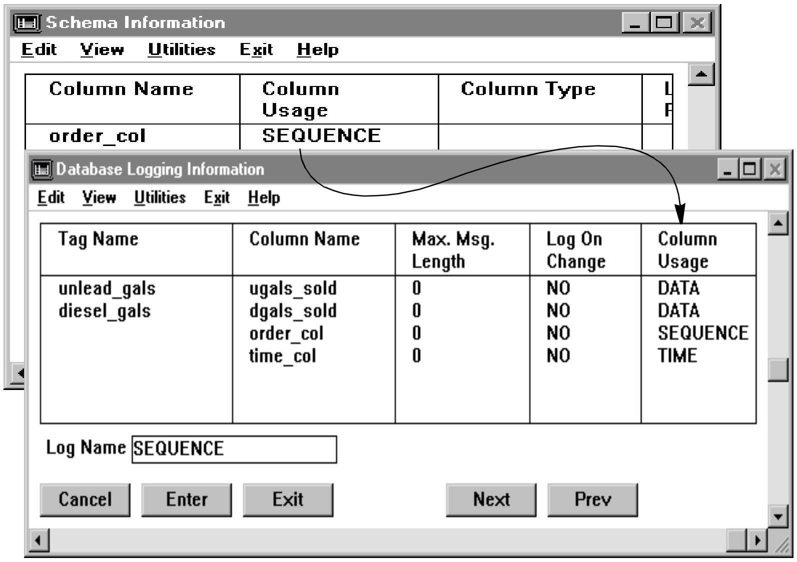
Log Name NONGROUP

If using nongrouped/sequenced data, this is one of the following:

data Use for columns that do not receive a sequence number in the form of an integer or time-stamping.

sequence Use for columns receiving a sequence number in the form of an integer.

time Use for columns receiving a sequence number in the form of a time-stamping. The time-stamping used is SECTIME.


Schema Information
Edit View Utilities Exit Help

Column Name	Column Usage	Column Type
order_col	SEQUENCE	

Database Logging Information
Edit View Utilities Exit Help

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	ugals_sold	0	NO	DATA
diesel_gals	dgals_sold	0	NO	DATA
	order_col	0	NO	SEQUENCE
	time_col	0	NO	TIME

Log Name SEQUENCE

Cancel
Enter
Exit
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If using grouped and/or subgrouped data, this is one of the following:

DATA Use for columns that do not receive a sequence number or group ID.

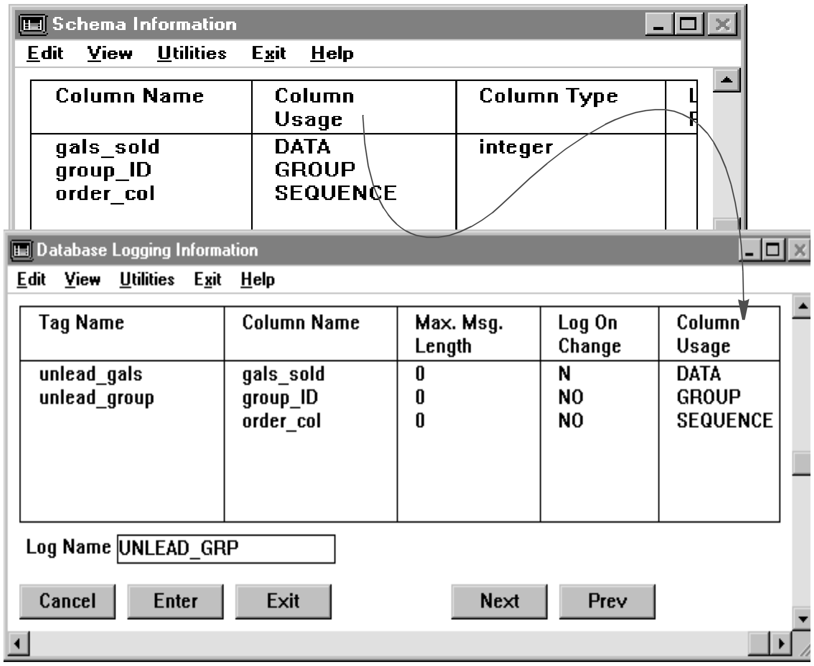
SEQUENCE Use for columns receiving a sequence number in the form of an integer.

TIME Use for columns receiving a sequence number in the form of a time-stamping. The time-stamping used is SECTIME.

GROUP Use for columns receiving the group identification assigned to the row of data.

If you leave this field blank, data is assumed even though the word data is not displayed in the field.

If the table structure is defined through FactoryLink, the value entered in this field must match the value entered for this column in the Column Usage field on the Schema Information panel.


Schema Information
Edit View Utilities Exit Help

Column Name	Column Usage	Column Type
gals_sold group_ID order_col	DATA GROUP SEQUENCE	integer

Database Logging Information
Edit View Utilities Exit Help

Tag Name	Column Name	Max. Msg. Length	Log On Change	Column Usage
unlead_gals	gals_sold	0	N	DATA
unlead_group	group_ID	0	NO	GROUP
	order_col	0	NO	SEQUENCE

Log Name UNLEAD_GRP

Cancel
Enter
Exit
Next
Prev

CONFIGURING PROGRAM ARGUMENTS

You can configure the following system configuration program arguments to affect Database Logging functions:

-E or -e This program switch causes Database Logging to set the completion trigger when the Historian task processes the logging operation. By default the completion is set when Database Logging sends the request to the Historian mailbox. With this switch, the completion trigger for all log operations means the Historian task has processed the logging transaction.

Setting the completion trigger does not guarantee the log transaction is successful; it only means the log transaction has completed.

-G or -g This new parameter is needed when PowerNet is used in conjunction with Distributed Alarm Logger and when many alarms are configured.

-H or -h In past releases, when reports were stopped and started before the end trigger, when the task is restarted and the begin (or repeat if no begin trigger) is activated, the working file from previous run is opened in append mode and a new begin section is added. Now the system will check to see if a report file already exists. If it does, the system will not add another header. This software enhancement is now the default. If your process mandates the previous mode of operation, then add this new parameter for backward compatibility.

-L or -l This program switch enables error logging to the log file. By default Database Logging does not log errors.

-Q or -q [100-2000] This program switch sets the maximum number of outstanding asynchronous logging transactions the Historian task has not completed. Once this limit is reached, Database Logging operates synchronously until the number of uncompleted logging transactions is reduced. By default Database Logging allows for 100 outstanding logging transactions before operating in a synchronous mode.

-S[4-160] or -s[4-160] This program switch sets the maximum number of SQL statements Database Logging has active at one time. The default is 30. Valid values are one to whatever the database server the Historian is connected to allows.

-V1 or -v1 This program switch writes the SQL statements generated by the Database Browser to the log file. The Database Browser must have logging enabled for this program switch to work. The default is to not write the SQL statements to the log file.

-W[5-36,000] or -w[5-36,000] This program switch sets the maximum timeout in seconds for Database Logging to wait for a response from the Historian task. The default is 30 seconds.

For values less than 30 seconds, this switch will only work correctly when the Historian initially achieved a successful connection with the database server. If the Historian has never successfully connected with the database server, Database Logging will time out in 30 seconds regardless of this switch setting. The -w switch always works for timeouts set at more than 30 seconds, whether the Historian initially achieved a successful connection with the database server or not.

Note: It is not recommended to set arbitrarily high values for this argument since it could unnecessarily delay the detection of actual network or server malfunction.

Perform the following steps to configure one or more arguments:

1. Choose System Configuration from the Configuration Manager Main Menu to display the System Configuration Information panel.

2. Enter one or more arguments separated by spaces in the Program Arguments field for the DBLOG task.

Chapter 5 . . . .

Configuring Data Point Logging

FactoryLink has two different logging tasks—Data Point Logging and Database Logging. Both tasks read data from the real-time database and send it to a disk-based relational database via a FactoryLink Historian.

Data Point Logging logs one data point at a time, while Database Logging logs blocks of data.

Data Point Logging simplifies the task of logging individual data points by providing preconfigured tables. Multiple shared numeric-value tags can be stored in the same database and sorted later if necessary. It also allows you to add or remove tags from the list of tags being logged during run time. Data Point Logging builds a database that will capture, for a specified tag:

- Date/time
- Tag name
- Tag value

Data Point Logging is best suited for situations in which the tags that are to be logged do not need to be grouped together. If information about the state of multiple tags at a particular trigger point is desired, use the Database Logging task.

An essential part of configuring Data Point Logging is relating the tags you are logging to a specific Data Point logging table, which is defined by a database schema (structure).

This chapter provides a field-by-field description of configuring the four panels used in the Data Point Logging table:

- Data Point Logger Control panel—Use the Data Point Logging Control panel to relate the Data Point logging tables to a schema that describes the table parameters.
- Data Point Schema Control panel—Use the Data Point Schema Control panel to control the structure or schema of the Data Point Logging tables.
- Data Point Logging Information panel—Use the Data Point Logging Information panel to specify which tags to log, when to log the tags, and which table to log the information to.
- Dynamic Logging Control panel—Use the Dynamic Logging Control panel to change the list of tags being logged during run time without stopping system processing.

This chapter also lists the Error Messages for Data Point Logging.

CONFIGURING DATA POINT LOGGING

Note: The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

DATA POINT LOGGER CONTROL PANEL

The Data Point Logger Control panel is preconfigured to contain the five default tables and their associated schemas, database alias names, and Historian mailboxes.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Data Point Logging from the Configuration Manager Main Menu to update a preconfigured Data Point Logger table record, edit the entry in one or more of the following fields, or add a row:

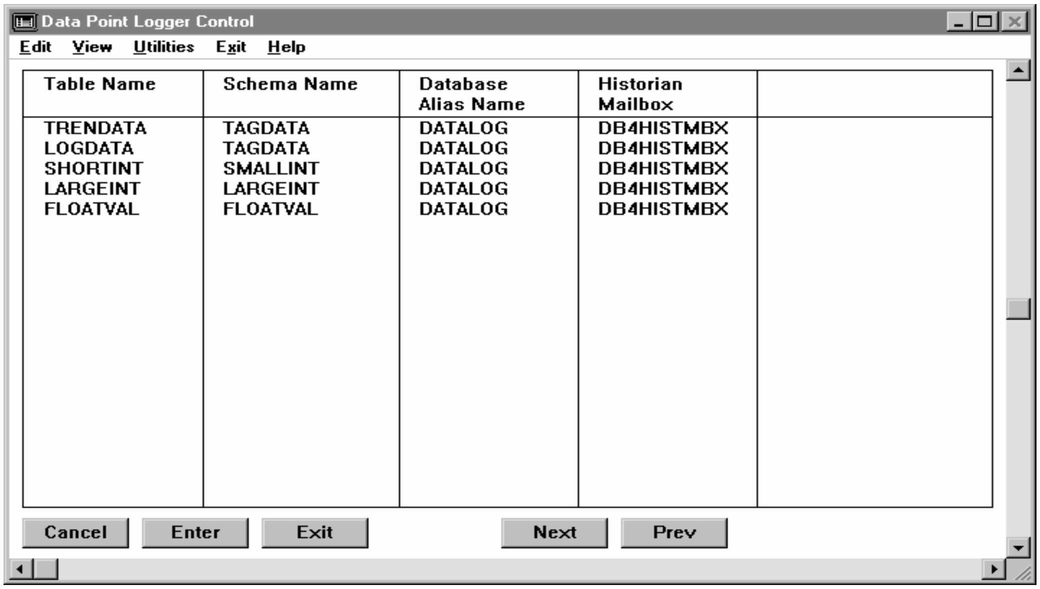


Table Name	Schema Name	Database Alias Name	Historian Mailbox	
TRENDDATA	TAGDATA	DATALOG	DB4HISTMBX	
LOGDATA	TAGDATA	DATALOG	DB4HISTMBX	
SHORTINT	SMALLINT	DATALOG	DB4HISTMBX	
LARGEINT	LARGEINT	DATALOG	DB4HISTMBX	
FLOATVAL	FLOATVAL	DATALOG	DB4HISTMBX	

Table Name — Unique alphanumeric name of up to 16 characters of the Data Point Logger table that receives the data.

If this table does not exist in the relational database, the Historian creates it using the schema defined in the Schema Name field when you make a corresponding entry on the Data Point Schema Control panel.

Each table name must be unique across all relational databases.

Valid Entry: unique alphanumeric name of up to 16 characters.

Schema Name — Unique alphanumeric name of up to 19 characters of the table schema that defines the structure of the relational database tables receiving the data.

This entry must correspond with an entry in the Data Point Schema Control panel. An error message is generated if there is no corresponding entry. See “Data Point Schema Control Panel” on page 217 for more information.

You must use SQL to drop the table from the list of objects being logged, alter the associated schema, then restart FactoryLink to revise any Schema Name after you have already logged data to a table using that schema. This recreates the table using the new table structure.

If you are using a database server, such as Oracle or Sybase, alter the table directly using the SQL command ALTER.TABLE. For more information on ALTER.TABLE, consult the *PowerSQL User Guide* supplied with the database server.

Valid Entry: unique alphanumeric character string of up to 19 characters

Database Alias Name

Name of up to 31 characters of the relational database where Historian sends the data from Data Point Logging. This entry must match a database alias name entry on a database-specific Historian Information for... panel. See the applicable “Configuring... Historian” chapter for more information.

An invalid entry causes a fatal error and run-time termination.

Valid Entry: character string of up to 31 characters

Historian Mailbox

Name of the mailbox tag used to transfer data to the Historian. This tag must match a mailbox tag entry on a database-specific Historian Information for... panel. See the applicable “Configuring... Historian” chapter for more information.

An invalid entry causes a fatal error and run-time termination.

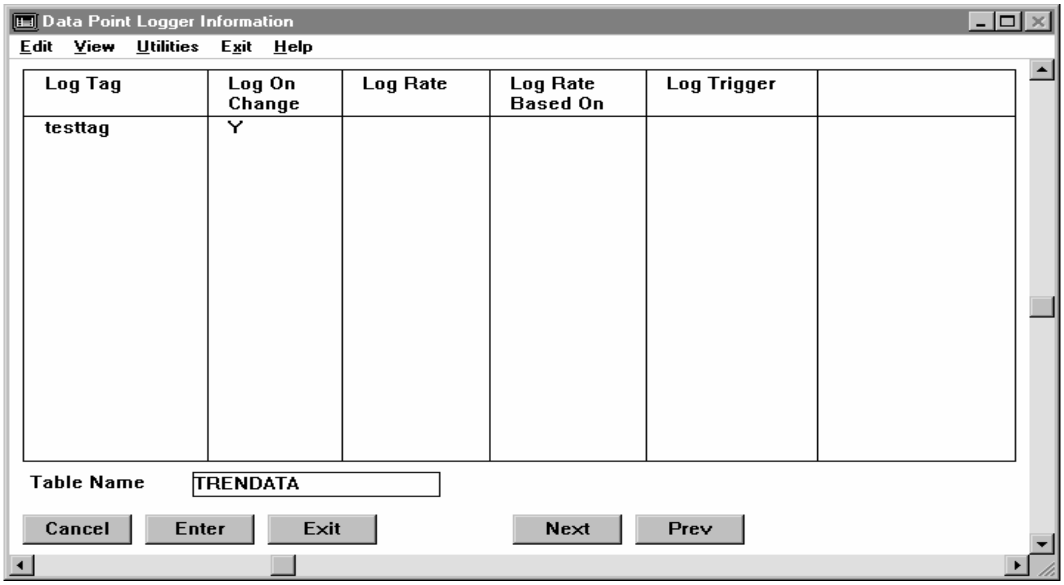
Valid Entry: standard tag name
Valid Data Type: mailbox

Click Next to go on to the Data Point Logger Information panel.

DATA POINT LOGGER INFORMATION PANEL

Use the Data Point Logger Information panel to relate the tags you are logging to a Data Point Logger table and to configure one or more tags to be logged to a specific relational database table configured in the Data Point Logger Control panel. Specify one or more of the following logging methods for each tag:

- On exception—using the Log On Change field.
- Fixed-time interval—using the Log Rate and Log Rate Based On fields.
- Upon an event trigger—using the Log Trigger field.



Log Tag	Log On Change	Log Rate	Log Rate Based On	Log Trigger	
testtag	Y				

Table Name TRENDATA

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Ensure the name of the table you want to log data to is displayed in the Table Name field at the bottom of the panel.

Enter a value for each tag to be logged in the Log Tag Field plus one or more of the following:

- Log on Change
- Log Rate and (optionally) Log Rate Based On
- Log Trigger

Log Tag Name of the real-time data to be logged.

Valid Entry: standard tag name (default = digital))
Valid Data Type: digital, analog, longana, float

Log On Change
Whether Data Point Logging is triggered when the value of the tag specified in the Log Tag field changes. Press CTRL+K for a list of valid entries.

Valid Entry: yes, y, no, n

Log Rate
Integer value to indicate the interval of time between logging occurrences of the tag being logged. This entry works in conjunction with the time unit the entry in the Log Rate Based On field defines.

Valid Entry: integer of 1 to 86,400

Log Rate Based On
Unit of time the Log Rate field entry is based on. Press CTRL+K for a list of valid entries.

Valid Entry: seconds, minutes, hours, days (default = seconds)

Log Trigger
Name of the tag that triggers the Data Point Logging operation. The log tag is logged when this log trigger is either digital equal to 1 or non-digital with variable value.

Any trigger tags you define in Data Point Logging must be triggered by another FactoryLink task, such as Timer.

Valid Entry: standard tag name (default = digital)
Valid Data Type: digital, analog, longana, float, message

An alternative to specifying tags to be logged on the Data Point Logger Information panel is to specify Data Point Logging on the Tag Definition panel.

You have completed the required configuration for Data Point Logger. If you wish to change the schemas for the preconfigured Data Point Logger tables or create additional schemas, then click Next to go on to the Data Point Schema Control panel.

Data Point Schema Control Panel

The Data Point Schema Control panel is used to control the structure or schema of the Data Point Logging tables. On the Data Point Schema Control panel, you can either:

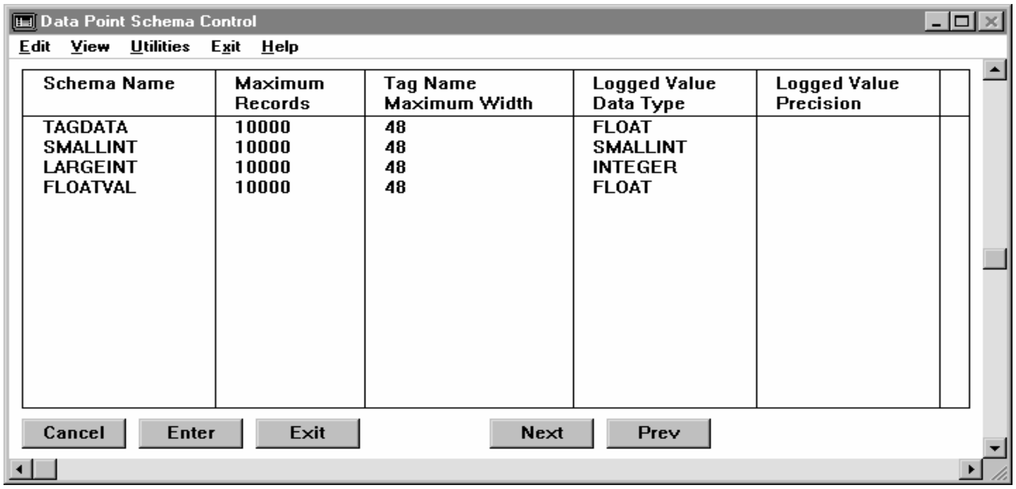
- Change the storage space occupied by the tag name and tag value fields for the pre-configured Data Point logging tables.
- Define additional Data Point logging table schemas. Before using a new schema, however, you must also add a record (row) for it to the Data Point Logging Control panel. Refer to "Data Point Logger Control Panel" on page 213 for more information.

Data Point Logging provides four default Data Point logging table schemas, each accepting a different logged data type.

Schema Name	Data Type
TAGDATA	Float.
SMALLINT	Smallint (analog, data).
LARGEINT	Integer (longana, analog, data).
FLOATVAL	Float (float, longana, analog, data).

The default maximum records specified in a dBASE IV database table governed by any of the four default Data Point Logging table schemas is 10,000. Each default schema also specifies a maximum tagname column width of 48.

The Data Point Schema Control panel is configured with the four default table schema records described previously.



Schema Name	Maximum Records	Tag Name Maximum Width	Logged Value Data Type	Logged Value Precision
TAGDATA	10000	48	FLOAT	
SMALLINT	10000	48	SMALLINT	
LARGEINT	10000	48	INTEGER	
FLOATVAL	10000	48	FLOAT	

Specify the following information to add a database schema record:

Schema Name — Unique alphanumeric character string of up to 19 characters of the schema that defines a unique Data Point Logging table structure. This schema is also referenced on the Data Point Logging Control panel.

Valid Entry: unique alphanumeric character string of up to 19 characters

Maximum Records — Maximum number of records allowed in a Data Point logging table governed by this schema in the dBASE IV database. Only dBASE IV databases use this field. You can use this parameter to automate table maintenance. When the maximum is reached, the oldest record is deleted. If you leave this field blank, as many records as disk space allows are logged.

Valid Entry: integer from 1 to 1,000,000

Tag Name Maximum Width — Maximum width the Data Point Logging table column receiving the tag name may occupy. If the tag name contains dimension specifications, you must include them when calculating the tag name width. You can use this parameter for efficient data space utilization. If you expect the logged tag name never to exceed 32 characters, then reduce the width to 32.

Valid Entry: integer from between 8 to 48 (default = 48)

Logged Value Data Type — Data types allowed for the tag being logged to the Data Point Logging table.

Valid Entry: float, integer, smallint or a user-specified, database-dependent numeric data type, such as NUMBER for Oracle

Length or Precision
Specify a precision qualifier, such as *xxx* or *xxx,yyy*, where *x* and *y* can be any number if the Logged Value Data Type field contains a specific data type supported by the relational database. The precision qualifier defines the number of digits and identifies the number of digits allowed in the column and the accuracy of the number before rounding occurs.

LOGGING MESSAGES AND CODES

During normal operations and upon detecting an error condition, FactoryLink generates and displays messages for the Data Point Logging task. These messages are briefly displayed on the Run-Time Manager screen. For FactoryLink to store system messages, you define database tags the messages are written to when they occur. To view the stored messages, you configure these tags as graphic objects using Application Editor.

This section explains the types of detectable errors and lists and describes the messages Data Point Logging can generate and display during development, startup, and run time.

Error Detection

FactoryLink detects errors and generates and displays three categories of messages during development, startup, and run time of Data Point Logging. This section describes each type of message.

- **Development-time messages**—Error detection during development is controlled by the Attribute Catalog (AC) file used by Configuration Manager Main Menu.
- **Startup messages**—During Data Point Logging startup, messages generated by Data Point Logging are displayed on the system monitor as the conditions prompting each message occur.
- **Run-time messages**—System messages generated by the Data Point Logging task at run time are displayed on the Run-Time Manager screen. These messages are displayed opposite the SharedTask description for Data Point Logging in the Last Message field.

Error Detection at Task Startup

Data Point Logging checks entries in two of its panels at Configuration Table load time:

- Data Point Logging Control panel—Data Point Logging verifies each Data Point Logging control record has a corresponding Historian Mailbox entry and Database Alias Name entry configured in Historian.

  A fatal error code is displayed on the Run-Time Manager screen if any control record fails this test, and Data Point Logging pauses for one second and then terminates.
- Dynamic Logging Control panel—Data Point Logging checks to see if the Dynamic Logging Control panel only contains one record (row).

  A warning is displayed on the Run-Time Manager screen if more than one record exists, but Data Point Logging continues to run.

Error Detection at Run Time

During dynamic Data Point logging, an error message is generated when any of the following occurs:

- An invalid tag name is specified.
- A tag created in the USER domain is specified.
- A Table Name/Schema Name entry in the Data Point Logging Control panel does not have a corresponding entry in the Data Point Schema Control panel.

Messages

This section references the directory as FLAPP when discussing errors associated with files in your FactoryLink application directory.

Startup Error Messages

The following messages report error conditions that occur at Data Point Logging task startup.

Bad size for CT # *record_number*

Cause: (Task terminated.) A discrepancy exists between the indicated .CT file size and the file size specified in the Data Point Logging task.

Action: Rebuild the .CT file by forcing a ctgen of the Data Point Logging task using ctgen -v2 dplogger.

Can’t open CT archive *file_name*

Cause: (Task terminated.) This .CT archive file is missing.

Action: Rebuild the .CT file by forcing a ctgen of the Data Point Logging task using ctgen -v2 dplogger. Call Customer Support if Data Point Logging does not run.

Can’t read CT # *record_number* in CT archive *file_name*

Cause: (Task terminated.) This .CT archive file is corrupt.

Action: Rebuild the .CT file by forcing a ctgen of the Data Point Logging task using ctgen -v2 dplogger. Call Customer Support if Data Point Logging does not run.

Database alias name not supplied for table name: *table_name*

Cause: This Data Point logging table does not have a Database Alias Name entry.

Action: Enter a valid Database Alias Name.

Historian mailbox not supplied for table name *table_name*

Cause: This Data Point logging table does not have an Historian Mailbox entry.

Action: Enter a valid Historian Mailbox name.

Loading CT archive *file_name*

Cause: This .CT file is being loaded.

Action: None. This is a status message only.

Loading Data Point save file *file_name*

Cause: This Data Point save file is being loaded.

Action: None. This is a status message only.

No CTs in CT archive *file_name*

Cause: (Task terminated.) No configuration data exists in this .CT archive file.

Action: Rebuild the .CT file by forcing a ctgen of Data Point Logging using ctgen -v2 dplogger. Call Customer Support if the task does not run.

No domain name for application directory *directory_name*

Cause: (Task terminated.) The domain is not defined.

Action: Define the environment variable FLDOMAIN.

No jobs configured in CT archive *file_name*

Cause: (Task terminated.) The Data Point Logging Control panel must have at least one row of data.

Action: Add a row to the Data Point Logging Control panel.

Out of RAM

Cause: (Task terminated.) Not enough memory remains to load FactoryLink.

Action: Either add more memory or reduce memory consumption.

Task cannot run in domain USER

Cause: (Task terminated.) The USER domain is specified.

Action: Start the task in the SHARED domain.

Task initialization failed

Cause: (Task terminated.) The Data Point Logging task failed to register with the kernel.

Action: Verify FactoryLink is up and running by using flshm -lum. Also verify the task is a purchased option. Call Customer Support if Data Point Logging does not run.

The table *table_name* is not valid

Cause: A Table Name/Schema Name entry in the Data Point Logging Control panel does not have a corresponding entry in the Data Point Schema Control panel.

Action: Enter the missing entry in the Data Point Schema Control panel.

Run-Time Error Messages

The following messages report error conditions that occur during Data Point Logging task run-time operation.

Can't open log file

Cause: The error log file could not be opened.

Action: Check to see if the disk is full. If so, free up adequate disk space.

Creation of save point file *file_name* failed

Cause: The Data Point save file is not created, possibly because an invalid path is specified in the Command File Tag.

Action: Check the syntax of the Command File Tag entry.

Dynamic request is being processed

Cause: A dynamic logging request is being processed.

Action: None. This is a status message only.

Dynamic request was successful

Cause: The dynamic logging request is successful.

Action: None. This is a status message only.

Error attaching to database *database_name <db_specific_error_message>*

Cause: Depends on content of <*db_specific_error_message*>.

Action: Depends on content of <*db_specific_error_message*>.

Error creating table *table_name <db_specific_error_message>*

Cause: Depends on content of <*db_specific_error_message*>.

Action: Depends on content of <*db_specific_error_message*>.

Error executing cursor for sql statement *SQL_statement <db_specific_error_message>*

Cause: Depends on content of <*db_specific_error_message*>.

Action: Depends on content of <*db_specific_error_message*>.

Error initializing cursor for sql statement *SQL_statement <db_specific_error_message>*

Cause: Depends on content of <*db_specific_error_message*>.

Action: Depends on content of <*db_specific_error_message*>.

Error occurred during reloading of save point file. Please view log file

Cause: An error occurred while reloading the Data Point save file.

Action: Check the error log file.

Error preparing cursor for sql statement *<db_specific_error_message>*

Cause: Depends on content of <*db_specific_error_message*>.

Action: Depends on content of <*db_specific_error_message*>.

Global tag *tag_name* not found

Cause: (Task terminated.) Possibly the global tag SECTIME or the global tag DPLOGHISTMBX is missing.

Action: Run FLCONV.

Invalid configuration for tag *tag_name* in table *table_name*

Cause: No logging method is specified for this tag.

Action: Specify one or more logging methods for the tag.

Invalid syntax in command *{LOG|REMOVE}*

Cause: Incorrect syntax is used in a LOG or REMOVE statement.

Action: Check the command syntax.

Multiple dynamic control records are not supported

Cause: Data Point Logging only reads the first dynamic logging control record. All other rows in this panel are ignored.

Action: Remove all dynamic logging control records except the first.

Table *table_name* is defined more than once

Cause: (Task terminated.) A table name can only be referenced once in the Data Point Logging Control panel.

Action: Remove one of the references.

The table *table_name* is not valid

Cause: The table specified in a dynamic logging command does not exist in the Data Point Logging Control panel.

Action: Enter the name of this table in the Table Name field in the Data Point Logging Control panel.

The tag *tag_name* is not valid. Error <*err_msg*>

Cause: An invalid tag name is specified.

Action: Specify a valid FactoryLink tag name. <*err_msg*> further describes why the tag is invalid.

Unable to remove tag *tag_name*

Cause: Tag(s) specified in a REMOVE statement cannot be removed.

Action: Check the tag name specified in the REMOVE command.

Was not able to read save point file *file_name*

Cause: This Data Point save file was not read, possibly because it does not exist or it exists in a directory other than the default directory.

Action: Create one if the Data Point save file does not exist. Specify the full path in the Command File Tag entry if the file exists in a directory other than the default directory.

Chapter 6 . . . .

Dynamic Data Exchange (DDE) Task Definition

Dynamic Data Exchange (DDE) is a protocol used in Microsoft Windows to transfer data from one application to another.

This chapter contains information about the following topics:

- Principles of Operation
  - DDE Server
  - DDE Client
- DDE Conversations
  - DDE Messages
- Setting Up DDE Server
- Establishing a DDE Link
  - Entering a DDE Formula
  - Modifying a Linked Element
  - Using a Create Link Option
- DDE Client Functions
  - Read Operations
  - Write Operations

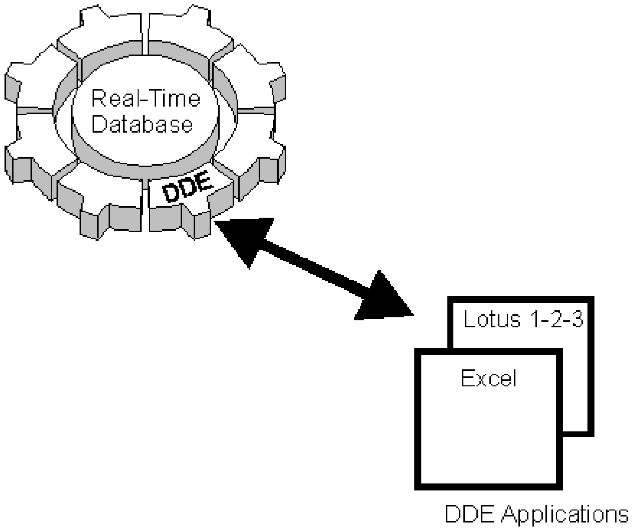
This chapter introduces the operational concepts to configure Dynamic Data Exchange (DDE) operations. For information on procedures to configure this task, refer to “Dynamic Data Exchange (DDE)” on page 941 in the *FactoryLink ECS Configuration Guide*. For a quick description of this task’s panels, its entries, and its associated error messages, use “DDE Client” on page 239 in the *FactoryLink ECS Reference Guide.*

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

PRINCIPLES OF OPERATION

Dynamic Data Exchange (DDE) is a form of interprocess communication used by many Windows applications to automatically update data and to regulate how and when data is passed between applications. Because DDE protocol is well-defined, two applications that follow the protocol can communicate with each other even though neither application was explicitly written to work with the other.

DDE allows you to perform data display techniques in any software package supporting DDE using FactoryLink data, as shown in the following illustration.



The FactoryLink IV system provides both DDE Server and DDE Client functionality.

DDE Server

Use the FactoryLink DDE Server to establish communications between the FactoryLink real-time database and client software products, such as Lotus 123 and Microsoft Excel.

You may set up DDE links for the FactoryLink DDE Server to be initiated from any external Windows application that offers DDE support; therefore, DDE applications, such as Lotus or Excel, can pass data to or retrieve data from FactoryLink. This means the FactoryLink real-time database can display and modify spreadsheet data, word processing files, and other Windows application data.

The DDE Server also allows client applications to request, modify, advise, and receive notification of updates to elements in the FactoryLink real-time database

Note:

DDE Client

Although the DDE Server is the preferred method for communicating with external DDE applications, you can also use DDE Client to configure bidirectional communication between the real-time database and one or more Windows DDE servers.

You can configure a single FactoryLink system for multiple external DDE servers simultaneously. You setup the FactoryLink DDE Client in the Configuration Manager Main Menu and initiate communication from a FactoryLink application.

DDE Conversations

DDE data exchanges occur via DDE conversations. These DDE conversations consist of a DDE server and a DDE client.

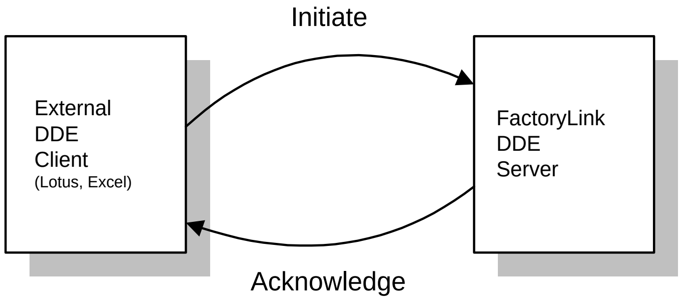
DDE servers supply information for client applications; thus, the FactoryLink DDE Server acts as an information source for client applications, such as Excel and Lotus.

Client applications control the DDE conversation and initiate all data requests. You can set up DDE links in external client applications to retrieve data from the real-time database via the FactoryLink DDE Server.

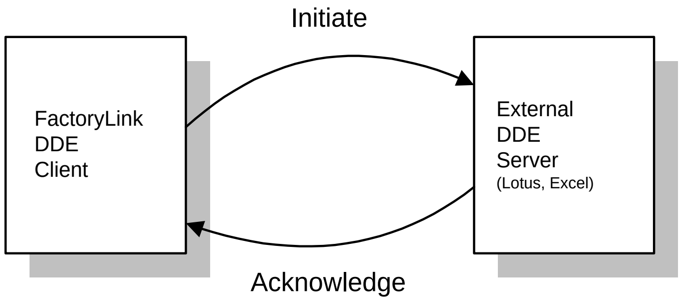
Also, a FactoryLink application can use the FactoryLink DDE Client task set up through the Main Menu to initiate communication and retrieve data from external servers in products, such as Excel or Lotus.

Either the server or the client can terminate DDE conversations. The following graphic illustrates this server/client relationship.

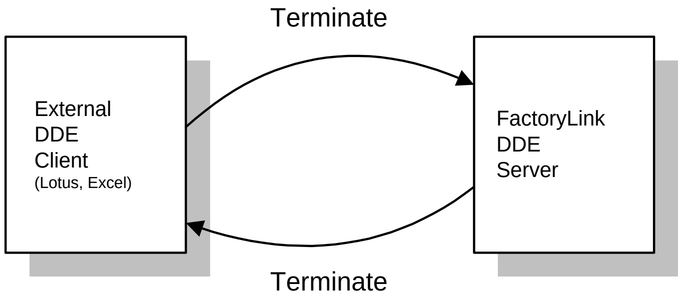
DDE clients access the FactoryLink DDE Server.



FactoryLink DDE Client can initiate DDE conversations with external DDE servers.



DDE conversations can be terminated by either the DDE server or the DDE client.



DDE Messages

The applications involved in a DDE conversation do not have to be specifically developed to work with each other since the applications communicate via DDE messages. DDE messages allow two or more Windows applications to communicate and share data.

FactoryLink supports the following standard DDE messages:

- **Advise**: Requests notification when an item changes
- **Execute**: Acknowledges the message
- **Initiate**: Start DDE conversation
- **Poke**: Send new value to the server
- **Request**: Request a value from the server
- **Unadvise**: Request that client is not notified of an item change
- **Data**: Notify client when an item changes
- **Ack**: ACK or NAK on message
- **Terminate**: Termination of the DDE Conversation

These messages are the basic building blocks the FactoryLink DDE Server and DDE Client work with.

SETTING UP DDE SERVER

Perform the following steps to set up the FactoryLink DDE Server:

1 Complete the following fields to configure the DDE Server in the *System Configuration Information* panel:

Flag FSR in the Flag field. These flags allow the DDE Server to automatically load each time FactoryLink is started.

Task Name Name FLDDESRV to identify the Server task.

Path Path name as /bin/flddesrv.

Note: When client references any tags, they are case insensitive and application developers should be careful when referencing tags from non-FL DDE Clients. If they type in secTIMe or sectime, when referencing SECTIME, it will still update the tags with SECTIME. This is because DDE protocol does not preserve the case of tagnames, so case sensitive search tags in this product will not be possible.

2 Establish a DDE Link using the application-specific procedures for a DDE Formula or Create Link. Refer to the appropriate application documentation, such as the *Microsoft Excel User Guide*, for detailed instruction. DDE Links give Windows application access to the FactoryLink real-time database. For example, the value of a specified element can be set up to be displayed automatically in a cell of a Microsoft Excel spreadsheet.

DDE Server may be associated with either the SHARED or USER domain.

ESTABLISHING A DDE LINK

When a DDE client initiates a DDE conversation with the FactoryLink DDE Server using the INITIATE message, the client must specify a formula that consists of an Application, Topic, and Item.

- Application—The name of the server application. Use the values of the FactoryLink environmental variables **FLNAME.FLUSER**, separated by a period delimiter, to specify a FactoryLink application.

  FLNAME is the environmental variable whose value is a FactoryLink application name. The default value of the environmental variable FLUSER is SHAREUSR. This default is established when the Run-Time Manager is started from the Start FactoryLink icon., Specify the FLUSER value used if the Run-Time Manager is started from the Run prompt.
- Topic— The name of the file containing the exchange data. For a FactoryLink application, use **RTDB** to represent the FactoryLink real-time database.
- Item— The actual data exchanged in a DDE conversation. This is the name of a specific FactoryLink tag name for a FactoryLink application.

> **Note:** In Excel, array tag names must be enclosed in single quotation marks. These quotation marks are not used for non-array tag names.

Element names specified for DDE must be unique. Refer to “Determining Unique Elements” in the *FactoryLink ECS Configuration Guide* for more information on determining a unique element.

The client must include the following string in its DDE message to obtain information from the FactoryLink real-time database:

```
=FLNAME.FLUSER|RTDB!’tag_name’
```

> **Note:** If you are creating an application in a language other than English, check your country’s system settings to verify the number format is set up properly. In addition, the DDE Item name can be country-dependent. For example, the English version of a DDE Item name called R1C1 becomes Z1S1 in German.

Using a DDE Formula

Although DDE is implemented in different ways, the actual DDE commands are very similar.

The following example is specific to Microsoft Excel; however, the basic concepts can be applied to any product that supports DDE:

1 Open a spreadsheet in Excel.

2 Highlight the destination area. It must match the size and shape of the source information.

3 Type an equal sign.

4 Type the source application name. Use the values of the FactoryLink environmental variables FLNAME.FLUSER, separated by a period delimiter.

5 Type a vertical bar (|).

6 Type the source topic name (`RTDB`).

7 Type an exclamation point.

8 Type the address of the source information, which is any standard FactoryLink tag name enclosed in single quotes.

Using a Create Link Option

Many Windows applications use Create Link to establish a DDE Link.

The following example is specific to Lotus 123W; however, the basic concept can be applied to any DDE client supporting the Create Link.

1 Open the Edit|Link Options menu and choose Create Link. Enter the following information:

- Type the value of the environmental variables FLNAME.FLUSER, separated by a period for application name.
- Type `RTDB` for topic.
- Type the name of any standard FactoryLink tag name For item name,.

The DDE Link is now in place and the client application can communicate with the FactoryLink real-time database.

MODIFYING A LINKED ELEMENT

Once a FactoryLink element is linked, it can be modified. The following example shows how an element linked to Excel is modified using an Excel macro.

Perform the following steps in Excel to create an Excel macro:

1 Choose File>New>Macro.

2 Open the appropriate spreadsheet in Excel.

3 Select cell A1.

4 Enter the following macro information in the spreadsheet.

Table 6-1 Spreadsheet Macro Information

A		B
1	SendChannel = INITIATE(“FLNAME.FLUSER”,"RTDB")	Open a channel.
2	=POKE(SendChannel,"message1",B2)	Send this to FactoryLink.
3	=TERMINATE(SendChannel)	End DDE conversation.
4	=RETURN()	

5 Choose Formula>Define Name.

6 Type a name for the macro and choose Command Type.

7 Enter `=$A$1` in the Refers To field.

8 Open the Macro menu and choose Run.

DDE CLIENT FUNCTIONS

Use the *DDE Client Table* to configure bidirectional communications between the FactoryLink real-time database and external Windows applications via a DDE link. This communication is established by entering data in configuration tables that enable the system to read data from and write data to an external DDE server.

The DDE Client task uses two types of configuration tables:

- Read/Write Control—This table allows the user to specify multiple DDE server configurations.
- Read/Write Information—This table allows the user to identify DDE item names to be read and transferred to the FactoryLink real-time database or real-time database values are written to.

The DDE Client task, through the DDE protocol, reads and writes data to and from a DDE server. Read and write operations can occur at timed intervals and upon triggered conditions, operator requests, or system events.

The DDE Client also times the response. If a time-out occurs or the response is not valid, the task determines the interface to be faulty and an error code is displayed on the Run-Time Manager screen indicating which device has the communication problem.

Read Operations

In a read operation, the DDE Client task performs a read of the DDE server item names specified in the *Read/Write table.*

The FactoryLink read operation can be of two types:

- Block Read or Triggered—Reads the values of the DDE server item names specified in a *Read/Write table* and writes them to the real-time database.

  As part of the configuration of a *Read/Write table* in a triggered block read, the user specifies a trigger element in the real-time database to initiate read operations. When the value of this trigger element is 1 (ON) and has changed since the last scan, the DDE Client task performs a read of the DDE Server item names you specified in the *Read/Write table.*

  Triggered block read operations allow the DDE Client task to achieve maximum performance by transmitting the minimum number of read commands necessary to collect the data specified in the *Read/Write table.*

- Advise/Unadvise or Not Triggered—The DDE Client task can be configured to notify the DDE server it wants to be updated when the values of the *Read/Write table* change. A digital tag value is associated with this feature. If the digital tag value is 1 (ON), the DDE Client alerts the DDE server it wants to be updated on changes of the *Read/Write table*. If the digital tag value is 0 (OFF), no such updating is performed.

Write Operations

In a write operation, the DDE Client task, through the DDE protocol, initiates a write operation to the DDE server item names specified by the user *Read/Write table.*

FactoryLink write operations can be of two types:

- Block Write or Triggered—Writes the values of all the elements specified in a Read/Write table.

  In a triggered block write, as part of the configuration of a Read/Write table, the user specifies a trigger element in the real-time database to initiate write operations. When the value of this trigger element is 1 (ON) and has changed since the last scan, the DDE task performs a write to the DDE server item names you specified in the Read/Write table.

  Triggered block write operations allow the DDE client to achieve maximum performance by transmitting the minimum number of write commands necessary to collect the data specified in the Read/Write table.
- Exception Write or Not Triggered—Writes only real-time database values that have changed or values of elements whose change-status flags have been set since the last time the task scanned the real-time database.

You can configure as many Read/Write tables as available memory allows, with the number of entries in each table also limited only by available memory.

SETTING UP DDE CLIENT

Perform the following step to set up the FactoryLink DDE Client:

1 Configure the task in the *System Configuration Information* panel by specifying the following information in each field:

Flag **FSR** in the Flag field. These flags allow the DDE Client to automatically load each time FactoryLink is started.

Task Name Name **FLDDECLI** to identify the Client task.

Path Pathname as /bin/flddecli.

Chapter 7 . . . .

DDE Client

Principles of Operation

Dynamic Data Exchange (DDE) is a form of interprocess communication used by many Windows applications to automatically update data and to regulate how and when data is passed between applications. Because DDE protocol is well-defined, two applications that follow the protocol can communicate with each other even though neither application was explicitly written to work with the other. DDE allows you to perform data display techniques in any software package supporting DDE using FactoryLink data.

The FactoryLink IV system provides both DDE Server and DDE Client functionality.

DDE Server—Use the FactoryLink DDE Server to establish communications between the FactoryLink real-time database and client software products, such as Lotus 123 and Microsoft Excel.

DDE Client—Although the DDE Server is the preferred method for communicating with external DDE applications, you can also use DDE Client to configure bidirectional communication between the real-time database and one or more Windows DDE servers.

You can configure a single FactoryLink system for multiple external DDE servers simultaneously. You set up the FactoryLink DDE Client in the Configuration Manager Main Menu and initiate communication from a FactoryLink application.

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

DDE Conversations

DDE data exchanges occur via DDE conversations. These DDE conversations consist of a DDE server and a DDE client. DDE servers supply information for client applications; thus, the FactoryLink DDE Server acts as an information source for client applications, such as Excel and Lotus.

Client applications control the DDE conversation and initiate all data requests. You can set up DDE links in external client applications to retrieve data from the real-time database via the FactoryLink DDE Server.

Establishing a DDE Link

When a DDE client initiates a DDE conversation with the FactoryLink DDE Server using the INITIATE message, the client must specify a formula that consists of an Application, Topic, and Item.

- Application—The name of the server application.
- Topic—The name of the file containing the exchange data.
- Item—The actual data exchanged in a DDE conversation. DDE Client Functions

Use the DDE Client Table to configure bidirectional communications between the FactoryLink real-time database and external Windows applications via a DDE link. This communication is established by entering data in configuration tables that enable the system to read data from and write data to an external DDE server.

> **Note:** Unlike some DDE conversations which can support a variety of clipboard formats, the FactoryLink DDE tasks only support the exchange of ASCII text. Any formatting information associated with the data will be lost as a result of the DDE conversation.

The DDE Client task uses two types of configuration tables:

- Read/Write Control—This table allows the user to specify multiple DDE server configurations.
- Read/Write Information—This table allows the user to identify DDE item names to be read and transferred to the FactoryLink real-time database or real-time database values are to be written to.

Setting Up DDE Client

Configure the task in the System Configuration Information panel by completing the following fields to set up the FactoryLink DDE Client:

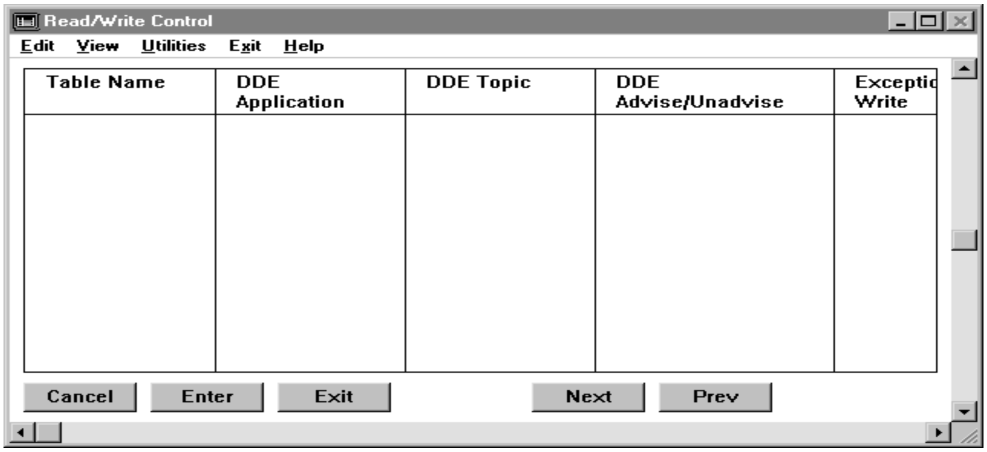
- Flag—Enter the flags FSR in the Flag field. These flags allow the DDE Client to automatically load each time FactoryLink is started.
- Task Name—Enter the name FLDDECLI to identify the Client task.
- Path—Enter the pathname as /bin/fldecli.

READ/WRITE CONTROL PANEL

Perform the following steps to configure the Read/Write Control panel:

1 Ensure the domain selected is correct in the Configuration Manager Main Menu Domain Selection box.

2 Choose DDE Client from the Configuration Manager Main Menu to display the Read/Write Control panel.



3 Specify the following information for this panel:

Table Name — Name of the Read/Write Table to be defined or modified.

Valid Entry: up to 16 characters

DDE Application — Name of the application a DDE link is to be established for. A DDE conversation is characterized by a DDE application and a DDE topic.

Valid Entry: up to 255 characters

DDE Topic — Name of the topic a DDE link is to be established for. A DDE conversation is characterized by a DDE application and a DDE topic.

Valid Entry: up to 255 characters

DDE Advise/Unadvise — Element whose value causes the corresponding DDE Server to update the client on changes in the Read/Write Table when set to 1 (ON).

Valid Entry: standard element tag name
Valid Data Type: digital

Exception Write
: Indicator specifying whether writes are to occur upon each change in the value of the elements specified in the DDE Client Read/Write Control panel.

YES	A change of status of any element generates a write of that element value, independently of any triggers or other values.
NO	No exception processing. Write operations are generated only when the value of the write trigger element is 1 (ON) and its change-status is set. All values are written, regardless of their change-status.

Block Read Trigger
: Element whose value initiates a block read of the values specified in the Read/Write Information panel when forced to 1 (ON). The Block Read Trigger is generally defined by another FactoryLink task, such as the Timer, Math & Logic, or Application Editor.

Valid Entry:	standard element tag name
Valid Data Type:	digital

Block Read Disable
: Element whose value disables the block read of elements specified in this table when 1 (ON).

Valid Entry:	standard element tag name
Valid Data Type:	digital

Block Read Complete
: Element whose value is force-written to 1 (ON) by the DDE Client task whenever any block read operation for this table is completed. If this element is defined when the DDE Client task initializes, its value is force-written to 1 (ON).

Valid Entry:	standard element tag name
Valid Data Type:	digital

Block Read State
: Element whose value is 0 (OFF) when a block read of the elements specified in this table is in progress and 1 (ON) when the table is inactive. If this element is defined when the DDE Client task initializes, its value is force-written to 1 (ON).

Valid Entry:	standard element tag name
Valid Data Type:	digital

Block Write Trigger
: Element whose value initiates a block write of the values specified in the Read/Write Information panel when forced to 1 (ON). The Block Write Trigger is generally defined in another FactoryLink task, such as the Timer, Math & Logic, or Application Editor.

Valid Entry:	standard tag name

Valid Data Type: digital

Block Write Disable
Element whose value disables a block write to the DDE server specified in this table when 1 (ON).

Valid Entry: standard tag name
Valid Data Type: digital

Block Write Complete
Element whose value is force-written to 1 (ON) whenever any block write operation for this table is completed. If this element is defined when the DDE Client task initializes, its value is force-written to 1 (ON).

Valid Entry: standard tag name
Valid Data Type: digital

Block Write State
Element whose value is 0 (OFF) when a block write of the elements specified in this table is in progress and 1 (ON) when the table is inactive. If this element is present when the DDE Client task initializes, its value is force-written to 1 (ON).

Valid Entry: standard tag name
Valid Data Type: digital

Error/Status Tag Name
Element whose value represents the last error message generated by this DDE Conversations. A value of 0 implies no errors have occurred.

Valid Entry: standard tag name
Valid Data Type: analog

Other possible error values are listed in the following table.

Error Value	Cause	Actions
1	DDE initiate failed	The DDE Server is not running or is not responding. Verify the server is running and the application and topic names are correct.
2	DDE acknowledge failed	The DDE Server did not respond to the DDE Client request in the time-out period. Verify the server is running and the application and topic names are correct.

Error Value	Cause	Actions
3	DDE block peek operation failed	An error occurred during the Peek operation. Verify the server is running and the DDE itemnames are correct.
4	DDE block poke operation failed	An error occurred during the Poke operation. Verify the server is running and the DDE itemnames are correct.
5	DDE block advise operation failed	An error occurred during the Advise operation. Verify the server is running and the DDE itemnames are correct.
6	DDE block unadvise operation failed	An error occurred during the Unadvise operation. Verify the server is running and the DDE itemnames are correct.

4 Click on Enter to save the information.

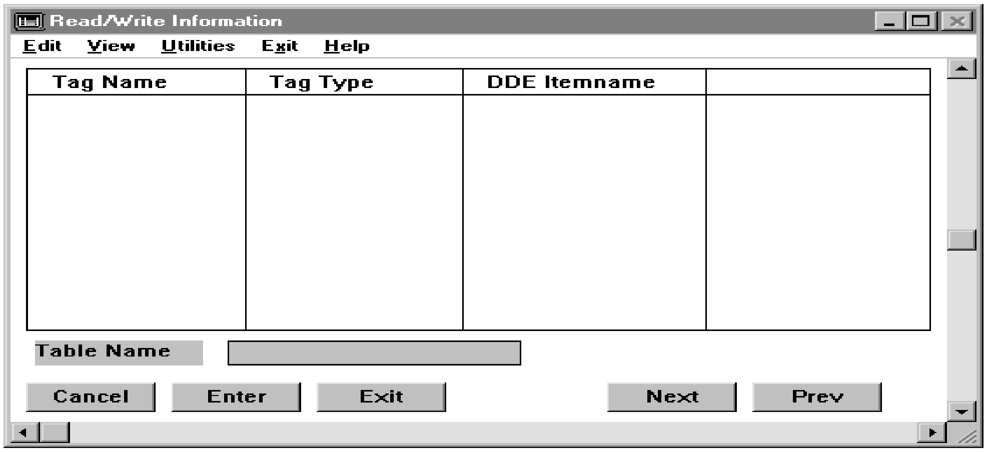
5 Click on Exit to return to the Main Menu.

READ/WRITE INFORMATION PANEL

Perform the following steps to configure the Read/Write Information panel:

1 Ensure the domain selected is correct in the Configuration Manager Main Menu Domain Selection box.

2 Choose DDE Client from the Configuration Manager Main Menu to display the Read/Write Information panel.



3 Specify the following information for this panel:

Tag Name Name of the element to be placed in the read/write/advise/unadvise table.

Valid Entry: standard tag name
Valid Data Type: digital, analog, longana, float, message, mailbox

Tag Type Type of FactoryLink element named in the Tag Name field. This is a display-only field.

DDE Itemname Name the DDE server identifies element by. Each tag name is referenced in DDE by a DDE Itemname.

Valid Entry: up to 255 characters

4 Click on Enter to save the information.

5 Click on Exit to return to the Main Menu.

DDE Messages

The corresponding message is displayed onscreen in a pop-up dialog whenever a DDE error message occurs. The FactoryLink DDE task can have the following errors:

Server

Advisory for tag already established

Cause: Multiple links exist for an element within a single DDE conversation.

Action: A DDE conversation may only contain one link per element. Establish a new link for the duplicate item to correct the problem.

Can’t lock memory
Can’t allocate memory
Couldn’t allocate memory

Cause: Memory is low.

Action: Stop any unnecessary tasks and/or clear space on the hard drive.

Could not initiate DDE conversation

Cause: The external application for the DDE conversation is not running.

Action: Start the external application and retry the operation.

DDE Send data failed

Cause: The client application is not available to FactoryLink.

Action: Restart the client application.

DDE Server can’t register with FactoryLink

Cause: FactoryLink is not available to the client application.

Action: Restart FactoryLink or shut down any unnecessary tasks.

Client

CT file not found.

Cause: The DDE Client cannot find its respective FLDDECLI.CT file.

Action: Shut down FactoryLink and try again.

DDE Client couldn’t Register with FactoryLink!

Cause: FactoryLink is not available to an external DDE client.

Action: Ensure the FactoryLink system started and is running in the Windows environment.

DDE Send data Failed!

Cause: DDE Server can not send data to the FactoryLink DDE Client.

Action: Ensure the external DDE server is running and the DDE Client is configured correctly.

Error Reading CT File

Cause: The FLDDECLI.CT file may be corrupted.

Action: Erase the file and try running FactoryLink again.

FLDOMAIN Environment variable not set!

Cause: Undefined environmental variable.

Action: Ensure the environmental variable FLDOMAIN is set to the appropriate domain.

Memory could not be allocated

Cause: Memory is low.

Action: Shutdown unnecessary Windows applications and try again.

Unable to lock memory!

Cause: Memory is low.

Action: Shutdown unnecessary Windows applications and try again.

Chapter 8 . . . .

File Manager

File Manager allows you to perform basic operating system file-management operations initiated by a FactoryLink application at run time. This task works in conjunction with FactoryLink's FLLAN option to initiate operations within other FactoryLink stations on the network.

This chapter covers the following topics:

- Principles of Operation
- File Manager Control Panel
- File Manager Information Panel
- Sample File Manager Operations
- Using Variable Specifiers in File Specifications
- Using Wildcard Characters in File Specifications
- Using the File Manager with Networks
- Changing Protocols
- Program Arguments
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

PRINCIPLES OF OPERATION

The File Manager initiates the following operations:

- Copy a file
- Rename a file
- Delete a file
- Print a file
- Display a directory
- Type a file

File Manager initiates these operations with six commands:

- COPY	- PRINT
- REN	- DIR
- DEL	- TYPE

These commands perform the same functions as their operating system counterparts. The File Manager controls all file operations through the FactoryLink real-time database.

You can configure other FactoryLink tasks to initiate File Manager operations. For example:

- You can configure input functions in Graphics so an operator can use them to initiate file-management operations at run time, such as to display a list of recipes or reports.
- The Timer task can trigger File Manager to automatically back up files to a networked server at certain intervals, such as each day at midnight.
- The Timer task can also trigger File Manager to delete log files automatically at certain intervals, such as once every four hours, or after certain events, such as when log files reach a specified size.
- Alarm Supervisor can trigger File Manager to print alarm files.

To enable a local node to perform file management operations with a remote node at run time, the FLFM_SERVER task must be running on the node that does not initiate the FLFM command. Either start the FLFM_SERVER task manually from the Run-Time Manager screen at startup or configure FactoryLink to start the FLFM_SERVER task automatically at system startup. Complete the following steps to do this.

1. Open the System Configuration Information panel from the Configuration Manager Main Menu on the remote node.
2. Locate the row containing the entry FLFM_SERVER in the Task field.
3. In the Flags field for that row, enter an R. This configures the FLFM_SERVER task on the remote node to start up automatically whenever FactoryLink is started.

FILE MANAGER CONTROL PANEL

The File Manager Control panel sets up triggers for the File Manager commands you want to perform and required source and destination path information.

File manager defaults to the USER domain, but you can configure it in to run in either the SHARED or the USER domain

Choose File Manager from the Configuration Manager Main Menu and specify the following information:

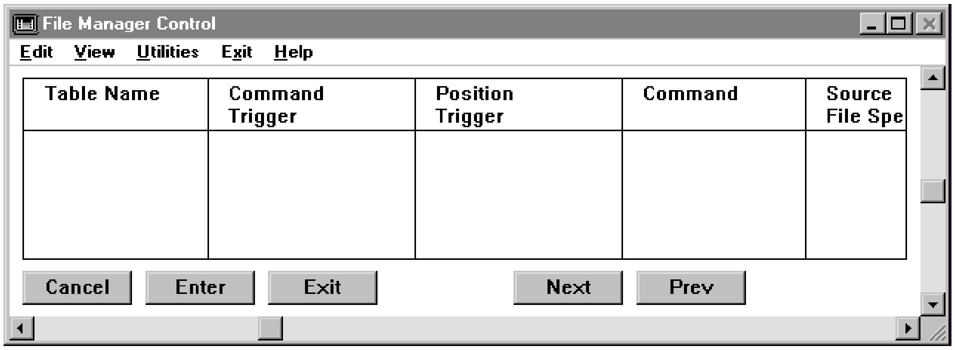


Table Name (Required for TYPE and DIR operations) Alphanumeric string of 1 to 16 characters that specifies the name of the operation being defined or modified. For TYPE and DIR operations, this field connects the entry in the File Manager Control panel with the associated File Manager Information panel for that entry.

This field is optional for COPY, REN, DEL, and PRINT operations. You can use it to distinguish different operations of the same type.

Valid Entry: alphanumeric string of 1 to 16 characters

Command Trigger Name of an element used to initiate the file operation.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter.

Valid Entry: standard tag name

Valid Data Type: digital, analog, longana, float, message

Position Trigger (Required only for DIR and TYPE operations; not used for COPY, PRINT, REN, and DEL operations.) Name of an element value that tells the File Manager where in a directory to start listing files or where in a file to start typing.

The File Manager starts reading after the line number specified by the value of the Position Trigger element. For example, if the value of the Position Trigger element is 6, the File Manager begins reading the file at line seven. The number of lines displayed or the number of files listed depends on the number of Tag Name elements defined in the File Manager Information panel.

You can configure the system so, at run time, you or any FactoryLink task can change the value of this element so the File Manager starts at a different point in a directory or file and shows a different subset of information.

Do not specify the same element name for DIR and TYPE operations. If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	analog

Command — File operation to be performed. This can be one of the following:

Note: All operations are defined in one File Manager Control panel. For COPY, REN, DEL, and PRINT operations, do not complete a File Manager Information panel. For each TYPE or DIR operation defined in the File Manager Control panel, however, complete one File Manager Information panel.

COPY — Copies the source file to the destination file. Specify both the source and destination paths. This operation does not require you to complete a File Manager Information panel.

REN — Renames the source file to the destination file. Specify both the source and destination paths. Both the source and destination paths must be the same; that is, they must point to the same directory. This operation does not require you to complete a File Manager Information panel.

DEL — Deletes the source file. The DEL command requires only the source path; the destination path is ignored. This operation does not require you to complete a File Manager Information panel.

PRINT — Causes the file specified by the source path to be printed on the device specified by the destination path. The destination path must contain the name of a device known to the Print Spooler task. This operation works only with the Print Spooler and does not require you to complete a File Manager Information panel.

DIR Displays a list of all files in the directory specified by the source path, which can include wildcard characters. The destination path is ignored. This operation requires you to complete a File Manager Information panel and to animate Text objects in Graphics to display lines from the file.

TYPE Displays the contents of the source file. The destination path is ignored. This operation requires you to complete a File Manager Information panel and to animate Text objects in Graphics to display lines from the file.

Note: File Manager reads 512 characters at a time rather than the 80, previously provided.

Note: When displaying a file name, File Manager replaces the first dot in the file name with a space. If you do not want this option, add a program argument, -c, to the File Manager command line parameters on the FactoryLink System Configuration Information panel.

Source File Spec. Full path name of the source file. The source file spec. can use the file name syntax for the operating system either the remote or the local station resides on. If you are using FLLAN, the source can reference a remote station.

The two remote stations must be the same if you specify a remote station for the destination and a remote station for the source.

You have no restriction on the source station if the destination is local. Similarly, you have no restriction on the destination if the source is local.

For more information about referencing remote stations, refer to “Using the File Manager with Networks” on page 271 of this guide.

Type wildcard characters in the path name to show a root directory’s contents using the DIR command. For example, in this field type:

```
C:\*.*
```

Only one file in a copy operation can be remote. Both files in a rename operation must be on the same station.

For standalone systems:

/DEVICE_NAME/DIR_NAME/SUB_DIR_NAME/FILE_NAME

For networked systems:

\\STATION_NAME\DEVICE_NAME/DIR_NAME/SUB_DIR_NAME/FILE_NAME

In the case of the COPY, DEL, and DIR commands, the source file specification may contain variable specifiers or wildcard characters (*). For more information about variable specifiers and wildcard characters, refer to "Using Variable Specifiers in File Specifications" on page 267 and "Using Wildcard Characters in File Specifications" on page 269 of this guide.

Valid Entry: full path name

Note: When using environment variables in path names, you can enter the name of the environment variable surrounded by braces { } and FactoryLink extends the pathname using the default setting. For example, use {HOME}/flink/csinfo.txt for DIR and TYPE.

Source Variables 1-4

Names of elements whose values replace the variable specifiers in the source path name. These fields work in conjunction with the Source File Spec. field to form the path of the file the File Manager performs operations to. The value of the element in the Source Variable 1 field replaces the first variable specifier, the value of the element in the Source Variable 2 field replaces the second variable specifier, and so on.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter.

Ensure the data type of the element matches the variable specifier type if using variable specifiers.

Valid Entry: standard tag name
Valid Data Type: digital, analog, longana, float, message

Destination File Spec.

Full path name of the destination file. The Destination File Spec. can use the file name syntax for the operating system either the remote or the local station resides on. The destination can reference a remote station if you are using FLLAN.

The two remote stations must be the same if you specify a remote station for the destination and a remote station for the source.

You have no restriction on the source station if the destination is local. Similarly, you have no restriction on the destination if the source is local.

For more information about referencing remote stations, refer to "Using the File Manager with Networks" on page 271 of this guide.

For standalone systems:

/DEVICE_NAME/DIR_NAME/SUB_DIR_NAME/FILE_NAME

For networked systems:

\\STATION_NAME\DEVICE_NAME/DIR_NAME/SUB_DIR_NAME/FILE_
NAME

Unless you use wildcard characters in the source file specification, specify the full path name of the destination. If you use wildcard characters, do not specify the full path; specify only the directory.

In the case of the COPY, DEL, and DIR commands, the destination file specification can contain variable specifiers or wildcard characters (*).

Use the following destination file specification format if using the PRINT command:

[\\station_name\] [flags] [spool_device]

where

station_name Is the optional FactoryLink station name (defaults to LOCAL). The FactoryLink station name is not used on standalone systems.

flags Are the optional flags. This can be one of the following.

NONE—This is the default.

B—Binary file.

S—Suppress Beginning and End of File. Used to concatenate files.

spool_device Is the optional spool device (defaults to 1; legal devices are 1 through 5).

Valid Entry Format	Description	Example
DRIVE:\DIR\SUBDIR\ FILE.EXT	For standalone systems	C:\LOG\HISTORY\ HISTORY.ARC
\\STATION\DRIVE:\ DIR\SUBDIR\FILE.EXT	For networked systems	\\NODE1\C:\HIST\PIC\ SCREEN1.PIC

Destination Variables 1-4

Names of elements whose values replace the variable specifiers in the destination path name. These fields work in conjunction with the Destination Format field to form the path of the file the File Manager performs operations in. The value of the element in the Destination Variable 1 field replaces the first variable specifier, the value of the element in the Destination Variable 2 field replaces the second variable specifier, and so on.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter.

Ensure the data type matches the variable specifier type if you use variable specifiers.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

Completion Trigger

Name of an element used to indicate a file-management operation is complete, but not necessarily successful. This element, if defined, is set by File Manager and can be referenced by any FactoryLink task, including File Manager to monitor file-management operations or trigger an event.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital

Completion Status

Name of an element set by the File Manager task to indicate the status of an operation. The Completion Status element can be referenced by any FactoryLink task, including the File Manager to handle file error situations or trigger the next File Manager table to start an operation.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of analog in the Type field. Accept this default.

The File Manager writes an analog value to the Completion Status element to indicate the status of a file management operation.

Use the task’s TASKMESSAGE_U[6] tag to report messages on the application screen in addition to the Completion Status tag. For example, if you get a status 12 in the Completion Status tag, you also see the message: Can’t open file (path/file name) in the tag TASKMESSAGE_U[6].

If you want to use IML for this function, set up a math procedure triggered by the status tag itself. In the procedure, assign the appropriate ASCII string for each possible status code to a message tag in a series of IF THEN statements. For example,

IF status = 1 THEN

MSG = “whatever”

ENDIF

This element can have any of the following status values.

Value	Description	Value	Description
0	Operation completed successfully.	12	Can’t open file (path/file name).
1	Current operation in progress.	13	Error occurred while reading a file.
2	Specified file(s) not found.	14	File could not be created.
* 3	Requested a line beyond end of file.	15	Error occurred while writing to a file.
5	Remote system could not perform requested action.	16	Illegal spool device was specified.
6	Attempt to log onto a remote station failed	17	Not enough memory to perform operation
8	Network transmission error occurred	97	Illegal file name was specified
* If the TYPE/DIR position trigger offset values are increased beyond the end of the file, the File Manager reads in as many lines as possible, sets the completion trigger, and sets the completion status to 3.			

For examples of File Manager operations, refer to “Sample File Manager Operations” on page 260 of this guide.

Valid Entry:	standard tag name
Valid Data Type:	analog

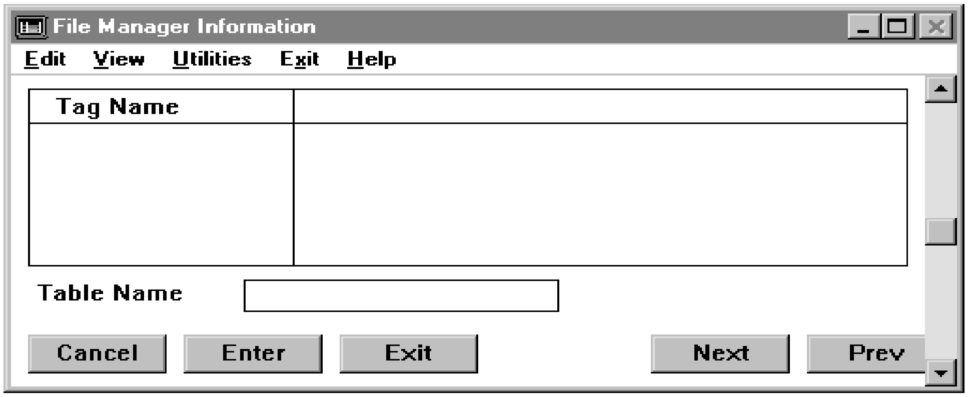
Click Next to go on to the File Manager Information panel.

FILE MANAGER INFORMATION PANEL

The File Manager Information panel defines the tags that will display the results of a TYPE or DIR operation. Animate these tags as Text objects on a graphics screen. Complete this panel ONLY if you are configuring a DIR or TYPE operation. Otherwise, you have completed the configuration of the File Manager task.

Ensure the domain selected is correct in the Configuration Manager Main Menu Domain Selection box.

Choose File Manager to display the File Manager Information panel.



Tag Name (Required only for DIR and TYPE operations; not used with COPY, PRINT, REN, and DEL operations.) Name of a message element that, as a result of a DIR or TYPE command, receives a message value to be displayed in a single line on a graphics screen. The number of Tag Name fields defined in this panel determines the number of lines displayed as a result of a DIR or TYPE command at run time. DIR file names are truncated at 49 characters for Windows NT and Windows 95 systems.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of message in the Type field. Accept this default.

Values are written to the elements defined in the Tag Name field whenever a DIR or TYPE operation is triggered or whenever the operator changes the value of the Position Trigger element defined in the Control panel. A different value in the Position Trigger element means information from a different place in the directory or file is displayed.

Note: Remember to configure one File Manager Information panel for each DIR or TYPE operation defined in the File Manager Control panel.

Valid Entry:	standard tag name
Valid Data Type:	message

Sample File Manager Operations

The examples below illustrate each type of file-management operation. In these examples, entries for each type of file-management operation are displayed in separate sample Control panels. In an actual FactoryLink application, all file-management operations are configured in one Control panel.

The first four examples do not require you to complete an associated File Manager Information panel. The last two examples do require you to complete a File Manager Information panel.

Example 1: COPY

Example 1 demonstrates how to configure a COPY operation using Windows file syntax. You can configure the Math & Logic task or an analog counter in the Counters task to use this operation to increment the alarm history file number. This results in a rolling count of the history file being transferred: Hist.001, Hist.002, and so on. Complete the Control panel to configure a COPY operation,

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	WINCOPY	Leave this field blank because the COPY operation does not require completion of the File Manager Information panel; however, we recommend you complete this field to distinguish different operations of the same type.
Command Trigger	copytrig	Name of the digital element that triggers the copy operation. You can configure other tasks to write to this element to trigger the copy operation.
Command	COPY	Designates a COPY operation.
Source File Spec.	c:\history\ hist.%03d	The path and file name of the file to be copied. In this example, the source path name contains a variable specifier. At run time, whenever the operator or another task triggers the digital element copytrig, File Manager replaces this variable with the value of the analog element fx1_ext.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Source Variable 1	fx1_ext	At run time, File Manager replaces the variable %03d in the Source File Spec. field with the value of this analog element. In this example, this value is a three-number file extension, such as .001.
Destination File Spec.	a:\archive	The path name where the source file is to be copied. Destination Variables are not necessary because this entry contains a static specifier.
Completion Trigger	copydone	When the COPY operation has been completed, File Manager forces the value of this element to 1 (ON), indicating the operation is complete.

Completion Status	copystat	When the COPY operation is complete, File Manager indicates the status of the operation by writing an analog value to this element. Use the task's TASKMESSAGE_U[6] tag to report messages on the application screen in addition to the Completion Status tag. For example, if you get a status 12 in the Completion Status tag, you also see the message: Can't open file (path/file name).
		If you want to use IML for this function, set up a math procedure triggered by the status tag itself. In the procedure, assign the appropriate ASCII string for each possible status code to a message tag in a series of IF THEN statements. For example,
		IF status = 1 THEN
		MSG = "whatever"
		ENDIF

Example 2: PRINT

Example 2 demonstrates how to configure a PRINT operation. Configure the Control panel to configure a PRINT operation. PRINT command file syntax is the same for all operating systems.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	PRINT	Designates the name of a PRINT operation.
Command Trigger	printtrig	Name of the digital element that triggers the print operation. You can also configure other tasks to write to this element to trigger a print operation.
Command	PRINT	Designates a PRINT operation.
Source File Spec.	%s	The name of the file to be printed. In this example, the file name is a variable specifier. At run time, File Manager replaces this variable with the value of the message element printpath, specified in the Source Variable 1 field.
Source Variable 1	printpath	At run time, the File Manager replaces the variable %s in the Source File Spec. field with the value of this message element. In this example, this value is a file name.
DestinationFile Spec.	1	1 designates the print spool device that prints the file specified by printpath. This example assumes you have already defined print spool device 1 in the Print Spooler task. At run time, when the operator or a task triggers the digital element printtrig, File Manager prints the file to Print Spooler device number one.

Example 3: REN (Rename)

Example 3 demonstrates how to configure a REN (rename) operation using Windows file syntax. Configure the Control panel to configure a REN operation.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	WINREN	Designates the name of a REN operation.
Command Trigger	rentrig	Name of the digital element that triggers the rename operation.
Command	REN	Designates a REN operation.
Source File Spec.	c:\temp\%s.log	This field contains a variable specifier, which File Manager replaces at run time with the value of the message element s_file, specified in the Source Variable 1 field.
Source Variable 1	s_file	File Manager replaces the variable %s in the Source File Spec. field at run time with the value of this analog element.
Destination File Spec.	%s.tmp	%s.tmp contains a variable specifier, which File Manager replaces at run time with the value of the message element rento, specified in the Destination Variable 1 field.
DestinationVariable 1	rento	When the value of the digital element rentrig is forced to 1 (ON), File Manager renames the file specified in s_file with the file name contained in rento.

Example 4: TYPE

Example 4 demonstrates the TYPE command. TYPE command file syntax is the same for all operating systems.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	TYPE	Designates the name of a TYPE operation.
Command Trigger	typetrig	Name of the digital element used to trigger the type operation.
Command	TYPE	Designates a TYPE operation.
Position Trigger	typescroll	Name of the analog element that controls the output of the TYPE command
Source File Spec.	%s	This field contains a variable specifier, which the File Manager replaces at run time with the value of the message element typepath, designated in the Source Variable 1 field.
Source Variable 1	typepath	At run time, when the value of the digital element typetrig is forced to 1 (ON), the File Manager types the file specified by typepath. Because TYPE operations do not need a destination, the Destination Variable fields are left blank.
Tag Name	typlin1 typlin2 typlin3 typlin4 typlin5 typlin6 typlin7 typlin8	At run time, when the value of the digital element typetrig is forced to 1 (ON), the File Manager reads the file specified in the Source Tag 1 element typepath. The File Manager starts reading after the line number specified by the Scroll element typescroll. In this example, eight lines of text from the specified file are read into message elements typlin1, typlin2, ...typlin8. These message elements may be referenced by other FactoryLink tasks or displayed on a graphics screen.

Example 5: DIR (Directory)

Example 5 demonstrates the DIR (Directory) command. DIR command file syntax is the same for all operating systems.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	DIR	Designates the name of a DIR operation.
Command Trigger	dirtrig	Name of the digital element used to trigger the dir operation.
Position Trigger	dirscroll	Name of the analog element that controls the output of the DIR command.
Command	DIR	Designates a DIR operation.
Source File Spec.	%s	This field contains a variable specifier, which the File Manager replaces at run time with the value of the message element dirpath, designated in the Source Variable 1 field.
Source Variable 1	dirpath	At run time, when the value of the digital element dirtrig is forced to 1 (ON), File Manager displays the directory specified by dirpath. The Destination Variable fields are blank because DIR operations do not need a destination.
		At run time, when the value of the digital element dirtrig is forced to 1 (ON), File Manager reads the directory specified in the Source Tag 1 element dirpath. File Manager starts reading after the line number specified by the Scroll element dirscroll. In this example, eight lines of text from the specified file are read into message elements dirlin1, dirlin2, ...dirlin8. These message elements may be referenced by other FactoryLink tasks or displayed on a graphics screen.

Example 6: DEL (Delete)

Example 6 demonstrates the DEL (Delete) command using Windows file syntax.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	WINDEL	Designates the name of a DEL operation.
Command Trigger	deltrig	Name of the digital element used to trigger the delete operation.
Command	DEL	Designates a DEL operation.
Source File Spec.	c:\hist\%s.tmp	This field contains a variable specifier, which File Manager replaces at run time with the value of the message element delfile, designated in the Source Variable 1 field.
Source Variable 1	delfile	At run time, when the value of the digital element deltrig is forced to 1 (ON), File Manager deletes the file specified by delfile. The Destination Variable fields are left blank because DEL operations do not need a destination.

USING VARIABLE SPECIFIERS IN FILE SPECIFICATIONS

Use variable specifiers if the operator or the system is to enter all or part of the source or destination specification; however, do not use variable specifiers if the same files are to be used for all operations. Use the Source and Destination Variable fields to designate variables to replace the variable specifiers.

You can include up to four variable specifiers (each one designated by a leading percent sign %) in the path or file name. These variable specifiers indicate a portion of the path or file name that is variable (replaced with data from elements when the file operation is performed). The variables can be digital, analog, long analog, floating-point, or message elements. Multiple variables can be used together, as in a file name and extension (for example, %8s.%3s).

If you want to vary the actual path/files used in either the source or destination paths, use one or more of the four variables and %xx type specifiers to dynamically build these at run time from tags; otherwise, hardcode the exact path/file names desired and leave the four tag variable fields blank.

The data type of the element must match the variable-specifier type as follows.

Variable Specifier	Variable Specifier Type	FactoryLink Data Type
%d	Decimal	Digital, Analog, Long Analog, Floating-point.
%s	String	Message.

The table below contains examples of variable specifiers using generic syntax.

Variable Specifier Examples		
Variable Description	**Entry**	**Sample Results**
Directory, subdirectory, or file name	%8s	FLINK.
Numeric file extension	.%d	.1, .2, .3.
	%.03d	.001, .002, .003.
File name and extension	%8s.%03d	file.001.
	%8s.%3s	file.exe.

The following table contains Windows-specific examples of variable specifiers used to designate paths. The last example shows the path name of a station on a network.

Samples of Variable Specifiers in Path Names		
Description	**Example**	**Comments**
Standard path	c:\history\exe\sample.exe	Base example.
1 variable	c:\%8s\exe\sample.exe	Variable for directory.
2 variables	c:\%8s\%8s\sample.exe	Variables for directory and subdirectory.
3 variables	c:\%8s\%8s\sample.%3s	Variables for directory, subdirectory, and 3-character file extension.
4 variables	%1s:\%.8s\%.8s\sample.%3s	Variables for drive, directory, subdirectory, and file extension.
Standard path for a network station	\\node2\c:\history\exe\sample.exe	\\node2\ is the name of a remote station.

USING WILDCARD CHARACTERS IN FILE SPECIFICATIONS

The File Manager task accepts the following wildcard character specifiers in the source and destination path names:

* (asterisk)	For string replacement.
? (question mark)	For single-character replacement.

Format path names are

source	/DEVICE_NAME/DIR_NAME/SUB_DIR_NAME/WILDCARD FILESPEC.
destination	/DEVICE_NAME/DIR_NAME/SUB_DIR_NAME. Do not specify a file name for the destination path with COPY as File Manager does it for you.

Path names with wildcard characters in the file specifications might resemble the following examples.

source	/DEVICE/FLINK/SAMPLE/SAMPLE.*
destination	/DEVICE/FLINK/EXE.

The following example is of a File Manager operation using wildcard characters (using Windows file syntax).

Sample File Manager Control Panel Using Wildcard Characters		
Field:	**Sample Entry:**	**Explanation:**
Command	COPY	Designates a COPY operation.
Trigger	copytrig	Name of the digital element used to trigger the copy operation.
Source Format	c:\hist\report\rpt*.*	Designates the source path.
Destination Format	C:\HIST\RECORDS	At run time, all files in the REPORT subdirectory that begin with RPT are copied to the RECORDS subdirectory.

Format pathnames as follows. Do not specify a file name for the destination path as File Manager will do it for you. Pathnames with wildcard characters in the file specifications might resemble the following examples.

source	C:\FLINK\SAMPLE\SAMPLE.*
destination	C:\FLINK\EXE

Using the File Manager with Networks

In addition to being fully compatible with FactoryLink, the FactoryLink File Manager is compatible with networks using the TCP/IP protocol type.

File-management functions, such as copying, deleting, printing, and renaming files, can be performed between the local FactoryLink system and any remote computer running File Manager as long as the FactoryLink system contains the FactoryLink Local Area Networking (FLLAN) option.

If using FLLAN, create the LOCAL file before filling in the configuration tables. Define the local station name in the ASCII file LOCAL in the FLAPP/NET directory. Remember: standalone systems require the LOCAL file.

Either the source or destination path name can refer to a file on a remote station. The format for a remote file path is

\\(station)\(path)

where

station	Is the name of the remote station, up to 256 characters.
path	Is the full path name of the file on the remote station.

The source and destination are interchangeable as long as one of them is the local FactoryLink station. The only difference between local file operations and remote file operations is remote file names must include the disk/drive specification if required by the operating system and must conform to the file name syntax for the remote computer’s operating system.

Only one file can be remote in a copy operation. Both files must be on the same station in a rename operation.

For example, to copy a file from a local FactoryLink station to a remote FactoryLink station, use the following format for the remote path name:

\\STATION_NAME\DEVICE_NAME/DIR_NAME/FILE_NAME

Other file-management operations can be performed with File Manager using the same format.

Do not use the remote file name (\\(STATION)\) when performing File Manager operations on networks unless you installed FLLAN on the local and remote computers. Using the FLLAN FactoryLink station name instructs FLLAN rather than the network to perform the operation.

At run time, ensure the FLFM_SERVER task is running on the remote node before invoking file management operations between local and remote nodes.

Using the COPY Command with FLLAN

COPY operations are the most common File Manager operations performed on a networked system and have the following uses:

- Copy local files to a remote station
- Copy remote files to a local station
- Copy local files to the local station

The following example is of a copy operation on a networked system. The source and destination paths are in Windows file syntax.

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Table Name	WINXFER	Designates a file-transfer operation on a network using FLLAN.
Command	COPY	Designates a COPY operation.
Trigger	filexfertrig	Name of the digital element used to trigger the copy operation.
Source Format	c:\arc\ %s.log	Source path where **%s** is the variable specifier. The string specified by the value of the message element s_file replaces the %s in the source specification.
Source Tag 1	s_file	At run time, File Manager replaces the variable **%s** in the Source Format field with the value of this analog element.
Destination Format	\\nod2\%s	File Manager computes the destination path in the same way as the source path.
Destination Tag 1	s_path	If the message element s_path contains the following message: C:\FLINK\RECIPE the computed destination specification is \\NOD2\C:\FLINK\RECIPE

Sample File Manager Control Panel		
Field:	**Sample Entry:**	**Explanation:**
Completion Trigger	copydone	File Manager forces the value of this element to 1 (ON) when the COPY operation is complete. Another FactoryLink task can use this element or to trigger another File Manager operation.
Completion Status	copystat	File Manager writes the status information to this analog element when the COPY operation is complete.

For details for information about variable specifiers, refer to *FactoryLink ECS Fundamentals*.

Using the COPY Command with a Network Without FLLAN

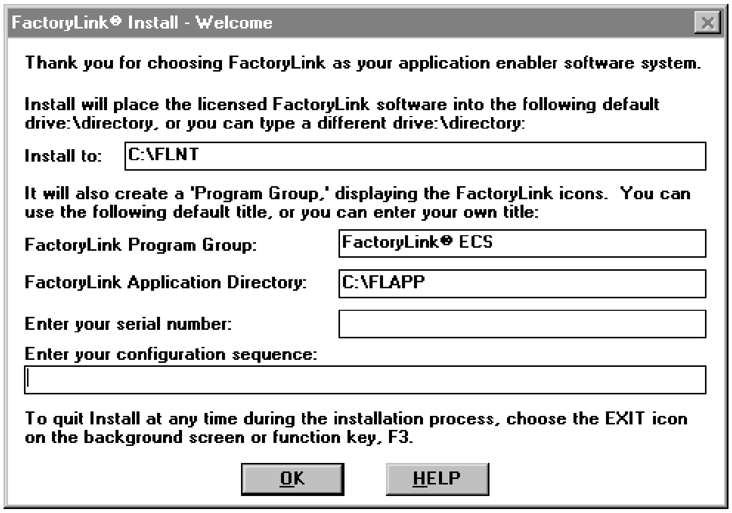
When specifying a COPY command for networks without FLLAN, do not specify a station name in the Source Format and Destination Format fields. Instead, specify a network device that is any logical device on a remote computer used as if it were a local device.

Different operating systems reference network devices in different ways. Consult the user's manual for the appropriate operating system to find the proper syntax for referencing these devices.

CHANGING PROTOCOLS

You specified a protocol when you installed FactoryLink. This section describes the procedure to use if you want to change to a different protocol.

1 Double-click the FactoryLink Install icon in the FactoryLink program group to open the Install program and display the Welcome dialog.



FactoryLink® Install - Welcome

Thank you for choosing FactoryLink as your application enabler software system.

Install will place the licensed FactoryLink software into the following default drive:\directory, or you can type a different drive:\directory:

Install to: C:\FLNT

It will also create a 'Program Group,' displaying the FactoryLink icons. You can use the following default title, or you can enter your own title:

FactoryLink Program Group: FactoryLink® ECS

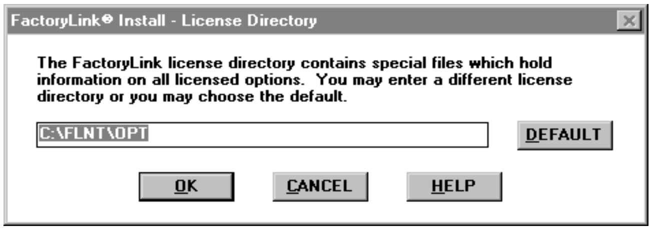
FactoryLink Application Directory: C:\FLAPP

Enter your serial number:

Enter your configuration sequence:

To quit Install at any time during the installation process, choose the EXIT icon on the background screen or function key, F3.

2 Click OK to display the License Directory dialog.

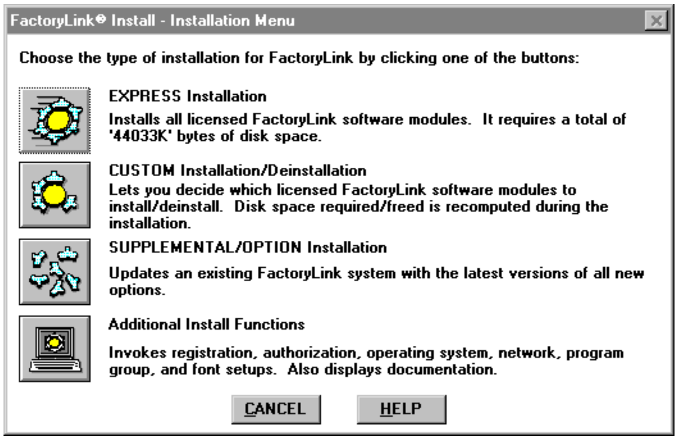


FactoryLink® Install - License Directory

The FactoryLink license directory contains special files which hold information on all licensed options. You may enter a different license directory or you may choose the default.

C:\FLNT\OPT

3 Click OK to display the Installation Menu dialog.



Choose the type of installation for FactoryLink by clicking one of the buttons:

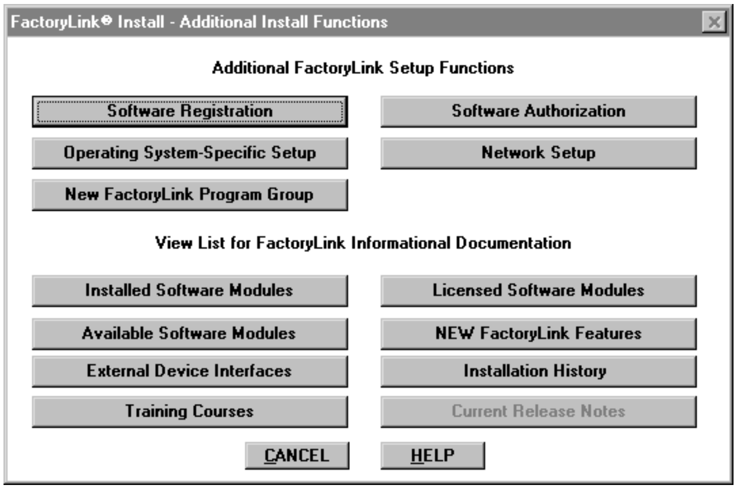
EXPRESS Installation
Installs all licensed FactoryLink software modules. It requires a total of '44033K' bytes of disk space.

CUSTOM Installation/Deinstallation
Lets you decide which licensed FactoryLink software modules to install/deinstall. Disk space required/freed is recomputed during the installation.

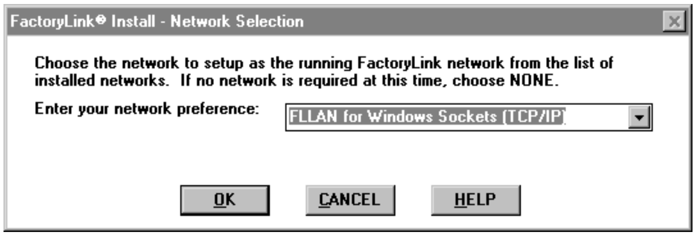
SUPPLEMENTAL/OPTION Installation
Updates an existing FactoryLink system with the latest versions of all new options.

Additional Install Functions
Invokes registration, authorization, operating system, network, program group, and font setups. Also displays documentation.

4 Choose Additional Install Functions to display the Additional Install Functions dialog.


FactoryLink® Install - Additional Install Functions
Additional FactoryLink Setup Functions
Software Registration
Software Authorization
Operating System-Specific Setup
Network Setup
New FactoryLink Program Group
View List for FactoryLink Informational Documentation
Installed Software Modules
Licensed Software Modules
Available Software Modules
NEW FactoryLink Features
External Device Interfaces
Installation History
Training Courses
Current Release Notes
CANCEL
HELP

5 Choose Network Setup.



FactoryLink® Install - Network Selection

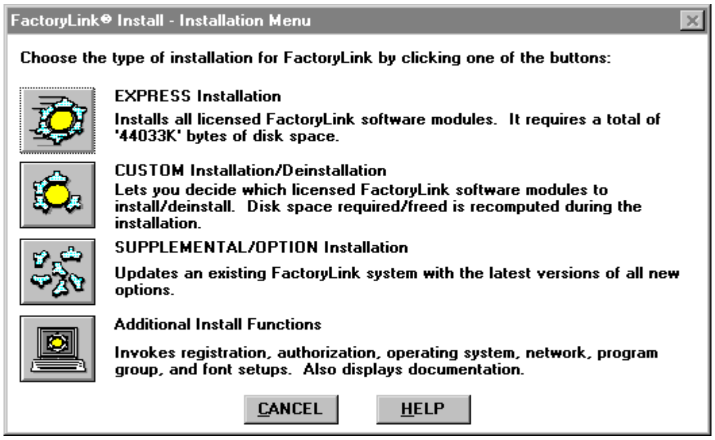
Choose the network to setup as the running FactoryLink network from the list of installed networks. If no network is required at this time, choose NONE.

Enter your network preference: FLLAN for Windows Sockets (TCP/IP)

6 Choose the appropriate network protocol from the Enter your network preference list.

7 Click OK.

8 Click Cancel to exit the Additional Install Functions dialog and display the Installation Menu.



FactoryLink® Install - Installation Menu

Choose the type of installation for FactoryLink by clicking one of the buttons:

EXPRESS Installation
Installs all licensed FactoryLink software modules. It requires a total of '44033K' bytes of disk space.

CUSTOM Installation/Deinstallation
Lets you decide which licensed FactoryLink software modules to install/deinstall. Disk space required/freed is recomputed during the installation.

SUPPLEMENTAL/OPTION Installation
Updates an existing FactoryLink system with the latest versions of all new options.

Additional Install Functions
Invokes registration, authorization, operating system, network, program group, and font setups. Also displays documentation.

9 Click Exit to exit the install program.

PROGRAM ARGUMENTS

Put the following parameter in the Program Arguments column of the System Configuration Information panel in FLCM:

-a<x> Where <x> is the ACK timeout in seconds

Each request is acknowledged. File Manager will wait a default of 15 seconds for the ACK. Use this parameter if you wish to change this timeout.

File Manager Error Messages

The following error messages may be displayed next to FLFM on the Run-Time Manager screen:

Can’t determine fluser name

Cause: No FLUSER name is specified.

Action: Specify an FLUSER name.

Can’t find Network

Cause: Either the network shut down or is not installed correctly.

Action: Restart the network if it shut down. Reinstall it if installed incorrectly.

Cause: The wrong name is entered in the LOCAL file.

Action: Enter the name the network is registered under in the LOCAL file.

Cause: The ETC services file may not have any entries if using a TCP/IP network.

Action: Refer to “FLLAN” in this guide for information about adding the correct entries to the ETC services file.

Can’t add local name to the network

Cause: Either the name specified in the LAN Local Names panel is not a valid network name or the network software may not have been installed properly.

Action: Choose Local Area Network Groups from the Configuration Manger Main Menu. Modify the local names on the LAN Local Names panel. Ensure the network software is operating properly if this does not correct the error.

Can’t determine local node name

Cause: Either the LAN local names file (FLAPP/NET/LOCAL) does not exist or it contains invalid data.

Action: Ensure FLAPP/NET/LOCAL exists. Create it if it does not exist. If it exists, find and correct any invalid data.

Can’t open file *filename*

Cause: The specified file may not exist or another task may have opened it.

Action: Ensure the specified file exists. Create it if it does not exist.

Can’t send ACK to inform client I'm ready
Received error or hangup during connect
New client communications setup failed

Cause: The client or network may not be operating.

Action: Check state of client and network connection.

Error creating temp file; check SPOOL dir

Cause: The hard disk is full.

Action: Delete any unnecessary files.

Cause: The /SPOOL directory was not created during installation.

Action: Create a /SPOOL directory or reinstall FactoryLink.

Cause: The /SPOOL directory was deleted.

Action: Create a /SPOOL directory or reinstall FactoryLink.

Cause: The permissions are corrupt.

Action: Change the permissions so the FactoryLink user name is authorized to create files in the /SPOOL directory.

Error opening CT

Cause: The /FLINK/CT/FLFM.CT file does not exist, may not be opened, or may be damaged. The installation may not have completed successfully.

Action: Ensure the /FLINK/CT/FLFM.CT file exists. If the file does exist, delete /FLINK/CT/FLFM.CT and restart the application to rebuild the FLFM.CT file.

Error opening *filename*

Cause: The file does not exist.

Action: Specify a different file or create the file.

Cause: A syntax error occurred when specifying the path or filename.

Action: Retry the command using the correct path and filename.

Cause: The File Manager task does not have permission to read the specified file.

Action: Change the permissions so the FactoryLink user name is authorized to open files in the specified directory.

Error printing file

Cause: Either the printer is disconnected, is not powered on, is not online, or has some other problem.

Action: Ensure the printer cables are connected, the power is on, and the printer is online. Contact the system administrator for the printer in use if the file still does not print.

Error reading CT index

Cause: The /FLINK/CT/FLFM.CT file is damaged.

Action: Delete /FLINK/CT/FLFM.CT. Restart the application to rebuild the FLFM.CT file.

File Manager task init. failed, err = *number*

Cause: The File Manager task could not register with the FactoryLink kernel.

Action: Choose System Configuration from the Configuration Manager Main Menu. Ensure the System Configuration Table contains the entry FLFM. Also, ensure the File Manager option is enabled on the FactoryLink key.

File Manager option bit not set

Cause: The option bit for the File Manager task is not enabled on the FactoryLink key. Either you entered the configuration sequence incorrectly during installation or you have not purchased the File Manager option.

Action: First, check the license material on the Exhibit A form that accompanies the FactoryLink package to see if File Manager is listed as a licensed option. If it is listed on the Exhibit A form, reenter the configuration sequence and authorization code to enable the option. For information about the configuration sequence and authorization code, refer to the *FactoryLink Installation Guide*.

If File Manager is not listed on the Exhibit A form, contact your FactoryLink sales representative to purchase the File Manager option.

File not found

Cause: The file does not exist.

Action: Specify a different file.

Cause: A syntax error occurred when specifying the path or filename.

Action: Retry the command using the correct path and filename.

Cause: The File Manager task does not have permission to print the specified file.

Action: Change the permissions so the FactoryLink user name is authorized to print files in the specified directory.

File read ERROR on *filename*

Cause: The disk may be corrupt.

Action: For Windows, run the disk diagnostic program CHKDSK to determine if the disk is corrupt. If the disk is corrupt, recreate the file from scratch or from the backup disk or tape.

If the corruption is not on the root drive, inform your system administrator of the corruption as fsck will not be able to repair it.

File write ERROR on *filename*

Cause: The disk may be full.

Action: Delete any unnecessary files. Add disk space if this error occurs frequently.

FLFM port in use-do file operation later

Cause: If the File Manager server gets this error, another server may already be up on that machine. If the File Manager client gets this error, then too many clients may be running on that machine. (The current limit is 10.)

Action: Check for existing File Manager server or clients. Try the file operation again later.

Internal request queue is corrupt

Cause: An internal FLFM error occurred.

Action: Contact Customer Support.

Invalid character in PRINT destination

Cause: An invalid character is entered after the node name in the Destination Format field of the File Manager Control panel.

Action: Open the File Manager Control panel. Specify a valid entry in the Destination Format field.

Invalid command

Cause: An invalid command is entered in the Command field of the File Manager Control panel.

Action: Open the File Manager Control panel. Specify a valid command in the Command field:

COPY	PRINT
DEL	REN
DIR	TYPE

Invalid CT file

Cause: The /FLINK/CT/FLFM.CT file is damaged.

Action: Delete /FLINK/CT/FLFM.CT. Restart the application to rebuild the FLFM.CT file.

Invalid local name file

Cause: An invalid character or parameter is entered in the LOCAL field.

Action: Choose Local Area Network Groups from the Configuration Manager Main Menu. Ensure all information defined on the LAN Local Names panel is valid. Correct invalid information. Refer to “FLLAN” in this guide for information about the correct syntax for this file.

Local wild-card copy failed on *filename*

Cause: Not enough RAM to build the file list.

Action: Shut down unnecessary tasks. Add RAM if this error occurs often.

Network open did not connect

Cause: The session is not properly connected.

Action: Retry the operation.

Network open failed *network name*

Cause: Either no available sessions exist or the node name is not valid.

Action: Ensure the remote node name (part of the file path name) is valid and retry the operation.

Network open timeout

Cause: The network may be down.

The node may be down.

The node name in the file path name may be invalid.

Action: Ensure the node name is valid and the node and network are up and running.

Network write error

Cause: The system cannot write to the network because the remote program shut down or terminated communications.

Action: Ensure the remote node is up and connected.

Never got ACK from server-giving up
Received no ACK or BUSY msg from server

Cause: Server or network may be down or may have gone down.

Action: Check state of server and network connection.

No network for receive

Cause: You have specified a remote node name for a File Manager operation; however, the FactoryLink system does not contain the FLLAN option. File Manager operations cannot be performed to remote nodes unless the FLLAN option is installed.

Action: Specify a local node or install the FLLAN option.

No network for send

Cause: You have specified a remote node name for a File Manager operation; however, the FactoryLink system does not contain the FLLAN option. File Manager operations cannot be performed to remote nodes unless the FLLAN option is installed.

Action: Specify a local node or install the FLLAN option.

No tables configured for this task

Cause: No File Manager configuration tables have been defined.

Action: Open the Configuration Manager Main Menu and choose File Manager. Specify information in the File Manager's configuration tables.

Out of RAM

Cause: Not enough memory to run this task.

Action: Restart the task. If it fails again, allocate more memory for this task or allocate more virtual memory.

Partial wild-card copy *filename*

Cause: An error occurred during a multi-file copy. The File Manager copied all files in the list prior to the specified file. The File Manager did not copy the specified file and any files after it on the list.

Action: Copy the files that were not copied or retry the operation.

Received error or hangup during connect

See "Can't send ACK to inform client I'm ready."

Received no ACK or BUSY msg from server

See "Never got ACK from server-giving up."

Remote wild-card copy failed

Cause: Not enough RAM exists to build the file list.

Action: Shut down unnecessary tasks. Add virtual memory if this error occurs often.

Request to allocate zero size RAM block

Cause: Either the operating system, third-party software, or hardware setup on your system is incorrect or incompatible or an internal error occurred.

Action: Verify the following:

The operating system is set up to run FactoryLink (tuning parameters, resources)

All third-party software needed by FactoryLink, such as X-Windows, is installed and set up correctly and you have the correct version for FactoryLink.

All hardware is correctly set up and all of the hardware is compatible.

Server busy-waiting for ACK from server

Cause: The server is currently servicing another client's request.

Action: No action is needed. The server will automatically serve the request when it is freed up.

Two different remote nodes, *node name node name*

Cause: A different remote name is entered in the Source Format field than was entered in the Destination Format field of the File Manager Control panel for the PRINT command. A remote name must be the same in both fields.

Action: Open the File Manager Control panel. Ensure both names are the same if remote names are specified in both the Source Format and Destination Format fields.

Unknown configuration option

Cause: An invalid parameter or character is entered in the LAN local names file (/FLAPP/NET/LOCAL).

Action: Choose Local Area Network Groups from the Configuration Manager Main Menu. Ensure a valid local name is defined on the *LAN* Local Names panel. Enter the correct information. Refer to the "Local Area Networking" section in this manual for information about correct LOCAL file syntax.

Chapter 9 . . . .

FactoryLink Local Area Networking

The FactoryLink Local Area Networking (FLLAN) module transmits FactoryLink data between computers (called stations) across a network. A network is a combination of hardware and software that lets multiple computers share resources, such as files, printers, or data. A network consists of the following parts.:

- A Network Operating System (NOS)—Software that transports data between software applications on different computers.
- A network application—Software that sends data to a similar application on another computer via the Network Operating System.
- The network hardware—Network interface cards installed on each computer on the network and cables that link them all together.

This chapter covers the following topics:

- Sending and Receiving Data
- Local and Remote Stations
- Defining the TIC/IP Hosts and Service Ports
- Interval Timer Information Panel

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Sending and Receiving Data

FLLAN uses send and receive operations to

- Send data to remote stations and
- Receive data from remote stations

Sending Values to Remote Stations

During a send operation, the FLLAN on the local station sends values from the FactoryLink real-time database across the network to the FLLAN on the remote station. The FLLAN on the remote station writes these values to the real-time database on the receiving station.

Receiving Values from Remote Stations

During a receive operation, FLLAN receives values from a remote station and stores them in the FactoryLink real-time database as elements.You do not need the module FLLAN on two or more FactoryLink stations in order to share and store files on a network server or use network printers. External networking software allowing peer services is sufficient to achieve this goal.

LOCAL AND REMOTE STATIONS

Each station on the network must have a unique station name so FLLAN can identify it. Each station views itself as the local station and views all other stations on the network as remote.

Network Groups

You can combine one or more stations into groups. Grouping permits you to transmit the same data to multiple stations with a single operation. A single station can belong to more than one group. You can use the same group name on more than one remote station; however, these groups are independent and do not correspond to each other.

Using Multiple Platforms on a Network

Because the Network Operating System is transparent to FactoryLink, you can use a different Network Operating System program on each station on a network. This lets you use FactoryLink for different platforms within the same network. For example, the following illustration shows a network of four stations, each running FactoryLink on a different platform. You must use the same protocol on all stations in the network.

Monitoring the Network

You can monitor the status of remote stations on the network, such as the number of transmissions the remote station has sent and received and whether these transmissions were successful. You can view the status at run time and other FactoryLink modules can use this information for other activities.

Local Station's Default Values

The local station name and the default values FLLAN uses to transmit data is stored in the local name file FLAPP/net/local on each FactoryLink station. We recommend you consult your network administrator if you need to change the default values.

Ordering Tag Names

When sending element values, FLLAN groups the elements by data type and sends them in the following order: digital, analog, floating-point, message, long analog, and mailbox. These groups are called packets. To maximize efficiency, place tags of like data-types next to each other in the LAN Send Information panel and order them by digital, analog, floating-point, message, long analog, and mailbox.

DEFINING THE TCP/IP HOSTS AND SERVICE PORTS

You must define host and service port information on each station using the following procedure if you are using TCP/IP. If you are using a name server, you may not need to perform some of the steps in this procedure as the name server automatically performs some of these actions.

1 Define the TCP/IP Internet addresses for all stations in the hosts file if you are not using a name server or if you are using a name server but the local station name is not in it. Host files for each network protocol are displayed in the following table.

If you are using...	Enter the station names, aliases, and addresses in the file...
Windows NT	*%* system root *%*\system 32\drivers\etc\hosts.
LAN WorkPlace on Windows NT or Windows 95	\Windows\hosts where *Windows* is the directory where you installed Windows 95.

Refer to the vendor's documentation for details on how to modify these files. Contact your system administrator if you do not know your TCP/IP addresses. The syntax for defining the TCP/IP address is

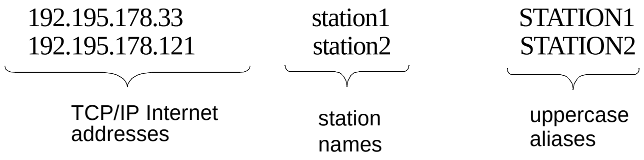
address *sta_name STA_ALIAS*

where

address Is the TCP/IP internet address.

sta_name Is the unique name assigned to the station.

STA_ALIAS Is the alias used to reference the station. This must be in all uppercase. For example,



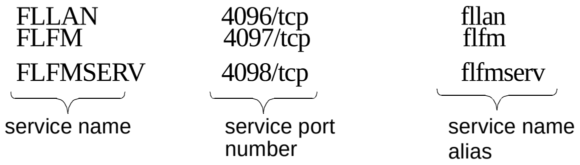
```
192.195.178.33     station1    STATION1
192.195.178.121    station2    STATION2
```

Currently, PowerNet restricts you to 1024 sessions. For each read-only entry in the external domain table, a session is needed for the client and the server. If the entry is a read-write connection, two sessions are created on both the server and client. The 1024 session limit is for each PowerNet application. This means a client can have 1024 sessions and the server can also have 1024 sessions. The current maximum 1024 session limit is for Windows NT and Windows 95. Other platforms may differ in their maximum session limit. See the -n option for changing the session limit.

2 Define the service ports for FLLAN. The file where you define these depends on your operating system. Refer to the following table for the correct file.

If you are using...	Define the service ports in the file...
Windows NT	%system root%\system32\drivers\etc\services.
Windows 95	\Windows*tcp_dir*\services where *tcp_dir* is the directory where you installed Windows 95.

Enter the following lines in the file defined for your operating system to define the service ports. Use all uppercase letters for the service names.



```
FLLAN       4096/tcp    fllan
FLFM        4097/tcp    flfm
FLFMSERV    4098/tcp    flfmserv
```

Use the service port numbers unless another service name in the services file is already using one of these numbers. If you use different service port numbers, make them consistent for all stations on the network. See the vendor's documentation for details about service port numbers.

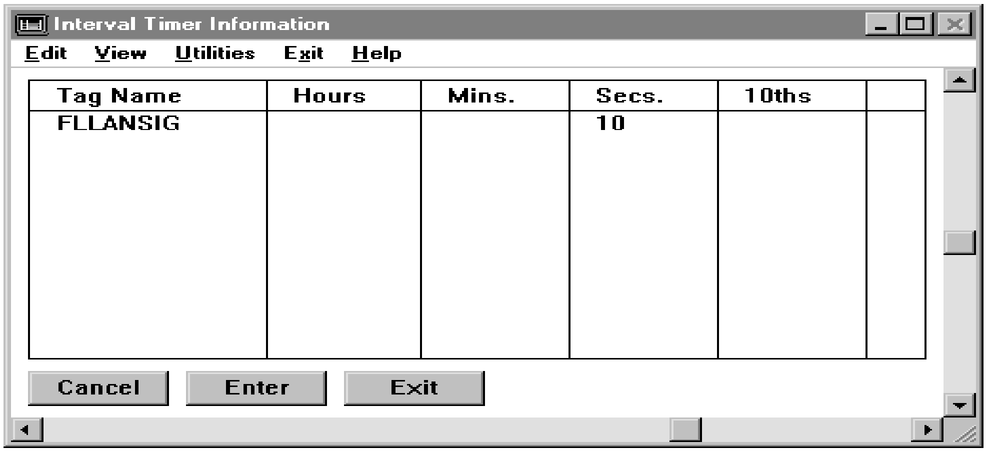
INTERVAL TIMER INFORMATION PANEL

If data is not sent to remote stations regularly, network connections may time out. You must configure the FLLANSIG tag to prevent network timeouts from occurring.

FLLANSIG is a predefined digital element that sends a wakeup to the FLLAN task at a configurable interval to all connected remote stations. FLLANSIG also triggers FLLAN to determine whether it is time to attempt connections to unconnected remote stations.

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Interval Timer from the Configuration Manager Main Menu to display the Interval Timer Information panel.



Tag Name	Hours	Mins.	Secs.	10ths
FLLANSIG			10	

Specify the following information for this panel:

Tag Name FLLANSIG.

Secs. Number either less than or equal to the number of seconds in either the TX or CALL parameter, depending on which is less.

If you did not change the local station default TX or CALL values, this is a number either less than or equal to 10.

If you changed the local station default TX or CALL values, this is a number less than or equal to the lesser of the two.

FLLAN does not wake up when the TX or CALL intervals have passed; rather, whenever the value of FLLANSIG changes, FLLAN wakes to check whether either of these two intervals have passed.

Valid Entry: numeric value

Chapter 10 . . . .

Testing the Network Connection

Once you have installed your network, you should test the communication between stations using the following utilities.

- NR—Tests whether a station can receive data from another station on the network.
- NS—Tests whether a station can send data to another station on the network.

These test programs send and receive data using the same format as FLLAN.

Run NR on one station (the local station), and run NS on the remote station to test the communications between two stations on the network. Then, reverse the process for the same two stations. Test every station on the network and test every station as both a local station and a remote station.

NR AND NS TEST PROGRAMS

Perform the following steps to run the NR and NS test programs:

1 Start NR on the local station. Use the following syntax for this command:

nr *local_name remote_name* [-d*verbose_level*][-x*debug_level*][-l]
[-b*bufsize*] [-a]

where

local_name Is the name of the computer that receives the data.

remote_name Is the name of the remote computer that sends the data.

verbose_level Controls how much information NR displays about each packet it receives. This can be one of the following:

- 0 Displays the sequence number of messages in multiples of 10 when every 10th message is received. The message is displayed on the same line as the sequence number; the message does not scroll. This is the default.
- 1 Displays the sequence number of the current message. The message is displayed on the same line as the sequence number; the message does not scroll.
- 2 Displays the sequence number of the current message. The message is displayed on different lines and scrolls.
- ≥3 In addition to level 2 output, the message is displayed in hexadecimal format. Any value greater than 3 displays the same information as 3.

debug_level Is a number ≥0 that indicates how much information the network debug layer displays about each packet. The higher the value, the more information NR displays. The default is 0.

-l Writes debug information to a log file named nr.log in the current directory.

bufsize Is a number from 128 to 2048 that specifies the number of bytes in a buffer (message). The default is 512.

-a Acknowledges all received messages. If you include -a with this command, you must include it with the NS command on the remote station.

In the following example, STATION1 is the local station running NR. STATION2 is the remote station running NS. The local station acknowledges all messages it receives from the remote station.

nr *STATION1 STATION2* -a

2 Start NS on the remote station when NR is in the listening mode. Use the following syntax for this command:

ns *local_name remote_name* [-d*verbose_level*][-x*debug_level*] [-l]
[-b*bufsize*][-p*secs*] [-a]

where

local_name Is the name of the computer that sends the data.

remote_name Is the name of the computer that receives the data.

verbose_level Controls how much information NS displays about each packet it sends. This can be one of the following:

0 Displays the sequence number of messages in multiples of 10 when every 10th message is sent. The message is displayed on the same line as the sequence number; the message does not scroll. This is the default.

1 Displays the sequence number of the current message. The message is displayed on the same line as the sequence number; the message does not scroll.

2 Displays the sequence number of the current message. The message is displayed on different lines and scrolls.

>3 In addition to level 2 output, the message is displayed in hexadecimal format. Any value greater than 3 displays the same information as 3.

debug_level Is a number $\geq$0 that indicates how much information the network layer displays about each packet. The default is 0. The higher the value, the more information NS displays.

-l Debug information to a log file named ns.log in the current directory.

bufsize Is a number from 128 to 2,048 that specifies the number of bytes in a buffer (message). The default is 512.

secs Is a number from 1 to 59 that specifies the number of seconds between packet sends.

-a Acknowledges all received messages. If you include -a with this command, you must include it with the NR command on the other station.

In the following example, STATION2 is running NS. STATION1 is running NR. STATION2 acknowledges all transmissions from STATION:

```
ns STATION2 STATION1 -a
```

After you start NR and NS, they display the following message on the computers they are running on:

```
n sessions, n buffers, buffer size = n
addname: local_station_name
```

The programs then display the following message until the two computers establish a connection:

```
open remote_station_name
```

You may experience a delay of several seconds between the two messages. Then the computers display the following message:

```
wait on call
```

3 Verify the computers establish a connection. After the computers establish a connection, NR and NS automatically begin transmitting messages. The computer running NR displays data-transfer information on its screen each time it receives data. The computer running NS displays data-transfer information on its screen each time it sends data.

4 Press Esc on either computer to stop the test.

5 Run NR and NS again at a higher debug level if the computers do not connect. Note any errors that display. For help resolving any problems, refer to “Troubleshooting FLLAN Communications” on page 793.

6 Repeat Step 5 until the computers connect.

7 Repeat this procedure again, but run NR on the station you first ran NS and run NS on the station you first ran NR.

8 Repeat this procedure on each station in the network.

Chapter 11 . . . .

Naming the Stations and Network Groups

FactoryLink must know the name of each local and remote station on the network running a FactoryLink application as well as any groups defined for the station. This information is defined in Local Area Network Groups configuration table, which consists of the following two panels:

- LAN Local Names—Defines local station name and any changes to station default values.
- LAN Remote Names—Defines the network groups and stations belonging to a group.

You can fill out as many Send tables as the RAM on your system allows.You can enter as many elements as the available RAM allows.

The Local Area Network Send table is filled out in the SHARED domain.

The panels in this chapter show a sample configuration. This example defines the following information:

- Names the local station
- Changes the default values of TX and RX
- Defines two network groups and assigns the remote stations to them

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

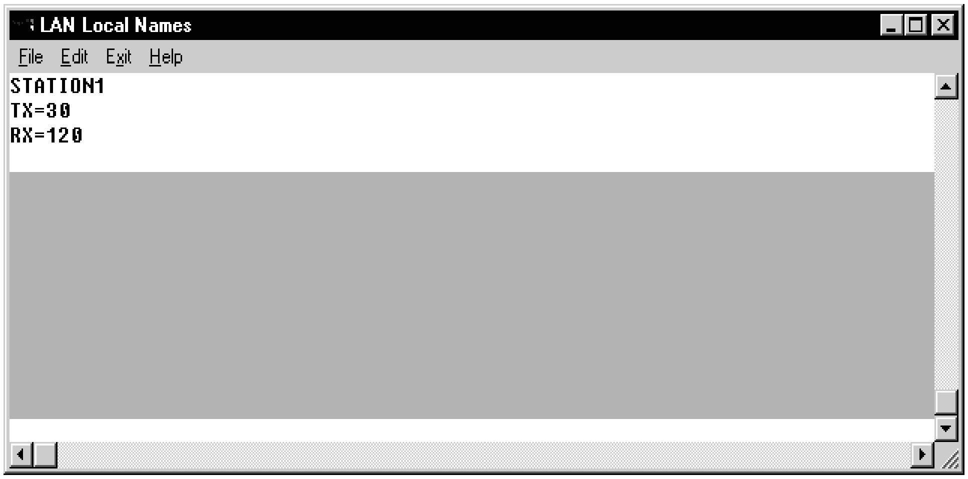
LAN Local Names Panel

Local station names are defined in the LAN Local Names panel.

Perform the following steps to define the station name for the local computer. You must repeat this procedure for each computer in the network running FactoryLink.

1 Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

2 Choose Local Area Network Groups from the Configuration Manager Main Menu to open the LAN Local Names panel.



```
STATION1
TX=30
RX=120
```

3 Enter the computer name of the local station as defined in the network operating system. (To find out what your computer name is, open the Control Panel and click the Network icon.)

In this example, the computer name is STATION1.

> **Note:** Computer names are case sensitive. Enter the computer name in the LAN Local Names exactly as it is spelled in the Control Panel.

The Main Menu does not validate the syntax of the computer name in the Local Names panel against the Control Panel.

4 *(Optional)* If you want to change any of the transmit parameters from their default values, enter the parameters and their new values beneath the station name.

This example changes the maximum time between data transmissions to 30 seconds (TX=30) and the maximum time between receipts of data to 120 seconds (RX=120).

The possible transmit parameters and their default values are given below.

5 Press Enter (Return) at the end of the last line to enter a hard return. If only a station name is entered, then press Enter after the station name. This hard return is required.

6 Complete the LAN Remote Names panel to define the network groups. (See next section.)

Local Station Transmit Parameters and Default Values

The table below lists all the transmit parameters used by the local station and their default values. The parameters are explained following the table:

Parameter	Default Value
TX	20
RX	60
INIT	0
CALL	10
BUFSIZE	512
MAXLEN	512
MAXSESS	32
ACK	0
ST	10
SD	10

Note: USDATA recommends that you consult your network administrator before changing any default values.

TX (Transmit Timeout)

A number between 0 and 65,527 that sets the maximum time, in seconds, between transmissions. The default is **20**. If the local station does not send any data to a given remote station after the indicated time, the local station sends an “I am still here” packet to the remote station.

RX (Receive Timeout)

A number between 0 and 65,527 that sets the maximum time, in seconds, between receptions. The default is **60**. **Make sure this value is at least three times greater than the TX value**. If the local station does not receive any data from a remote station after the indicated time, the local station disconnects from the remote station and attempts to reconnect.

If you specify an RX value greater than 60, modify the -t program argument in the System Configuration table; otherwise, FLLANRCV may not shut down properly. To do this, complete the following steps:

1. In the Configuration Explorer, open the System Configuration table in the Shared domain. The System Configuration editor appears.
2. Click the right arrow at the bottom of the editor to select the FLLANRCV task.
3. In the Program Arguments field, enter the -t argument with the required RX value. For example, if the RX value in the Local Names panel = 90, then enter **-t90**.
4. Click Apply to save the change and then close the System Configuration editor.

INIT

A value of 0 or 1 that specifies whether the local station sends all data when it first connects with another station. The default is **0**. The local station uses this value only when a remote station starts up.

- If INIT = 0, then when the local station first connects to another station, it does not send values until one of the values has changed.
- If INIT = 1, then when the local station first connects to another station, it sends all values during the first real-time database scan. This can be useful when you start a remote station after the local station has been running. The new station has no values when it starts, so the local station sends the values it has at that time. After that, the local station values as it normally does.

Because startup data can contain uninitialized values, USDATA recommends that you leave INIT at 0.

CALL

A number between 0 and 65,527 that defines the minimum amount of time, in seconds, the local station waits for a call to a remote station to connect. The default is **10**. If the remote station does not connect to the local station, the local station waits at least CALL seconds before attempting to reconnect. The remote station may still connect to the local station in the interim.

MAXLEN

Only FLLAN uses the MAXLEN parameter. The largest number of bytes a station can send or receive in a single data packet. The minimum is 512; the maximum is 65,536. The default is **512**. The tag data is truncated if a message or mailbox tag is sent that is larger than MAXLEN. Make sure this number is the same on all stations.

- If you enter a value less than the minimum of 512, FLLAN uses 512.
- If you enter a value greater than the maximum of 65,536, FLLAN uses 65,536.

Each element uses a specific number of bytes, depending on its data type. All elements use 4 bytes to store its tag name + *x* number of bytes to store the value, as shown in the table below:

The tag type...	uses ... for the tag name	+ ... for the value	which =
Digital	4 bytes	2 bytes	6 bytes
Analog	4 bytes	2 bytes	6 bytes
Longana	4 bytes	4 bytes	8 bytes
Float	4 bytes	8 bytes	12 bytes
Message	6 bytes (4 + 2 bytes for the length)	the number of characters in the string	*y* bytes
Mailbox	30 bytes (4 + 26 bytes for the header)	the number of characters in the string	*y* bytes

The MAXLEN parameter must be configured to specify the maximum number of bytes each node requires to send or receive a single data packet.

To distribute alarms and logbook entries along the network, use the following formula to calculate the number of bytes required at each node:

((84 x number of active alarms) + 38) + (number of logbook entries x (24 + msg space)) = bytes

where

number of active alarms is the maximum number of alarms defined for display in the Active Alarms field in the General Alarm Setup Control table.

number of logbook entries is the maximum number of logbook entries expected to be generated for the alarms defined. This number can be smaller than or equal to the number of active alarms. A practical estimate of the normal volume of logbook entries is 20-30% of the total alarms.

msg space this number is smaller than or equal to the number of input lines.

MAXLEN parameters must match on all nodes that receive distributed alarms.

BUFSIZE

Only File Manager uses the BUFSIZE parameter. A number between 128 and 2,048 that sets the size of each buffer in bytes. The default is **512** bytes. The size of the buffer determines the amount of data File Manager can transmit across the network in a single message.

MAXSESS

The maximum number of stations to which the local station can connect at the same time. These are called *connections*. The default is **32**. The maximum number of connections varies by network protocol:

- For NetBIOS, any number from 1 to *x* where *x* is the maximum allowed by NetBIOS. See the NetBIOS documentation.
- For TCP/IP and DECnet, any number from 1 to 64.

ACK

A number from 0 to 1,024 that specifies the number of seconds the local station will wait for a remote station to send a data packet acknowledgment before disconnecting from that station. The default is **0**, which indicates the local does not require an acknowledgment from a remote.

ST (Send Timeout)

A number from 0 to 1,024 that specifies the number of seconds the local station will keep trying to send its data if the remote station cannot accept it because it cannot process data fast enough. The default is **10** seconds. When the timeout expires, the local station generates an error.

SD (Send Delay)

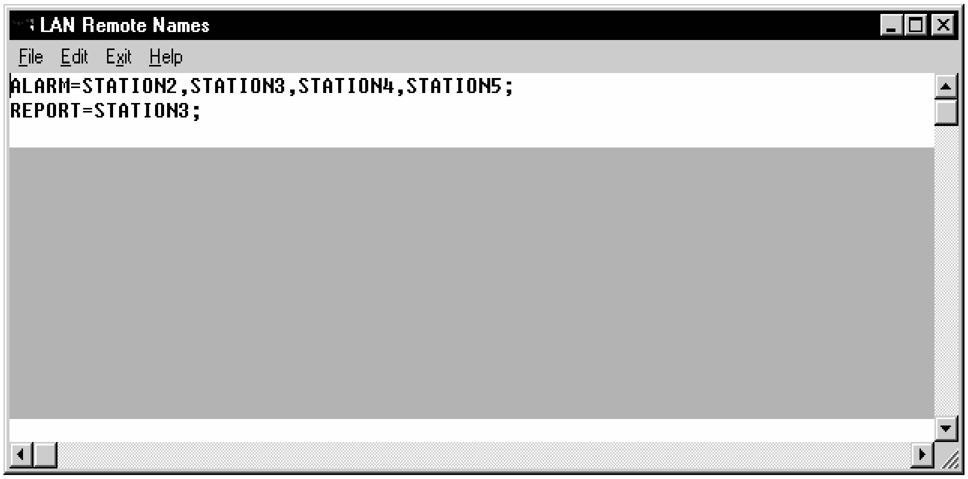
A number from 0 to 1,024 that specifies the number of seconds the local station waits between tries to send its data if the remote station cannot accept it because it cannot process data fast enough. The default is **10** seconds. If you increase this number, you will reduce CPU consumption but you may cause the overall performance to drop.

LAN Remote Names Panel

Network groups are defined in the LAN Remote Names panel. You must assign each remote station on the network to a network group. Do not include the name of the local station in a network group.

Perform the following steps to define network groups for the local station. You must repeat this procedure for each computer in the network running FactoryLink.

1 Choose Exit >Exit on the LAN Local Names panel to display the LAN Remote Names panel.



```
ALARM=STATION2,STATION3,STATION4,STATION5;
REPORT=STATION3;
```

2 Complete the LAN Remote Names panel. Enter all group names on a separate line using the following format.

group = *STATION*[, *STATION*,...];

where

group	Alphanumeric name of 1 to 16 characters assigned to a network group. Group names can be either upper or lowercase.
STATION	Computer name, as defined in the network operating system, of one or more remote stations to include in the group. Spell the name of the remote station as it is spelled in the Control Panel. Separate each name with a comma. The station list can be split at the end of the line, but the comma must be on the same line as the station name. Place a semicolon (;) at the end of a group name definition.

In this example, the ALARM group consists of STATION2, STATION3, STATION4, and STATION5. The REPORT group consists of STATION3.

Note that STATION3 belongs to both groups and that each line ends in a semicolon.

3 Press Enter (Return) at the end of the last line to enter a hard return. **This hard return is required.**

4 Choose File>Save when you have completed this panel.

5 Choose Exit>Exit.

Chapter 12 . . . .

Sending Element Values to Other Stations

Data is sent from one station to another using send operations. Each send operation defines what data to send when the operation executes. The operations and the data to send with each operation are defined in the Local Area Network Send configuration table.

This chapter provides a field-by-field description of the following two panels:

- LAN Send Control panel—Defines the stations to receive data and the conditions under which FLLAN sends the data.
- LAN Send Information panel—Defines the elements sent to the remote stations with the send operation.

You can complete as many Send tables as the RAM on your system allows.

You can enter as many elements as the available RAM allows.

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

LAN Send Control Panel

Send operations are defined on the LAN Send Control panel.

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Local Area Network Send from the Configuration Manager Main Menu to display the LAN Send Control panel.

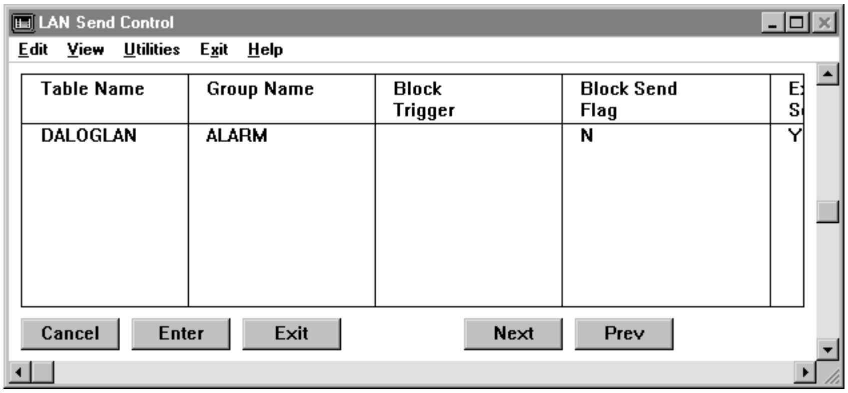


Table Name	Group Name	Block Trigger	Block Send Flag	E S
DALOGLAN	ALARM		N	Y

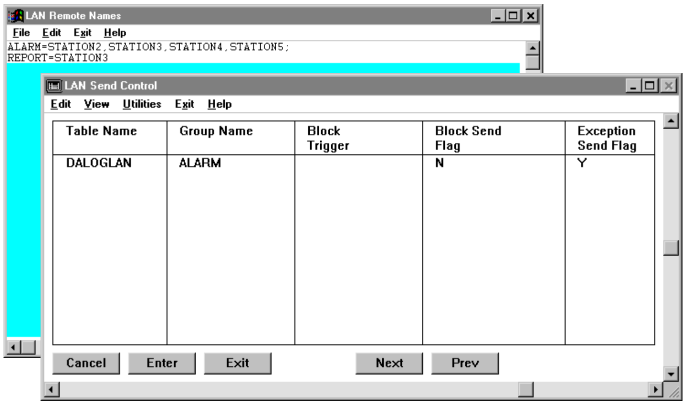
Specify the following information for this panel. Add an entry for each send operation you want FLLAN to transmit across the network.

Table Name Alphanumeric name of 1 to 16 characters to reference the send operation.

Valid Entry: alphanumeric name of 1 to 16 characters

Group Name Name of the group of network stations that the local station sends data to. This name must match a group name defined in the LAN Remote Names panel.

From the example used for the LAN Remote Names, the group ALARM is defined as STATION2, STATION3, STATION4, and STATION5. Therefore, the FLLAN task on the local station (STATION1 from the LAN Local Names example) would send data to the stations belonging to the ALARM group.



```
ALARM=STATION2,STATION3,STATION4,STATION5;
REPORT=STATION3
```

Table Name	Group Name	Block Trigger	Block Send Flag	Exception Send Flag
DALOGLAN	ALARM		N	Y

Enter ALL if you want to send the data to all stations named in the GROUPS file.

Valid Entry: alphanumeric name of 1 to 16 characters

Block Trigger Name of a tag that triggers this operation. When the change-status flag for this task is set, FLLAN sends the values specified in the LAN Send Information to the stations included in the group specified in the Group Name field of this panel. You must activate the send operation with the Exception Send Flag field if you leave this field blank.

You can specify both a trigger in this field and an exception send in the Exception Send Flag field on this panel. The operation executes each time the trigger is set and each time the tag value changes; however, if you do this, the value may not always be sent on exception because the block trigger may reset the change status bit before FLLAN processes the exception send table.

The tag specified must be in the SHARED domain.

To send the table only when this tag value is forced to 1 (on), define this tag as digital.

To send this table whenever this tag value changes, define this tag as analog, longana, floating-point, message, or mailbox.

To send individual values only as the table tag values change, rather than as a triggered block send, leave this field blank.

You must define the Block Send Flag if you define this field.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message, mailbox

Block Send Flag

Values sent when this operation is triggered. This can be one of the following:

W	Writes only the values that have changed since the last send.
YES	Force-writes only the values that have changed since the last send. If you enter YES, FLLAN does not send a tag’s default value at start up. Instead, FLLAN waits to send it until the tag value changes to something other than the default.
NO	Sends all values except empty mailboxes, whether or not they have changed.

You must define a Block Trigger for the Block Send Flag to work.

Exception Send Flag

Defines whether or not to send values of individual elements as they change. This can be one of the following:

W	Writes values that change when they change.
YES	Force-writes values that change when they change. If you enter YES, FLLAN does not send a tag default value at start up. Instead, FLLAN waits to send it until the tag value changes to something other than the default.
NO	Does not send values when they change. If you enter NO, you must activate the send operation with the Block Trigger field. This is the default.

You minimize network traffic if this data is changing infrequently to send only the values that change. If data is changing frequently and at regular intervals, then it is more effective to send the data in triggered blocks.

You can also specify both a trigger in the Block Trigger field and an exception send in this field for the same operation. The operation executes each time the trigger is set and sends the individual elements each time an element value changes.

If you set up FLLAN to send the data as it changes and the change bit for the data is set before FLLAN establishes communication with the remote node, FLLAN does not send the data until the next time the data changes. Define a Send State tag in the Network Monitor table (refer to “Monitoring Remote Station Communications” on page 321 for more information) and define a Math & Logic procedure to monitor the value of the Send State tag to ensure FLLAN sends the changed data.

Do not use the same element in more than one exception table if you specify exception sends. If you have the same tag in a block send table and an exception send table, the triggered table may reset the change status bit before the exception send table is processed with the result that the value/tag is not sent on exception.

Note: For further explanation, the following table lists the flags to use based on what modes to use.

Block Trigger	Block Send Flag	Exception Send Flag	Flag
sec1	NO	NO	1
sec1	W or YES	NO	2
none required	W or YES	W or YES	3

Enable/Disable Tag

Name of a digital tag to disable this operation. When the value of this tag is set to 0, this operation is not executed, even when the Block Trigger is set. This field disables the operation for all stations included in the group.

This element is useful if a remote station will not be available for the network for a long period of time.

Valid Entry:	standard tag name (default = 1)
Valid Data Type:	digital

-r

FLLAN send also has a command-line option. This option prevents FLLAN send from setting all of the tags configured in the Enable/Disable column of the FLLAN send table to 1. With the “-r” option, FLLAN send will leave these tags at 0. Without the “-r” option, which is the default, FLLAN send will set these tags to 1 at FLLAN send startup.

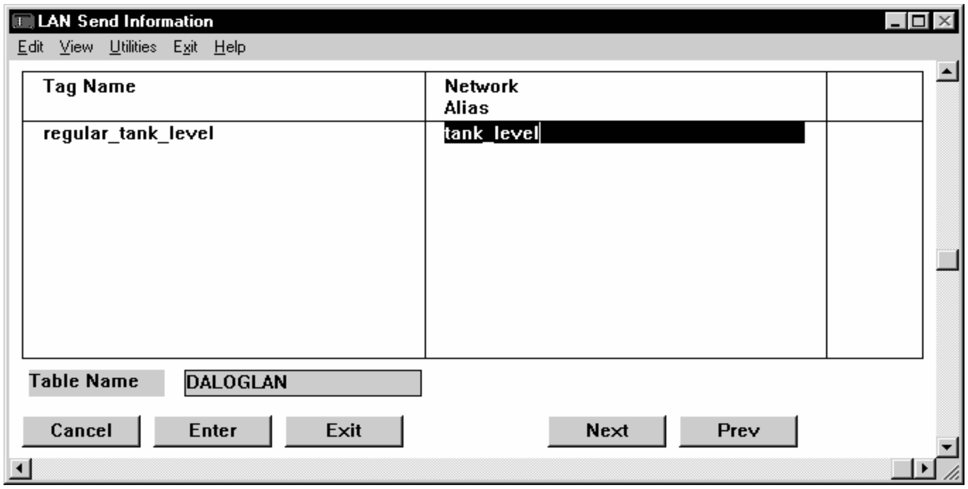
Note: The “-r” command-line option is case-sensitive and must be lowercase.

LAN SEND INFORMATION PANEL

The data to send with each send operation is defined in the LAN Send Control panel.

Ensure the cursor is positioned on the line entry on the LAN Send Control panel representing the send operation you are configuring.

Click Next to display the LAN Send Information panel.



Tag Name	Network Alias
regular_tank_level	tank_level

Table Name DALOGLAN

The name of the send operation you are configuring is displayed in the Table Name field at the bottom of the panel.

In this example, the local station sends the value of the element regular_tank_level to a corresponding element on some remote station. The element on the remote station may, or may not, be the same name as regular_tank_level. If it is not the same name, then you can specify an alias to link the “sending” element on the local station to the “receiving” element on the remote station. Here, the element tank_level is defined as the alias.

Using r87_tank_level as the name of the receiving element on the remote station, the local station sends the value of regular_tank_level across the network identified as tank_level. The alias tank_level would also be used on the remote station and map to the element r87_tank_level. Because the alias between the two stations is the same, the local station can send the value of regular_tank_level to the remote station element r87_tank_level.

Specify the following information for this panel. Add an entry for each element you want FLLAN to send to a remote station when the operation is triggered. Group tags by data type and order them by digital, analog, floating-point, long analog, message, and mailbox if you want to maximize performance.

Tag Name

Tag name that references the Real-Time Database element to send with this operation.

The tag specified must be in the SHARED domain.

If you enter message or mailbox tags, ensure the MAXLEN value is set to slightly larger than the longest message or mailbox value. The value is truncated if the MAXLEN value is set lower than the length of a message or mailbox value.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, floating-point, message, mailbox

Network Alias (Optional)

Alphanumeric alias name of 1 to 48 characters. Do not use a number for the first character. This is the name FLLAN uses to transfer data on the network.

The alias name is a tag name used globally by all stations on the network. It identifies data being sent from one station to another. Define this name on the sending station and reference it on all remote stations that receive data from the sending station.

If you leave this field blank, FLLAN automatically uses the name in the Tag Name field as the network alias.

If you use an alias name, you can be more flexible when naming elements among systems. For instance, at one station an analog element may be called alrm7, while at another station an analog element containing the same data may be called temphigh. To transfer data across the network from alrm7 to temphigh, you can designate an alias name, such as hot, for that data.

Valid Entry:	alphanumeric alias name of 1 to 48 characters

Chapter 13 . . . .

Receiving Element Values from Remote Stations

FLLAN can receive data from elements on remote FactoryLink stations and write them to the Real-Time Database on the local station. This mapping is defined in the Local Area Network Receive configuration table.

This chapter provides a field-by-field description of the following two panels:

- LAN Receive Control panel—Defines the remote stations that can send data to the local station.
- LAN Receive Information panel—Defines the elements in the local real-time database that are updated by data received from remote stations. Another station cannot change its value unless you list an element name in this table. This provides security for sensitive data.

You can complete as many Receive tables as the RAM on your system allows.

You can enter as many elements as the available RAM allows.

> **Note:** The representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

LAN RECEIVE CONTROL PANEL

Remote stations that send data to this local station are identified in the LAN Receive Control panel.

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Local Area Network Receive from the Configuration Manager Main Menu to open the LAN Receive Control panel.

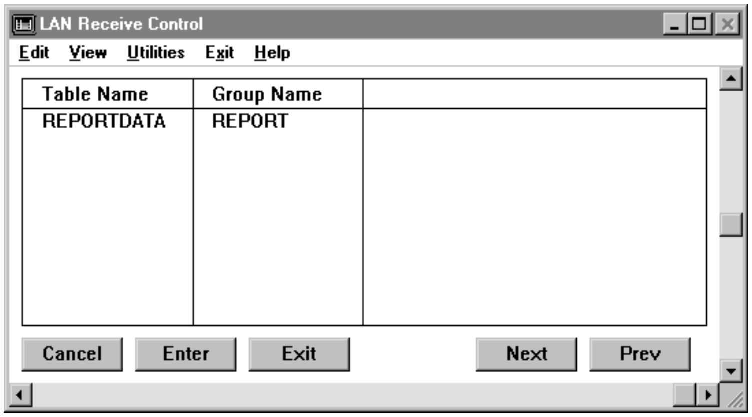


Table Name	Group Name
REPORTDATA	REPORT

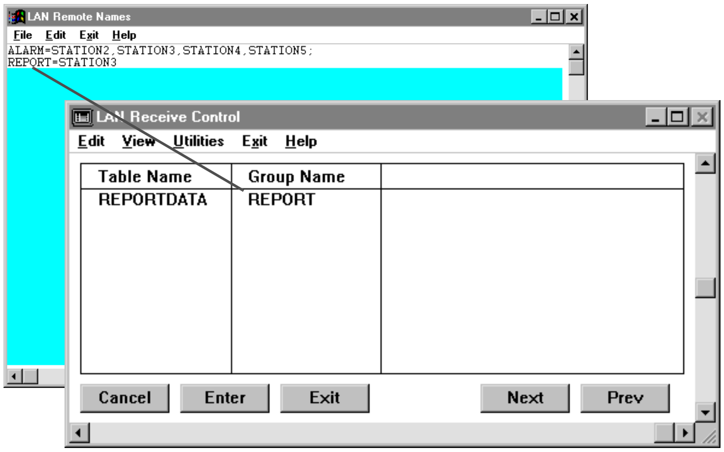
In this example, the local station receives data from the remote stations belonging to the network group REPORT.

Specify the following information for this panel:

Table Name — Alphanumeric name of 1 to 16 characters for this receive operation.

Valid Entry: alphanumeric name of 1 to 16 characters

Group Name — Alphanumeric name of 1 to 16 characters that identifies the group of network stations FLLAN receives the element values from. This name must match a name defined in the LAN Remote Names panel.



```
ALARM=STATION2,STATION3,STATION4,STATION5;
REPORT=STATION3
```

Table Name	Group Name	
REPORTDATA	REPORT	

Enter ALL if you want to receive data from all stations named in the GROUPS file.

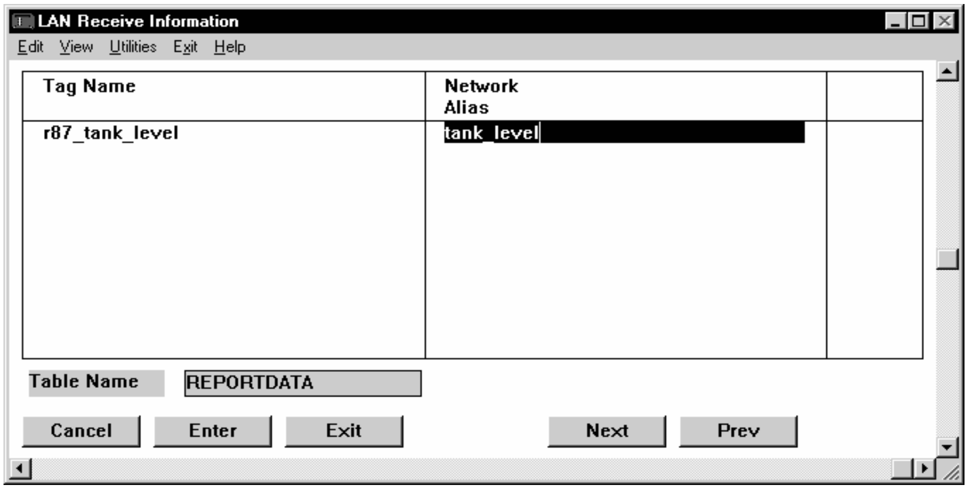
Valid Entry: alphanumeric name of 1 to 16 characters

LAN Receive Information Panel

Define the elements in the Real-Time Database for the local station that are updated with the data received from a remote station.

Ensure the cursor is positioned on the line entry in the LAN Receive Control panel representing the receive operation you are configuring.

Click Next to display the LAN Receive Information panel.



Tag Name	Network Alias
r87_tank_level	tank_level

Table Name: REPORTDATA

The name of the receive operation you are configuring is displayed in the Table Name field at the bottom of the panel.

In this example, this station receives data from the sending station via the alias tank_level. The alias tank_level mapped the element regular_tank_level on the sending station; here on the receiving station, it maps to the element r87_tank_level.

Specify the following information for this panel. Add an entry for each element received from any remote station in the network group.

Tag Name — Tag name of the database element to be updated when the data identified by network alias is received. The tag specified must be in the SHARED domain.

If you enter message or mailbox tags, ensure the MAXLEN value is set to slightly larger than the longest message or mailbox value. The value is truncated if the MAXLEN value is set lower than the length of a message or mailbox value.

Valid Entry:	standard
Valid Data Type:	digital, analog, longana, float, message, mailbox

Network Alias (Optional)

Alphanumeric alias name of 1 to 48 characters that FLLAN uses to transfer data on the network. Do not use a number for the first character. This name must match the name assigned to a database element in a send operation on a remote station.

The alias name is a tag name used globally by all stations on the network. It identifies data being sent from one station to another. Define this name on the sending station and reference it on all stations that receive data from the sending station.

If you leave this field blank, FLLAN automatically uses the name in the Tag Name field as the network alias.

If you use an alias name, you can be more flexible when naming elements among systems. For instance, at one station, an analog element may be called alrm7 while at another station an analog element containing the same data may be called temphigh. To transfer data across the network from alrm7 to temphigh, you can designate an alias name, such as hot, for that data.

Valid Entry:	alphanumeric alias name of 1 to 48 characters

Chapter 14 . . . .

Monitoring Remote Station Communications

Configure the Network Monitor table if you want to monitor the status of remote stations on the network, such as the number of transmissions a remote station has sent and received and whether these transmissions were successful. This table consists of the Network Monitoring panel that defines the stations you want to monitor and the tags to hold the information.

You can monitor any or all FactoryLink stations on the network as long as they are running FLLAN.

The panels in this chapter show a sample configuration. This example defines elements to contain the status of the STATION3 remote station.

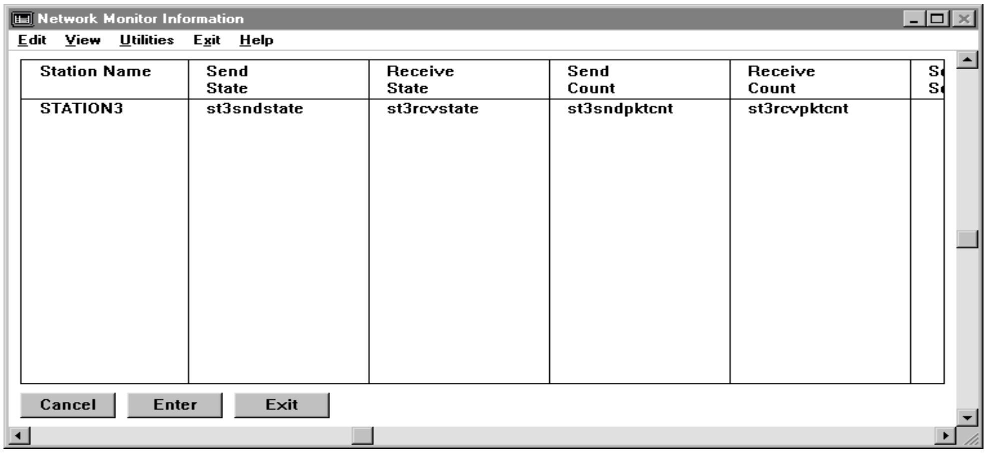
The procedures in this chapter assume you know how to open the Configuration Manager Main Menu and navigate the panels.

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

NETWORK MONITOR INFORMATION PANEL

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

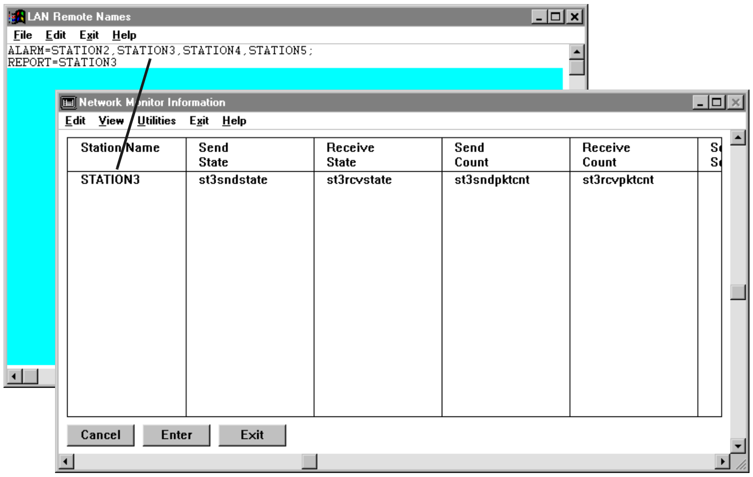
Choose Network Monitoring from the Configuration Manager Main Menu to open the Network Monitor Information panel.



Station Name	Send State	Receive State	Send Count	Receive Count	Se Se
STATION3	st3sndstate	st3rcvstate	st3sndpktcnt	st3rcvpktcnt	

Specify the following information for this panel:

Station Name — Name of the remote station to monitor. This name must match one of the station names in the LAN Remote Names panel.



```
ALARM=STATION2,STATION3,STATION4,STATION5;
REPORT=STATION3
```

Station Name	Send State	Receive State	Send Count	Receive Count
STATION3	st3sndstate	st3rcvstate	st3sndpktcnt	st3rcvpktcnt

Send State Name of an analog tag to contain the status of transmissions to the remote station. At run time, this element uses the following values to indicate the status:

0	The remote station is available.
1	The remote station is not available and is not yet active.
3	The local station called the remote station but the remote station has not responded.
6	One of the stations has disconnected.
7	The connection has permanently terminated. This occurs if the remote station buffer is a different size from the local station buffer.
10	The remote station is ready to connect.
11	The remote station responded to a call request but it is not yet ready to receive data.
12	The remote station is ready to receive data. Use this value to ensure you have established communication with the remote node before sending any data.

Receive State Name of an analog tag to contain the status of transmissions from the remote station. At run time this element uses the following values to indicate the status.

0	The remote station is available.
1	The remote station is not available and is not yet active.
2	The local station is listening for a call from the remote station.
6	One of the stations has disconnected.
7	The connection has permanently terminated. This occurs if FLLAN does not reset the remote station when it disconnects.
10	The remote station is ready to listen.
11	The remote station called the local station but the local station is not yet ready to receive data.
12	The local station is ready to receive data.

Send Count Name of an analog tag that counts the number of times the local station sent data to the remote station. FLLAN does not reset this value to 0 when the remote station disconnects.

Valid Entry: standard tag name
Valid Data Type: analog

Receive Count Name of an analog tag that counts the number of times the local station received data from the remote station. FLLAN does not reset this value to 0 when the remote station disconnects.

Valid Entry: standard tag name
Valid Data Type: analog

Send Sequence Name of an analog tag that indicates the number of the packet the local station sent.

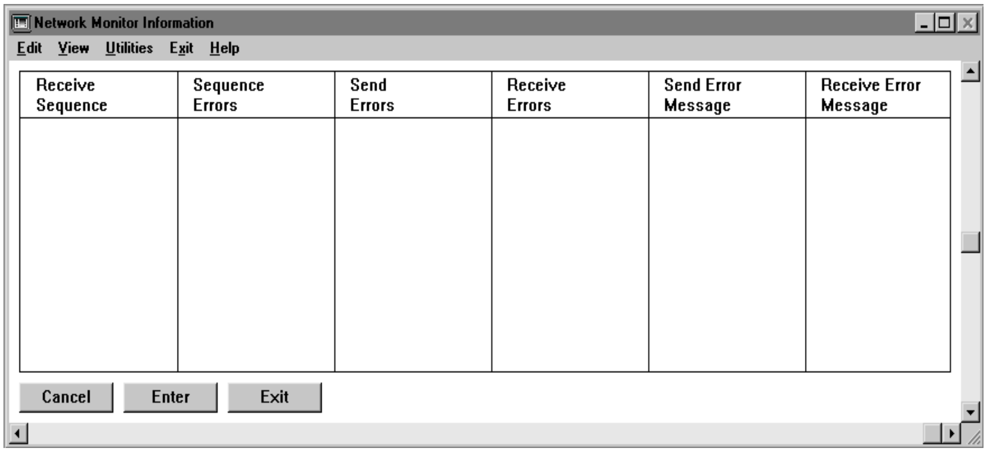
FLLAN assigns a number, called the send sequence number, for each packet the local station sends to the remote station you are monitoring. As the local station sends each packet, this number increments. You can monitor this number to see whether the local station is sending data packets in the correct order. FLLAN resets this value to 0 each time the stations reconnect.

Valid Entry: standard tag name
Valid Data Type: analog

Receive Sequence

Name of an analog tag that indicates the number of the packet the local station receives.

FLLAN assigns a number called the send sequence number for each packet the local station sends to the remote station you are monitoring. As the local station receives each packet, this number increments. You can monitor this number to see whether the local station receives data packets in the correct order. FLLAN resets this value to 0 each time the stations reconnect.



Receive Sequence	Sequence Errors	Send Errors	Receive Errors	Send Error Message	Receive Error Message

Sequence Errors

Name of an analog tag that counts the number of times the local station sends or receives data out of sequence.

Valid Entry:	standard tag name
Valid Data Type:	analog

Send Errors

Name of an analog tag that counts the number of times the local station could not successfully send data to the remote station. This usually occurs when the local station tries to send data to the remote station while the remote station is disconnected.

Valid Entry:	standard tag name
Valid Data Type:	analog

Receive Errors

Name of an analog tag that counts the number of times the local station could not successfully receive data from the remote station. This usually occurs when the remote station is disconnected and the local station is waiting for data.

Valid Entry:	standard tag name

Valid Data Type: analog

Send Error Message Name of a message tag that contains the latest error or status message for the send link for the remote station.

Valid Entry: standard tag name
Valid Data Type: message

Receive Error Message Name of a message tag that contains the latest error or status message for the receive link for the remote station.

Valid Entry: standard tag name
Valid Data Type: message

If you want to view the status on screen at run time, design and configure a graphics screen to display the information.

If you want other FactoryLink modules to view and use this information for other activities, configure those modules' panels. For example, you can configure Math & Logic and Alarm Supervisor to monitor these elements and trigger an alarm whenever a remote station disconnects.

Chapter 15 . . . .

Configuring the System to Work with a Historian

The Historian task is the interface between FactoryLink and a relational database. It processes data requests from other FactoryLink tasks and sends them to the relational database. Data requests from Database Logger or Data-Point Logger tasks can store data in the relational database. Data requests from Trending or Database Browser tasks can retrieve data from the relational database.

You need to set program arguments to create and generate log files, define system parameters that control how the Historian functions during run time, how the system logs errors regardless of what Historian you are using, and how the system disconnects from and reconnects to the database. All supported Historian options are displayed in the Configuration Manager Main Menu.

This chapter provides information for the following procedures:

- Setting Program Arguments to Create and Generate Log Files
- Setting Historian Run-time Parameters
- Setting Run-time Fatal Error Code Values
- Database Disconnects And Reconnects

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

SETTING PROGRAM ARGUMENTS TO GENERATE/CREATE LOG FILES

Program arguments can be set for Historians and Client tasks to generate diagnostic log files at different verbosities.

The spec of the log files of Historians and Client tasks is as follows:

{FLAPP}/{FLNAME}/{FLDOMAIN}/{FLUSER}/LOG/xxmmddyy.log

On the PCs, the default value of {FLAPP} is C:\FLAPP, of {FLNAME} is FLAPP1.

For the historians and their “client” tasks, the default value of {FLUSER} is SHAREUSR as value of {FLDOMAIN} is SHARED.

The value of xx for historians is as follows:

- d4 for DB4_HIST
- od for ODBCHIST
- oh for OR7_HIST & OR8_HIST
- sy for SYB_HIST

The value of xx for client tasks is as follows:

- al for AL_LOG
- db for DBBROWSE
- dl for DBLOG
- dp for DPLOGGER
- sq for POWERSQL
- sd for SPCDATA (powerspc.exe)
- sg for SPCGRAPH (powerspc.exe)
- tr for TREND

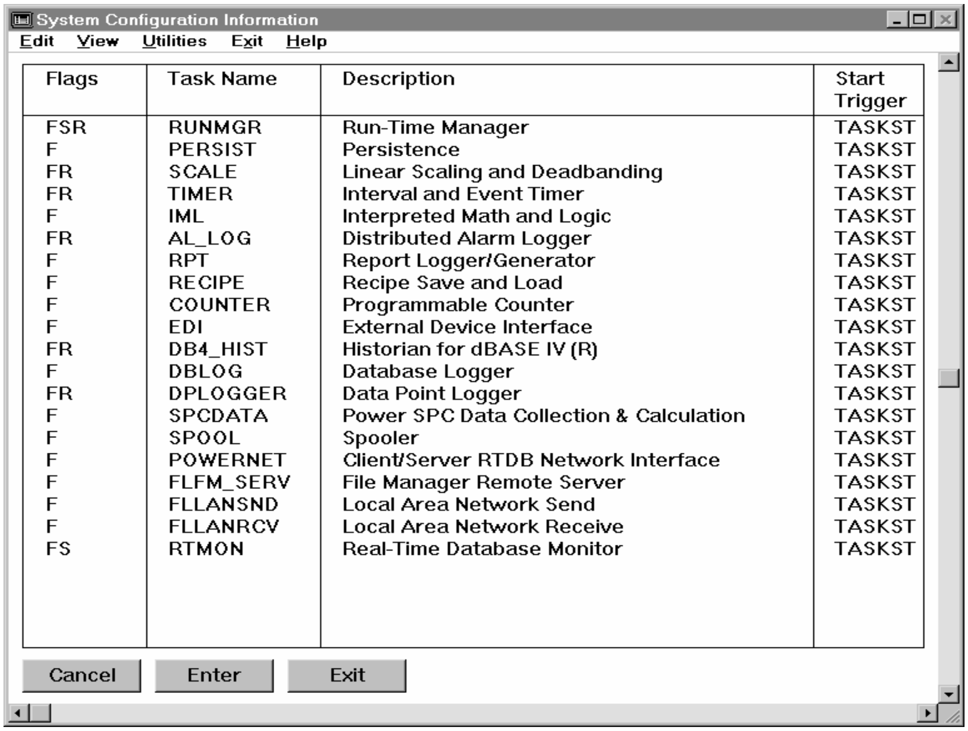
Mm, dd, yy are two-digit numerals for the month, day, year in the date of creation of the log file.

SETTING HISTORIAN RUN-TIME PARAMETERS

Perform the following steps to configure a Historian other than the dBASE IV Historian as part of the FactoryLink application. You must do this for each Historian you want to configure.

1 Ensure the domain is SHARED in the Configuration Manager Domain Selection box.

2 Choose System Configuration from the Configuration Manager Main Menu to display the System Configuration Information panel. Each FactoryLink task is a separate line item on this panel.



Flags	Task Name	Description	Start Trigger
FSR	RUNMGR	Run-Time Manager	TASKST
F	PERSIST	Persistence	TASKST
FR	SCALE	Linear Scaling and Deadbanding	TASKST
FR	TIMER	Interval and Event Timer	TASKST
F	IML	Interpreted Math and Logic	TASKST
FR	AL_LOG	Distributed Alarm Logger	TASKST
F	RPT	Report Logger/Generator	TASKST
F	RECIPE	Recipe Save and Load	TASKST
F	COUNTER	Programmable Counter	TASKST
F	EDI	External Device Interface	TASKST
FR	DB4_HIST	Historian for dBASE IV (R)	TASKST
F	DBLOG	Database Logger	TASKST
FR	DPLOGGER	Data Point Logger	TASKST
F	SPCDATA	Power SPC Data Collection & Calculation	TASKST
F	SPOOL	Spooler	TASKST
F	POWERNET	Client/Server RTDB Network Interface	TASKST
F	FLFM_SERV	File Manager Remote Server	TASKST
F	FLLANSND	Local Area Network Send	TASKST
F	FLLANRCV	Local Area Network Receive	TASKST
FS	RTMON	Real-Time Database Monitor	TASKST

3 Copy the dBASE IV Historian entry line and paste it as the last entry on this panel.

4 Specify the following information for the Historian you are adding:

Flags F and R so Historian runs in the foreground when your FactoryLink application starts.

Valid Entry: F and R

Task Name Name assigned to the Historian task. The names assigned to each Historian are listed in the following table.

Historian	Task Name
dBASE IV	DB4_HIST
Oracle	OR7_HIST, OR8_HIST
Sybase	SYB_HIST
ODBC	ODBCHIST

Description Alphanumeric string that identifies the task.

Valid Entry: alphanumeric string of up to N characters

Start Trigger Trigger task that starts the task. This tag is part of an array and is always named TASKSTARTS*[n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry: standard tag name
Valid Data Type: TASKSTARTS[*n*]

Task Status Tag that indicates the run-time task status. This tag is part of an array and is always named TASKSTATUSS[*n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry: standard tag name
Valid Data Type: TASKSTATUSS[*n*]

Task Message Tag that receives run-time messages for this task. This tag is part of an array and is always named TASKMESSAGES[*n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry: standard tag name
Valid Data Type: TASKMESSAGES[*n*]

Display Status Tag that receives the text version of the task status. This tag is part of an array and is always named TASKSTATUSS[*n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry: standard tag name
Valid Data Type: TASKSTATUSS*[n*]

Display Name
Tag containing the string entered in the Task Name field. The field value is displayed on the Run-Time Manager screen. This tag is part of an array and is always named TASKNAMES[*n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry:	standard tag name
Valid Data Type:	TASKNAMES[*n*]

Display Description
Tag that contains the string entered in the Description field on this panel. This tag is part of an array and is always named TASKDESCS[*n*] where *n* identifies the tag instance. Increment *n* for this task to the next available number in the array.

Valid Entry:	standard tag name
Valid Data Type:	TASKDESCS[*n*]

Start Order
Value of 1 that defines the order this task is started in at run time. Historians must have a higher start order than the tasks that use Historian, such as Database Logger, Database Browser, and Trend.

Valid Entry: numeric value of 1

Priority
Value of 201 that defines the order the Run-Time Manager services task requests in. This value is relative to the other tasks.

Valid Entry: numeric value of 201

Executable File
Complete executable file name for this Historian task relative to the FLINK environment variable. Refer to the table below to determine what you need to enter.

Task Name	Executable File
DB4_HIST	bin/db4_hist
OR7_HIST, OR8_HIST	bin/or7_hist, bin/or8_hist
SYB_HIST	bin/syb_hist
ODBCHIST	bin/odbchist

Application Directory
Leave this field blank.

Program Directory
Leave this field blank.

Program Argument
Any desired program arguments. These arguments control how the task functions at run time. Following is a partial list specific to Historian.

-i*xxx* Maximum Cursor Inactivity

Maximum cursor inactivity time, in minutes, before the Historian task closes the SQL cursor. The default is 15 minutes.

Valid Entry: number between 15 and 300

-l*xxxx* Maximum Connect Inactivity

Set a maximum time in minutes of inactivity before the Historian task closes the SQL connection. The default is to never close the connection.

Valid Entry: number between 15 and 4320

-L*x* or -l*x* Turn On Historian Logging

By default logging is enabled. The Historian always logs errors to the log file. The transaction is logged if a logging level is specified.

Level 1 is minimum logging that logs OPEN/CLOSE transactions for SQL connections and cursors.

Level 2 logs the EXECUTE and FETCH transactions as well as level 1 transactions.

Level 3 logs level 1 and 2 transactions and also logs the data supplied by the EXECUTE transaction. Level 3 may generate a tremendous amount of data. Usually these levels are used for debugging a FactoryLink application. Once the application is debugged, the logging program argument is unnecessary.

Valid Entry: number between 1 and 3

-V*x* or -v*x* Echo Historian Transactions to Terminal Output.

Levels 1 and 2 echo the same information as stated above in the logging program argument.

Valid Entry: number between 1 and 2

-X or -x Add extra lines.

Adds extra lines to the log file giving times when Historian sent and received messages. The message ID sequences these lines for better cross-referencing with similar lines in the Historian task log file.

If you are using the dBASE IV Historian, the following arguments are also available. For additional information regarding the settings described below, refer to the dBASE IV Historian chapter in this guide.

Note: Please be aware that, when using multiple Historians, some or all transactions for the various clients are synchronous while others are asynchronous. If a client executes synchronous transaction with one Historian and it does not respond for whatever reason, the client must wait until the timeout period for that transaction elapses before it can process any other triggered transactions for any of the Historians.

-C or -c Checks for possible corruption before opening the dBASE IV file. This check is done only if the dBASE IV Historian has this argument and the computer is improperly shut down, or if the dBASE IV Historian task aborts. In either situation, some dBASE IV files will not have closed properly. Once the dBASE IV Historian task is restarted, the dBASE IV Historian detects the improper event and does not allow the dBASE IV files to open until the bh_sql task verifies them.

When the DB4_HIST task has the argument -c, it checks for possible corruption before opening the dBASE IV table. If the file is not closed properly, it gives a message like “table improperly closed” and does not carry out the SQL command (from DBLOG or DBBOWSE, etc.). This will prevent the database from getting corrupted further or returning corrupt data. You need to go into BH_SQL and use the command “repair\noclose *tablename*” to repair the corrupt table *tablename.* If no *tablename* is specified, all the tables in the DB directory are repaired. Once the tables are repaired, the Historian will recognize that they are closed properly and will function normally thereon. This argument would be useful if the computer was properly shut down. or if the DB4_HIST task aborted. In either situation, some dBASE IV files would not have been closed properly.

Consider the scenario where one PC is logging (DBLOG) to a dBASE IV database on a network drive and a second PC is reading from that database (TREND or DBBROWSE). If the DB4_HIST on the first PC opens the database first, it will find that the files were closed and so may use the -c argument. In that case, the DB4_HIST on the second PC will find the database files open and so it cannot use the -c argument (else it will give “table improperly closed” error!) The reverse is true if the second PC accesses the database first. Therefore, in general, it is not a good idea to use this argument when you are dealing with shared databases.

-Fxxx or -fxxx Sets the maximum number of file handles that the dBASE IV Historian can open concurrently. The default value is 40. Valid values are between 40 and 200. A low value my cause significant performance problems for applications that have large numbers of tables/databases. This is due to the constant closing and opening of files. Increase this value if performance problems occur.

This setting is operating system dependent. The dBASE IV Historian continues to open as many filefhandles as the operating system will allow. If a file open call fails due to exceeding the maximum number of file handles, then reduce this number accordingly.

-M or -m Allows the dBASE IV Historian to be multiuser. Every update, insert, and delete causes the dBASE IV file to be flushed to disk. This allows other third-party software to view the data as it is added or modified by the dBASE IV Historian.

-dbase Switches to generate dBASE IV-compatible database files. The dBASE file has an extension of .dbf and the files are compatible with PC format even though they may have been created on RISC UNIX platforms.

Index files with extensions of .mdx are not dBASE IV-compatible when they have been created on any UNIX platform.

In Oracle only Starting from version 6.6.0, the Oracle Historian supports non-blocking network calls. Selecting non-blocking mode will allow a timeout to be configured for the Historian. This is in addition to the existing client timeout parameter using the -Wnnn argument. In the case of certain network and server malfunctions, this will prevent the Historian from not responding for prolonged and potentially indefinite periods.

The syntax for the arguments to control this mode is:

-omode=NBL /* Enables non-blocking mode, default is still blocking.*/

-otimeout=nn /*Replaces nn with number of seconds after which Oracle calls time out (default 30).*/

-osleep=nn /*Replaces nn with number of milliseconds to sleep between retries (default 50).*/

Note: When using the non-blocking mode, the enable/disable tag must be cycled for any alias that experiences a timeout in order to clear out pending results from the request on the server. It is possible that after the Historian timed out, the server actually completed the request successfully. In this case, the connection to the server may be left in a state that requires the result to be passed back to the Historian. This will prevent the execution of any new SQL statements or receiving erroneous returned data if the same SQL statement that timed out is executed again.

5 Save and exit.

Database Disconnects and Reconnects

The state of the connection is maintained in a Connection Status tag. The state determines the acceptable actions you can take to any table in the database accessible by FactoryLink.

Connection State	Description
0 = Database Connection Inactive	Indicates Historian is not connected to the database. At startup, Historian writes a zero to the status tag for each database. You can perform maintenance on the database outside of FactoryLink while the connection is in this state.
10 = Normal connection	Indicates Historian is connected to database. SQL data requests from FactoryLink tasks can be transmitted to and from the database.
20 = Connecting to database	Request for a connection in progress.
30 = Disconnecting from database	Connection is in the process of being disabled. When the connection is disabled, the status returns to zero. You do not want to maintain the database until the connection status is zero.
110 = Fatal Error Condition/Lost Connection	Indicates the connection failed, resulting in a fatal error. If you receive a fatal error status, you can find out about what caused the error from the contents of the database error tag.

Possible states are described in the following table.

Disconnects from a relational database can occur for either of the following reasons:

- They are scheduled to occur at predefined times.
- A fatal error forces an unscheduled disconnect.

Scheduled Disconnects

You can schedule disconnects on a periodic basis to perform maintenance on relational database tables FactoryLink accesses. When you schedule a disconnect, you also have the option of changing the connection from the database you are disabling to another database so data requests can continue to be processed.

Configuring Scheduled Disconnects

You must configure a FactoryLink task to set the disable/enable connection tag defined on the Historian Configuration panel to 1 to initiate a disconnect. Once a connection is disabled, the Historian returns a HSDISABLED error code to the requesting tasks. All data is lost during the period of disconnect.

You must configure a FactoryLink task to write the connection strings required to connect to the new database to the tags that define the connection you want to change. These tags are specified in the Historian Configuration panels. Then write 0 to the disable/enable connection tag defined on the Historian Configuration panels.

Unscheduled disconnects can occur because of fatal errors. Historians detect fatal error conditions returned either by the RDBMS server or the network client software. The Historian tasks consider an error condition to be fatal when an error code generated by a database server is found in the Fatal Error Codes list you defined in the FLINK/bin/flhst.ini file. For more information on how to define these codes, refer to “Setting Run-Time Fatal Error Code Values” on page 338 of this guide.

Database Reconnect

Database reconnect provides the ability to reconnect to a database when the connection has been lost. Historian reconnect is only valid when the task is running. The Historian information may not get updated after the reconnect if a screen is open when the database is disconnected and reconnected. If this occurs, exit and reenter the screen to refresh Historian updating. Reconnect does not work if the Historian is brought down and then brought back up.

Setting Run-Time Fatal Error Code Values

You must define the range of numeric codes that qualify as fatal for Historian to detect fatal run-time errors. If you are using ODBC, you must also define the data sources and servers supported by each operating system platform.

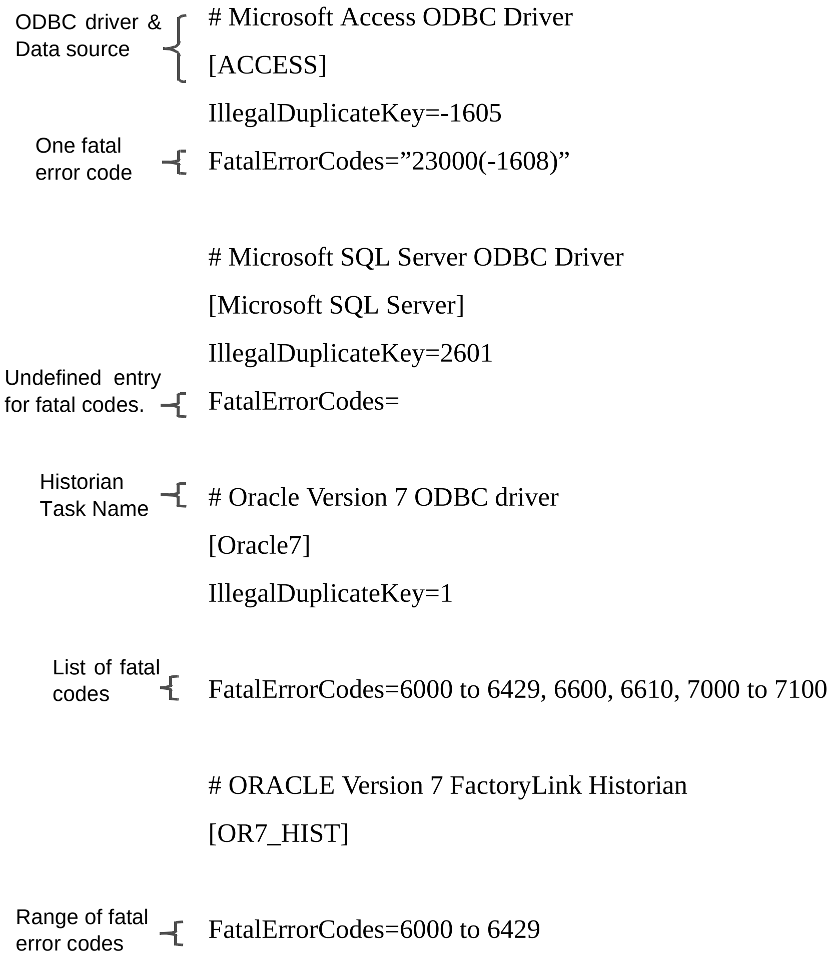
Fatal run-time error codes and ODBC support information are configured in the FLINK/bin/flhst.ini file. This file contains a section for each Historian and one or more ODBC database server names. Following is a sample of the contents for this file.

Alphanumeric Error Codes in ODBC

Only ODBC supports alphanumeric error codes. Any alphanumeric error code must be surrounded by quotation marks. The alphanumeric error code consists of two parts. The first part is the ODBC “state” string. The second part (enclosed in parentheses) is the native error produced by the database. The following examples illustrate the correct syntax.

List of alphanumeric error codes	FatalErrorCodes=”08S01(0)”, “08S01(11)”,”08S01(14)”
State string only	FatalErrorCodes=”08S01”
Range of alphanumeric error codes	FatalErrorCodes=”08S01(0)” TO ”08S01(14)”

Sample flhst.ini File



```
# Microsoft Access ODBC Driver
[ACCESS]
IllegalDuplicateKey=-1605
FatalErrorCodes=”23000(-1608)”

# Microsoft SQL Server ODBC Driver
[Microsoft SQL Server]
IllegalDuplicateKey=2601
FatalErrorCodes=

# Oracle Version 7 ODBC driver
[Oracle7]
IllegalDuplicateKey=1

FatalErrorCodes=6000 to 6429, 6600, 6610, 7000 to 7100

# ORACLE Version 7 FactoryLink Historian
[OR7_HIST]

FatalErrorCodes=6000 to 6429
```

ODBC driver & Data source
One fatal error code
Undefined entry for fatal codes.
Historian Task Name
List of fatal codes
Range of fatal error codes

Caution: The error code values listed in the Fatal Error Codes example are not actual error codes. For the actual codes, refer to the RDBMS user's manual.

This configuration file is divided into sections. Each section represents a different ODBC data source name for ODBC support information or a different Historian for definition of fatal error codes.

Following is an explanation of these entries:

# A pound sign in column 1 identifies a comment that the Historian task ignores.

[*taskname*] Name entered in the System Configuration panel. For ODBC, it is a data source.

IllegalDuplicateKey Single value valid only for an ODBC data source. Other Historians ignore this.

FatalErrorCodes Single value or a range of values considered fatal run-time errors to the Historian. The Fatal Error Codes can be a single value or a single range of values. It can also be a list where each value or a range is delimited by a comma.

SQLDescRequired = True Reserved words ASCENDING and DESCENDING are shortened to ASC and DESC for proper syntax usage by the database server.

Use any text editor to edit this file.

Handling Fatal Errors

If an unscheduled disconnect occurs because of a fatal error, the information about what caused the fatal error is written to the database error tag. The format of the error message depends on the error tag data type.

If the error tag data type is message, the error message is written in the following format:

taskname:err_msg

where

taskname Is the Historian task name that initiated the error condition.

err_msg Is the text from the relational database server.

If the error tag data type is a long analog, the tag contains the database-dependent error code number.

Every time the relational database server returns an error code to the Historian, the Historian tests this code against the range defined in the flhst.ini file.

When a Historian determines an error is fatal, it sets the connection status tag to 110. What happens next depends on how the FactoryLink application is configured to handle fatal errors. Your FactoryLink application can reconnect to the database after an error has been resolved.

One approach is to have the FactoryLink application set the disable/enable connection tag to 1 to disable the connection to the database causing the error, then attempt to reconnect by setting the disable/enable connection tag to 0.

Chapter 16 . . . .

Configuring Oracle Historians

This chapter provides a field-by-field description of the two panels the Oracle Historian uses and covers the following topics:

- Oracle Historian Considerations
- Historian Mailbox Information for Oracle Panel
- Historian Information for Oracle Panel
- Connecting the Historian to an Oracle Database

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Oracle Historian Considerations

This section explains how to set your FactoryLink application to work with the Oracle Historian. Read this section before you configure your Historian.

Network Software Needed

If you want to use OR7_HIST, purchase SQL*Net V2; if you want to use OR8_HIST, purchase Oracle Net8 Client 8.0.x.

Oracle Licenses

Oracle requires you purchase licenses for the number of FactoryLink processes using an Oracle database. Connection strings often use platform-defined aliases to easily reference Oracle servers.

Calculate the number of Oracle licenses required for each Oracle database:

1. One license for the Database Administrator.
2. One license for each unique Oracle User Name and connect string pair.

The minimum user requirement to connect FactoryLink to one Oracle server is two user licenses.

> **Note:** EACH Historian running in the application creates a FactoryLink process. For example, there are four Historians (ODBCHIST, ODBCHIST1, ODBCHIST2, and ODBCHIST3) on FactoryLink ECS NT 7.0 client box1, all talking with the Oracle server box, while on client box2, there are also four Historians talking with the same server box. Even if all eight Historians use the same user name and password, for example, flink/flink, the server considers these as eight different processes. For license information, please check with Oracle.

Number of Cursors per User

The OPEN CURSORS parameter determines the maximum number of cursors per user. Before you start the Oracle Historian the first time, increase the value of the OPEN CURSORS parameter to 200 or above. This setting is in the INIT.ORA file and has a valid range of 5 to 255. For instructions for increasing the value of OPEN_CURSORS, refer to the *Oracle RDBMS Database Administrator Guide*.

A setting of 200 cursors may not be high enough for extremely large applications. When this setting is not high enough, the following message is written to the directory defined by the environment variables in the log file ohmmddyy.log, where oh is the identifier for the Oracle Historian and mmddyy represents the date.

FLAPP/FLNAME/FLDOMAIN/FLUSER/log:
ORA-01000: maximum open cursors exceeded

Increase the value of the OPEN CURSORS parameter to 255. Contact Customer Support if this message continues to be displayed in the log file.

Data Types Supported by Oracle Database

For information on the supported data types, please refer to the Oracle documentation.

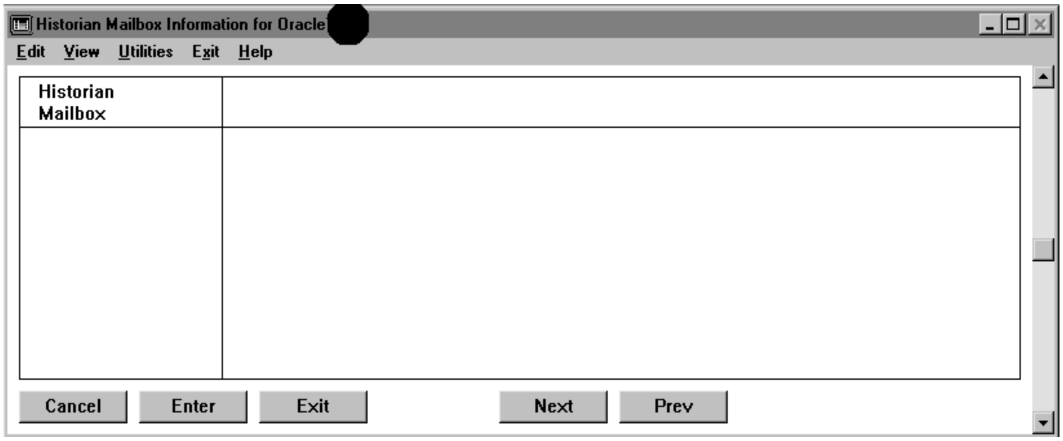
In the previous versions of FactoryLink, the format of the FactoryLink supported date data type had to be a string in the format of *yyyymmddhhmmss*. The tag had to be defined as a message with a minimum default length of 14 bytes to retrieve the date data type into a tag. If a tag was to insert or update a database row with the date data type, then the tag also had to be a message data type using previous format. In addition, the product now supports a direct conversion to and from a long analog tag (such as SECTIME) that equates to the elapsed seconds since January 1, 1980 to the date data type.

HISTORIAN MAILBOX INFORMATION FOR ORACLE PANEL

Historians process data requests queued to a mailbox. A single Historian can service multiple mailboxes; however, there is no requirement to create multiple mailboxes for an instance of the Historian. There is also no advantage in using multiple mailboxes from an application behavior or performance standpoint. It is generally more efficient to use a single mailbox for each Historian instance, regardless of the number of clients it services, than to have multiple mailboxes. However, some developers may choose to use different mailboxes for purposes related to application maintenance and readability. The mailboxes a Historian services are defined in the Historian Mailbox Information panel.

Ensure that the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose the Historian for Oracle from the Configuration Manager Main Menu and define the mailboxes that this Historian will service:


Historian Mailbox Information for Oracle
Edit View Utilities Exit Help
Historian Mailbox
Cancel
Enter
Exit
Next
Prev

Historian Mailbox   Mailbox name this Historian services. This name must match the name defined in the task using Historian to process data requests.

Create a separate mailbox for each task that submits data requests except for Database Logging and Trending, which can share a mailbox.

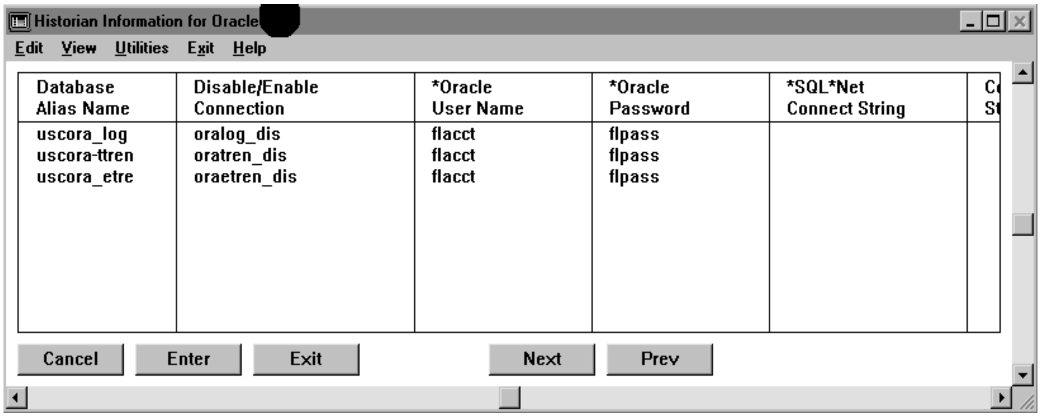
Valid Entry: standard tag name
Valid Data Type: mailbox

Click Next to go on to the Historian Information panel.

HISTORIAN INFORMATION FOR ORACLE PANEL

Database connection information is defined in the Historian Information panel. Add at least one entry for each uniquely defined database to be accessed by this Historian instance. Database connection information may be shared by multiple client tasks. Multiple entries for the same database connection are only necessary if separate control and monitoring of the connection status (and the tables that define) are required through the use of the Disable/Enable Connection, Connection Status, and Database Error tags. If the connection to a database via its defined alias closes for one task, it will close for all tasks. If separate entries are defined, then closing the connection for one alias does not affect the tasks using the other entries.

Ensure that the domain selected is SHARED in the Configuration Manager Domain Selection box.



Database Alias Name	Disable/Enable Connection	*Oracle User Name	*Oracle Password	*SQL*Net Connect String	C St
uscora_log	oralog_dis	flacct	flpass		
uscora-ttren	oratren_dis	flacct	flpass		
uscora_etre	oraetren_dis	flacct	flpass		

Specify the following information to set up one or more database connections and an alias for each:

Database Alias Name — Unique name to represent a database connection. This must match the database name defined in the task using Historian to process data requests.

Valid Entry: database connection name

Disable/ Enable Connection — Name of a digital tag that enables or disables the connection. When this tag is set to one, the connection to the relational database defined in this entry is closed; when set to 0, the connection opens.

Note: Database aliases should not share connection tags. Sharing connection tags between database aliases can result in errors.

Valid Entry: standard tag name

Valid Data Type: digital

*Oracle User Name

Login name required to connect to the database. This name must be a valid Oracle account with connect, read/write, and create access to database tables. This name can either be a constant or a tag name.

If you enter a constant, precede the user name with a single quote.

The tag specified must be a message tag type if you enter a tag name. You must specify a login name in the tag Default Value field and a maximum length of 32 in the Length field.

Valid Entry: standard tag name or constant
Valid Data Type: tag name: message of up to 32 characters

*Oracle Password

Password required to connect to the database. This password can be either a constant or a tag name.

If you enter a constant, precede the password with a single quote.

The tag specified must be a message tag type if you enter a tag name. You must specify a password name in the tag Default Value field and a maximum length of 32 in the Length field.

Valid Entry: standard tag name or constant
Valid Data Type: tag name: message of up to 32 characters

*SQL *NET Connect String

SQL*Net connect string required to connect to the database. Leave this field blank if you want to use the default connection. This can either be a constant or a tag name.

If you enter a constant, precede the connect string with a single quote.

The tag specified must be a message tag type if you enter a tag name. You must specify the connect string in the tag Default Value field and a length in the Length field that accommodates the longest connect string you define for this tag. If the connect string exceeds the defined length, it is truncated and the connection is not made. Define 64 as the length for the best results.

Valid Entry: standard tag name or constant
Valid Data Type: tag name: message of up to 64 characters

Connection Status

Name of an analog tag that defines the state of this connection.

Note: Database aliases should not share status tags. Sharing status tags between database aliases can result in errors.

Valid Entry: standard tag name
Valid Data Type: analog

Database Error

Name of a tag to receive the error value passed from the database software.

The tag specified must be either long analog or message. It should correspond to the type of error the relational database sends. If it is a number use long analog; if it is text use message.

Valid Entry:	standard tag name
Valid Data Type:	longana, message

Connecting the Historian to an Oracle Database

Two key areas must be set for your Oracle Historian to pass data requests to your Oracle RDBMS:

- Grant RDBMS access to the user account that runs your FactoryLink application
- Set the correct connection string

Granting the FactoryLink Account Oracle Access

You must grant access to the user account for the Historian to exchange data with an Oracle database, meaning the username and password, specified in the Historian Information panel. For the instructions on how to create an Oracle user account, refer to the *Oracle System Administration Guide*.

The Oracle user account must have system privileges to connect to a database and delete, update, insert, and select rows from a database table. Additionally, if the FactoryLink application requires, this account may also need to create table and index privileges.

Setting Connection Strings

This section provides the syntax to connect to SQL*Net V1 and V2 clients. Refer to the SQL*Net documentation set for your Oracle server running on your server host before you define a connect string to any platform.

SQL*Net V1 Syntax

For information about using aliases and default configurations, refer to the SQL*Net V1 documentation for your client operating system.

@*prefix*:*host_name*:*system_ID*

where

@	Marks the start of the connect string.
:	Is a field delimiter.
prefix	Represents the network transport.
host_name	Is the server host.
system_ID	Is the Oracle system ID.

This is an example connect string for the SQL*Net TCP/IP network protocol to a UNIX server:

@T:FLORASRV:B

where

@	Marks the start of the connect string.
T	Represents the TCP/IP network transport.
FLORASRV	Is the server host.
B	Is the Oracle System ID.

SQL*Net V2 Syntax

For information about how to define aliases in V2, refer to the SQL*Net V2 documentation for your client operating system.

@alias

where

@	Marks the start of the connect string.
alias	Is an alias name defined in an SQL*Net V2 configuration file.

This example is valid across all platforms.

```
@FLORACLE
```

where

FLORACLE	Is an alias configured in an SQL*Net V2 configuration file.

Chapter 17 . . . .

Configuring Multi-Instance ODBC Historian

This chapter discusses the following topics:

- FactoryLink ODBC Historian Overview
- ODBC Historian Considerations
  - Supported Drivers
  - Conformance Levels
  - SQL Statements
- Setting up ODBC in FactoryLink
- Setting up ODBC Drivers and Data Sources
- Historian Configuration Panels for ODBC
  - Historian Instance Number Panel for ODBC
  - Historian Mailbox Information Panel for ODBC
  - Historian Information Panel for ODBC
- Executing Multiple Instances of the ODBC Historian

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

FactoryLink ODBC Overview

The FactoryLink ODBC Historian makes it possible for FactoryLink to access data from multiple, diverse Relational DataBase Management Systems (RDBMS). ODBC refers to (Microsoft) Open DataBase Connectivity, which focuses on the Application Programming Interface (API) that supports connections to various database systems. The standard used for connecting and accessing a database is the Structured Query Language (SQL). Software components, called drivers, link a FactoryLink application to an RDBMS. Beginning with FactoryLink 6.6.0, the ODBC Historian has been enhanced to allow multiple instances of the task to be run in a single application. More information on the theory and configuration requirements for this feature is included later in this chapter.

The ODBC application programming interface (API) enables FactoryLink to access data from several diverse database systems through this single interface while the Historian remains independent of any RDBMS from which it accesses data. In summary, the ODBC interface defines the following:

- Dynamic-link libraries (DLL) of ODBC function calls that enable FactoryLink to connect to an RDBMS execute statements and retrieve results
- SQL syntax of function calls
- Standards for connecting to an RDBMS
- Standard representation for data types and the mapping between FactoryLink and RDBMS data types
- Error codes

The following components work together to make ODBC and FactoryLink communicate:

- FactoryLink—Performs processing and calls to third-party ODBC drivers to provide data to or request data from a data source.
- Driver Manager—Loads ODBC drivers on behalf of an ODBC-enabled application for the needed data source.
- Driver—Processes ODBC function calls, submits SQL requests to a specific data source, and returns results to FactoryLink.
- Data Source—Contains the data the driver accesses. Connection strings link a data source—RDBMS—to a driver.

ODBC Historian Considerations

This section discusses the following topics:

- Supported drivers
- Conformance levels
- SQL statements
- Conversion issue

Supported Drivers

FactoryLink ODBC Historian supports drivers only for the Windows NT and Windows 95/98 platforms. The drivers supported are:

- Microsoft ODBC Drivers for Access and Microsoft SQL Server
- Sybase SQL Driver
- MERANT ODBC 3.5 Drivers for Sybase, Oracle7, Oracle8, and Informix
- IBM DB2 Drivers

These drivers handle the connections to the various platforms relational databases run on.

For the most recent list of ODBC drivers certified for use with the ODBC Historian, please refer to the USDATA Web site.

ODBC defines two types of drivers:

- Single-tier—Processes both ODBC calls and SQL statements
- Multiple-tier—Processes ODBC calls and passes SQL statements to the data source

Single-tier drivers do not require additional RDBMS software; however, multiple-tier drivers do require the purchase of RDBMS server and connectivity products. Communication with most RDBMSs on servers requires the installation of the RDBMS client software on the FactoryLink client box.

The following table specifies the required additional connectivity software for each driver. For specific information regarding the additional software requirements, refer to the document on your driver and the network protocol that connect to your server. For specific software version numbers for the various products listed in the table below, see the Product Matrix on the USDATA Web site (http://www.usdata.com).

Driver	Type	Bit	Additional Software Requirements
Access	Single-tier	32-bit	None
MS SQL Server	Multiple-tier	32-bit	MS SQL Server Client
Sybase	Multiple-tier	32-bit	Sybase Open Client-Library and Net-Library
IBM DB 2	Multiple-tier	32-bit	IBM DATABASE 2 Client Pack
MERANT ODBC 3.5	Multiple-tier	32-bit	Appropriate RDBMS Vendor Client Software

Conformance Levels

Drivers and their associated RDBMS provide a varying range of functionality. The ODBC Historian requires that drivers conform to the Level 1 API conformance, which determines the ODBC procedures and SQL statements the driver supports. Use of the Level 2 API function SQLExtendedFetch is based on whether the driver and its data source support it.

SQL Statements

The ODBC Historian does not totally depend on the SQL conformance levels, but rather it tries to map the FactoryLink data types to the best match provided by each data source. When a data type maps, its SQL statement is accepted as long as the driver and data source can perform that operation.

Data stored on an RDBMS has an SQL data type, which may be specific to that data source. A driver maps data source-specific SQL data types to ODBC SQL data types and driver-specific SQL data types.

Setting Up ODBC in FactoryLink

Perform the following steps to establish the link between the ODBC Historian, an ODBC driver, and an RDBMS:

1. Install a driver for each relational database management system FactoryLink should access.
2. Connect a data source to an installed driver.

   For additional information and instructions for Steps 1 and 2, refer to the Microsoft ODBC Desktop Database Drivers book *Getting Started* and the *MERANT DataDirect ODBC Drivers Reference*.
3. Set up driver sources. Refer to “Setting up the ODBC Drivers and Data Sources” of this guide.
4. Complete FactoryLink panels. Connection information is defined in the following panels:
   - Historian Mailbox Information—Defines each mailbox the Historian services. Refer to “Historian Mailbox Information Panel for ODBC” on page 310 of this guide.
   - Historian Information—Defines information needed to connect the Historian to the relational database. Refer to “Historian Information Panel for ODBC” on page 312.

Data Types Supported by ODBC Driver

For information on the data types supported by the relational database, with which the ODBC driver is transacting, please refer to the database documentation.

In the previous versions of FactoryLink, the format of the FactoryLink supported date data type had to be a string in the format of *yyyymmddhhmmss*. The tag had to be defined as a message with a minimum default length of 14 bytes to retrieve the date data type into a tag. If a tag was to insert or update a database row with the date data type, then the tag also had to be a message data type using previous format. In addition, the product now supports a direct conversion to and from a long analog tag (such as SECTIME) that equates to the elapsed seconds since January 1, 1980 to the date data type.

Conversion Issue

If you are converting an application that has the ODBC Historian configured, the conversion to the multi-instance ODBC Historian requires that you run **FLCONV** directly against the pre-6.6.0 ODBC Historian configuration or a restore of a platform-specific save. Do not perform a multiplatform restore of the application before running **FLCONV**.

Setting up the ODBC Drivers and Data Sources

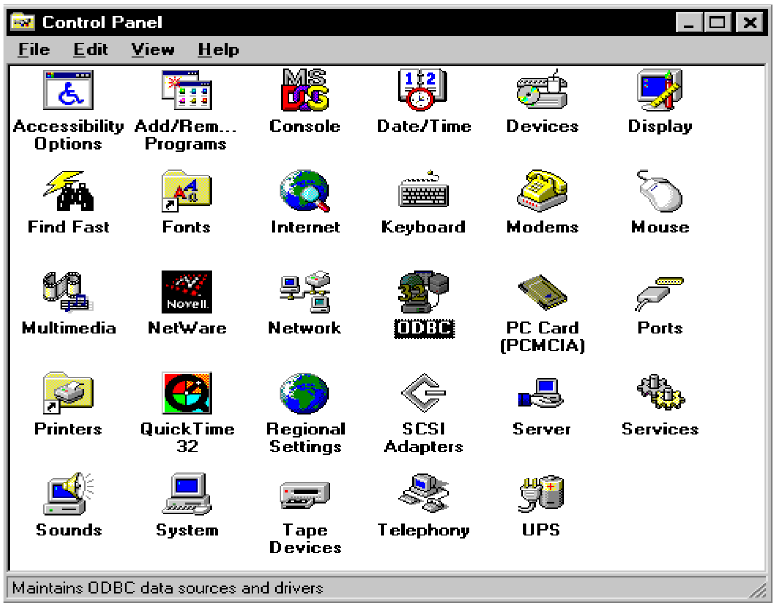
The in-depth information regarding a supported driver, its data sources, and their network connections are not within the scope of this guide. Refer to the documentation set associated with the software you have questions about.

Drivers and Data Sources

You use the ODBC Administrator to add and delete drivers, and to add, configure, and delete data sources. You can open the ODBC Administrator from the Control Panel.

Perform the following steps to complete information for drivers and data sources:

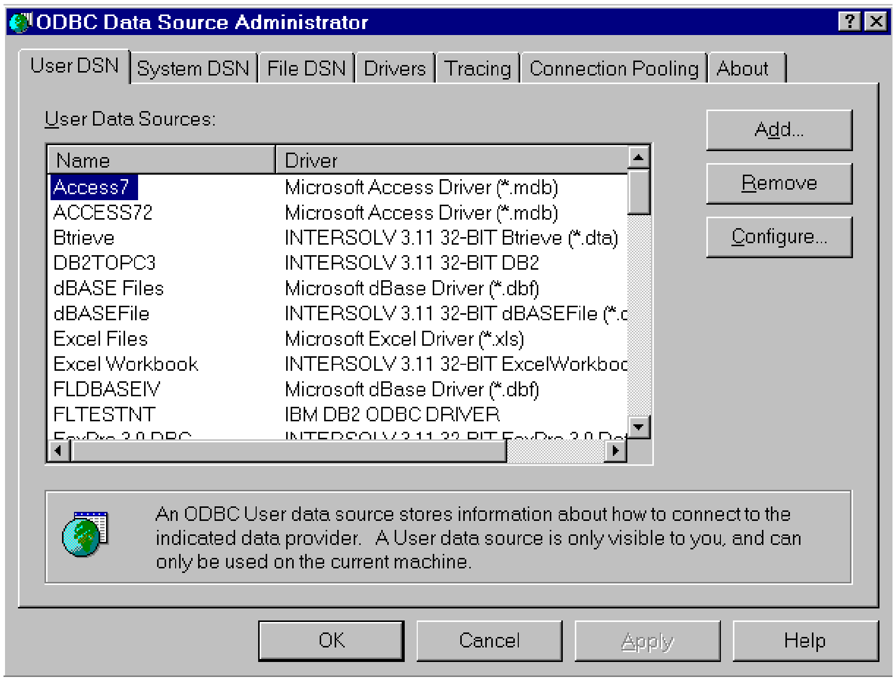
1 Click the ODBC icon.



Maintains ODBC data sources and drivers

After you install an ODBC driver, define one or more data sources for it. A data source name provides a unique pointer to the name and location of the RDB associated with the driver.

The data sources defined for the currently installed drivers are displayed in the User DSN list box within the ODBC Data Source Administrator dialog.



User Data Sources:

Name	Driver
Access7	Microsoft Access Driver (*.mdb)
ACCESS72	Microsoft Access Driver (*.mdb)
Btrieve	INTERSOLV 3.11 32-BIT Btrieve (*.dta)
DB2TOPC3	INTERSOLV 3.11 32-BIT DB2
dBASE Files	Microsoft dBase Driver (*.dbf)
dBASEFile	INTERSOLV 3.11 32-BIT dBASEFile (*.c
Excel Files	Microsoft Excel Driver (*.xls)
Excel Workbook	INTERSOLV 3.11 32-BIT ExcelWorkboc
FLDBASEIV	Microsoft dBase Driver (*.dbf)
FLTESTNT	IBM DB2 ODBC DRIVER
FoxPro 3.0 DBC	INTERSOLV 3.11 32-BIT FoxPro 3.0 Dat

An ODBC User data source stores information about how to connect to the indicated data provider. A User data source is only visible to you, and can only be used on the current machine.

2 Select the driver you want to define as part of the data source definition. For a list of currently supported drivers, check the USDATA Web site.

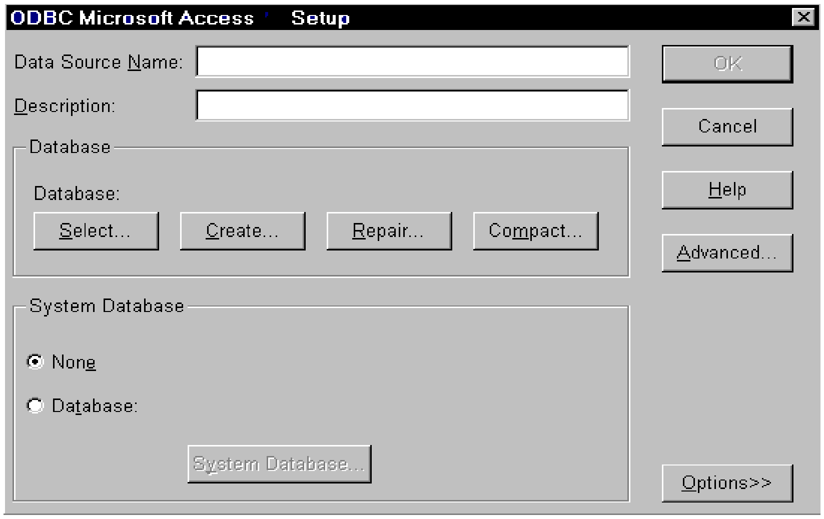
3 Click Add to display the setup dialog for the selected driver. For the setup instructions on each supported driver, refer to “Defining Drivers” of this guide.

Defining Drivers

Within this section are subsections, one for each driver you can define. Within each subsection is the Setup screen for that driver and the syntax for the data source you must enter in that screen and on the ODBC Historian Information panel.

Setting up the Microsoft Access Driver and Data Source

Following is the Setup dialog for Microsoft Access:



For details on the setup information you must enter, refer to the *Microsoft ODBC Desktop Database Drivers Getting Started* book.

Perform the following steps to the Microsoft Access Driver and Data Source:

1 The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the "Historian Information Panel for ODBC" on page 312 of this guide.

2 To create a new database, click Create. Choose the path drive and directory, e.g., d:\fl660acc97, and database name, e.g., plant1.mdb in the follow-up dialog box which pops up. Click OK and the database is created, which a popup message indicates.

3 To connect to an existing database, click Select and then OK for the path and database file in the follow-up dialog box.

4 Click OK to accept this setup.

5 Click OK to close the ODBC Administrator.

Setting up the MERANT Oracle ODBC 3.5 Driver and Data Source

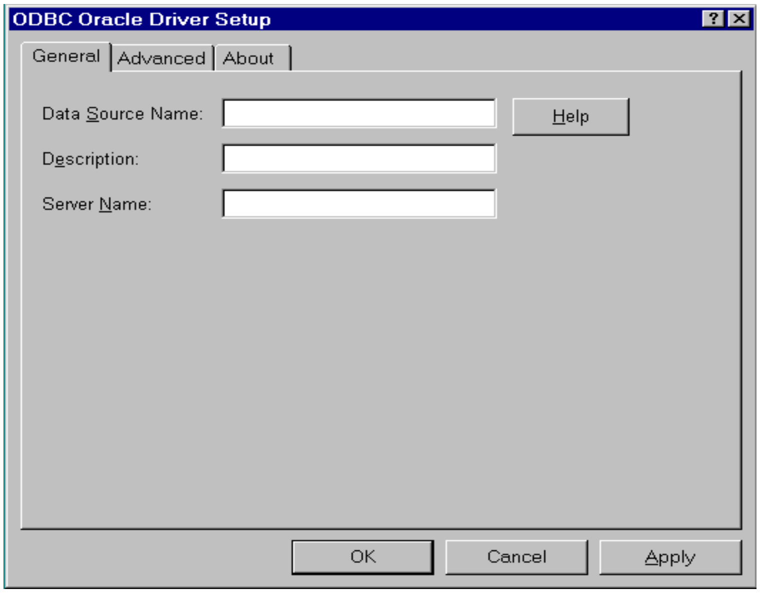
The Oracle ODBC driver supports the Oracle database system available from Oracle. For information on the setup information you must enter, refer to the *MERANT DataDirect ODBC Drivers Reference* book.You must have Oracle client software already installed on your

FactoryLink Client NT box, database alias(es) already set up, pointing to the Oracle server, and the Instance(s) and connection tested out.

USDATA now supports Oracle7 and Oracle8 for the ODBC interface. Oracle states that the two versions are interoperable. This means that an Oracle7 client can connect to an Oracle8 server and an Oracle8 client can connect to an Oracle7 server. If you install Oracle7 client software, use ODBCHIST with MERANT ODBC Oracle7 driver; if you install Oracle8 client software, use ODBCHIST with MERANT ODBC Oracle8 driver. You need to set up two DSNs, one using the Oracle7 driver, the other using the Oracle8 driver.

> **Note:** When using ODBC Historian connected with Oracle, make a stored procedure call. However, the stored procedure cannot contain data array or INOUT data type.

Following is the Setup dialog for the Oracle ODBC driver.



Perform the following steps to complete setting up the Oracle Server Driver and Data Source:

1 Type the required information.

The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the “Historian Information Panel for ODBC” of this guide.

2 In the Server Name field, enter your database alias (from your TNSNAMES.ORA file in your Oracle client software), e.g., if there is an entry for database alias in TNSNAMES.ORA file under nt_fl.world, you may enter nt_fl as your server name.

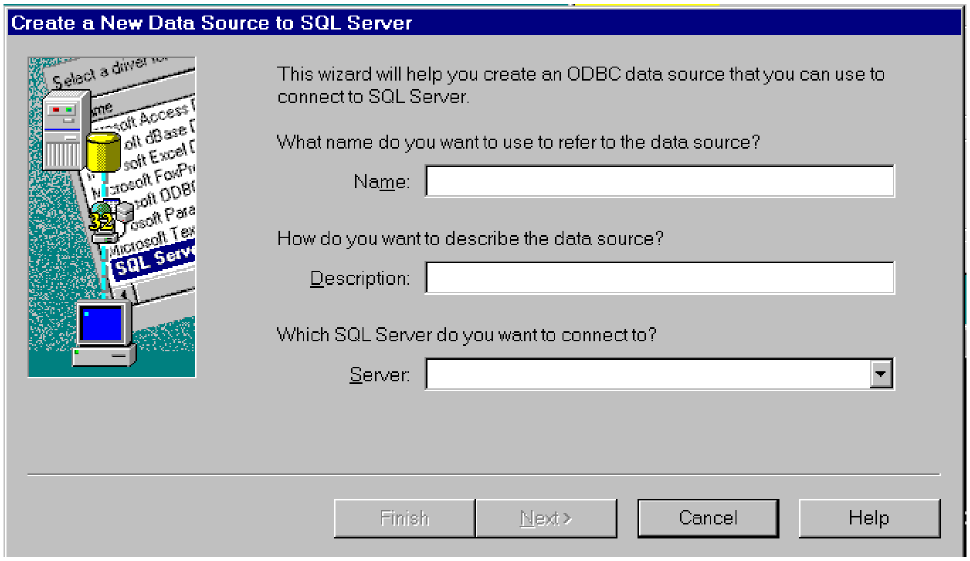
3 Click OK to add the Data Source Name.

4 Click OK to close the ODBC Administrator.

Setting up the SQL Server Driver and Data Source

The SQL Server driver supports the SQL Server database system available from Microsoft and Sybase. For information on the setup information you must enter, refer to the *MERANT DataDirect ODBC Drivers Reference* book.

Following is the Setup dialog for the SQL Server.



Create a New Data Source to SQL Server

This wizard will help you create an ODBC data source that you can use to connect to SQL Server.

What name do you want to use to refer to the data source?

Name:

How do you want to describe the data source?

Description:

Which SQL Server do you want to connect to?

Server:

Perform the following steps to complete setting up the SQL Server:

1 Type the required information.

The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the "Historian Information Panel for ODBC" on page 312.

2 Enter the server name (where Microsoft SQL server database is located).

3 In the follow-up screen, key in the Database Name.

4 In the follow-up screen, check Two Phase Commit.

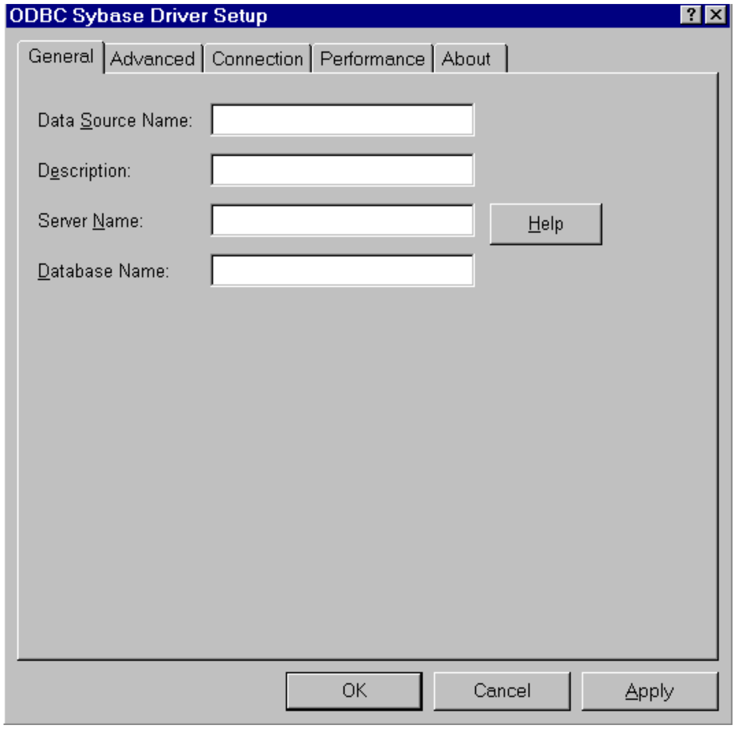
5 Click OK to add the Data Source Name.

6 Click OK to close the ODBC Administrator.

Setting up the Sybase System driver and Data Source

The Sybase System driver supports the SQL Server 10 database system available from Sybase. For information on the setup information you must enter, refer to the *MERANT DataDirect ODBC Drivers Reference* book.

Following is the Setup dialog for the Sybase System 10.



Perform the following steps to complete setting up the Sybase System driver and Data Source:

1 Type the required information, then click OK.

The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the “Historian Information Panel for ODBC” on page 312.

2 Key in the Server Name (from the SyberClient software, which should have already been installed on the FLClient NT box).

3 Type the Database Name, then click OK to add the Data Source Name.

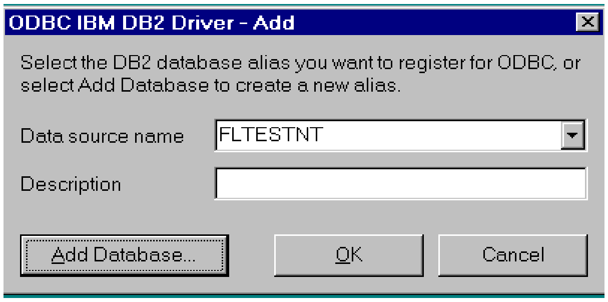
4 Click OK to close the ODBC Administrator.

Setting up the IBM DB2 ODBC Driver and Data Source

The IBM DB2 driver supports DB2 for Windows NT. For information on the setup information you must enter, refer to the *IBM DB2 Administration Guide* and *Installing & Using Windows NT*.

You must have already installed the DB2 client software, configured database alias(es) and tested the connection.

Following is the Setup dialog for the IBM DB2 driver:



Select the DB2 database alias you want to register for ODBC, or select Add Database to create a new alias.

Data source name: FLTESTNT

Description:

Perform the following steps to complete setting up the IBM DB2 Driver and Data Source:

1 Type the required information, then click OK.

The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the “Historian Information Panel for ODBC” on page 312.

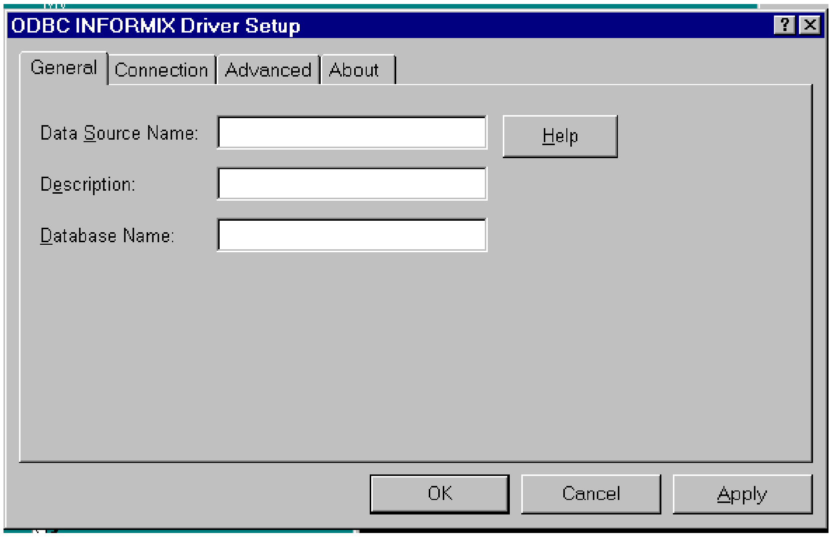
2 Type the Database Name (from the database aliases already set up in DB2 client software). Then click OK to add this Data Source Name.

3 Click OK to close the ODBC Administrator.

Setting up the Informix Driver

The Informix driver supports the Informix database system available from Microsoft and Sybase. For information on the setup information you must enter, refer to the *MERANT DataDirect ODBC Drivers Reference* book.

Following is the Setup dialog for the Informix driver.



Perform the following steps to complete setting up the Informix driver:

1 Type the required information.

The Data Source Name—DSN—you type in this dialog must be used in the FactoryLink Historian for ODBC Information panel explained in the “Historian Information Panel for ODBC” on page 312.

2 Type the Database Name, then click OK to display the Data Sources screen listing the Data Source Name just added.

3 Fill in the connection panel with values appropriate to your installation (you may get this information from your network administrator).

4 After suitably filling in other panels, click OK to add this Data Source Name.

5 Click OK to close the ODBC Administrator.

Historian Configuration Panels for ODBC

A single Historian task can service several client tasks such as the Database Logger, Database Browser, Trending, Alarm and Data Point Logger tasks. However, a single Historian can only process one database query at a time. This design has often resulted in application performance issues since some of these queries can be quite time-consuming and block the execution of more critical queries. The ODBC Historian now supports the configuration and execution of up to 10 instances of the task in a single application. This will allow developers to selectively distribute the various database queries required by the application across different running instances of the task. The developer can now route the more critical and high-speed queries to one Historian instance and the slower and less critical requests to another and thereby alleviate the performance issues associated with a single Historian servicing all client queries.

For example, the execution of stored procedures through PowerSQL, large SELECT, UPDATE, or DELETE queries from DBBROWSE and PowerSQL and Historical data requests by Trending have the potential to be very time-consuming queries. However, the logging of records by the Database Logger or Data Point Logging tasks are generally a faster and more time critical operation. Therefore, one instance of the ODBC Historian could be configured and run to service all Database Logger queries and another to handle the PowerSQL and DBBROWSE task queries. Keep in mind that the configuration for a Realtime Trending chart requires that the logging be routed by the same Historian as the trending task connects to. The Multi-instance ODBC Historian still has potential for performance relief in this situation but would require a slightly more complex configuration. One possibility is to configure one chart for realtime only that uses logging and trending through one Historian instance, and another chart just for historical viewing through another Historian instance. Of course, the distribution can also be set up so that some of the queries from a specific client go to one Historian instance while others are routed to another instance. The database queries are routed to a specific Historian by defining a unique mailbox (or set of mailbox) tags and database data source names for each instance and referencing these mailbox tags and data source names in the ODBC task configuration panels.

The following rules apply to the configuration requirements across the Historian instances:

1. Each instance of the ODBC Historian MUST use a unique set of mailbox tags.
2. Each instance of the ODBC Historian MUST use a unique set of Disable/Enable Connection, Connection Status, and Database Error tags. If tags are used for the Connect String, they must be unique for each Historian Instance.
3. Alias names could be the same in different instances of the Historian since these are simply symbolic references. However, this could cause confusion in debugging and interpretation of runtime messages by operators; so it is discouraged.
4. Different instances of the Historian may reference the same connection strings and thus connect to the same database. However, connections to the same databases from different

Historian instances will result in additional physical connections and must be taken into account when configuring the user license requirements for database servers. Multiple references to the same connection strings within one Historian instance do not create multiple physical connections to the database.

The following sections give a field-by-field description of the configuration panels for ODBC:

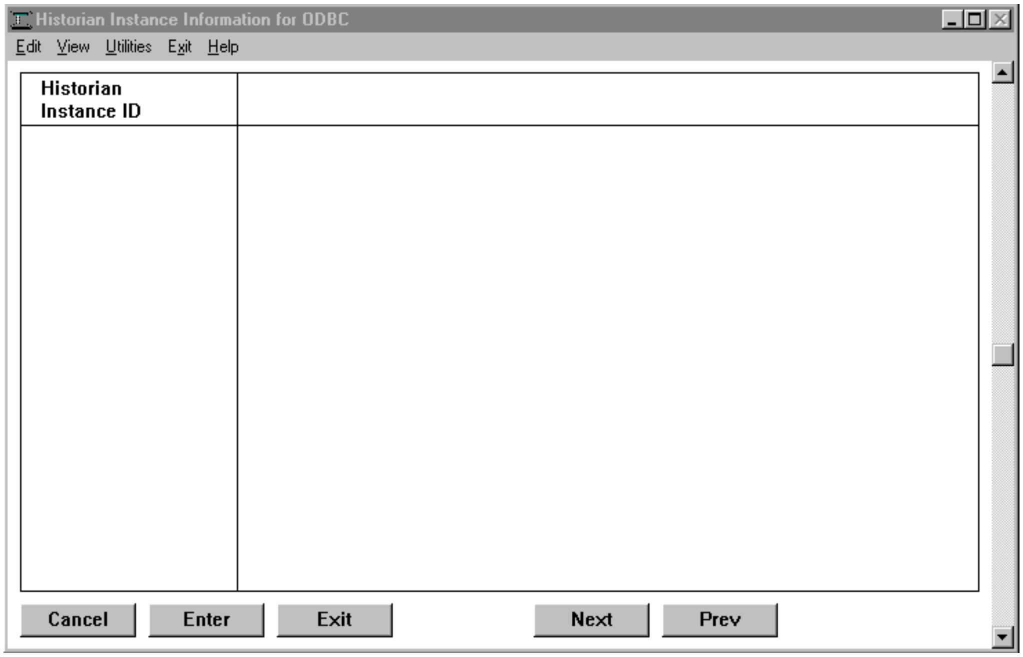
- Historian Instance Number Panel for ODBC
- Historian Mailbox Information Panel for ODBC
- Historian Information Panel for ODBC

All these panels are configured in the SHARED domain.

Historian Instance Number Panel for ODBC

In order to support multiple instances of the ODBC Historian, a new panel has been added to the previously existing panels. The Historian Instance Number panel shown below is used to specify the instance numbers to be configured. The instance numbers entered create a relationship to the specific configuration information required by that instance in the Historian Mailbox Information and Historian Information panels. Running the FLCONV utility on application that contains an ODBC Historian configuration will update the configuration tables and define the existing configuration to instance zero.

Choose the Historian for ODBC from the Configuration Manager Main Menu and specify the following information for each instance of the ODBC Historian to be configured:


Historian Instance Information for ODBC
Edit View Utilities Exit Help
Historian Instance ID
Cancel
Enter
Exit
Next
Prev

Historian Instance ID — Enter a number to specify the specific instance of the ODBC Historian task being configured. The first instance to be configured is instance zero.

Create a separate mailbox or set of mailboxes for each instance of the Historian that is to be configured. Different Historian instances may not reference the same mailboxes.

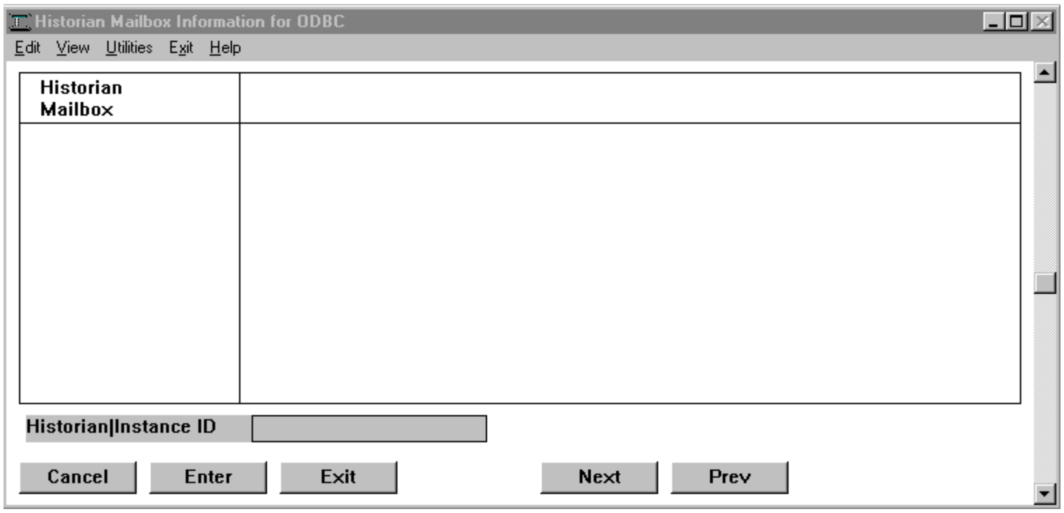
Valid Entry: 0-9

Click Next to go on to the Historian Mailbox Information panel.

HISTORIAN MAILBOX INFORMATION PANEL FOR ODBC

Historians process data requests queued to a mailbox. A single Historian can service multiple mailboxes, however, there is no requirement to create multiple mailboxes for an instance of the Historian. There is also no advantage in using multiple mailboxes from an application behavior or performance standpoint. It is generally more efficient to use a single mailbox for each Historian instance, regardless of the number of clients it services, than to have multiple mailboxes. However, some developers may choose to use different mailboxes for purposes related to application maintenance and readability. The mailboxes a Historian services are defined in the Historian Mailbox Information panel.

Specify the following information for each mailbox this Historian services:


Historian Mailbox Information for ODBC
Edit View Utilities Exit Help
Historian Mailbox
Historian|Instance ID
Cancel
Enter
Exit
Next
Prev

Historian Mailbox — Mailbox name this Historian services. This name must match the name defined in the task using Historian to process data requests.

Create a separate mailbox or set of mailboxes for each instance of the Historian that is to be configured. Different Historian instances may not reference the same mailboxes.

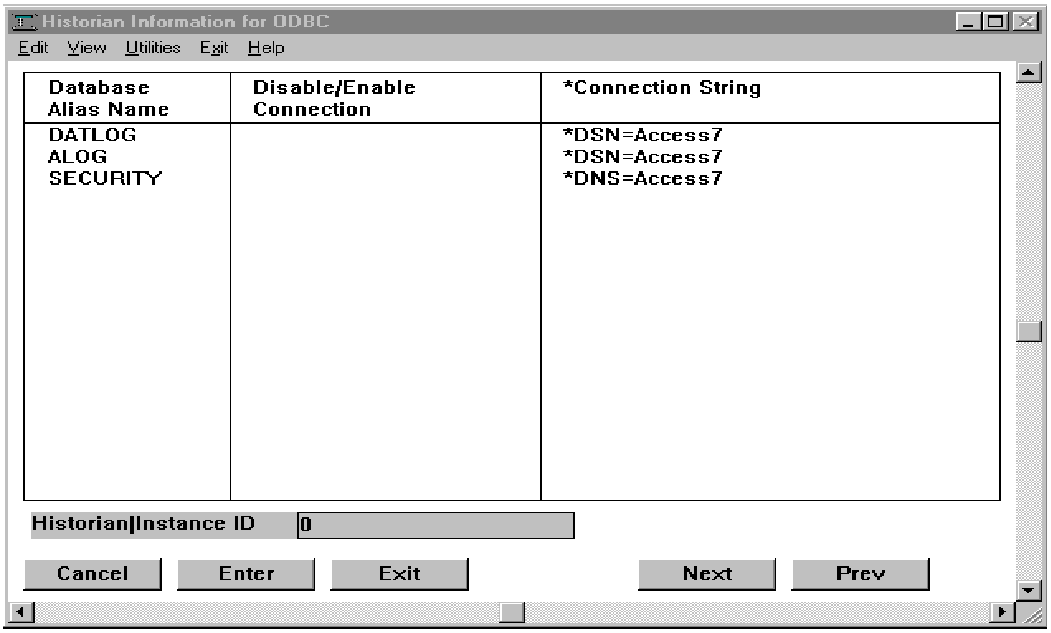
Valid Entry: mailbox name

Click Next to go on to the Historian Information panel.

Historian Information Panel for ODBC

Database connection information is defined in the Historian Information panel. Add at least one entry for each uniquely defined database to be accessed by this Historian instance. Database connection information may be shared by multiple client tasks. Multiple entries for the same database connection are only necessary if separate control and monitoring of the connection status (and the tables that define) are required through the use of the Disable/Enable Connection, Connection Status, and Database Error tags. If the connection to a database via its defined alias closes for one task, it will close for all tasks. If separate entries are defined, then closing the connection for one alias does not affect the tasks using the other entries.

Specify the following information to set up one or more connection strings and an alias for each:



Database Alias Name	Disable/Enable Connection	*Connection String
DATLOG		*DSN=Access7
ALOG		*DSN=Access7
SECURITY		*DNS=Access7

Historian|Instance ID: 0

Database Alias Name Unique name to represent a database connection. This must match the database name defined in the task using Historian to process data requests.

Valid Entry: database connection name

Disable/Enable Connection Name of a digital tag that enables or disables the connection. When this tag is set to 1, the connection to the relational database defined in this entry is closed; when set to 0, the connection opens.

Valid Entry:	standard tag name
Valid Data Type:	digital

Note: Database aliases should not share connection tags. Sharing connection tags between database aliases can result in errors.

*Connection String

Connect string required to connect to the database. The connection string information defined in an ODBC driver setup must match what you define in the FactoryLink ODBC Historian Information panel. Use either a short DSN name or a long DSN in the connection string as defined below.

DSN=*data_source_name*

where

data_source_name is the Data Source Name defined in the ODBC Data Source Administrator

for example, DSN=Access7 or

DSN=*data_source_name*[;*attribute*=*value*[;*attribute*=*value*]..]

where

[;*attribute= value*...]

provides optional pairs of information, such as a user ID and password, used when more information or overrides are needed to log on. The default values are those set in driver dialogs.

for example, DSN=Oracle_NT; UID=flink; PDW=flink

Information specified in a connection string either adds to or overrides the data source information defined in the Setup dialog for each driver.

This can either be a constant or a tag name.

If you enter a constant, precede the connect string with a single quote.

You must specify the connect string in the tag Default Value field and a length in the Length field that accommodates the longest connect string you might define for this tag if you enter a tag name. If the connect string exceeds the defined length, it is truncated and the connection will not be made. Define 254 as the length for the best results.

Valid Entry:	standard tag name or string constant
Valid Data Type:	tag name or string constant of up to 254 characters

To connect to a local Oracle database, enter the connection string as:

DSN=data_src;SRVR=;UID=userid;PWD=password

Connection Status Name of an analog tag that defines the state of this connection.

Note: Database aliases should not share status tags. Sharing status tags between database aliases can result in errors.

Valid Entry:	standard tag name
Valid Data Type:	analog

Database Error Name of a tag to receive the error value passed from the database software.

The tag should correspond to the type of error the relational database sends. If it is a number use long analog; if it is text use message.

Valid Entry:	standard tag name
Valid Data Type:	longana or message

The Database Error tag is updated only when a fatal error is defined in the flhst.ini file or if a database open connect call fails.

Executing Multiple Instances of the ODBC Historian

The following procedures are required to execute multiple instances of the ODBC Historian:

1. An entry must be added to the System Configuration table for each instance of the Historian to be executed.
2. The first instance to be run will always be considered instance zero. Additional instances will be instance 1 through 9 for a total maximum of 10 instances.
3. The Task Name filed for instance zero (the first instance) should be "ODBCHIST." This is the same as in previous versions, and existing applications do not require any modification to the System Configuration table. The FLCONV function will make all necessary modifications. The Task Name for each additional instance to be added will be "ODBCHISTn" where n is the instance number (1-9).
4. The Program Arguments field in the System Configuration table should include a new argument "-Un", where n is the instance number (0-9). The argument is not required for the first instance and will be assumed to be "-U0" if not included. The argument is required for all other instances.
5. The entry in the Executable File field of the System Configuration table will be "bin/odbchist" for all instances.

Note: The correct operation of FLCONV utility to convert the old ODBC Historian panels to new multiple instance ODBCHIST panels should be run on the 6.5.0 or earlier version of the application, which has NOT been restored with 6.6.0 FLREST option. To transfer 6.5.0 or earlier version application from another box, you need to have it in the form of a 6.5.0 platform specific save file, or a .zip file or similar format.

Administrative Duties

Some of the ongoing administrative duties required for ODBC are

- Adding and deleting drivers through the ODBC Administrator. You can open the ODBC Administrator either from the Control Panel or from the ODBC program group.
- Adding, modifying, and deleting data sources through the ODBC Administrator program.
- Testing unsupported drivers using the ODBC driver conformance utility.

Maintaining Drivers and Data Sources

The Microsoft ODBC Desktop Database Drivers diskettes and documentation are included with your ODBC Historian. Refer to the ODBC *Getting Started* manual regarding Access

Drivers or the *MERANT DataDirect ODBC Drivers Reference* book regarding Oracle, the SQL Servers, and Sybase System drivers to set up your ODBC drivers.

Testing Unsupported Drivers

The ODBC Driver Conformance Test utility validates the level of conformance provided by an unsupported driver meets the requirements of a supported data source.

This utility is installed by default in the FLINK/BIN directory during installation. This directory contains all the FactoryLink program files. The executable program file for this utility is FLHSTDRV.EXE.

For ease of use, you can create an icon within the Windows Explorer to use to initiate the running of this program.

Before you start, a driver must be connected to a data source.

Perform the following steps to use this utility:

1. Run the utility executable: FLHSTDRV.EXE to display the Data Sources dialog listing the SQL data sources already set up through the ODBC Administrator.
2. Choose a data source from the displayed list, then click OK. A message notifies you of a successful connection to the data source. The FactoryLink Driver Conformance Test window is displayed behind the message. From this window, the File pull-down menu lists the options:
   - Connect
   - Disconnect
   - FactoryLink Driver Conformance Test
3. Choose the Driver Conformance Test option to run the test and display the status of the test results:
   - Successful—FactoryLink Auto-Test message confirmation of

     Driver PASSED minimum FactoryLink conformance requirements
   - Unsuccessful—Driver is not supported.
4. Click OK to display a chart that gives status details from the test.

   If the test is unsuccessful, disconnect the current data source from the File menu and connect it again. Or, you may want to connect a different data source for another test.

CAUTION

Passing the FactoryLink Driver Conformance Test means that an ODBC driver passed only the minimal FactoryLink conformance requirements and it may work with FL ODBCHIST. However, a driver could pass the test and still be incompatible for FactoryLink use. There is no brief test available to certify that a driver is supported completely. USDATA performs elaborate testing of ODBC drivers with each release and lists the drivers that were tested and certified for use with the release.

Chapter 18 . . . .

Configuring Sybase Historian

This chapter provides a field-by-field description of the two panels that the Sybase Historian uses and covers the following topics:

- Sybase Historian Considerations
- Historian Mailbox Information for Sybase Panel
- Historian Information for Sybase Panel
- User Access to Server and Database
- Granting FactoryLink Users Access to Create Commands

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Sybase Historian Considerations

By default, 25 is the maximum number of Sybase connections allowed per process; however, you can increase this maximum, which is limited only by system resources, by changing the value set by the environment variable MAXDBPROCS. The Historian checks MAXDBPROCS against the actual number of Sybase connections per process; therefore, if you want to use more than 25 Sybase connections per process, set the environment variable MAXDBPROCS to that value or greater.

Data Types Supported by Sybase Database

For information on the data types supported by the Sybase database, please refer to the Sybase documentation.

The Sybase Historian task does not support text and image data types.

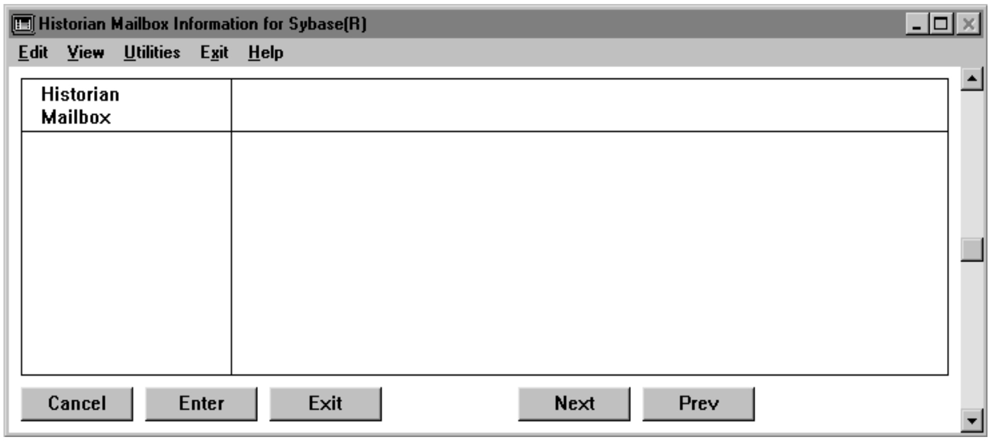
In the previous versions of FactoryLink, the format of the FactoryLink supported date data type had to be a string in the format of *yyyymmddhhmmss*. The tag had to be defined as a message with a minimum default length of 14 bytes to retrieve the date data type into a tag. If a tag was to insert or update a database row with the date data type, then the tag also had to be a message data type using previous format. Starting from FactoryLink 6.6, the product supports a direct conversion to and from a long analog tag (such as SECTIME) that equates to the elapsed seconds since January 1, 1980 to the date data type.

HISTORIAN MAILBOX INFORMATION FOR SYBASE PANEL

Historians process data requests queued to a mailbox. A single Historian can service multiple mailboxes; however, there is no requirement to create multiple mailboxes for an instance of the historian. There is also no advantage in using multiple mailboxes from an application behavior or performance standpoint. It is generally more efficient to use a single mailbox for each historian instance, regardless of the number of clients it services, than to have multiple mailboxes. However, some developers may choose to use different mailboxes for purposes related to application maintenance and readability. The mailboxes a Historian services are defined in the Historian Mailbox Information panel.

Ensure that the domain selected is SHARED in the Configuration Domain Selection box.

Choose the Historian for Sybase from the Configuration Manager Main Menu and define the mailboxes that this Historian will service:


Historian Mailbox Information for Sybase(R)
Edit View Utilities Exit Help
Historian Mailbox
Cancel
Enter
Exit
Next
Prev

Historian Mailbox — Mailbox name this Historian services. This name must match the name defined in the task using Historian to process data requests.

Valid Entry: standard tag name

Valid Entry: mailbox name

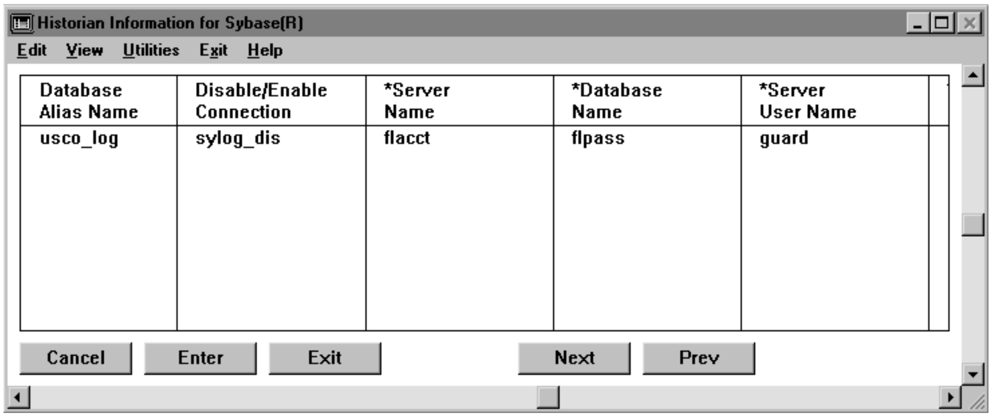
Click Next to go on to the Historian Information panel.

HISTORIAN INFORMATION FOR SYBASE PANEL

Database connection information is defined in the Historian Information panel. Add at least one entry for each uniquely defined database to be accessed by this historian instance. Database connection information may be shared by multiple client tasks. Multiple entries for the same database connection are only necessary if separate control and monitoring of the connection status (and the tables that define) are required through the use of the Disable/Enable Connection, Connection Status, and Database Error tags. If the connection to a database via its defined alias closes for one task, it will close for all tasks. If separate entries are defined, then closing the connection for one alias does not affect the tasks using the other entries.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Specify the following information to set up one or more database names and an alias for each:



Historian Information for Sybase(R)
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Database Alias Name	Disable/Enable Connection	*Server Name	*Database Name	*Server User Name
usco_log	sylog_dis	flacct	flpass	guard

Database Alias Name — Unique name to represent a database connection. This must match the database name defined in the task using Historian to process data requests.

Valid Entry: database connection name

Disable/Enable Connection — Name of a digital tag that enables or disables the connection. When this tag is set to one, the connection to the relational database defined in this entry is closed; when set to 0, the connection opens.

Note: Database aliases should not share connection tags. Sharing connection tags between database aliases can result in errors.

Valid Entry: standard tag name
Valid Data Type: digital

*Server Name

Server name you want to connect to. The server name is the alias given to the server in the Sybase Interfaces files. This name can be either a constant or a tag name.

If you enter a constant, precede the path with a single quote.

You must specify the server in the tag Default Value field and a maximum length of 32 in the Length field if you enter a tag name.

*Database Name

Sybase database to use. This database must exist before restarting the Historian at run time. This database can be either a constant or a tag name.

If you enter a constant, precede the path with a single quote.

If you enter a tag name, you must specify the path where the database resides in the tag Default Value field and a maximum length of 32 in the Length field.

Valid Entry:	standard tag name or string constant
Valid Data Type:	tag name or string constant of up to 32 characters

*Server User Name

Login name required to connect to the database. This name must be a valid Sybase account with connect, read/write, and create access to database tables. This name can either be a constant or a tag name.

If you enter a constant, precede the path with a single quote.

You must specify a login name in the tag Default Value field and a maximum length of 32 in the Length field if you enter a tag name.

Valid Entry:	standard tag name or string constant
Valid Data Type:	tag name or string constant of up to 32 characters

*Server Password

Password required to connect to the database. This password can either be a constant or a tag name.

If you enter a constant, precede the password with a single quote.

The tag type must be message if you enter a tag name. You must specify a password in the tag Default Value field.

Valid Entry:	standard tag name or string constant
Valid Data Type:	tag name or string constant of up to 32 characters

Connection Status

Name of an analog tag that defines the state of this connection.

Note: Database aliases should not share status tags. Sharing status tags between database aliases can result in errors.

Valid Entry:	standard tag name
Valid Data Type:	analog

Database Error	Name of a tag to receive the error value passed from the database software.

The tag specified must be one of the following types: long analog or message. It should correspond to the type of error the relational database sends. If it is a number use long analog; if it is text use message.

The database error tag is updated only when a fatal error is defined in the FLHST.INI file or if a database open connect call fails.

Valid Entry:	standard tag name
Valid Data Type:	longana or message

USER ACCESS TO SERVER AND DATABASE

You must enable the Historian to access the Sybase database before the Historian for Sybase can exchange data with a Sybase database.

Perform these steps to establish this connection:

1. Install the Sybase SQL server.
2. Modify the interfaces file.
3. Create Sybase databases. Create all Sybase databases for FactoryLink to use before you start up the Historian.
4. Add login names for server users.
5. Add server users to the database.
6. Grant permission to the FactoryLink account to use CREATE PROC and CREATE TABLE commands.

For instructions on how you complete these steps, refer to the *Sybase System Administration Guide* and *Sybase Commands Reference*.

Setting the Sybase Interfaces File for FactoryLink

All FactoryLink users must be able to read all interface files, which must reside in the Sybase home directory. The Sybase home directory is the directory where Sybase is installed. This can be a Sybase product that allows you to connect remotely.

Use the following guidelines to modify the interfaces file:

1. Verify the interface file location is correct, based on:
   - If Sybase SQL server and FactoryLink run on the same machine, the interfaces file resides in the Sybase home directory.
   - If the Sybase SQL server and FactoryLink run on a different machines, create the interfaces file in the Sybase home directory.
2. Add one entry for each SQL server to the interfaces file when using more than one Sybase SQL server.

GRANTING FACTORYLINK USERS ACCESS TO CREATE COMMANDS

Authorized FactoryLink users of the Sybase server need permission to use the CREATE PROC and CREATE TABLE commands.

Perform the following steps to grant this permission:

1 Log into the Sybase SQL server as the System Administrator.

2 At the Sybase SQL server prompt, enter

```
use database
go
```

where

database Is the name of the Sybase database FactoryLink uses.

3 At the Sybase SQL server prompt, enter

```
grant CREATE PROC, CREATE TABLE to username
go
```

where

username Is the name of the user accessing the Sybase SQL server.

Chapter 19 . . . .

Troubleshooting

You can set two types of files to record Historian operations: a Historian log file and a Historian trace file. These two files will best help you and Customer Support troubleshoot what might be incorrect in your FactoryLink application.

> **Note:** The screen cited in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Historian log files are accessible on disk for seven days. After seven days, old log files are deleted. At the start of each new day, the previous day log file closes and a new one opens.

Log files reside in the FLAPP/FLNAME/shared/FLUSER/log directory. The name of a log file follows the format of

PRMMDDYY.log

where

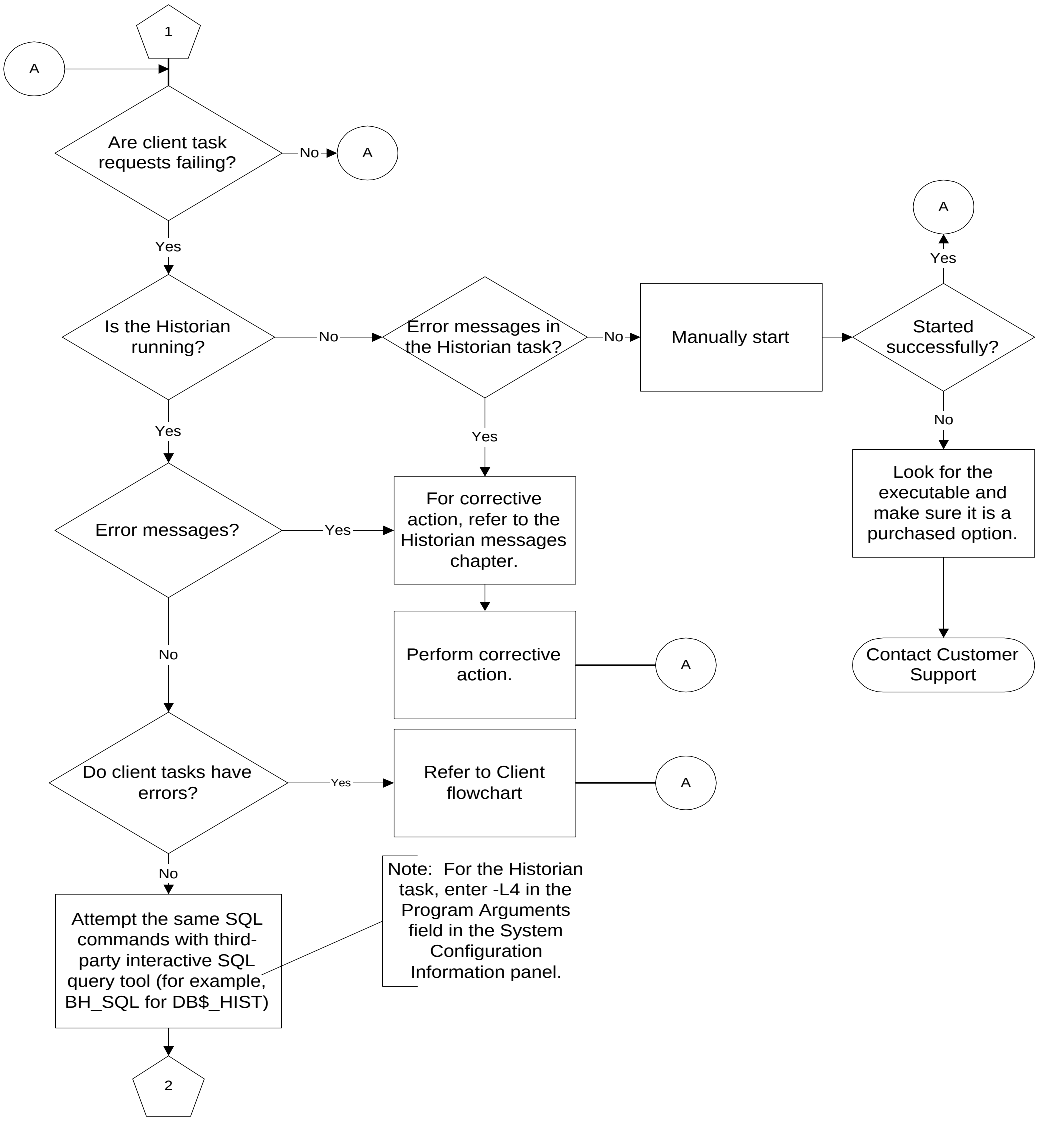
PR Identifies the Historian name.

The following table lists the prefix and sample log file names for each Historian.

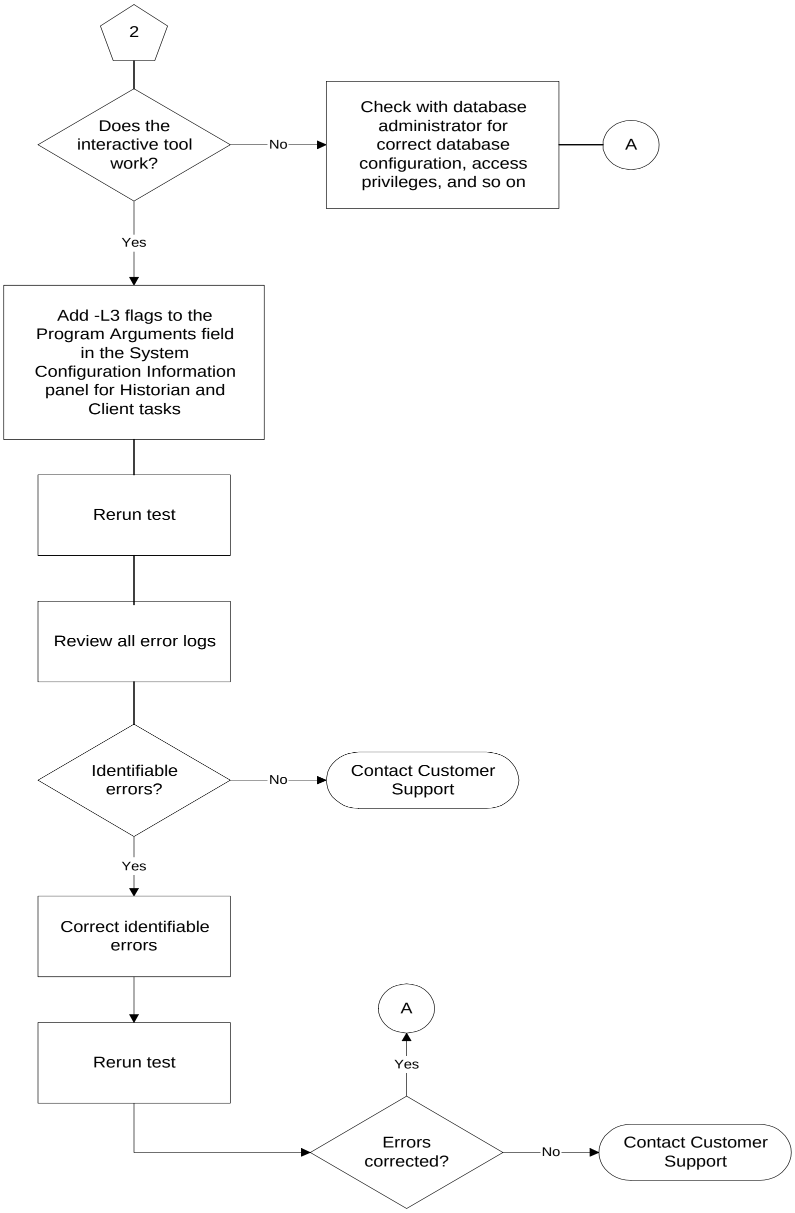
Historian	Prefix	Log file - Sample name
Oracle	oh	oh010195.log
DB IV	d4	d4010195.log
ODBC	od	od010195.log
Sybase	sy	isy010195.log

Entries continue to append to each .log file. Consequently, these files can grow and take up large amounts of disk space. Delete the file contents or the file itself. Remove the Program Arguments on the System Configuration Information panel to stop logging for a Historian.

Use the following flowchart for help in troubleshooting the logging configuration.


1
A
Are client task requests failing?
No
A
Yes
Is the Historian running?
No
Error messages in the Historian task?
No
Manually start
Started successfully?
Yes
A
No
Look for the executable and make sure it is a purchased option.
Contact Customer Support
Yes
Yes
For corrective action, refer to the Historian messages chapter.
Error messages?
Yes
Perform corrective action.
A
No
Do client tasks have errors?
Yes
Refer to Client flowchart
A
No
Attempt the same SQL commands with third-party interactive SQL query tool (for example, BH_SQL for DB$_HIST)
Note: For the Historian task, enter -L4 in the Program Arguments field in the System Configuration Information panel.
2

TROUBLESHOOTING


2
Does the interactive tool work?
No
Check with database administrator for correct database configuration, access privileges, and so on
A
Yes
Add -L3 flags to the Program Arguments field in the System Configuration Information panel for Historian and Client tasks
Rerun test
Review all error logs
Identifiable errors?
No
Contact Customer Support
Yes
Correct identifiable errors
Rerun test
A
Yes
Errors corrected?
No
Contact Customer Support

TROUBLESHOOTING ODBC DRIVER

Display the Data Source Setup dialog and perform the following steps to troubleshoot the ODBC driver:

1. Highlight your data source and click Options.
2. Click the Trace ODBC Calls checkbox to enable tracing.

   By default, the Stop Tracing Automatically checkbox is enabled, which sets tracing to stop automatically upon a disconnect from the data source.

   Make note of the trace file location—SQL.log. You can change this location.
3. Click Select File.
4. Define a new location.
5. Click OK.
6. Click Close.

HISTORIAN MESSAGES

Messages may come from FactoryLink, a database driver, or data source. Messages communicate a status or a condition that may or may not require an action from you. This section explains the messages logged and, where appropriate, what action to take.

Run-time Messages

FactoryLink Historians generally do not write error messages generated from a data source to the Task Status tag. The Historian reports all database errors to its log file and returns a status code to the Historian client tasks, such as Database Browser for every Historian operation.

Errors and messages may display as your FactoryLink application runs. FactoryLink sends a code or message to the Run-Time Manager screen for display whenever an error occurs in a Historian or a Historian-client task. You can also define an output text object to display codes and messages on a graphics screen.

FactoryLink also sends a longer, more descriptive message to the log file when the log file Program Argument is set. This section describes the error codes and messages displayed on the Run-Time Manager screen.

The Task Status tag is located on the System Configuration Information panel. The data type you assign to this tag for a Historian and any FactoryLink task determines the type of codes written to this tag.

The data types you can assign are

- Digital data type reports these two codes

  0**—**indicates the requested operation successfully completed

  1—indicates an error occurred

- Analog, longana, or float data type

  A Historian generates the following codes. These status codes are returned to all tasks requesting data from a Historian. For status codes and status messages for Browser, refer to Database Browser chapter in this guide.

Error Codes Generated While Communicating to a Historian Task

Code	Error	Cause	Action
-1	A FactoryLink error occurred.	A read or a write to a mailbox occurred for either a Historian-client task or a Historian task.	Contact Customer Support.
0	Successful operation with no return data.	Historian operation was successful.	No action required.
1	Successful operation with return data.	Historian operation was successful.	No action required.
2	Unsolicited data sent to a Historian client task.	An unsolicited fetch was performed for a Historian-client task.	No action required.
3	Maximum OPEN connections exceeded.	A Historian-client task tried to access data from more than 10 unique database aliases.	Reference fewer than 10 unique database aliases for a Historian-client task.
4	A dynamic memory allocation operation failed.	An internal error occurred in a Historian-client task or in a Historian task.	Contact Customer Support.
5	Historian-client task referenced an invalid Historian connection handle.	An internal error occurred within a Historian-client task.	Contact Customer Support.
6	Failed to prepare a Historian statement handle.	An internal error occurred within a Historian-client task.	Contact Customer Support.

Error Codes Generated While Communicating to a Historian Task

Code	Error	Cause	Action
7	Invalid stmtid returned from Historian	1) Historian shut down before Browser or another Historian-client task shut down. 2) An error occurred within a Historian-client task.	1)Shut down all Historian-client tasks running on the system. Then, shut down the Historian. Then, start up the Historian and then Browser and all other Historian-client tasks running on the system. 2) Contact Customer Support.
8	Last row fetched, or no rows affected by SQL operation.	Historian task operation affected no rows for an UPDATE, DELETE operation or a FETCH for a SELECT operation reached the end of the result table. In addition, for Database Browser an attempt to move past the end or before the beginning of the result table generates this error code.	No action required. An informational message only. An appropriate action is a FactoryLink application logic decision.
9	A Historian database alias is invalid.	A Historian-client task referenced a Historian Database Alias that does not match any of the entries defined in the Historian Information panel.	Ensure all Historian database aliases referenced by the Historian-client task exist in the Historian Information panel.

Error Codes Generated While Communicating to a Historian Task

Code	Error	Cause	Action
10	An operation exceeded its maximum timeout period.	1. The mailbox specified as a Historian mailbox is not listed in the Historian mailbox panel. 2. SQL operation is taking too long to perform. 3. Historian task is busy with other operations and is unable to service new Historian-client requests.	1. Occurs in an OPEN connection call. Ensure mailbox exists in the Historian mailbox panel. 2. Set the program arguments to -L2 -X on the Historian to figure out how long the database server is taking to perform SQL operation. Either change the SQL statement to perform less work or have the database server to this operation instead of the Historian task. 3. Slow down the amount of work the Historian is doing by either ensuring the SQL operations are not time-consuming or slow down the Database Logger to trigger less frequently.
11	A Historian-client task passed an invalid Historian connection handle to a Historian.	1. The Historian task was terminated before other Historian-client tasks. 2. An internal error occurred within a Historian task.	1. Shut down all Historian-client tasks running on the system. Next, shut down the Historian. Then, start Historian followed by all other Historian-client tasks. 2. Contact Customer Support.

Error Codes Generated While Communicating to a Historian Task

Code	Error	Cause	Action
12	A Historian-client task passed an invalid Historian statement handle to a Historian.	1. The Historian task was terminated before other Historian-client tasks. 2. An internal error occurred within a Historian task.	1. Shut down all Historian-client tasks running on the system. Next, shut down the Historian. Then, start Historian followed by all other Historian-client tasks. 2. Contact Customer Support.
14	Historian-client task operation failed because the Historian disabled the connection to the database.	The FactoryLink application has disabled the connection to the database by setting the Historian Disable/Enable tag.	Enable the Historian Disable/Enable tag to perform this operation.
16	An SQL operation is not supported.	A Historian-client task has used an SQL feature not supported by the Historian.	If using dBASE IV, consult the chapter on SQL limitations for the dBASE IV Historian. If other Historian, see the Historian log file for the SQL statement and then consult appropriate user's manual.
17	Historian database error.	This is a general error code for the Historian. The error text string may contain more information. This code is accompanied by various descriptive messages.	Read the accompanying message displayed on the Run-Time Manager screen or in the .LOG file and attempt to correct the problem based on that message's instructions.
18	Unknown function request sent to Historian	An internal error occurred within a Historian-client task.	Contact Customer Support.

Error Codes Generated While Communicating to a Historian Task

Code	Error	Cause	Action
19	Tried to insert a duplicate row.	INSERT operation caused a UNIQUE constraint error on the database table.	No action required.
20	Table exists, tried to create a table that already exists.	CREATE TABLE operation failed because the table name already exists in the database.	No action required.
22	Table does not exist.	You tried to access a table that does not exist in database.	No action required.
23	Field does not exist.	You tried to access a field that does not exist in database table.	No action required.

Start-up Messages

This section explains errors that occur at startup with a Historian. Refer to the Historian’s .log file to display the complete message.

Bad CT record size in CT archive *filename*

Cause: The archive file *HIST.CT is corrupt.

Action: Delete the archive file *HIST.CT. Restart the application to rebuild the archive file.

Bad CT type in CT archive *filename*

Cause: The archive file *HIST.CT is corrupt.

Action: Delete the archive file *HIST.CT. Restart the application to rebuild the archive file.

Bad hist. mailbox in CT archive *filename*

Cause: The file *HIST.CT contains an invalid element name for a mailbox element.

Action: Open the Configuration Manager Main Menu and choose the appropriate Historian. Delete the invalid element name from the Historian Mailbox Information panel and enter a valid element name.

Can’t open CT archive *filename*

Cause: Either the archive file *HIST.CT does not exist or is corrupt.

Action: Delete it if the file exists. Restart the application to rebuild the archive file.

Can’t open .LOG file

Cause: The Database Logging task can not open a .LOG file.

Action: Ensure the FLAPP/LOG directory exists.

Can’t read record in CT archive *filename*

Cause: The archive file *HIST.CT is corrupt.

Action: Delete the archive file *HIST.CT. Restart the application to rebuild the archive file.

Duplicate mailboxes in CT archive *filename*

Cause: The Historian Mailbox Information panel contains duplicate mailbox elements.

Action: Open the Configuration Manager Main Menu and choose the appropriate Historian. Delete the duplicate entry in the Historian Mailbox Information panel.

Invalid # *number* of CT types in CT *archive name*

Cause: The archive file *HIST.CT is corrupt.

Action: Delete the archive file *HIST.CT. Restart the application to rebuild the archive file.

No CTs in CT archive *filename*

Cause: The Historian Table is not configured.

Action: Open the Configuration Manager Main Menu, choose Historian, and complete the Historian table.

No dbases defined in CT archive *filename*

Cause: The Historian Information panel is not configured.

Action: Open the Configuration Manager Main Menu, choose the appropriate Historian, and complete the Historian Information panel.

No mailboxes in CT archive *filename*

Cause: The Historian Mailbox Information panel is not configured.

Action: Open the Configuration Manager Main Menu, choose the appropriate Historian, and complete the Historian Mailbox Information panel.

Out of RAM

Cause: Not enough RAM to run this task.

Action: Restart the task. If it fails again, allocate more RAM for this task or install more RAM.

SQLERROR: Can’t *function* for task *task_name* due to error: *error*

Cause: An SQL error occurred during the execution of an SQL statement for a FactoryLink task. This error may originate with that FactoryLink task or with the Historian task.

Action: Refer to the user manual for the database in use for instructions for correcting this error.

SQLERROR: Can’t *function* serial id with SQL statement: *sql_statement* for task *task_name* due to error: *error*

Cause: An SQL error occurred during the execution of an SQL statement for a FactoryLink task. This error may originate with that FactoryLink task or with the Historian task.

Action: Refer to the user manual for the database in use for instructions for correcting this error.

Error Messages Recorded in Historian Log Files

This section contains error messages written to a Historian .log file.

SQLERROR: Can't *sql_function* SQL statement *sql_statement* for task *task_name* due to error: *error*

Cause: An SQL error occurred during the execution of an SQL statement for a FactoryLink task. This error may originate with that FactoryLink task or with the Historian task.

Action: Refer to the documentation for the database in use for instructions for correcting this error.

SQLERROR: Can't *function* unique index: *unique_index* for task *task_name* due to error: *error*

Cause: An SQL error occurred during the execution of an SQL statement for a FactoryLink task. This error may originate with that FactoryLink task or with the Historian task.

Action: Refer to the documentation for the database in use for instructions for correcting this error.

Task initialization failed

Cause: The Historian task is installed incorrectly.

Action: Reinstall FactoryLink.

ODBC Driver and Data Source Messages

This section explains messages that can occur during the running of the ODBC Historian. ODBC messages can come from the following:

- Driver manager
- Database manager
- ODBC driver
- The driver manager is a DLL that establishes connections with drivers, submits requests to drivers, and returns results to applications. An error that occurs in the driver manager has the following format:

  [*vendor*][*ODBC DLL*]*message*

  where

  vendor Is Microsoft.
- An error that occurs in the database system includes the database name. For example, you might get the following message from an Oracle data source:

  [Microsoft][ODBC *XXX driver*][*XXX*]*message*

If you get this type of error, you have attempted to do something incorrectly with the database system. Check your system documentation for more information or consult your database administrator.

- An error that occurs in an ODBC driver has the following format:

  [Microsoft][ODBC *XXX driver*]*message*

Chapter 20 . . . .

Configuring Math and Logic

Math and Logic programs are user designed solutions providing control of the interactions of the FactoryLink tasks and system activity.

A Math and Logic program is comprised of one or more procedures that can contain variables and triggers. These variables and triggers are defined within the Math and Logic editor or in the FactoryLink tables prior to writing the procedures. Variables are tags that can be global to FactoryLink use or local to the program that contains the procedure. Triggers define the method to invoke a one or more procedures.

Configuration of procedures includes definition as a Compiled Math and Logic (CML) or Interpreted Math and Logic (IML) procedure. FactoryLink loads the IML program files (the user defined .prg file) into memory at startup. Each time the IML procedure (proc) is triggered, the task interprets the procedure instructions and then performs the actions required. With CML, the original .prg file remains unaltered. At startup, the CML program files are compiled into executable C source code files and linked with FactoryLink and externally supplied libraries. When CML procedures are triggered, the CML executable files are invoked. The FactoryLink designer must determine the type of mode to use.

In addition to defining procedures there are two tasks, the IML and CML tasks, associated with Math and Logic that must be operational to support the respective modes.

Table 20-1 Comparison of IML and CML Modes

IML	CML
Interpreted Mode	Compiled mode
No compiler required	External compiler application required
Cannot access any C functions	C, C++ functions can be accessed
Less efficient	More efficient and faster processing
Debug switches can be used	No debug switches
Validate procedures before running program file	Cannot validate entire procedure specifically the data between cbegin and cend

A new program, when saved, is automatically stored at: c:\{FLAPP}\{FL DOMAIN}\procs. It is essential that the file remains in this directory.

The number of programs and their respective components is limited only by the amount of available memory and the operating system. There are additional compiler limitations when using Compiled Math and Logic (CML). Using CML is optional and requires a compiler program in addition to the FactoryLink software. There are no additional compiler requirements for using Interpreted Math and Logic (IML).

The Microsoft® Visual C++ compiler is the recommended compiler to use with the FactoryLink CML processing. Refer to the documentation supplied with the compiler for details on the compiler limitations for your system. Refer to the FactoryLink installation instructions for the compatible version.

This chapter describes how to use the Configuration Explorer program to configure the Math and Logic tables, variables, triggers and tasks plus the Math and Logic editor functions. The requirements to accommodate CML procedures are also detailed. A basic comprehension of how to use the Configuration Explorer program is necessary to use the instructions in this chapter.

> **Note:** All configuration for FactoryLink 7.0 is in the SHARED domain. USER domain indicators are provided for upgrades from older FactoryLink versions.

There are ten sections to describe Math and Logic functionality:

- Locating Math and Logic Functions in Configuration Explorer
- Configure Math and Logic Tasks
- Configure Math and Logic Tables
- Program Files and Procedures
- Modify Makefiles
- Compiled Math and Logic
- CML Utilities Call Sequence
- CML Variables
- Calling C Code
- The Math and Logic Editor Reference Pages

For additional information about other Math and Logic topics, refer to the FactoryLink 6.6 documentation as indicated below:

Operational concepts	FactoryLink Fundamentals Chapter 12

Syntax, tokens, naming conventions, structure, declarations, data types and data conversions, expressions, operators, precedence, statements and directives	FactoryLink Configuration Reference Chapter 7
Procedures, functions, arguments	FactoryLink Configuration Reference Chapter 8
Makefiles, CML process and CML executables	FactoryLink Configuration Reference Chapter 9
Error code list	FactoryLink Reference Guide Chapter 11

LOCATING MATH AND LOGIC FUNCTIONS IN CONFIGURATION EXPLORER

The FactoryLink server and the FactoryLink application are set up using the Configuration Explorer program. For a complete description on how to use the Configuration Explorer program and all of its features, refer to the Configuration Explorer User Guide.

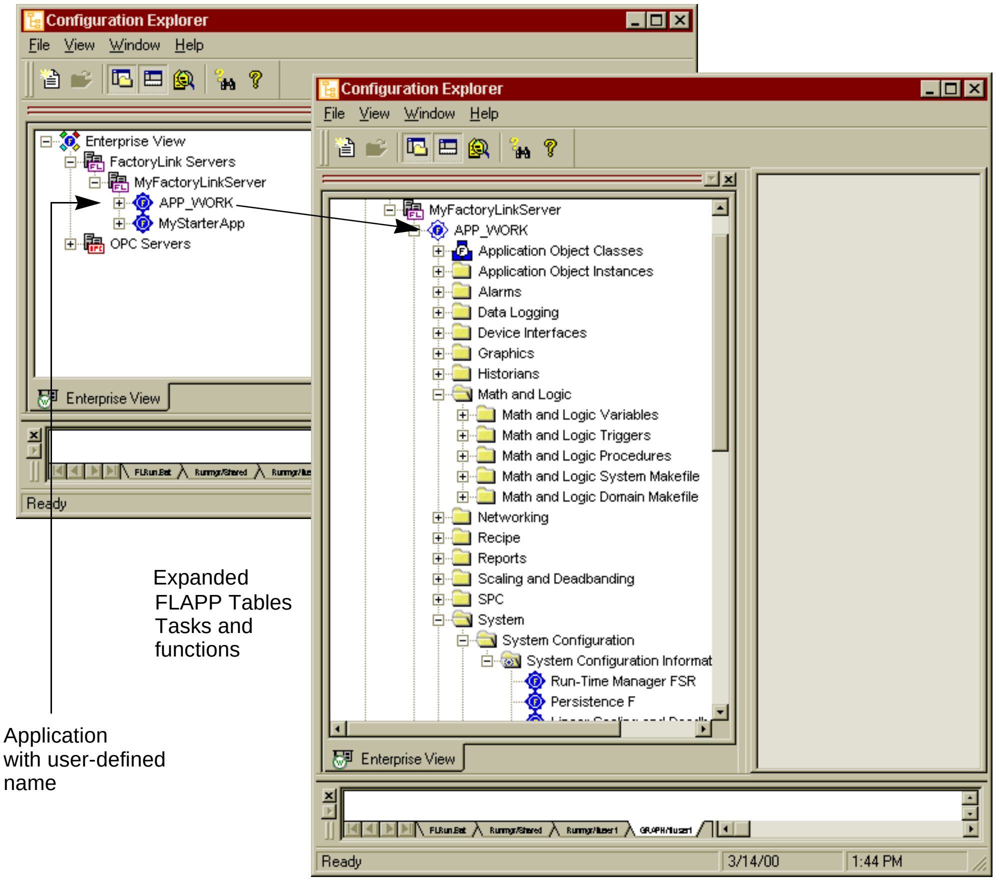
This section explains how to use the Configuration Explorer program to locate the Math and Logic functions:

- Launch Configuration Explorer
- Locate Math and Logic Tasks, Tables and Editor

Launch Configuration Explorer

To launch Configuration Explorer, click the Configuration Explorer icon displayed on the desktop. The Configuration Explorer window appears as shown in Figure 20-1.

Figure 20-1 The Workspace and the Application Tree



Expanded FLAPP Tables Tasks and functions

Application with user-defined name

Click FactoryLink Servers to display the defined servers. Expand the server you will use to configure Math and Logic programs. One or more of the applications available on this server appear. Right-click the application you will use to configure Math and Logic programs to expand and display the table, task and function items of the FLAPP.

The Math and Logic item in the application tree provides access to configure all the properties of Math and Logic programs.

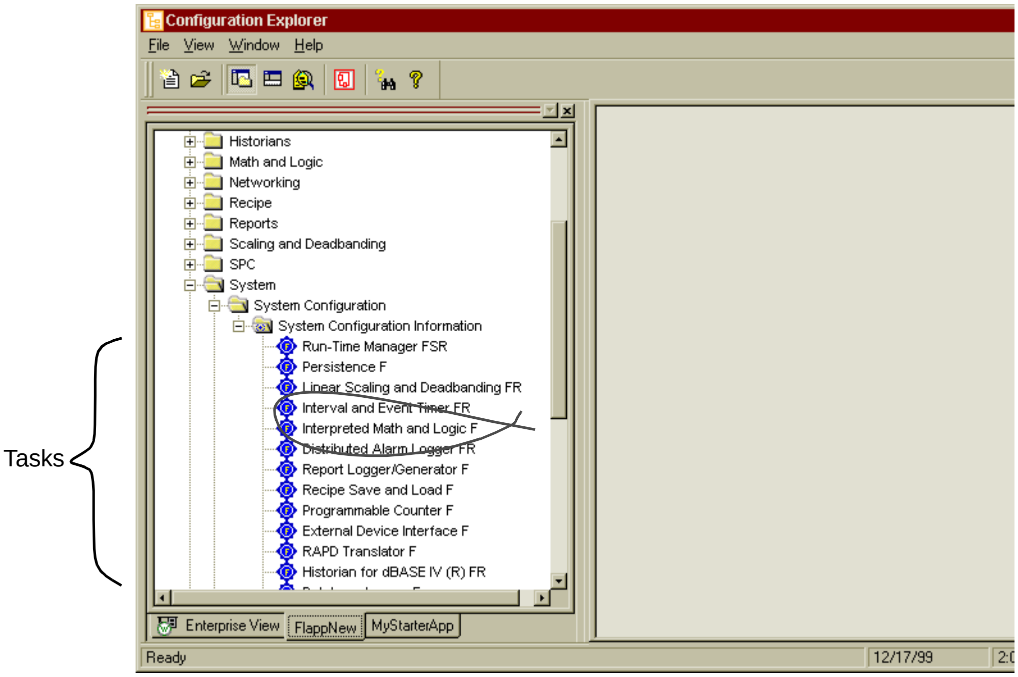
Locate Math and Logic Tasks, Tables and Editor

Math and Logic Tasks

There is one task preconfigured in FactoryLink to accommodate IML processing. If your installation is using CML processing, the CML task must be added.

To view the Math and Logic tasks, expand the System item in the application tree. Then expand the System Configuration and the System Configuration Information items respectively. Double-click the Interpreted Math and Logic item. The System Configuration Information dialog box displays. For an example of the expanded application tree, refer to Figure 20-2.

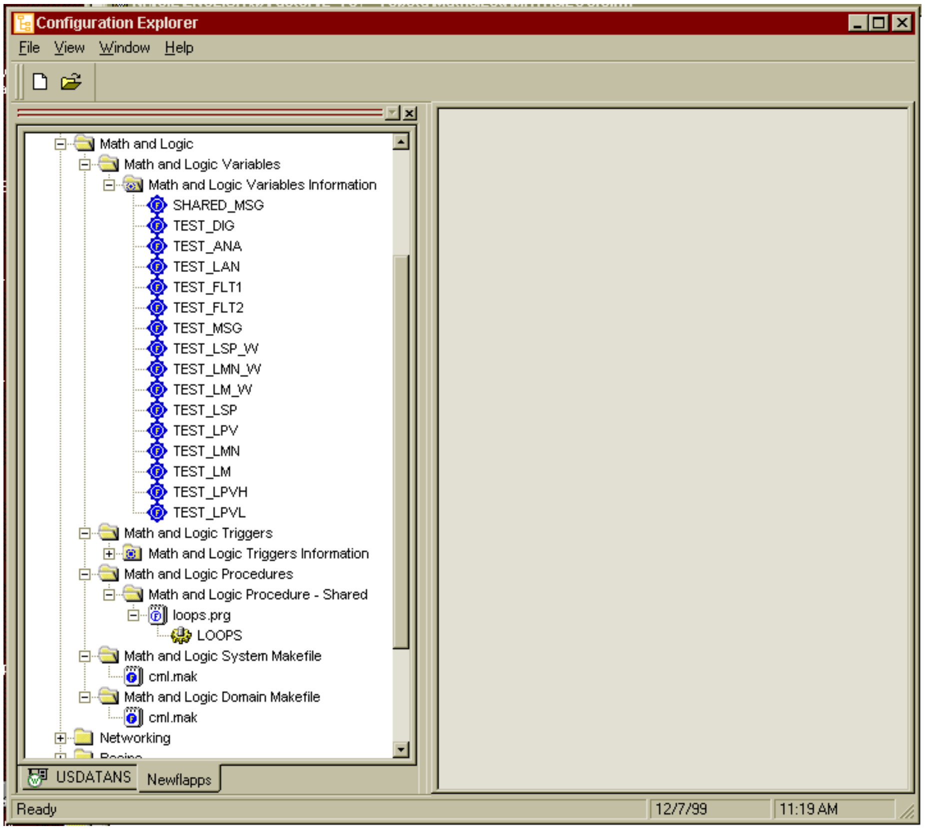
Figure 20-2 Locate Tasks in Configuration Explorer



Math and Logic Tables and Editor

To view the Math and Logic tables and text editor functions, expand the Math and Logic item in the application tree. Figure 20-3 shows an example of a Math and Logic tree with predefined variables, triggers and editor files.

Figure 20-3 Expanded Math and Logic Tree Items



Five items are listed under Math and Logic in the application tree:

- Math and Logic Variables Information
- Math and Logic Triggers
- Math and Logic Procedures
- Math and Logic System Makefile
- Math and Logic Domain Makefile

The first two items contain configuration tables and the remaining three items launch the Math and Logic editor to enable creation or modification of executable files.

The default Configuration Explorer settings only display the Share domain options. To view both the user and share domain items, right-click the FLAPP name and select Shared+User from the menu.

Names supporting the Math and Logic functions, for example, constants, variables (tags), procedures and files, must be unique. They are also case sensitive. Not all special characters are supported. For CML procedures the unique naming is also limited by the effects of the compiled C code. For example, special characters ($.*) become _ by the parsing routine.

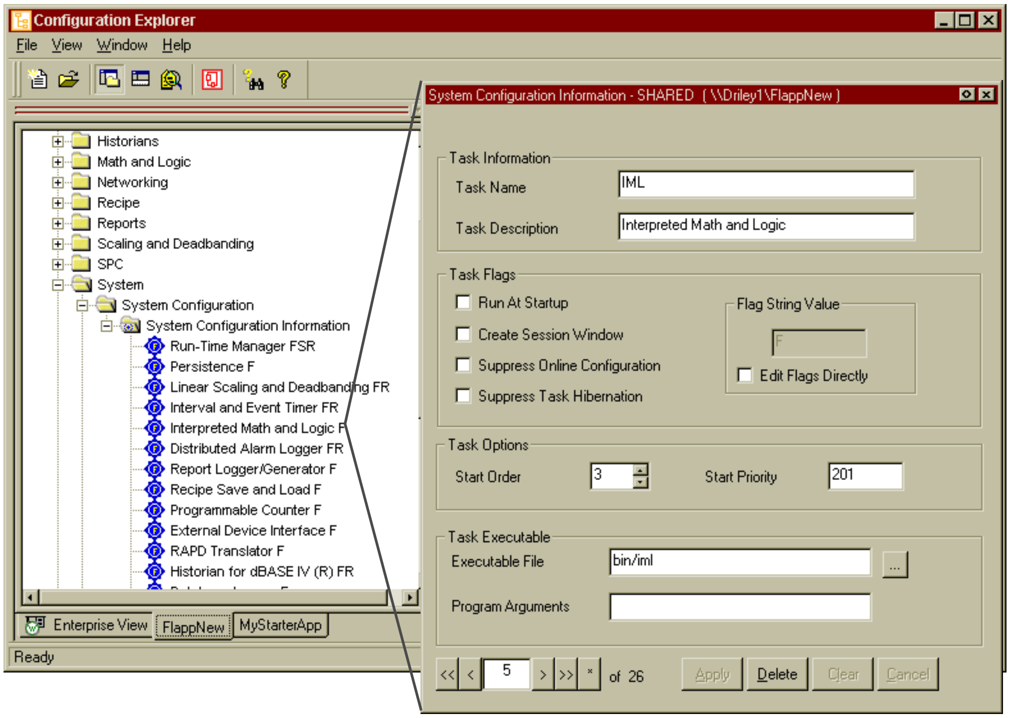
The variables, triggers, and procedures can be configured and managed from the Math and Logic editor as the program is developed. However, the variables and triggers can be defined before developing the procedures. The following section describes setting up tasks, configuring the tables and using the editor. The view illustrated for each section, either form view or grid view, is the default view for the item.

Configure Math and Logic Tasks

The preconfigured IML task is located in the System Configuration Information dialog box.

To view the Interpreted Math and Logic task dialog box, double-click the task in the System Configuration Information list as shown in Figure 20-4. The dialog box displays.

Figure 20-4 IML System Configuration Task Dialog Box



Task Information

Task Name: IML

Task Description: Interpreted Math and Logic

Task Flags

☐ Run At Startup

☐ Create Session Window

☐ Suppress Online Configuration

☐ Suppress Task Hibernation

Flag String Value: F

☐ Edit Flags Directly

Task Options

Start Order: 3

Start Priority: 201

Task Executable

Executable File: bin/iml

Program Arguments:

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To enable CML processing, the CML task must be added to the task item list. The IML task does not need to be removed. Both tasks can be enabled and run at the same time.

The CML task can be added anywhere in the task list. Adding a task requires displaying an existing task to use the dialog box as a template. The new task is added to the list below the task displayed to create it. The position of the task in the list does not determine its rank in the run-time process. Run-time rank is determined by the Start Order field.

To add a task, double-click an existing task in the list, for example, the Interpreted Math and Logic task, to display the System Configuration Task dialog box. Click the Asterisk button in the lower left portion of the dialog box. Complete all the fields using the information from

]

Table 20-2. Click the Apply button and the new task is completed. Refresh the application tree to display the new task in the list.

Table 20-2 shows the optional and required entries to run both the IML and the CML tasks.

Table 20-2 IML and CML Task Dialog Box Fields (Sheet 1 of 2)

Field Name	Definition		Default Field Data	
			IML	CML
Domain	For new FactoryLink 7.0 users, with no application conversion requirements from previous FactoryLink versions, shared is the recommended domain option. for legacy USER domain requirements refer to the FactoryLink 6.6 system documentation.		Shared	Shared
Task Information	Task Name	Predefined name for the task which cannot be changed.	IML	CML
	Task Description	Optional alphanumeric description.	Interpreted Math and Logic	Optional: Compiled Math and Logic
Task Flags	Run at Startup	R: Invokes task at FactoryLink startup. This must be set to use IML or CLM.	Optional	Optional
	Create Session Window	S: Provides the process with its own tab window. Output prints to the Configuration Explorer Output window.	Optional	Optional
	Suppress Online Configuration	O: Suppress online updates for this process.	Optional	Optional
	Suppress Task Hibernation	H: Not applicable for Math and Logic functions.	Not applicable	Not applicable
Flag String Value	Input box	Displays value code of selected Task Flags. F: Foreground Flag. Puts this task in the foreground at startup.	F	Not applicable
	Edit Flags Directly	If selected, allows user input of string values to input box.		

Table 20-2 IML and CML Task Dialog Box Fields (Sheet 2 of 2)

Field Name	Definition		Default Field Data	
			IML	CML
Task Options	Start Order	Specifies the runtime rank for invoking the task when FactoryLink is started.[1]	3	3
	Start Priority	Processing priority.	201 (default)	201 (default)
Task Executable	Executable File	Path and name of the file which executes this task. CML. For legacy USER domain requirements refer to the FactoryLink 6.6 system documentation.	bin/iml	bin/cml
	Program Arguments	Codes which add customization to the functions of the task. The codes which add customization to the functions of the task. -L: log error messages to a file [2] -L-V#: log error messages with more information to a file. Verbose level increases from 1 through 9	None	None

1. Start order is coordinated with the function requirements in the procedures. If Math and Logic procedures use the information from another process, that process must start first.

2. Default message file location is {FLAPP}/{FLNAME}/{FLDOMAIN}/log

For more information about creating and modifying tasks, refer to the Configuration Explorer User Guide.

CONFIGURE MATH AND LOGIC TABLES

There are two types of tables used to configure the variables and triggers in Math and Logic program and procedures:

- Math and Logic Variables
- Math and Logic Triggers

Math and Logic Variables

Variables in Math and Logic are known as tags in other FactoryLink functions. All Math and Logic variables (tags) can be defined using the Math and Logic Information table or defined during the editing process while creating procedures in a program file. Any tags defined in this table are globally available to any FactoryLink process. Defined variables automatically appear in the FactoryLink global Tag Browser, the Object Table and the Xref Table. However, when deleted from the Math and Logic Variables Information table, variables are not deleted from the global Tag Browser or the Object Table.

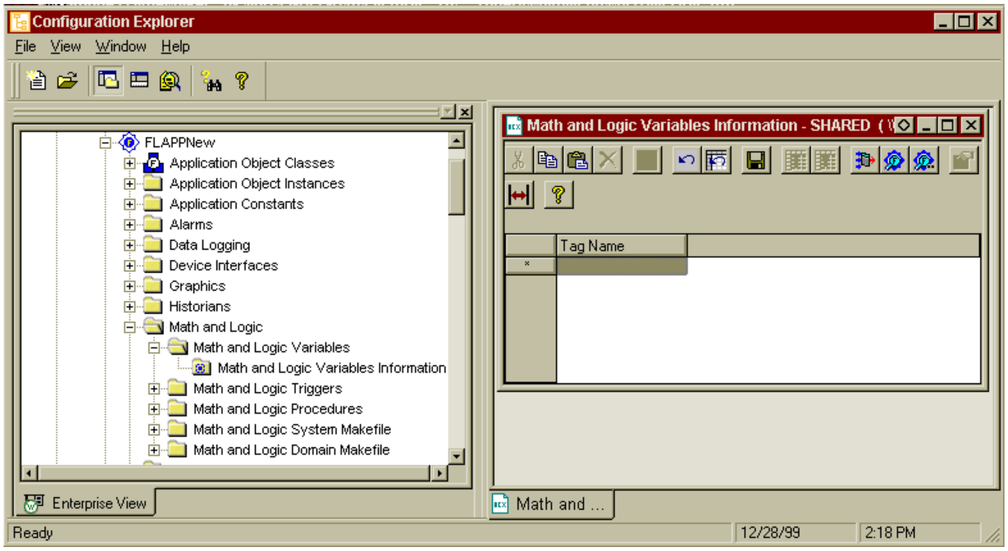
Local variables, specific to a file, can be defined within the program and cannot be used or referenced outside of the program.

The Math and Logic Variables Information Table

The Math and Logic Variables Information table stores the definitions of all of the global variables (tags) defined for use in the Math and Logic programs associated with the current FLAPP.

Expand the Math and Logic Variables item in the application tree to display the Math and Logic Variables Information item as shown in Figure 20-5). Double-click this item and the grid view of the table appears. One field is required for the definition of each variable (tag) name.

Figure 20-5 Math and Logic Variables Information Table



Define global variables (tags) using the default grid, the record generation box or application objects. For a complete explanation and attributes of each method, refer to the Configuration Explorer User Guide.

There is one field for each tag definition in the table:

Tag Name

Name of the tag to be used in a Math and Logic procedure. Do not use a Math and Logic reserved keyword as an element name. If the tag is to be defined as an array, specify 0 for each array dimension when entering its name here, for example, batch[0][0].

Valid Entry: standard tag name, 1 through 16 characters
Valid Data Type: digital, analog, longana, message, float

Enter one or more tag names to the grid and click the Save button. The Tag dialog box displays for each tag in succession to enable complete definition of each tag. If the tag is defined as an array, specify the number of elements for each array dimension in the Dimension field of the Tag Definition dialog.

When defined, the tag name appears in the Xref Table, the Tag Browser Table and the Object Table in addition to the Math and Logic Variables table.

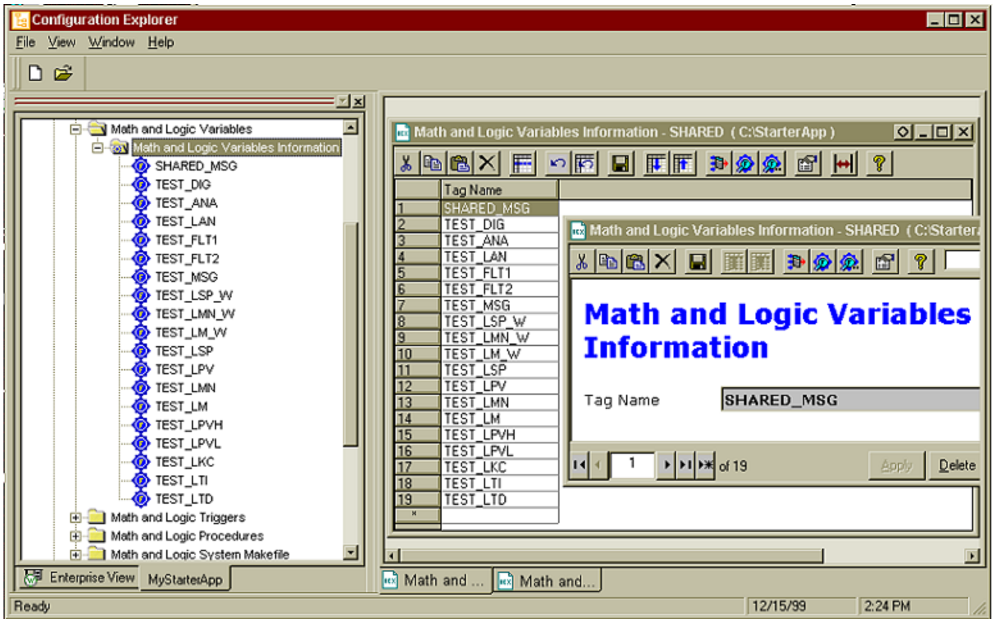
Click the Save button to save the information after configuring this table in the grid or form views.

Math and Logic Variables Information Table Example

Once variables are defined, each variable is listed below the Math and Logic Variables Information item in the application tree and in the grid view of the table. For an example showing an application with defined Math and Logic variables, refer to Figure 20-6.

After a variable has been defined it can be displayed in form view as an individual item. Double-click any of the listed variables in the application tree and the form view of the variable appears.

Figure 20-6 Example of Defined Math and Logic Variables in Grid and Form Views



	Tag Name
1	SHARED_MSG
2	TEST_DIG
3	TEST_ANA
4	TEST_LAN
5	TEST_FLT1
6	TEST_FLT2
7	TEST_MSG
8	TEST_LSP_W
9	TEST_LMN_W
10	TEST_LM_W
11	TEST_LSP
12	TEST_LPV
13	TEST_LMN
14	TEST_LM
15	TEST_LPVH
16	TEST_LPVL
17	TEST_LKC
18	TEST_LTI
19	TEST_LTD
*	

Math and Logic Variables Information

Tag Name SHARED_MSG

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Math and Logic Triggers

Math and Logic Triggers are used to invoke the Math and Logic procedures in both IML and CML program files. Triggers must be defined in the Triggers Information Table.

Triggers can be referenced in a procedure but it is not required. If referenced, the trigger can invoke the same procedure or an external procedure. If not referenced, a trigger invokes procedures, one or more, according to its definition in the Triggers Information Table. Each procedure invoked by the trigger must be defined in a separate record in the Triggers Information Table.

Triggers referenced in a procedure can be defined before or during the procedure design process. Triggers not referenced in a procedure can be defined at any time.

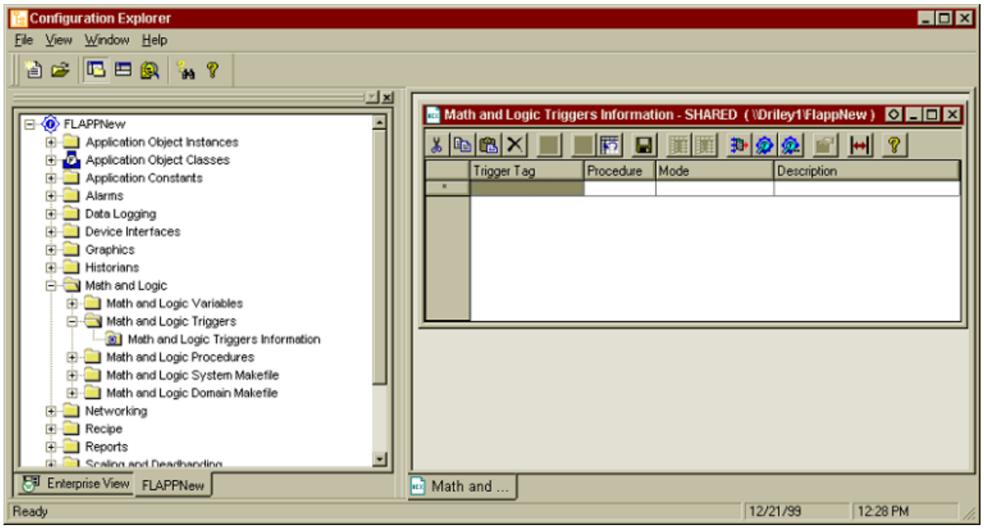
Digital tags are the most common trigger type but any tag type can be specified except the mailbox type. Digital tags only trigger a procedure when the value is true. Other tag types trigger procedures whenever their value changes.

An alternative to using a trigger to invoke a procedure is to call a procedure from another procedure using a function call. However, procedures that do not require triggers are must still be defined in the Trigger Information Table with no entry in the Trigger field.

The Math and Logic Triggers Information Table

Expand the Math and Logic Triggers item in the application tree to display the Math and Logic Triggers Information item as shown in Figure 20-7. Double-click this item and the grid view of the table appears. Define triggers using this Math and Logic Triggers Information table grid, the record generation box, or application objects. For a complete explanation and attributes of each method, refer to the Configuration Explorer User Guide.

Figure 20-7 Math and Logic Trigger Information Table



Four fields are provided for the definition of each trigger:

Trigger Tag
Name of the tag whose value can trigger a Math and Logic procedure.

Valid Entry: standard tag name, 1 through 16 characters
Valid Data Type: digital, analog, longana, message

Procedure
Unique name of the Math and Logic procedure exactly as entered in the procedures (proc) statement within the program file.

Valid Entry: alphanumeric string: 1 to 16 characters, case sensitive, cannot be the same as a defined tag name and must begin with an alphabetic character.

Mode
Determines how the Math and Logic procedure instructions are executed.

Valid Entry: INTERPRETED
or COMPILED

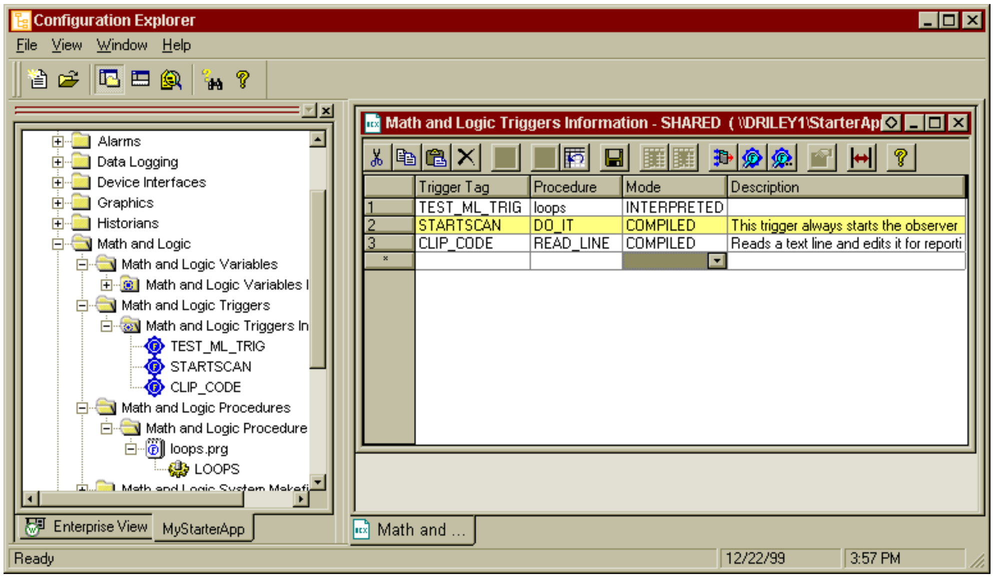
Description
Indicates the intended use of the tag specified in the Trigger Tag field.

Valid Entry: Alphanumeric string; 1 to 80 characters

The Math and Logic Triggers Information Table Example

An example of the grid view of a Math and Logic table with defined triggers is provided in Figure 20-8.

Figure 20-8 Math and Logic Trigger Information Table Example



	Trigger Tag	Procedure	Mode	Description
1	TEST_ML_TRIG	loops	INTERPRETED	
2	STARTSCAN	DO_IT	COMPILED	This trigger always starts the observer
3	CLIP_CODE	READ_LINE	COMPILED	Reads a text line and edits it for reporti
*				

The Trigger Tag is not automatically added to the Math and Logic Variables Information table. It is, however, added to the global Tag browser table after definition in the Math and Logic Triggers Information table.

To save the table entries at any time click the save icon 💾 at the top of the edit window or use the keyboard shortcut. For keyboard shortcut descriptions refer to Table 20-11.

PROGRAM FILES AND PROCEDURES

Program files consist of one or more procedures. Procedures within a program file can be totally unrelated in functionality as they are individually invoked by the predefined trigger or a function call embedded in another procedure. All procedures within a program must be defined as either IML or CML procedures.

The Math and Logic editor, located within the Configuration Explorer environment, is used to create and modify the program files and associated procedures using the C-type programming language standards. If you use another editor, validate the procedures you write with the Math and Logic editor.

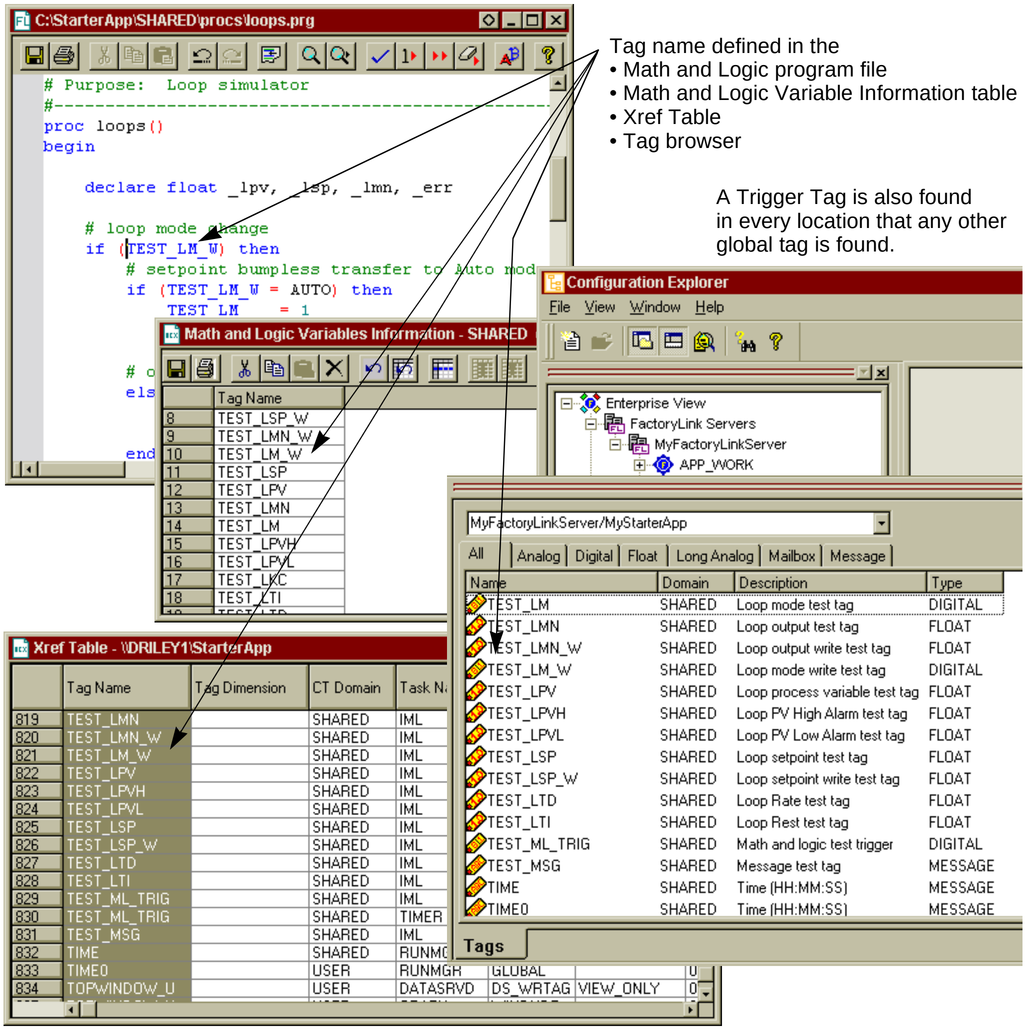
Program files provide the FactoryLink user the ability to control the interactions of FactoryLink tasks. The program file name must be in lower case and have the .prg extension. The .prg extension is added automatically to the file name when defined. Program file names are not referenced in any FactoryLink tables.

> **Note:** In FactoryLink versions before the 7.0 release, the program file name matched the eight-character name of a procedure within the program file. This restriction is no longer applicable.

All procedures must be listed in the Math and Logic Triggers Information table. If a procedure is not listed in the Math and Logic Triggers table it will never be invoked regardless of the method used to invoke it. The IML task uses this table to locate and load IML procedures. The CML compiling process at startup also uses this table. Procedure names are case sensitive. Ensure that the naming of the procedures is always consistent to avoid errors.

As global variables (tags) and triggers are defined they are added to FactoryLink reference lists as shown in Figure 20-9. These variables are available to all FactoryLink tasks. Local variables are defined in the procedure, not in any of the tables, are only available to the procedures or program files dependent on the type of declaration.

Figure 20-9 Data Locations for a Global Shared Tag



Tag name defined in the
- Math and Logic program file
- Math and Logic Variable Information table
- Xref Table
- Tag browser

A Trigger Tag is also found in every location that any other global tag is found.

```
# Purpose:  Loop simulator
#------------------------------------------------
proc loops()
begin

    declare float _lpv, _lsp, _lmn, _err

    # loop mode change
    if (TEST_LM_W) then
        # setpoint bumpless transfer to Auto mod
        if (TEST_LM_W = AUTO) then
            TEST LM     = 1


        # o
        els


        end
```

	Tag Name
8	TEST_LSP_W
9	TEST_LMN_W
10	TEST_LM_W
11	TEST_LSP
12	TEST_LPV
13	TEST_LMN
14	TEST_LM
15	TEST_LPVH
16	TEST_LPVL
17	TEST_LKC
18	TEST_LTI

	Tag Name	Tag Dimension	CT Domain	Task Na			
819	TEST_LMN		SHARED	IML			
820	TEST_LMN_W		SHARED	IML			
821	TEST_LM_W		SHARED	IML			
822	TEST_LPV		SHARED	IML			
823	TEST_LPVH		SHARED	IML			
824	TEST_LPVL		SHARED	IML			
825	TEST_LSP		SHARED	IML			
826	TEST_LSP_W		SHARED	IML			
827	TEST_LTD		SHARED	IML			
828	TEST_LTI		SHARED	IML			
829	TEST_ML_TRIG		SHARED	IML			
830	TEST_ML_TRIG		SHARED	TIMER			
831	TEST_MSG		SHARED	IML			
832	TIME		SHARED	RUNMG			
833	TIME0		USER	RUNMGR	GLOBAL		0
834	TOPWINDOW_U		USER	DATASRVD	DS_WRTAG	VIEW_ONLY	0

Name	Domain	Description	Type
TEST_LM	SHARED	Loop mode test tag	DIGITAL
TEST_LMN	SHARED	Loop output test tag	FLOAT
TEST_LMN_W	SHARED	Loop output write test tag	FLOAT
TEST_LM_W	SHARED	Loop mode write test tag	DIGITAL
TEST_LPV	SHARED	Loop process variable test tag	FLOAT
TEST_LPVH	SHARED	Loop PV High Alarm test tag	FLOAT
TEST_LPVL	SHARED	Loop PV Low Alarm test tag	FLOAT
TEST_LSP	SHARED	Loop setpoint test tag	FLOAT
TEST_LSP_W	SHARED	Loop setpoint write test tag	FLOAT
TEST_LTD	SHARED	Loop Rate test tag	FLOAT
TEST_LTI	SHARED	Loop Rest test tag	FLOAT
TEST_ML_TRIG	SHARED	Math and logic test trigger	DIGITAL
TEST_MSG	SHARED	Message test tag	MESSAGE
TIME	SHARED	Time (HH:MM:SS)	MESSAGE
TIME0	SHARED	Time (HH:MM:SS)	MESSAGE

It is recommended that definition of new programs and procedures be accomplished in an off-line mode (without FactoryLink running).

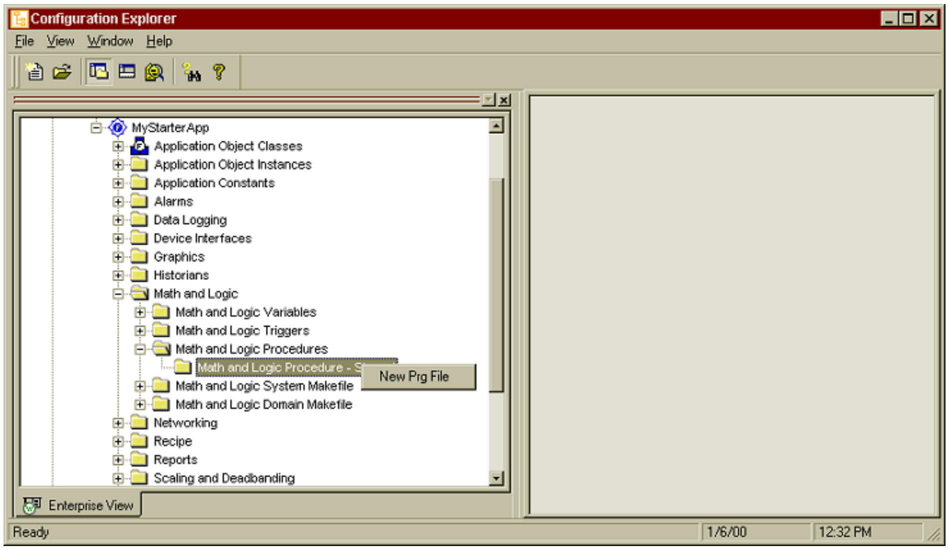
There are many methods to perform file functions using the Math and Logic editor, for example: Save, Redo, Find, and Validate. For a complete reference of these options refer to the section Math and Logic Editor Reference Pages on page 449 at the end of this chapter.

Defining a New Program File

Program files are defined and created in Configuration Explorer. Locate the FLAPP in the Configuration Explorer Workspace window, expand the FLAPP and expand the Math and Logic item.

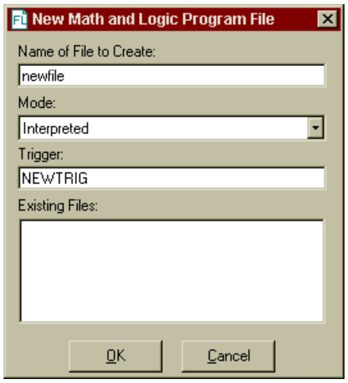
To open a new program file, right-click the Math and Logic Procedure - Shared item. Select the only option: New Prg file. See Figure 20-10.

Figure 20-10 New Program File Selection



A New Math and Logic Program File dialog box appears as shown in Figure 20-11.

Figure 20-11 New Math and Logic Program File


New Math and Logic Program File

Name of File to Create: newfile

Mode: Interpreted

Trigger: NEWTRIG

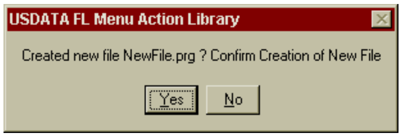
Existing Files:

Type the program file name in the Name of File to Create field. The .prg extension is added automatically. Select the mode: Interpreted or Compiled. To define a trigger for this file, enter the name of the trigger now. A trigger can be added at a later time.

If there are any previously created files they appear in the Existing Files field.

Click the OK button. The first time the USDATA FL Menu Action Library dialog box appears as shown in Figure 20-12.

Figure 20-12 USDATA FL Menu Action Library Dialog Box


USDATA FL Menu Action Library

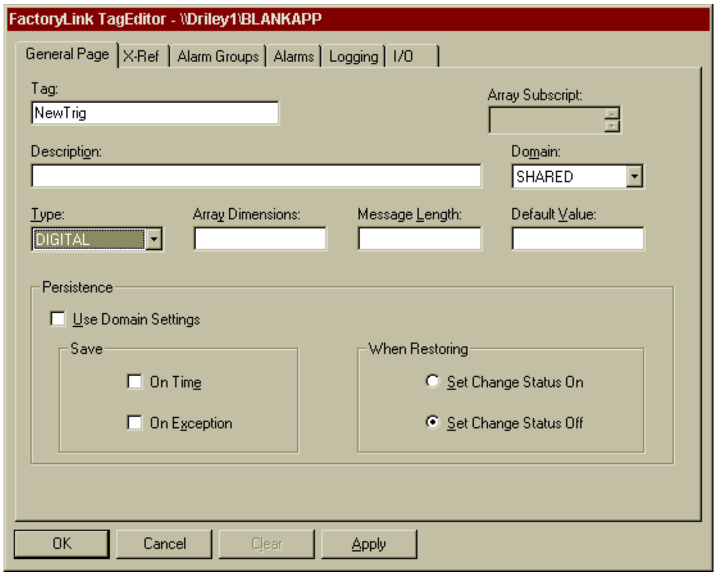
Created new file NewFile.prg ? Confirm Creation of New File

Click the Yes button.

If a trigger was specified the FactoryLink Tag Editor dialog box appears as shown in Figure 20-13. Complete the definition of the trigger. For more information about defining Factorylink tags refer to the Configuration Explorer User Guide.

If no trigger was specified, the definition is complete.

Figure 20-13 The FactoryLink Tag Editor Dialog Box


FactoryLink TagEditor - \\Driley1\BLANKAPP

Tag: NewTrig

Array Subscript:

Description:

Domain: SHARED

Type: DIGITAL

Array Dimensions:

Message Length:

Default Value:

Persistence

□ Use Domain Settings

Save

□ On Time

□ On Exception

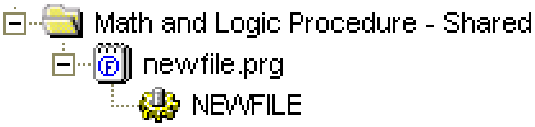
When Restoring

○ Set Change Status On

● Set Change Status Off

In the Configuration Explorer tree, expand the Math and Logic Procedure - Shared item and then expand the program name. A new procedure appears under the program name with the same name minus the extension. The program and the procedures have unique icons as shown in Figure 20-14.

Figure 20-14 New Program and Procedures Items in Configuration Explorer


Math and Logic Procedure - Shared

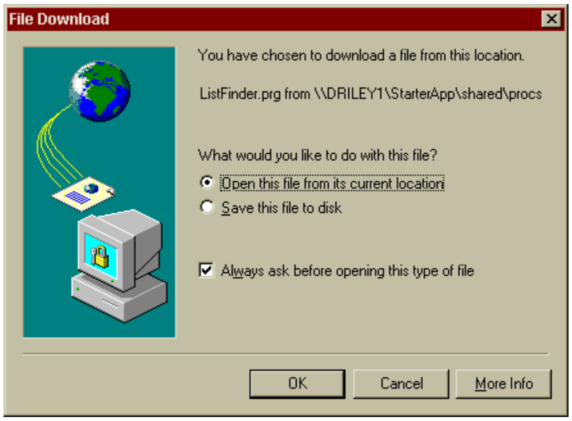
newfile.prg

NEWFILE

Double-click the program name to open the program.

The File Download dialog box appears as shown in Figure 20-15.

Figure 20-15 File Download Dialog Box



You have chosen to download a file from this location.

ListFinder.prg from \\DRILEY1\StarterApp\shared\procs

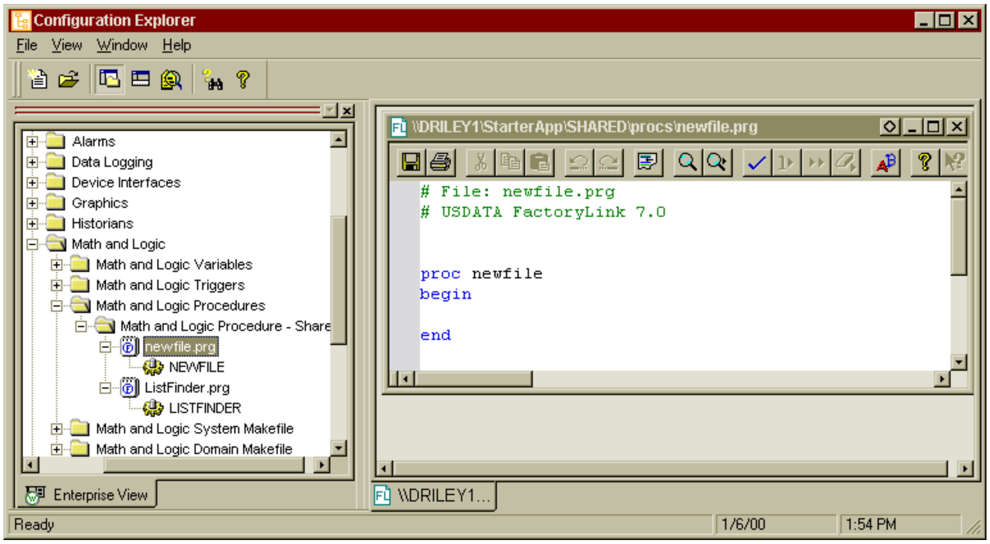
What would you like to do with this file?

● Open this file from its current location
○ Save this file to disk

☑ Always ask before opening this type of file

Select the radio button: Open this file from its Current Location. Click the OK button. The program file displays. For an example of a new program file, refer to Figure 20-16.

Figure 20-16 The New Program File in Configuration Explorer



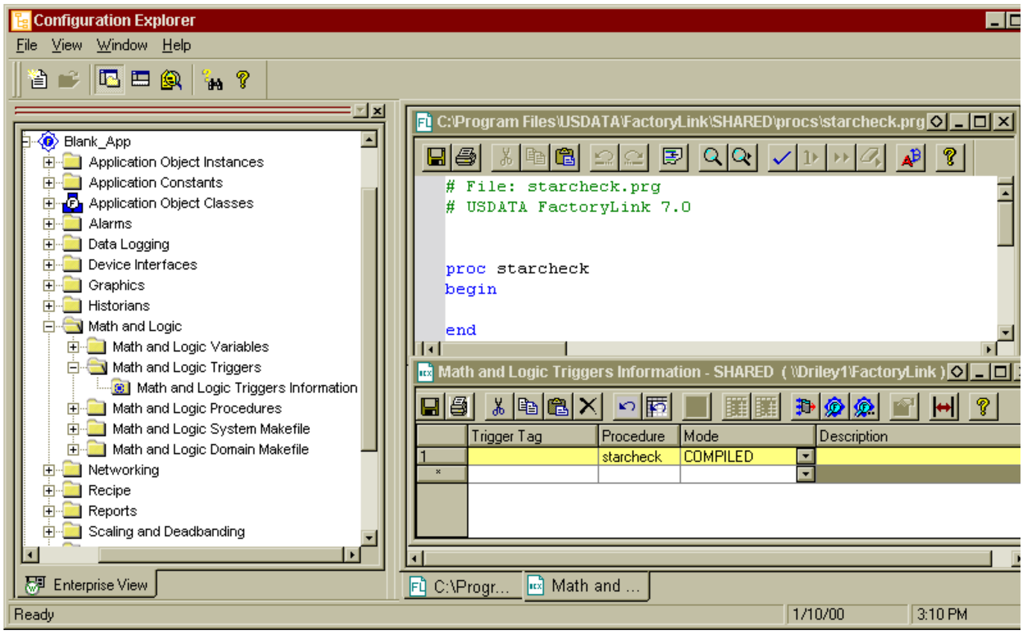
```
# File: newfile.prg
# USDATA FactoryLink 7.0


proc newfile
begin

end
```

You can add code to the new procedure that was created when the program file was defined. Regardless, the procedure must remain in the program to enable FactoryLink to locate the program file.

To save the program file at any time, click the save icon at the top of the edit window.

The program information must be listed in the Math and Logic Triggers Information table as shown in Figure 20-17. For more information about the Math and Logic Triggers Information table, refer to the section Math and Logic Triggers on page 415 in this chapter. Display the table and type the procedure name in the Procedure field. Select the mode from the Mode drop-down field. A Trigger Tag does not need to be defined at this time but can be added later if code is added to the procedure.

Figure 20-17 Updated Math and Logic Trigger Information Table


Configuration Explorer
File View Window Help
Blank_App
Application Object Instances
Application Constants
Application Object Classes
Alarms
Data Logging
Device Interfaces
Graphics
Historians
Math and Logic
Math and Logic Variables
Math and Logic Triggers
Math and Logic Triggers Information
Math and Logic Procedures
Math and Logic System Makefile
Math and Logic Domain Makefile
Networking
Recipe
Reports
Scaling and Deadbanding
Enterprise View
C:\Program Files\USDATA\FactoryLink\SHARED\procs\starcheck.prg
Math and Logic Triggers Information - SHARED (\\Driley1\FactoryLink)
C:\Progr...
Math and ...
Ready
1/10/00
3:10 PM

```
# File: starcheck.prg
# USDATA FactoryLink 7.0


proc starcheck
begin

end
```

	Trigger Tag	Procedure	Mode	Description
1		starcheck	COMPILED	
*				

To save the table entries at any time click the save icon at the top of the edit window or use the keycode.

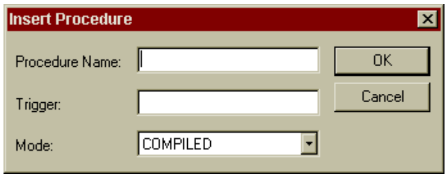
One or many additional procedures can be added to the program file.

Add New Procedures

With the program file displayed in Configuration Explorer, position the cursor at the beginning of the line where you will add the new procedure.

To add a procedure: click the insert procedure icon . The Insert Procedure dialog box displays as shown in Figure 20-18.

Figure 20-18 Insert Procedure Dialog Box



Mode: COMPILED

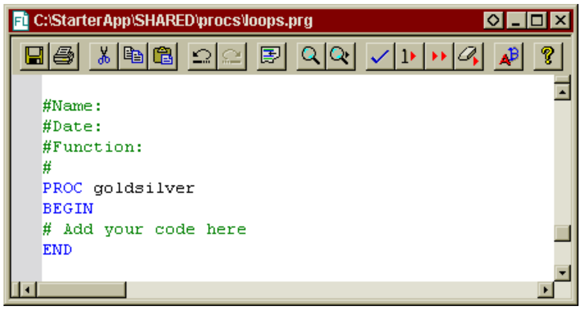
Use the guidelines in Table 20-3 to type the Procedure Name, the Trigger tag name (if applicable) and select the Mode. Click the OK button. A template is inserted in the file to assist you to write the procedure.

Table 20-3 Procedure Definitions

Field Name	Description
Procedure Name	Procedure names are case sensitive. Use a consistent naming convention, for example, all caps.
Trigger	A Trigger tag name is required if the procedure is invoked by the change in the value of a tag. If the procedure is to be invoked by a call statement or used as a function to return values, leave this field blank. Tag names are case sensitive.
Mode	The choices are Interpreted or Compiled. All procedures in a program file must be the same.

Procedure definitions contain a minimum of three statements: proc, begin, and end. These statements are inserted into the program file as shown in Figure 20-19. For more information on the Math and Logic features, for example, text color, refer to Math and Logic Editor Reference Pages on page 449 at the end of this chapter.

Figure 20-19 New Procedures Template Inserted in Program File



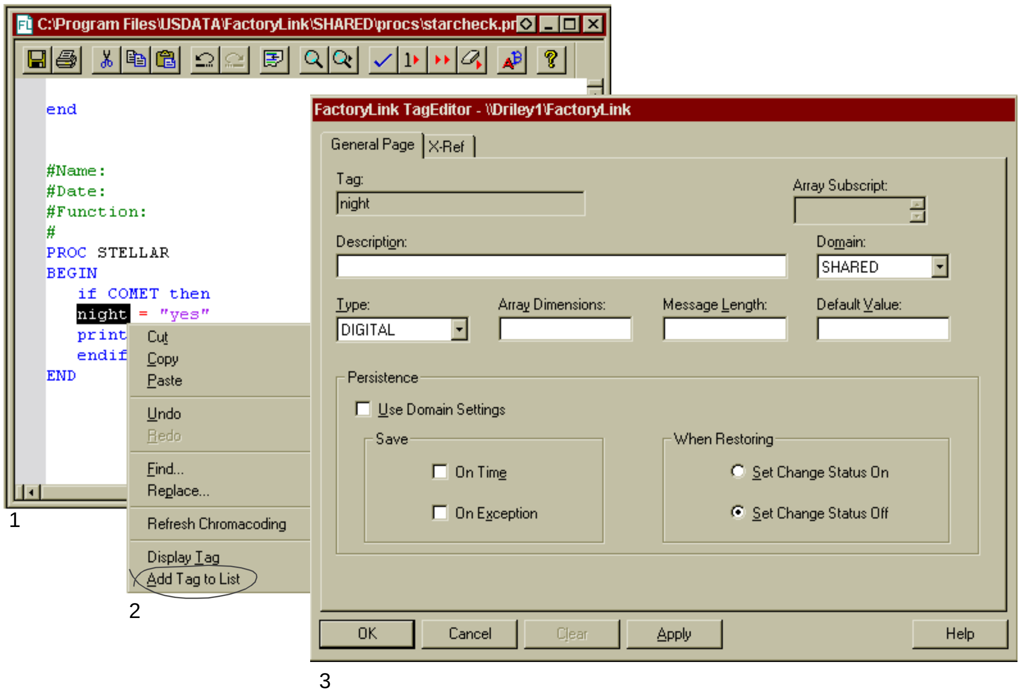
```
#Name:
#Date:
#Function:
#
PROC goldsilver
BEGIN
# Add your code here
END
```

Add code to the template information to create the new procedure. Keywords are not case-sensitive, but tag names are. Use the *FactoryLink 6.6 Configuration Guide* as a reference for syntax, keywords, structure and CML requirements.

A local variable (tag) can be declared in the program. If it is added to the top of the file above the initial BEGIN keyword, it is available to all procedures in all program files. Or, the local variables can be added at the procedure level.

Global variables (tags) are added to a procedure by typing the tag name in the procedure, highlighting the name. Right-click the tag name. Select Add to Tag List from the menu. The FactoryLink Tag Editor dialog box appears providing definition of the tag as shown in Figure 20-20. For more information regarding tag definitions, refer to the Configuration Explorer User Guide.The tag color changes to blue when the definition is completed.

Figure 20-20 Adding a Global Tag to a Procedure



```
end


#Name:
#Date:
#Function:
#
PROC STELLAR
BEGIN
   if COMET then
   night = "yes"
   print
   endif
END
```

Tag: night

Array Subscript:

Description:

Domain: SHARED

Type: DIGITAL

Array Dimensions:

Message Length:

Default Value:

Persistence

□ Use Domain Settings

Save

□ On Time

□ On Exception

When Restoring

○ Set Change Status On

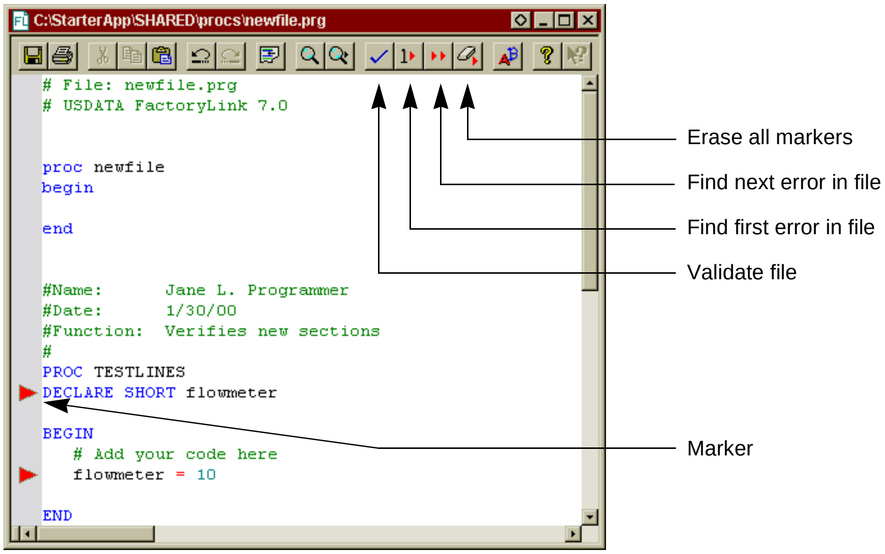
● Set Change Status Off

Once defined, the tag name appears in the Xref Table, the Tag browser, Table and the Object Table in addition to the Math and Logic Variables table. Global variables (tags) can also be added at any time to the Math and Logic Variables Information table and then typed into the procedure. Type the variable (tag) name and the variable text color changes from black to blue indicating it has already been defined.

After you have typed the procedure, you must validate it to check for syntax errors. Click the validate icon ✓ to verify the syntax, for example, matching braces, parens and brackets and correct use of operators. The correct definition of local and global variables (tags) is checked plus the essential keywords are present (begin, end, proc).

If there are no errors, the system reports nothing. If there are errors, red triangle markers display in the left hand margin for each line with an error as shown in Figure 20-21. Correct the errors and revalidate the program.

Figure 20-21 Errors Indicated in the Math and Logic Editor



```
# File: newfile.prg
# USDATA FactoryLink 7.0


proc newfile
begin

end


#Name:      Jane L. Programmer
#Date:      1/30/00
#Function:  Verifies new sections
#
PROC TESTLINES
DECLARE SHORT flowmeter

BEGIN
   # Add your code here
   flowmeter = 10

END
```

User inserted markers and error markers appear the same as error markers. Markers can be toggled with the keycode <Ctrl + F2> on a specific line or added to one to many lines using the find function. All previously set markers are erased when the validate function is performed.

For more information on the edit icons and keycodes, refer to the Math and Logic Editor Reference Pages on page 449 in this chapter.

Click the save icon after the editing session is complete.

Customize the Procedure Header File for the FactoryLink Server

Customization of header information for the .prg files on the FactoryLink server is provided by editing a text file.

The file location and name are {Flink}\MSG\MLProcHeader.txt.

MLProcHeader.txt is created after a user creates the first .prg file on the server. The edits appear in all **new** .prg files. As additional edits are made to MLProcHeader.txt the new edits appear only in .prg files created after the edit is made. Table 20-4 shows the tokens and values provided for the edit customization.

Table 20-4 Math and Logic Tokens and Values

Token	Value
$FILENAME	The file name including the extension (not the full path)
$PROCNAME	The procedure name
$REPORTNAME	The report name
$FILEPATH	The full path to the file
$FLAPP	FactoryLink application directory
$FLAPPDIR	FactoryLink application directory
$FLINK	FactoryLink server directory
$FLINKDIR	FactoryLink server directory
$DOMAIN	Domain
$DATE	Date (long format)
$TIME	Time (long format)
$LONGDATE	Date (long format)
$LONGTIME	Time (long format)
$SHORTDATE	Date (short format)
$SHORTTIME	Time (short format)
$MEDIUMDATE	Date (Medium format)
$MEDIUMTIME	Time (Medium format)
$GENERALDATE	Date (General format)

The date and time formats provide further customization as shown in Table 20-5.

Table 20-5 Formatting Descriptions for Math and Logic Tokens (Sheet 1 of 2)

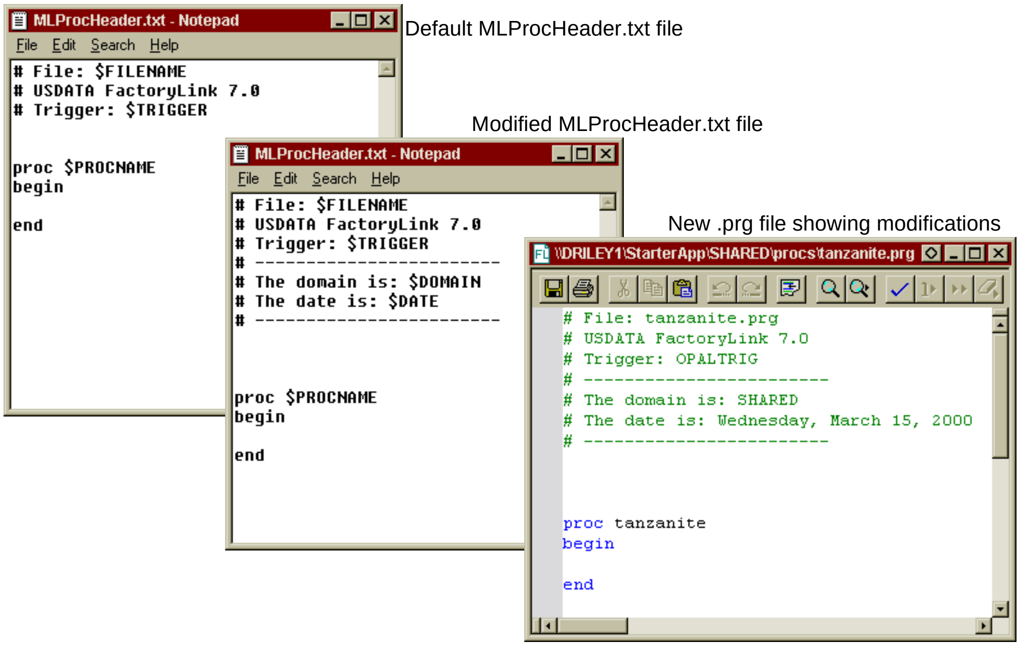
Item	Format Description
General Date	Display a date and/or time. For real numbers, display a date and time, for example, 4/3/93 05:34 PM. If there is no fractional part, display only a date, for example, 4/3/93. If there is no integer part, display time only, for example, 05:34 PM. Date display is determined by your system settings.
Long Date	Display a date according to your system’s long date format.

Table 20-5 Formatting Descriptions for Math and Logic Tokens (Sheet 2 of 2)

Item	Format Description
Medium Date	Display a date using the medium date format appropriate for your language version of Outlook®, for example, the English-U.S. version includes the day, month, and year (05-Jan-96).
Short Date	Display a date using your system's short date format.
Long Time	Display a time using your system's long time format: includes hours, minutes, seconds.
Medium Time	Display time in 12-hour format using hours and minutes and the AM/PM designator.
Short Time	Display a time using the 24-hour format, for example, 17:45.

The MLProcHeader.txt file can be edited in any standard text editor, for example, NotePad®. Figure 20-22 shows the relationship between the MLProcHeader.txt file tokens and how they appear in the .prg file.

Figure 20-22 A Modified MLProcHeader.txt File and a Sample .prg File


MLProcHeader.txt - Notepad
File Edit Search Help
MLProcHeader.txt - Notepad
File Edit Search Help
\\DRILEY1\StarterApp\SHARED\procs\tanzanite.prg

Default MLProcHeader.txt file

```
# File: $FILENAME
# USDATA FactoryLink 7.0
# Trigger: $TRIGGER


proc $PROCNAME
begin

end
```

Modified MLProcHeader.txt file

```
# File: $FILENAME
# USDATA FactoryLink 7.0
# Trigger: $TRIGGER
# ------------------------
# The domain is: $DOMAIN
# The date is: $DATE
# ------------------------



proc $PROCNAME
begin

end
```

New .prg file showing modifications

```
# File: tanzanite.prg
# USDATA FactoryLink 7.0
# Trigger: OPALTRIG
# ------------------------
# The domain is: SHARED
# The date is: Wednesday, March 15, 2000
# ------------------------



proc tanzanite
begin

end
```

MODIFY MAKEFILES

A makefile is a file containing all the information needed by the CCCML utility to compile the .C files produced by PARSECML and create an executable for the current domain. The name of the makefile used by CCCML is cml.mak and is unique for each operating system.

The cml.mak file, located in the {FLINK}/CML directory, typically contains the following information to create the final executable file:

- Name of the C compiler to use for a given operating system
- Command-line switches to be used when compiling
- Name of the operating system's object linker
- Linker command-line switches
- References to the FactoryLink libraries to be linked
- References to the developer-supplied libraries to be linked

As an aid for advanced users, CML provides a method for editing the cml.mak file. You can change the compiler and linker options, specify command-line switches, and specify which object files and libraries to link, giving you the flexibility to create a makefile unique to an application for a given domain.

A domain-specific makefile does not exist until you create one. When the Math and Logic System Makefile item is expanded, this item contains placeholder for a system makefile named cml.mak. This file opens in the Math and Logic editor and can be used to set the defaults to control the compile job instructions for CML procedures.

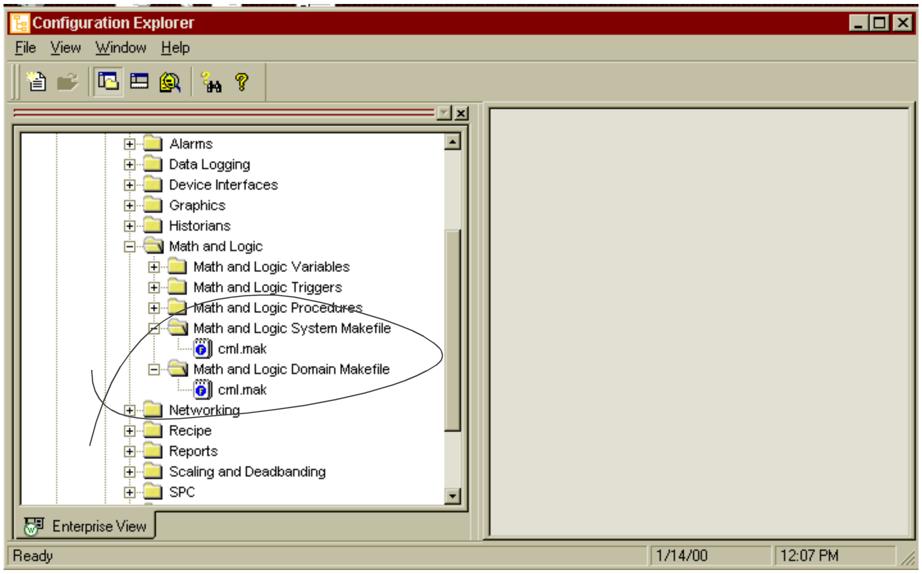
CML provides two file options:

- Math and Logic System Makefile
- Math and Logic Domain Makefile

Both files for these options must retain the same name: cml.mak.

Configuration Explorer provides access and the Math and Logic editing tools for the makefiles as shown in Figure 20-23.

Figure 20-23 Access to the Makefiles



Math and Logic System Makefile

Any changes made to this file are global; they apply to all applications on the system. However, it is not recommended that any changes be made to this file. Any definitions in the system-specific makefile in the application directory override the definitions in the master makefile in /FLINK/CML directory.

If the cml.mak file requires editing, copy the cml.mak file from the {FLINK}/CML directory to the {FLAPP}/{FL DOMAIN}/CML directory. The domain recommended for FactoryLink 7.0 is the SHARED domain. Or a new file can be created and edited in the Domain Makefile.

Click the save icon 💾 after the editing session is complete.

Math and Logic Domain Makefile

If the cml.mak file requires editing, copy the cml.mak file from the {FLINK}/CML directory to the {FLAPP}/{FL DOMAIN}/CML directory for the FactoryLink 7.0 version SHARED domain. Or right-click the cml.mak item and a menu provides the New option. Click New and a new file, with the same is created. This file is an exact copy of the System Makefile.

To edit cml.mak: Expand the Math and Logic System Makefile item to display cml.mak. Double-click cml.mak to open the file. The file opens in the Math and Logic editor containing the cml.mak file from the {FLINK}/CML directory. Edit the file as required.

Any definitions in the domain-specific makefile in the application directory override the definitions in the master system makefile in {FLINK}/CML directory.

Click the save icon 💾 after the editing session is complete.

COMPILED MATH AND LOGIC (CML)

CML is a combination of utilities and libraries that, at run time, create binary executable files from the program files you specified to run in the compiled mode.

The compile process begins at run time:

1. Translates the program (.prg) files into C source code
2. Puts the C code into files with an extension of .c
3. Compiles the .c files to produce object (.obj) files
4. Links the object files to the appropriate libraries to create binary executable (.exe) files
5. Runs the executable file as each program’s associated trigger(s) are set.

Because FactoryLink applications can be configured in both the SHARED and USER domains, CML creates one executable file for each domain that contains.prg files.

The file name of each executable is unique. The filename begins with a C and is followed by the domain name:

- {FLAPP}/SHARED/CML/CSHARED.EXE for the SHARED domain
- {FLAPP}/USER/CML/CUSER.EXE for the USER domain

CML Requirements

CML requires the following software and hardware:

- FactoryLink software version 7.0 or later
- An ANSI-compatible C-language compiler for the development and run-time systems. Refer to the user guide for the particular compiler in use for information about compiler switches and setup options.

Option bits:

- Development Systems—the CML run-time and development options.
- Run-Time only Systems—the CML run-time option.

Compiled Math and Logic for Windows NT requires the environment variable FLCOMPILE to be set. This environment variable points to the directory of the compiler you are using. Set the FLCOMPILE variable from the Control Panel, System, Environment, and System Variable panels.

For example:

For Microsoft C++ 6

Windows NT®:

```
FLCOMPILE=DRIVE:\COMPILER_DIRECTORY
```

Running CML

CML compiles and runs on both development systems and run-time systems.

CML on a Development System

Before starting the Run-Time Manager, FLRUN invokes several utilities to compile programs into a single executable file. The compiled programs will have COMPILED entered in the Mode field of the Math and Logic Triggers Information table.

CML on a Run-Time-Only System

The CML development system executables must be transferred from the development system to the run-time system to run CML on a run-time-only system.

Perform the following steps to run CML on a run-time-only system:

1. Use either of the following methods to transfer the CML executables to the run-time system:
   - Use the FLSAVE and FLREST utilities to perform a save and restore of the application from the development system to the run-time system. This saves and restores the compiled CML task along with the rest of the application.
   - Copy the executables from {FLAPP}/USER/CML or {FLAPP}/SHARED/CML on the development system to the same path on the run-time system.
2. Start CML. Depending on whether the R flag was set in the System Configuration Information panel, do one of the following:
   - If the R flag was set then in Configuration Explorer, right-click the select the application name to display a context menu. Select Start on the menu to launch FactoryLink.
   - If the R flag was not set start CML from the Run-Time Manager (RTMON).

The compile process begins and CML creates the executables. Because the development and run-time operating systems are the same, CML runs as is.

CML Utilities Call Sequence

CML includes three utilities that create the executables CML uses at run time:

- MKCML
- PARSECML
- CCCML

At run time FLRUN is executed and starts a utilities call sequence as shown in Figure 20-24. Utilities are launched in a specific order:

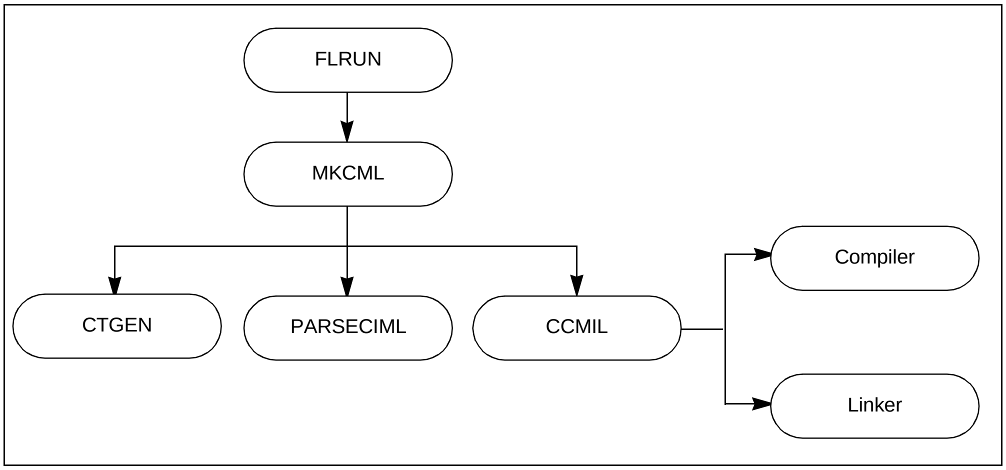
1. FLRUN calls the MKCML utility. The FLRUN command sets the FactoryLink path, the application directory path, the user name, and the domain name to the environment variables and turns off the verbose-level and clean-build parameters.

   Note: CTGEN (and GENDEF) run normally as part of FLRUN. If you are debugging and need to run the items separately, you should always run CTGEN and GENDEF before running MKCML.
   MKCML calls CTGEN, which ensures the Math and Logic .ct file is up to date.

2. MKCML calls PARSECML to produce .c files from the program (.prg) files.

3. MKCML then calls CCCML to compile the .c files into object files using an external compiler. Using an object linker, the object files are linked with library files into binary executable files.

Figure 20-24 CML Utilities Call Hierarchy



MKCML

The MKCML utility is a shell that calls the PARSECML and CCCML utilities as needed for the current application. For each domain, MKCML checks the dependencies between the configuration tables (named iml.ct for both IML and CML) and the program files. MKCML performs these tasks:

- Calls CTGEN which compares iml.ct against the database files. If the database files have a later time/date stamp than iml.ct, CTGEN rebuilds iml.ct to bring it up to date.
- Determines whether the time/date of iml.ct has changed. If so, MKCML reproduces and recompiles all of the .C files by calling PARSECML and CCCML.

When you redirect the output of MKCML to a file, the messages displayed in the dump seem to be out of order because of the method used by the operating system to buffer and output messages. If you do not redirect the output of MKCML, the messages are reported to the standard output in the correct order.

PARSECML

The PARSECML utility parses the application program files and produces .c files for each domain. It produces a .c file for each program file if the program Mode field is set to COMPILED in the Math and Logic Triggers Information table.

This utility also checks the dependencies between the program files and the .c files to check if any procedures have been updated since the .c files were last produced.

PARSECML has various levels of debugging via the -Vx parameter that can generate more detailed output or even add debugging statements to the C code.

CCCML

The CCCML utility compiles each .c file produced by PARSECML into an object file using an external compiler. It then links the object files with the FactoryLink and developer-supplied libraries into a binary executable. To determine the name of the compiler to use for a specific operating system, CCCML uses a special file called a makefile that is named: {FLINK}/CML/CML.MAK.

Its debugging levels provide minimal information, for example, the exact command line used to compile and link the code.

CML VARIABLES

CML variables provide manipulation of the CML environment as shown in Table 20-6.

Table 20-6 Miscellaneous CML Commands

Command	Definition	Example
CC	Designates the command line compiler.	CC
CCFLAGS	Specifies all of the command line options for compiling the .C files.	CCFLAGS - -dos2 -AL -Au -Od -Zp -G2s -nologo -c -I{FLINK}\inc
CMLOBJS	The stock CML files that are not application dependent. They are liable to change as versions change	CMLOBJS glvars.obj CMLOBJS cmlprocs.obj
USEROBJS	USEROBJS allows for the inclusion of user-defined object module at link time.	USEROBJS
LINK	Designates the command line linker	LKFLAGS - /NOE/ST:16384/se:512
CMLLKOBJS USERLKOBJS	These variables also allow for the inclusion of object modules that are not usually part of CML.	CMLLKOBJS USERLKOBJS
CMLLIBS USERLIBS	These variables also allow for the inclusion of libraries not usually part of CML.	CMLLIBS {FLINK}\LIB\FLIB.LIB\ CMLLIBS {FLINK}\LIB\CML.LIB USERLIBS
DEFFILE	This specifies the link definition file. It contains special information about window attributes, resources, or compiled output options. If this is altered, your customer support representative no longer supports it.	DEFFILE - {FLINK}\CML\CML.DEF
TARGET	This is the destination executable.	TARGET {FLAPP}\ {FLDOMAIN}\ cm,l\c{FLDOMAIN}.exe

User-defined C language includes files that use quotes; for example, #include “sample.h” should be placed in the {FLAPP}/{DOMAIN}/CML directory. Include files of the form #include <sample.h> should be placed in the path searched by the compiler. You may want to place them in the {FLINK}/INC directory. However, the include files are not saved with the application during a compressed save (MPS). The best place to put the include files is in the {FLAPP}/{DOMAIN}/CML to ensure the fields are saved with the application when an MPS is performed. If you place the include files in the latter directory, you should add the following to the cml.mak file on the line CFLAGS:

```
-dos2 -AL -Au -Od -Zp -G2s -nologo -c -I{FLINK}\inc -I{FLAPP}\ {FLDOMAIN}\CML
```

Running the Utilities from the Command Prompt Window

CML is designed so each of the CML utilities can be started from the command prompt window. This is useful when only a portion of the compile process needs to be processed.

The command line parameters used by all CML utilities are described in the Table 20-7.

Table 20-7 CML Command Line Parameters

Parameter	Description
-P	Sets the path to the FactoryLink program files
-A	Sets the path to the application directory
-U	Sets the user name
-N	Sets the domain name
-V*x*	Sets the verbose (debug) level to *x* where 1 is the lowest and 5 is the highest value
-C	Performs a clean build, reproducing all files from scratch

Verbose-Level Parameters

When you use a verbose-level parameter, the utility displays messages about its progress as it performs its part of the compile process. This serves as a debugging aid.

Table 20-8 shows the messages produced by each utility at the verbose level indicated.

Table 20-8 Verbose Setting Messages by Level

Utility	Verbose Level	Result Displayed	Run-time Effects
MKCML	1 or higher	Application name and domains as they are processed.	None
CCCML	1 or higher	—Message, “Not authorized to run Math and Logic” if the system cannot find the run-time bit. —Current application and domain being processed. —Message, “No .PRG files are configured as COMPILED”. —Message echoing the command line that calls the compiler or linker before making the call. —Names of each file as it is compiled. —Message indicating all files are up to date.	None
PARSCML	1	Name of each .c file name as it is produced.	None
PARSCML	2	Verbose level 1 message, plus: —The comments, containing the original source lines of the Math and Logic program, placed by the utility at the start of the generated C code. —All programs as they are parsed.	None
PARSCML	3 or higher	Verbose level 1 and 2 messages.	Print a statement upon entry and exit of procedure.
PARSCML	4	Verbose Level 1, 2.	Print each line as it executes.

CALLING C CODE

Use the following CML-specific keywords to call C code in a Math and Logic program:

- cfunc
- cbegin
- cend

Using cfunc

Use the keyword cfunc to declare standard C functions and user-defined C functions as callable in-line functions within a CML program. In-line C functions allow a CML program to call a C function directly without opening a C code block. The function must be declared before it is called.

The C code generated by CML provides prototypes for standard library functions; however, it does not include prototypes for user-defined C functions. You must provide function prototypes for all user-defined functions. Including a function without a prototype may result in compiler warnings regarding the missing functions.

Use only C functions that use the Math and Logic data types of SHORT, LONG, FLOAT, and STRING with cfunc. Although a C function may use any data type internally, its interface to Math and Logic must use only these types.

In the following example, testfunc is declared to use four arguments whose values are SHORT, LONG, FLOAT, and STRING data types and to return a value with a SHORT data type:

```
DECLARE cfunc SHORT testfunc(SHORT,LONG,FLOAT,STRING)
```

You may declare C functions to return the following data types:

Function:	**Value returned:**
SHORT	Short-integer
LONG	Long-integer
FLOAT	Floating-point
STRING	String
VOID	None

The VOID data type is unique to CML. Use VOID when declaring a function not required to return a value.

Do not use VOID in programs designed to run in interpreted mode.

cfunc Examples

The following examples show how to use cfunc:

Example 1—uses cfunc to declare the standard C function strcmp( ) for use within a CML program:

```
DECLARE cfunc SHORT strcmp(STRING, STRING)

PROC TEST(STRING s1)
BEGIN

   IF strcmp(s1,"QUIT")=0 THEN
      PRINT “QUITTING\n”
   ENDIF

END
```

The function strcmp( ) compares two strings and returns a value that indicates their relationship. In this program, strcmp compares the input string s1 to the string QUIT and is declared to have a return value of the data type SHORT.

- If the return value equals 0, then s1 is identical to QUIT and the program prints the message QUITTING.
- If the return value is less than or greater than 0, the program prints nothing.

C functions declared using cfunc have full data conversion wrapped around them, meaning any data type can be passed to and returned from them.

Given the previous sample code, the following program is legal within CML:

```
PROC MYPROC
BEGIN

DECLARE FLOAT   f
DECLARE LONG    k
DECLARE STRING  buff

   buff=strcmp(f,k)

END
```

In this program, strcmp converts the FLOAT value f and the LONG value k to strings, compares the two strings, and then returns a number (buff) that indicates whether the comparison was less than, greater than, or equal to zero. This comparison is:

- If f < k, then buff is a number less than 0.
- If f = k, then buff is equal to 0.
- If f > k, then buff is a number greater than 0.

Example 2—uses cfunc to declare the function testfunc which has a return data type of VOID:

```
DECLARE cfunc VOID testfunc(FLOAT)

PROC MYPROC
BEGIN

DECLARE FLOAT flp
   flp=100.0
   testfunc(flp)

END
```

In this program, the declared floating-point variable flp is set to 100.0 and this value is passed to the function testfunc. Note that VOID is entered in place of the data type for the function's return value. This is because the program is only passing a value to testfunc and the function is not required to return a value.

Using cbegin and cend

You can use the keywords cbegin and cend to embed C code directly into a CML procedure. Between these keywords, you can call external library functions and manipulate structures and pointers Math and Logic does not support; however, you cannot declare C variables inside a cbegin/cend block already within the scope of a procedure. When you declare a C variable, the declaration block from cbegin to cend must be displayed outside the procedure, above the PROC statement. Refer to the declaration of static FILE *Fp=stderr; in Example 2.

The cbegin and cend statement must each be on a line by itself with no preceding tabs or spaces. All lines between these two keywords (the C code block) are passed directly to the .C file PARSECML produces for this program.

The following examples show how to use the cbegin and cend keywords.

# Example 1:

```
PROC TEST(STRING message)
BEGIN

DECLARE STRING buff

   IF message="QUIT" THEN
      PRINT “FINISHED.\n”
   ENDIF

cbegin
   sprintf(buff,"The message was %s\n",message);
   fprintf(stderr,buff);
cend

END
```

In this program, the sprintf and fprintf functions, called between cbegin and cend, are passed directly to the .C file PARSECML generates for TEST. Note that local variables are within the scope of the C code block and can be accessed during calls to external functions.

Any C code blocks outside the body of a CML program are collected and moved to the top of the generated .C file, as shown in Example 2:

# Example 2:

```
cbegin
#include “mylib.h”
cend

PROC TEST(STRING s1)
BEGIN

   PRINT “The message is ”,s1
END

cbegin
static FILE *Fp=stderr;
cend

PROC SOMETHING (FLOAT f1)
BEGIN

cbegin
   fprintf(Fp,"%6.2g\n",f1);
cend

END
```

In this program file, the statement:

static FILE *Fp=stderr;

is moved to the top of the program file just after the line

include “mylib.h”

The following example shows how to access real-time database elements from within embedded C code blocks. It increments the values of two analog elements, Tag1 and Tag2[5], by 10.

```
cbegin

   int fl_tagname_to_id(TAG*, int, ...); /* function
   prototype missing from CML.H*/
cend

PROC example
BEGIN
cbegin
{

   TAG tag[2];
   ANA value[2];

   fl_tagname_to_id(tag,2, “TAG1”,“TAG2[5]”);
   fl_read(Task_id,tag,2,value);
   value[0] += 10;
   value[1] += 10;
   fl_write(Task_id,tag,2,value);

}
cend
END
```

> **Note:** The variable task_id is a predefined global CML variable and does not need to be declared.

The following example shows how to manipulate message tags within embedded C code (cbegin/cend code blocks). This example reads from TAG1, adds X to the string, then writes the result to TAG2.

```
PROC ADD_X
BEGIN
cbegin
{

   #define MAX_LEN 80            /* default maximum
                                    message length */
   int fl_tagname_to_id(TAG*,    /* function prototype /*
   int,...);                      /* missing from CML.H */
   TAG tags[2];
   MSG tag1, tag2;
   char string_buff[MAX_LEN+1];  /* max length plus
                                    terminating 0 */

   tag1.m_ptr=tag2.m_ptr=string_buf;
   tag1.m_max=tag2.m_max=MAX_LEN;

   fl_tagname_to_id(tags,2,"TAG1","TAG2");
   fl_read(Task_id,&tags[0],1,&tag1);

   strcat(string_buf,"X");
   tag2.m_len=strien(string_buf);
   fl_write(Task_id,&tags[1],1,&tag2);

}
cend
END
```

When values are assigned to and read from MESSAGE tags in the normal syntax for the procedure files the MAX LEN field is limited to 1023 characters. All message values are truncated at 1023 characters. The function f1_write ( ) must be called directly to store values longer than 1023 characters into a MESSAGE tag. The following example shows how to use a C macro to call the procedure msgtest to store a 90-character constant into the MESSAGE tag msgtag:

MSGTEST.PRG:

```
cbegin
void fl_tagname_to_id(TAG*,int,...);
#define assign_msg(tagname, value) {\
   TAG tag; \
   MSG msg; \
   char buf[] = value; \
   fl_tagname_to_id(&tag,1,tagname); \
   msg.m_ptr = buf; \
   msg.m_len = strlen(buf); \
   msg.m_max = strlen(buf)+100; /* leave plenty of room */ \
   fl_write(Task_id,&tag,1,&msg); \

}
cend

PROC msgtest
BEGIN
```

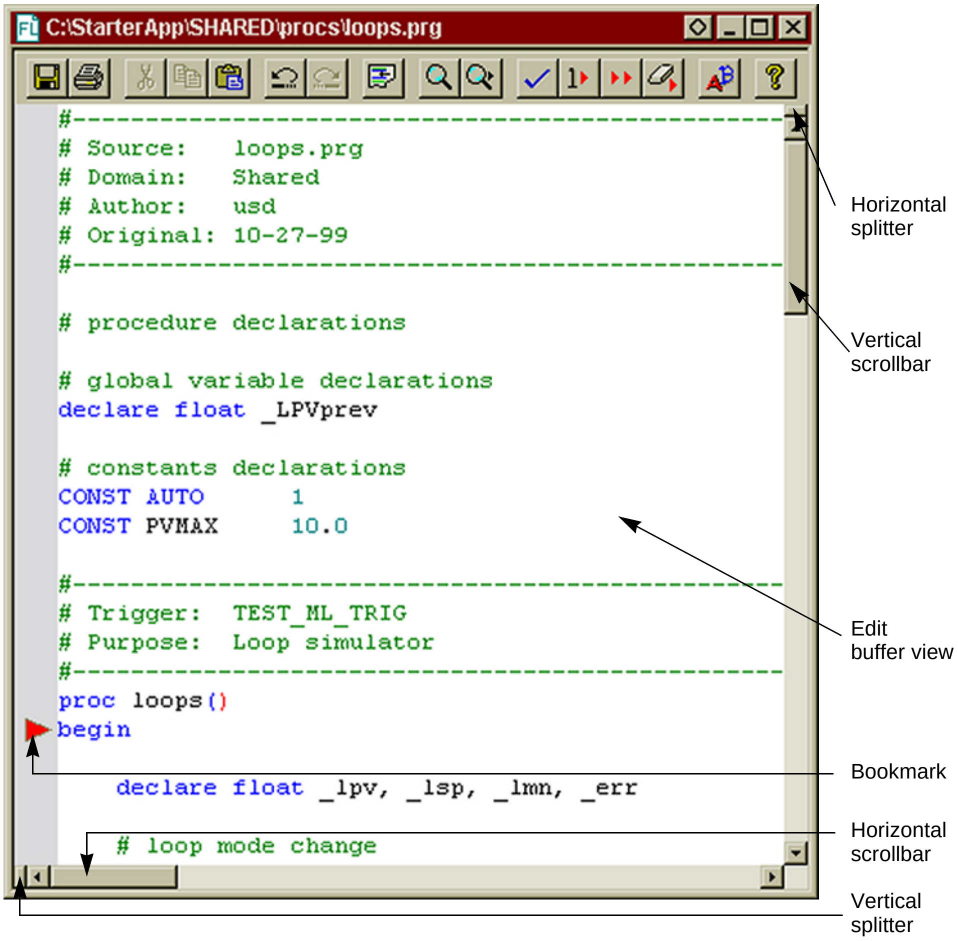
```
cbegin
assign_msg(“msgtag”,”12345678901234567890123456789012345678901234567890123456789
0123456789012345678901234567890”)
cend
END
```

Math and Logic Editor Reference Pages

The Math and Logic editor is a Single Document Interface (SDI) application that allows multiple concurrent instances to run within the FactoryLink environment. The editor is accessed using the Configuration Explorer program and acts as an in-place active server.

Chromocoding, color automatically assigned according to syntax, is provided by the editor to assist the user in identifying keywords, operators, declarations, global tags, commented lines and strings. See the example Math and Logic Editor file in Figure 20-25. Find the definitions of the screen icons in Table 20-9.

Figure 20-25 Math and Logic Editor Screen Example



```
#--------------------------------------------------
# Source:   loops.prg
# Domain:   Shared
# Author:   usd
# Original: 10-27-99
#--------------------------------------------------

# procedure declarations

# global variable declarations
declare float _LPVprev

# constants declarations
CONST AUTO       1
CONST PVMAX      10.0

#--------------------------------------------------
# Trigger:  TEST_ML_TRIG
# Purpose:  Loop simulator
#--------------------------------------------------
proc loops()
begin

    declare float _lpv, _lsp, _lmn, _err

    # loop mode change
```

Other features supported by the Math and Logic Editor are:

- Keyboard shortcuts
- Split horizontal and vertical views of the same edit buffer which can be scrolled separately
- Configurable window properties for customizable views
- Numerous edit commands with keystroke functions enabling, for example, quick copy-paste, drag and drop, find-replace, tab-to-space/space-to-tab conversion.
- Microsoft IntelliMouse® support for quick scrolling.

Math and Logic Editor Icons

Icons provided for quick access to functions appear at the top of the editor window. Their functions and descriptions are shown in Table 20-9.

Table 20-9 Math and Logic Editor Icons (Sheet 1 of 2)

Icon	Function	Description
💾	Save	Saves the changes in the selected (active) file
🖨	Print	Prints the selected (active) file
✂	Cut	Copies the selected text
⎘	Copy	Copies the selected text
📋	Paste	Pastes the information that has been saved in the clipboard
↶	Undo	Remove the last edit(s) in reverse sequence they were made. The undo function buffers the last XX edits to undo.
↷	Redo	Read last edit(s) in reverse sequence they were removed. The redo function buffers the last XX undo functions.
📝	Insert procedure	Inserts the text and initiates a new procedure.
🔍	Find	Search for whole word, fragment and match case. This standard find function provides the addition of setting bookmarks at each find location to facilitate editing.
🔍	Find next	Repeat last find with same properties.

Table 20-9 Math and Logic Editor Icons (Sheet 2 of 2)

Icon	Function	Description
✓	Validate	Checks the file for: matching braces, parens and brackets definition of local and global variables (tags) basic syntax such as correct use of operators essential keywords are preset (BEGIN, END, PROC)
1▸	Go to first error	Advances the cursor to the first line with an error in the file.
▸▸	Go to next error	Advances the cursor to the next line containing an error. Wraps to the top of the file if cursor is on or below the last error line.
	Clear all marks	Clears all bookmarks and error marks from the file.
AB	Font	Displays the Font dialog box to enable selection of font type, style and size
?	Display the About information box.	Shows current Math and Logic software version plus the location of the FLAPP and FLINK directories

Mouse Functions

Custom mouse functions are described in Table 20-10.

Table 20-10 Mouse Actions in the Math and Logic Editor

Mouse Action	Result
Left-button click over text	Inserts the cursor in the text at the position the mouse is clicked
Right-button click	Displays the Math and Logic context menu
Left-button down over selection, and drag	Moves the selected text
Control + Left-button down over selection, and drag	Copies the selected text
Left-Button click over left margin	Selects line
Left-Button click over left margin, and drag	Selects multiple lines
Alt + Left-Button down, and drag	Select columns of text
Left-Button double click over text	Select word under cursor

Table 20-10 Mouse Actions in the Math and Logic Editor

Mouse Action	Result
Spin IntelliMouse mouse wheel	Scroll the window vertically
Single click IntelliMouse mouse wheel	Select the word under the cursor
Double click IntelliMouse mouse wheel	Select the line under the cursor
Click and drag splitter bar	Split the window into multiple views or adjust the current splitter position
Double click splitter bar	Split the window in half into multiple views or combine the window if already split

Keyboard Shortcuts

For users who prefer keyboard commands, the Math and Logic editor provides an abundance of keyboard shortcuts. For a complete list of the actions and keycodes arranged alphabetically by keyword, refer to Table 20-11.

Table 20-11 Keyboard Shortcuts (Sheet 1 of 4)

Keyword	Action	Keycode
BookmarkNext	Go to next bookmark	F2
BookmarkPrev	Previous bookmark	Shift + F2
BookmarkToggle	Set/delete bookmark on current line	Control + F2
CharLeftExtend	Select character(s) left and extend	Shift + Left Arrow
CharRightExtend	Select character(s) right and extend	Shift + Right Arrow
Copy	Copy	Control + C
	Copy	Control + Insert
Cut	Cut selection	Shift + Delete
		Control + x
		Control + Alt + w
Delete	Delete forward	Delete
	Delete back	Backspace
DocumentEnd	Go to end of document	Control + End
DocumentEndExtend	Select from cursor location to end of document	Control + Shift + End
DocumentStart	Go to start of document	Control + Home

Table 20-11 Keyboard Shortcuts (Sheet 2 of 4)

Keyword	Action	Keycode
DocumentStartExtend	Select from cursor location to start of document	Control + Shift + Home
Find	Open find dialog box	Alt + F3
Find		Control + F
FindNext	Find next match	F3
FindPrev	Find previous word	Shift + F3
FindReplace	Open find and replace dialog box	Control + Alt + F3
GoToLine	Open go-to-line dialog box	Control + G
GoToMatchBrace	Go to matching brace	Control +]
Home	Go to start of line	Home
HomeExtend	Select from cursor back to start of line	Shift + Home
LineCut	Cut current line	Control + Y
LineDowNextend	Select from cursor to line below cursor	Shift + Down
LineEnd	Go to end of line	End
LineEndExtend	Select from cursor to end of line	Shift + End
LineOpenAbove	Add line above current line	Control + Shift + N
LineUpExtend	Select from cursor to line below cursor	Shift + Up
LowercaseSelection	Change selection to lower case	Control + U
PageDownExtend	Select from cursor to top of next page	Shift + Page Down
PageUpExtend	Select from cursor to bottom of previous page	Shift + Page Up
Paste	Paste	Control + V
		Shift + Insert
Properties	Display Window Properties dialog box	Alt + Enter
RecordMacro	Record a new macro	Control + Shift + R
SelectLine	Select line	Control + Alt + F8

Table 20-11 Keyboard Shortcuts (Sheet 3 of 4)

Keyword	Action	Keycode
SentenceCut	Cut current sentence and all sentences above up to first occurring blank line	Control + Alt + K
SentenceLeft	Go to beginning of previous line after line break (previous sentence)	Control + Alt + Left
SentenceRight	Go to beginning of next blank line (next sentence)	Control + Alt + Right
SetRepeatCount	Set repeat counter (use this in conjunction with macros to repeat the macro)	Control + R
TabInsertSelection	Change every four spaces in selection to tabs	Control + Shift + T
TabRemoveSelection	Change tabs in selection to four spaces per tab	Control + Shift + Space
ToggleOvertype	Toggle between overtype and insert	Insert
ToggleWhitespaceDisplay	Toggle between white space and no white space display	Control + Alt + T
Undo	Undo last edit(s) in reverse sequence they were made. The undo function buffers the last XX edits to undo.	Control + Z Alt + Backspace
UnindentSelection	Unindent Selection (doesn’t work - only moves tab to right)	Shift + Tab
UppercaseSelection	Change selection to uppercase	Control + Shift + U
WindowScrollDown	Cursor remains in current line but file scrolls down	Control + Up Arrow
WindowScrollLeft	Window scrolls to the left one character at a time	Control + Page Up
WindowScrollRight	Window scrolls to the right one character at a time	Control + Page Down
WindowScrollUp	Cursor remains in current line but window scrolls up	Control + Down Arrow
WordDeleteToEnd	Delete the word or symbol to the right	Control + Delete

Table 20-11 Keyboard Shortcuts (Sheet 4 of 4)

Keyword	Action	Keycode
WordDeleteToStart	Delete the word or symbol to the left	Control + Backspace
WordLeft	Move the cursor one word to the left	Control + Left Arrow
WordLeftExtend	Select word(s) to the left	Control + Shift + Left Arrow
WordRight	Move the cursor one word to the left	Control + Right Arrow
WordRightExtend	Select word(s) to the right	Control + Shift + Right Arrow

Chromocoding

Color helps to define the purpose of the text at a glance. Colors are automatically assigned to the text as soon as the editor recognizes the special character, numeric, or word. For a description of the colors and the functions they describe, refer to Table 20-12.

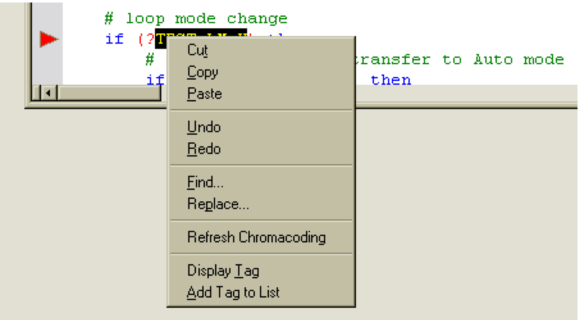
Table 20-12 Color Codes for the Math and Logic Editor

Color	Function
Red	Punctuation symbols
Blue	Reserved words and globally defined variables
Purple	Strings
Black	Text not globally defined
Green	Comments
Aquamarine	Numerics

Menu Commands

Right-click the mouse with the cursor positioned in the edit buffer to display a context menu as shown in Figure 20-26.

Figure 20-26 Math and Logic Context Menu



```
    # loop mode change
    if (?T
        #                    transfer to Auto mode
        if                   then
```

For a list of the context menu commands and their corresponding actions, refer to Table 20-13.

Table 20-13 Editor Right-Click Context Menu Commands

Command	Action	Comment
Cut	Remove selected test	Standard cut function
Copy	Copy selected text	Standard copy function
Paste	Paste test from the clipboard	Standard paste function
Undo	Remove last edit	Remove the last edit(s) in reverse sequence they were made. The undo function buffers the last XX edits to undo.
Redo	Read last removed edit	Read last edit(s) in reverse sequence they were removed. The redo function buffers the last XX undo functions.
Find	Search for whole word, fragment and match case	Standard find function which provides the addition of setting bookmarks at each find location to facilitate editing.
Replace	Search for above and substitute new text	Standard replace function providing the ability to find and replace the entire document or just the selected text.
Refresh Chromocoding	Check syntax/function color settings	Standard window refresh function
Display Tag	Displays the FactoryLink TagEditor dialog box if the tag is not previously defined	Use this box to configure or modify the global tag and add it automatically to the Tag list and the Math and Logic Variables table.

Table 20-13 Editor Right-Click Context Menu Commands

Command	Action	Comment
Add to Tag List	Displays the FactoryLink TagEditor dialog box if the tag is not previously defined	Use this box to configure or modify the global tag and add it automatically to the Tag list and the Math and Logic Variables table.

Chapter 21 . . . .

Persistence

The Persistence task saves values from an active FactoryLink application at predetermined times to prevent loss of useful data if FactoryLink shuts down unexpectedly. These saved values are written to disk and are not affected when FactoryLink shuts down. Then, when you restart FactoryLink with the warm start command-line option, the Run-Time Manager restores the real-time database from the values in the disk file.

This chapter covers the following topics:

- Persistence Overview
- Principles of Operation
- Resolving Configuration Changes
- Configuring Persistence
  - Individual Elements
  - Domain Element List
  - Persistence Save Information Panel
- Persistence Task Start Order
- Persistence and Digital Elements
- Persistence Save File Name
- Editing Tag Persistence Setting Using BH_SQL Utility
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

PERSISTENCE OVERVIEW

The memory-resident real-time database is a collection of element values and it represents the current state of the application. The values of the elements are lost when the application is shut down because the real-time database is removed from RAM. When the application is started again, the real-time database is recreated and its elements are initialized to zero or their default values, if defined.

This can be a problem if FactoryLink unexpectedly shuts down because of an event, such as a power loss or a faulty process. Useful information can be lost because of the initialization of the real-time database to zero or its default values when the system is restarted. Since most of the information in FactoryLink applications is the accumulation of data over time, you cannot recover this data unless it is saved. Persistence provides a way of saving the state of an active FactoryLink application.

Persistence is the ability of an element to maintain its value over an indefinite period of time. Non-persistent elements lose their value when the Run-Time Manager exits and shuts down the real-time database. Persistent elements, however, are written to disk so they are not affected when the real-time database shuts down.

The job of the Persistence task, therefore, is to write element values to disk, making these values persistent. The file the task creates is called a *persistence save file*.

The task offers the following features:

- Offers two ways to configure which elements will be persistent:

  - On a per-element basis
  - On a domain basis

- Allows you to specify either a warm or cold start when starting FactoryLink

  - Cold start initializes all elements to their default values as configured in the Tag Definition dialog. Persistent elements are not restored to their previous values but are initialized to their default values.

  - Warm start initializes all non-persistent elements to their default values just like a cold start and restores all persistent elements to their previously saved values.

- Uses its own internal disk cache to increase speed and reduce disk I/O overhead
- Resolves configuration changes to the application
- Allows you to specify a trigger element that triggers the Persistence task to copy the current persistent save file to a backup file

Principles of Operation

Before configuring Persistence, you must first determine which elements must be saved, when their values are saved, and how these saved values are restored during a warm start. Then, specify this information on the Tag Definition dialog for each persistent element.

At run time, the Persistence task saves the values of the persistent elements to its own internal disk cache and then writes the data to disk from there. Saving the persistent values to memory first increases processing speed and ensures all values meant to be saved are saved within the allotted time.

The RESOLVE program, executed by the FLRUN command, creates a blank persistence save file the first time it is executed. At startup, the Persistence task loads the persistence save file to determine which elements in the application are persistent and when the values of those elements are to be saved. It also loads the PERSIST.CT file to get specific information about the configuration of the Persistence task itself.

Performing a Warm Start

Unless you tell FactoryLink to use the persistence save file, it will initialize all values in the real-time database with either zeros or default values, as usual. To initialize the database with values from the save file, you must use a special command line argument, -*w*, when starting FactoryLink. The -w means *warm start*, and it tells FactoryLink to use the save file. When you warm start FactoryLink, Persistence loads the save file. Then the Run-Time Manager restores the real-time database from the values in the save file. Non-persistent values (those not in the save file) are initialized to either zero or their default values.

To add the -w to the command line for the Start FactoryLink icon, follow the steps below:

1. Right-click the Start FactoryLink icon. Click Copy.
2. Right-click inside the FactoryLink program group. Click Paste. A copy of the Start FactoryLink icon is pasted into the program group.
3. Right-click the new icon. Click Properties. The Properties dialog appears.
4. Choose the Shortcut tab. Go to the end of the command line in the Target field and add -w. Make sure there is a space between the last character in the command line and the dash in -w. Click OK.
5. Right-click the new icon again and click Rename to change its label; for example, Warm Start FactoryLink. Press Enter.

Resolving Configuration Changes

Configuration changes to an application could affect the Persistence save file. After you reconfigure an application using either the Main Menu or the Application Editor, the elements and their values stored in the Persistence save file either may not exist or may not have the same data type when you restart the application. Before each FactoryLink session is restarted, the element names stored in the Persistence save file must be checked for changes against the OBJECT.CT and the DOMAIN.CT files.

The RESOLVE.EXE program automatically resolves any configuration changes. The FLRUN command automatically executes this program before it starts the Run-Time Manager.

The RESOLVE program serves three purposes:

1. Creates the blank Persistence save file the first time it is run
2. Manages the changes between the Persistence save file and the FactoryLink configuration files
3. Determines if the Persistence save file is usable and, if not, the program looks for and uses the Persistence backup file

RESOLVE makes the following changes:

- Removes element names from the Persistence save file that have been deleted from the application or changed to a different data type
- Updates the element name ID for element names that were deleted, then recreated
- Adds element names to the Persistence save file that have been reconfigured to have Persistence (these element names are added with no data values.)
- Copies the Persistence backup file over the Persistence save file if the save file is corrupted

Configuring Persistence

Before configuring Persistence, you must first consider which elements in the application are critical to application startup and must be saved. This subset of elements from your application will be the ones you mark as persistent. It is not feasible for Persistence to save every value in an application. Rather, you want to make sure that Persistence saves only those values that need to be maintained after the application shuts down. To make use of this save file after FactoryLink has shut down, you must restart FactoryLink with the *-w* argument.

There are two steps in configuring Persistence in an application:

1. Mark the elements to be saved as persistent.
2. Configure the Persistence task itself by completing the Persistence Save Information table.

Marking the elements tells the Persistence task which elements to save, but the task does not run until you configure its table.

Marking Elements to be Persistent

There are two ways to mark elements as persistent:

- Individually
- Per domain

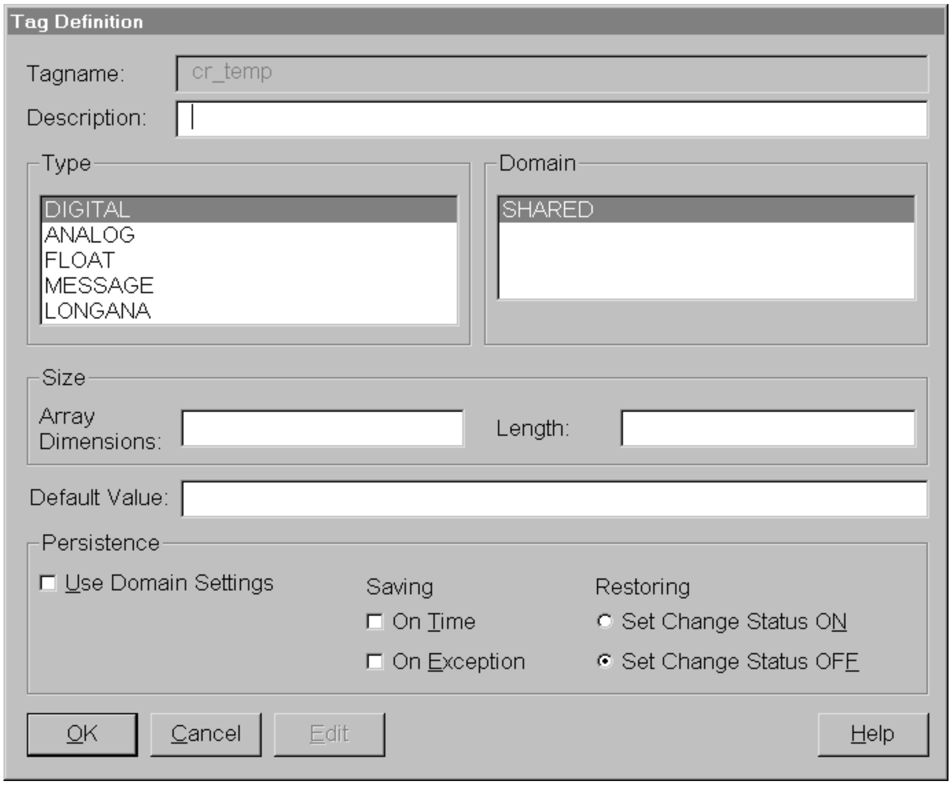
You mark individual elements as persistent in the Tag Definition dialog. You mark elements on a domain basis using both the Tag Definition dialog and the Domain Element List in the Main Menu. Each method is explained in the following sections. In both methods, you indicate how element values will be saved, and how the elements' change-status bits will be set when their values are restored during a warm start of FactoryLink.

Persistence for Individual Elements

Configure Persistence for individual elements using the Persistence section of the Tag Definition dialog. The Tag Definition dialog is displayed when you:

- Define a new element in either a configuration panel from the Main Menu or in an animation dialog in the Application Editor, or
- Press Ctrl-T in a Tag field for a previously defined element.

The Persistence section of the Tag Definition dialog is explained below:



Tag Definition

Tagname: cr_temp

Description:

Type: DIGITAL, ANALOG, FLOAT, MESSAGE, LONGANA (DIGITAL selected)

Domain: SHARED (selected)

Size — Array Dimensions: Length:

Default Value:

Persistence

□ Use Domain Settings

Saving
□ On Time
□ On Exception

Restoring
○ Set Change Status ON
● Set Change Status OFF

Use Domain Settings Saves the value of this persistent element according to the option chosen in the Domain Element List. The Saving and Restoring options are disabled when this option is chosen.

Deselect Use Domain Settings to enable the Saving and Restoring options for this element specifically.

Saving Indicates when the value of this persistent element is saved. Click one, or both, of the following:

On Time—Saves the value of the persistent element on a timed trigger.

On Exception—Saves the value of the persistent element whenever its value changes.

Restoring Indicates how to set this element's change-status bits when it's value is restored in the real-time database. Click one of the following:

Set Change Status ON—Restores the persistent element with its change-status bits set to 1 (ON) after a warm start.

Set Change Status OFF—Restores the persistent element with its change-status bits set to 0 (OFF) after a warm start. This is the default.

For example, you may have several Math & Logic procedures triggered by digital tags but the application controls when these tags are force-written to a 1 (value = 1; change-status bits = 1). If you perform a warm start with Change Bits ON, all of the digital tags change-status bits are written to a 1 and all of your IML procs run at once.

No Options Selected — This element is not marked as persistent.

To configure Persistence for individual elements, follow the steps below:

1 Make sure the Use Domain Settings box is NOT checked.

2 Choose when you want to save this element's value by clicking On Time, On Exception, or both.

3 Choose how you want to restore this element's value from the persistence save file to the real-time database at application startup by clicking Set Change Status ON or Set Change Status OFF.

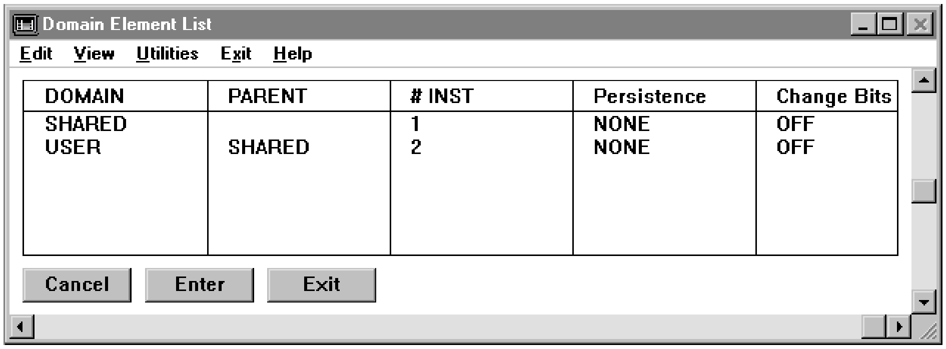
4 Click OK.

Persistence for a Domain

Domain persistence means that all persistent elements in a domain are saved the same way and restored the same way. This is in contrast to the individual method just described where each element can be marked differently for saving and restoring. Configure persistence for a domain using both the Tag Definition dialog and the Domain Element List. Elements that have Use Domain Settings checked in their Tag Definition dialog follow the domain configuration in the Domain Element List.

To configure Persistence for a domain, follow the steps below:

1 Open the Domain Element List in the Main Menu.



DOMAIN	PARENT	# INST	Persistence	Change Bits
SHARED		1	NONE	OFF
USER	SHARED	2	NONE	OFF

Use the Persistence and Change Bits fields.

> **Note:** The options selected here apply ONLY to those elements that have Use Domain Settings checked in their Tag Definition dialog.

2 Choose the Persistence field in the row containing the domain to be made persistent. Press Ctrl/K to open the key list and select the method to save the elements' values:

None The elements are not persistent.

Timed Saves the values of the elements on a timed trigger.

Except Saves the values of the elements whenever their values change.

Both Saves the values of the elements both on a timed trigger and whenever their values change.

3 Choose the Change Bits field for the same domain and press Ctrl/K. Select how to set the elements' change-status bits when their values are restored to the real-time database:

ON Restores the elements with their change-status bits set to 1 (ON) after a warm start.

OFF Restores the elements with their change-status bits set to 0 (OFF) after a warm start.

4 For those elements that you want to mark as persistent, open the Tag Definition dialog for that element and select Use Domain Settings in the Persistence section. The elements will be saved in the Persistence save file and restored to the real-time database per the selections in the Domain Element List.

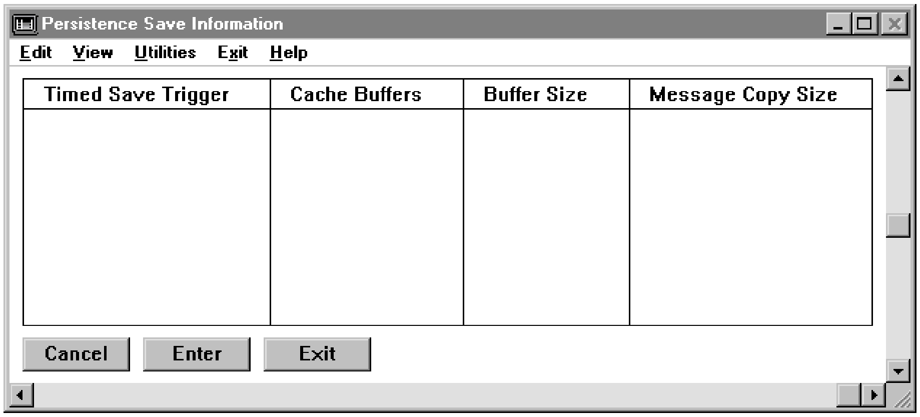
Note that if no elements are marked as Use Domain Settings, then the selections in the Domain Element List are ignored.

Configuring the Persistence Task

You must also configure the operation of the Persistence task itself along with marking Persistence for individual elements or domains.

Ensure the correct domain is selected in the Configuration Manager Main Menu Domain Selection box.

Choose Persistence from the Main Menu to display the Persistence Save Information panel. Specify the following information:



Timed Save Trigger Name of an element used to trigger a timed save of the values of all elements marked as persistent by time.

When the element defined here is triggered at run time, the Persistence task reads all elements in the current domain instance configured to be saved on a timed basis and writes their values to disk (the Persistence save file).

Leave this field blank only if no timed saves are required.

Note: If this field is left blank, you MUST fill in the Cache Buffers field. Not entering the appropriate information in a Persistence Save Information panel will result in problems when creating the .ct file for Persistence. An error message will appear at run time, and the Persistence task will not run.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is undefined.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

Cache Buffers

Number between 0 and 32766 indicating the number of buffers to be set aside for the Persistence task's internal disk cache. The greater the number of buffers, the less the task writes to the disk, which improves performance.

Use the following guidelines to aid in determining the number of buffers:

- How often the data is changing
- How much of the data is changing
- The size of the data that is changing

While there is no definitive way to determine the ideal number of buffers, you can use the total number of tags of each data type that are persistent in the application to calculate an estimation of the maximum buffer size. The formula is

max buffer size = [(# of analog + digital)*2] + [(# of longana)*4] +
[(# of float)*8] + [(# of msg)*len]

where len is the message length from the Persistence panel. Then select a combination of number of buffers multiplied by buffer size that equals this value.

If you enter 0, no disk caching is done.

Valid Entry: numeric value of up to 32766 (default =16)

Buffer Size

Number between 64 and 32766 indicating the size, in bytes, of each buffer in the cache. The default is 512. The larger the buffer, the less the task writes to the disk, which improves performance.

Valid Entry: numeric value of up to 32766 (default = 512)

Message Copy Size

Number between 80 and 32766 indicating the maximum length allowed for message elements during persistent saves. FactoryLink uses the number entered here when it reads elements from the real-time database and when restoring values during a warm start. The default is 2048.

Valid Entry: numeric value of up to 32766 (default = 2048)

Backup Trigger

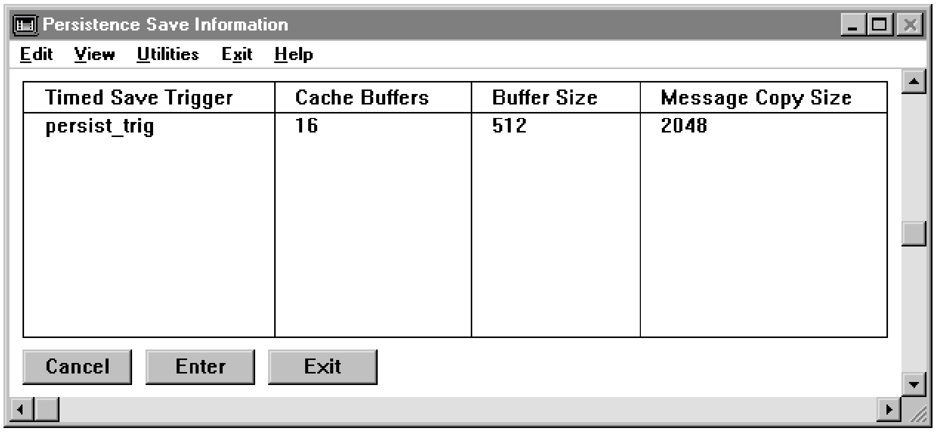
Name of an element used to trigger a backup of the current persistent save file.

A Tag Definition dialog is displayed when you click Enter if the tag specified in this field is not already defined.

At run time, when the application triggers the element defined here, the Persistence task copies the current Persistence save file to a backup file.

Valid Entry: standard tag name
Valid Data Type: digital, analog, longana, float, message

The completed panel resembles the following sample.



Timed Save Trigger	Cache Buffers	Buffer Size	Message Copy Size
persist_trig	16	512	2048

In this example, when the value of the element persist_trig changes to 1 (ON), it triggers the Persistence task to write to disk the values of all elements in the application configured as persistent by time. The number of buffers set aside for the internal cache is 16 with 512 bytes per buffer. A disk cache is a way to compensate for the slowness of the disk drive in comparison to RAM (memory). The Persistence task’s cache process speeds up computer operations by keeping data in memory. Rather than writing each piece of data to be saved to the hard disk, the task writes the data to its internal disk cache (reserved memory area). When the disk is not busy with other processing or when the cache process can perform several writes in an order that minimizes the movements of the disk’s heads, the cache process writes the saved data to the hard disk.

The maximum length for message elements during persistent saves is 2048 bytes. When the value of the element persist_backup changes to 1, it triggers Persistence to copy the current Persistence save file to a backup file.

PERSISTENCE TASK START ORDER

This section describes some possible effects of warm restarts on the application depending on when Persistence starts and what has happened to the other tasks during the startup process.

Caution: This discussion applies only if the TASKSTART_? tags from the System Configuration Table are made persistent.

Example 1: Persistence starts last and shuts down first

After the application starts, the values of the TASKSTART_? tags are 1, so Persistence saves a 1 as their last known value. At shutdown, because Persistence stops first, Persistence does not see the change in value of the TASKSTART_? tags from 1 to 0 (zero), so the saved values remain as 1. On a warm start of the application, the TASKSTART_? tags for all tasks running at shutdown are restored to 1 and therefore, their tasks will start. It is important to note that these same tasks will be started regardless of their “R” flag settings in the SYS.CT file.

Note: This assumes no manual starts/terminations.

Example 2: Persistence starts first and shuts down last

Because Persistence starts first, it sees the application starting and, therefore, sees the values of the TASKSTART_? tags at 0. Because Persistence stops last, it saves a 0 as the last known value of the TASKSTART_? tags if a termination happens during the startup process. On a warm start of the application, none of the tasks start because all of the TASKSTART_? tags have a last known value of 0.

The shutdown order is more significant than the startup order if the tags are saved on change. In general, specify the Persistence task to shutdown first (and therefore, start last) so the saved values in the Persistence save file reflect the last known running state of the application at shutdown. Then, the warm start restores it to that state, which is the purpose of the Persistence task.

Persistence and Digital Elements

The way a digital element is used in an application affects how that element is configured for Persistence. Digital elements are often used to trigger some action in an application. Examples include starting a Math & Logic procedure or starting a FactoryLink task. When a digital element is triggered (its value is changed from 0 to 1 or force-written to 1), FactoryLink starts the associated procedure or task. When FactoryLink is warm-started, these elements are restored to their last saved value. Configuring a digital element as persistent with its value to be restored with Change Status ON can be used to start any procedure or task associated with this element after the system is initialized.

However, the digital elements RTMCMD and RTMCMD_U, cannot be made persistent because, when the value of these elements is set to 1, the FactoryLink system shuts down, which makes these elements persistent and immediately shuts down the system.

Note that the R (Run) flag for each task in the System Configuration Information panel supersedes the value of the digital start trigger associated with a task.

Examples

The following examples show the relationship between the R flag in the System Configuration Information panel and the restored value of a digital element.

Example 1

The R flag is NOT set for task A, and the digital start trigger associated with task A is defined as persistent by Exception (always updated) with Force Change Status ON if:

- Task A is running when the system is shut down, then the value of the task’s digital start trigger is 1. When a warm start is performed, the system restarts task A because the value of the digital start trigger is restored to 1.
- Task A is not running when the system is shut down, then the value of the task’s digital start trigger is 0. When a warm start is performed, the system does not restart task A because the value of the digital start trigger is restored to 0.

Example 2

The R flag IS set for task A and the digital start trigger associated with task A is defined to be persistent by Exception (always updated) with Force Change Status ON if:

- Task A is running when the system is shut down, then the value of the task’s digital start trigger is 1. When a warm start is performed, the system restarts task A because the value of the digital start trigger is restored to 1.
- Task A is not running when the system is shut down, then the value of the task’s digital start trigger is 0. When a warm start is performed, the system still restarts task A because, even

though the value of the digital start trigger is restored to 0, the task's Run flag is set and the Run flag supersedes the restored value of the digital start trigger.

PERSISTENCE SAVE FILE NAME

The persistent data is saved in a unique Persistence save file for each domain instance. The Persistence save files have the extension .PRS and are located in the /FLAPP/FLNAME/FLDOMAIN directory.

where

FLAPP	Translated application environment variable.
FLNAME	Translated application environment variable.
FLDOMAIN	Translated domain environment variable.

The name of each Persistence save file is {FLUSER}.PRS where FLUSER is the translated environment variable for the domain user name. The Persistence save file contains the saved values for that domain user.

For example, in Windows, where the FLRUN.BAT file sets the Shared FLUSER environment variable to SHAREUSR, but the USER domain FLUSER environment variable remains at the default setup in the AUTOEXEC.BAT file, the Shared persist file is named SHAREUSR.PRS and the User persist file is named FLUSER1.PRS.

The Persistence backup files are in the same place and have the same name, except they have the extension .BAK.

EDITING TAG PERSISTENCE SETTINGS USING BH_SQL UTILITY

It may be useful for users to be able to make mass edits to the current Persistence settings for defined tags in the OBJECT configuration table, such as changing the field entries for all tags that currently are blank to a specific setting, such as NONE. This can be done using the BH_SQL utility provided with all FactoryLink systems. This utility has the following functions:

1. Modifies the OBJECT.CDB file in the FLAPP director
2. Modifies the TAGPERWHEN field in that file

TAGPERWHEN (meaning Tag is saved when) is the text equivalent of the radio buttons on the Tag Definition dialog when defining a tag or using CTRL-T to view the tag definition. The possible values are:

- NONE—tag is not persistent
- Left blank—same as NONE
- DOMAIN—save based on domain Persistence definition as configured in the Domain configuration panel.
- TIMED—save on timed trigger
- EXCEPT—save on change

The procedure updates the table changing all instances of a specific entry in the TAGPERWHEN field at one time to a new value.

Prior to executing the instructions below, we recommend you make a backup of the application using the FLSAVE utility or some other backup utility. At least make a backup copy of the OBJECT.CDB and OBJECT.MDX files so if anything goes wrong during the procedure, the backup can be restored with no damage done to the application. The general syntax can be modified to update the Persistence setting for any group of tags from the current settings to any valid new setting as a group, by varying the literal values in the first and second instance of tagperwhen = '????'.

Perform the following steps to use the BH_SQL utility:

1 Type the program name at a prompt for all systems except MS Windows. For MS Windows, run the program from Start>Run.

2 Type

```
SQL >  connect  flapp <ret>
```

at the BH_SQL prompt

where

flapp	Actual path to the FLAPP directory as defined in the FLAPP environment variable.

3 Type

```
SQL >  update object set tagperwhen = ’NONE’ where tagperwhen = ” <ret>
```

at the BH_SQL prompt (quote marks are all single quotes not double quotes) where the first instance of tagperwhen = ’NONE’ is the desired new value for the field and the second instance is the current value of the field (in this case a blank entry). This command finds all records in the OBJECT table for which the current tag Persistence setting is blank and changes all the settings to NONE.

Use the following command if you have a large number of tags configured to be saved as defined for the domain configuration and you want to change the setting for all of these tags to be saved individually when they change value or on exception.

```
SQL >  update object set tagperwhen = ’DOMAIN’ where tagperwhen = ’EXCEPT’  <ret>
```

Type QUIT at the BH_SQL prompt once all desired changes have been made.

4 Click Enter to save the information.

5 Click Exit to return to the Main Menu.

PERSISTENCE ERROR MESSAGES

One of the following messages may be displayed next to PERSIST on the Run-Time Manager screen if an error occurs with Persistence at run time.

Can’t get a task ID for %s

Cause: Could not connect to a running FactoryLink application.

Action: Ensure the application is running, then try again.

Can’t open the file or the /FLAPP/CT/PERSISTENCE.CT file does not exist or is corrupt.

Action: If the file exists, delete it and restart the application to recreate the file. If the file does not exist, create it by restarting the application.

Can’t use backup save file

Cause: If the RESOLVE program cannot use the Persistence save file (*.PRS) because it is corrupted, the program looks for the Persistence backup file (*.BAK). If RESOLVE cannot use the .BAK file, it generates this message.

Action: Delete the original save and backup files and the task creates new save file and a new backup file.

Error deleting the file:

Cause: The specified file cannot be deleted. Another developer may be using it or the file is read-only.

Action: Check to see if the file is being opened by another developer or if the file is read-only.

Error getting FLINK environment variables

Cause: The variables FLDOMAIN, FLNAME, and FLUSER are not defined.

Action: Define the variables from the system prompt using the following format:

```
set (flvar)=(flvardef)
```

where

flvar is the FactoryLink environment variable FLDOMAIN, FLNAME, or

FLUSER.

flvardef is the developer-defined name for this variable.

Error reading CT file: *filename*

Cause: Either the file /CT/PERSISTENCE.CT is corrupt, or the .CT script file (/FLINK/CTG/PERSISTENCE.CTG) and the FactoryLink Run-Time version are not of the same version.

Action: Delete the file /FLAPP/CT/PERSISTENCE.CT. Restart the application to rebuild the file.

Error reading Persistence file: *filename*

Cause: Either the file is corrupt or the disk is damaged.

Action: Inspect the file. Run CHKDSK or any disk diagnostic program to locate problems with the disk drive.

Error reading RTDB: %d

Cause: You tried to read an element value from the database and the kernel returned this message with an error number.

Action: Shut down and restart the application and try to read the value again.

Error seeking in file: *filename*

Cause: Either a hardware error or a corrupted system exists.

Action: Contact Customer Support.

Error writing to file: *filename*

Cause: Either a hardware error or a corrupted system exists.

Action: Contact Customer Support.

Invalid CT file structure in: *filename*

Cause: The specified .CT file is corrupted.

Action: Run ctgen -r to rebuild the .CT files and try again.

Invalid or corrupt save file

Cause: The Persistence save file (*.PRS) is corrupt. The task looks for and attempt to use the Persistence backup file (*.BAK).

Action: No action required - information message only.

Out of RAM

Cause: Not enough RAM available to perform this task.

Action: Close any unnecessary windows or programs, such as the Application Editor or any text editor. Add RAM to the system if this error message occurs often.

%s is not a FactoryLink Persistence file

Cause: The specified file is not in the Persistence save file format and does not have a .PRS extension.

Action: Remove the offending file. If the Persistence backup file (*.BAK) exists, copy it to the save file with a .PRS extension.

Save file was not closed properly

Cause: The task generates this message when it begins to copy the Persistence backup (*.BAK) file on the Persistence save (*.PRS) file.

Action: No action required - information message only.

Task Initialization failed

Cause: The Persistence task is already running, a key is not installed, the wrong key is installed, or you are not authorized to have the key.

Action: Check that the proper key is installed if you are authorized to have the key.

Chapter 22. . . .

Programmable Counters

Programmable Counters task provides count-per-unit-of-time measurements and event delays, such as defining a trigger to unlock a door and then specifying a delay before the door locks again.

This chapter covers the following topics:

- Principles of Operation
- Programmable Counters Information Panel
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Principles of Operation

A programmable counter is a group of elements with components that work together to perform a count. Outputs from programmable counters can be used to provide input to Math & Logic programs or other FactoryLink tasks or to trigger Math & Logic programs.

Each programmable counter is made up of some or all of the following elements and analog and digital values.

Elements

- Enable—triggers counting activity.
- Up Clock—initiates the count upward.
- Down Clock— initiates the count downward.
- Clear—resets the counted value to the starting point.
- Positive Output—contains the value 1 (on) when the counting limit has been reached.
- Negative Output—contains the value 0 (off) when the counting limit has been reached.
- Current Value—indicates the current value of the count.

Digital and Analog Values

- Preset Value—analog value that specifies the starting value.
- Increment Value—analog value that specifies the amount by which the count is to increase or decrease each time.
- Terminal Value—analog value that specifies the counting limit.
- AutoClear—digital value that resets the count to the starting point whenever the terminal value is reached.

Counting begins when another FactoryLink task, such as Math & Logic or EDI, writes a 1 (ON) to the Up Clock element. This triggers the Programmable Counters task to move the Current Value toward the Terminal Value by the Increment Value. If the Preset Value is less than the Terminal Value, the Increment is added to the Current Value. If the Preset Value is more than the Terminal Value, the Increment is subtracted from the Current Value.

There is no limit, except the amount of memory, to the number of programmable counters that can be defined.

Example One

In this example, counting is triggered to count bottles (20 per case). The Preset Value (start count) is 0 and the Terminal Value (count limit) for the number of bottles per case is 20. The Increment Value of 1 represents one bottle. When counting is triggered, each bottle counted increases the current count of bottles (starting with 0 in the case) by 1 until the case contains 20 bottles (until the Current Value reaches the Terminal Value of 20).

When the case contains 20 bottles (when the Current Value reaches the Terminal Value), the Counter task indicates the case is full by force-writing a 1 (ON) to the Positive Output element and force-writing a 0 (OFF) to the Negative Output element. At this point, if AutoClear = YES, the Current Value element is reset to 0 (the Preset Value) and the count can begin again. If AutoClear = NO, the current Value element remains at 20 (the Terminal Value) until another task writes a 1 (ON) to the clear element, indicating the count can begin again. The count does not continue past 20 (the Terminal Value). Each time the bottle count reaches 20 (the Terminal Value), the Counter task again force-writes a 1 (ON) and a 0 (OFF) to the Positive and Negative Output elements. When AutoClear = YES or when the Clear element is triggered, the bottle count is reset to 0 (the Preset Value), ready for a repeat of the counting process.

Example Two

You can set up another task, such as EDI or Math & Logic, to react to a deviation, such as a defective bottle, during the count by adjusting the count. To adjust the count, that task writes a 1 (ON) to the Down Clock element to cause the value of the Current Value element to move toward the Preset Value by the Increment Value.

For example, during counting, if a defective bottle is counted but not packed in the case, the EDI or Math & Logic task subtracts that bottle from the total count by writing a 1 (ON) to the Down Clock element to cause the Current Value to move toward the Preset Value (0 in this example) by the Increment Value (1 in this example).

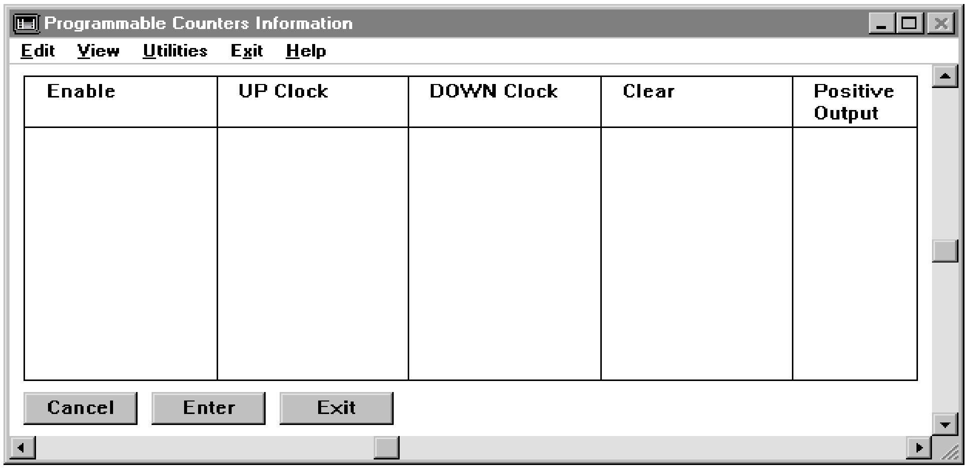
After six bottles have been counted and packed in the case, the Counter task counts the seventh bottle. But the seventh bottle is defective, so it is not packed in the case. Therefore, the EDI or Math & Logic task subtracts that bottle from the total count by writing a 1 (ON) to the Down Clock element. This causes the Current Value to move from 7 down to 6.

PROGRAMMABLE COUNTERS INFORMATION PANEL

The Programmable Counters task establishes parameters for the initiation, performance, and conclusion of counting activity. With the -t program argument in the System Configuration for the Counters task, negative output, positive output, and current value are initialized. Positive output is set to 0. Negative output is set to 1. With no program argument, those tags remain at their default/persistent values.

The Programmable Counters task uses either SHARED or USER domain. We recommend SHARED domain unless counters should be unique to each user for the purposes of the application.

Choose Programmable Counters from the Configuration Manager Main Menu and specify the following information:



Programmable Counters Information
Edit View Utilities Exit Help

Enable	UP Clock	DOWN Clock	Clear	Positive Output

Enable Name of an element that enables or triggers counting. If this field is left blank, counting is always enabled because the trigger becomes either the UP CLOCK or the DOWN CLOCK. When the value of Enable is set to 1 (ON), counting occurs. If the value of Enable is set to 0 (OFF), counting does not occur.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital

Up Clock

Name of an element that causes the value of the Current Value element (present count) to move toward the Terminal Value (count limit). When a 1 (ON) is written to the Up Clock element, the value in the Current Value element is increased by the amount specified by the Increment Value element. If the Preset Value (starting count) is less than the Terminal Value, the Increment Value is added to the Current Value. If the Preset Value is greater than the Terminal Value, the Increment Value is subtracted from the Current Value.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

At least one type of clock must be defined; that is, an entry is required in either the Up Clock or Down Clock field.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

Down Clock

Name of an element that causes the value of the Current Value element (present value) to move away from the Terminal Value (toward the Preset Value). When a 1 (ON) is written to the Down Clock element, the value in the Current Value element is decreased by the amount specified by the Increment Value element. If the Preset Value is less than the Terminal Value, the Increment Value is subtracted from the Current Value. If the Preset Value is greater than the Terminal Value, the Increment is added to the Current Value. The Current Value does not move past the Preset Value, and the Positive/Negative Outputs are not triggered when the Preset Value is reached. The data type for this tag is digital.

At least one type of clock must be defined; that is, an entry is required in either the Up Clock or Down Clock field.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

Clear

Name of an element that causes the Current Value to be reset to the Preset Value each time a 1 (ON) is written to it (the Clear element). Each time a 1 (ON) is force-written to the Clear element, a 0 (OFF) is force-written to the Positive Output element and a 1 (ON) is written to the Negative Output element.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital, analog, longana, float, message

Positive Output

Name of an element a 1 (ON) is written to each time the Current Value reaches the Terminal Value. The value of the Positive Output element remains 1 (ON) until a 1 (ON) is written to the Clear element.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital

Negative Output

Name of an element a 0 (OFF) is written to each time the Current Value reaches the Terminal Value. The value of the Negative Output element remains 0 (OFF) until a 1 (ON) is written to the Clear element. This tag is set to 1 at task startup.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	digital

Current Value

Name of an element to specify the name of an element that contains the current value of the counter. This value is always between the Preset Value and the Terminal Value.
The default is 0.

If the tag specified in this field is not already defined, a Tag Definition dialog is displayed when you click Enter with a tag type of analog in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	analog, longana

Preset Value

Enter a number between -32768 and 32767 to specify the starting value for a count. This numerical value is written to the Current Value element whenever the value of the Clear element is set to 1 (ON).

Valid Entry:	numeric value between -32768 and 32767 (default = 0)

Increment Value

Enter a number between 0 and 32767 to specify the numerical value that is combined with the Current Value when the Up or Down Clock is triggered.

Valid Entry:	numeric value between 0 and 32767 (default = 1)

Terminal Value

Enter a number between -32768 and 32767 to define the numerical value that specifies a limit for counting activity. When the Current Value is the same as the Terminal Value, counting stops and Positive and Negative

Outputs are triggered. Counting remains stopped until the Clear element is triggered; however, if AutoClear is set, a Clear is performed immediately after the Positive and Negative Outputs are triggered.

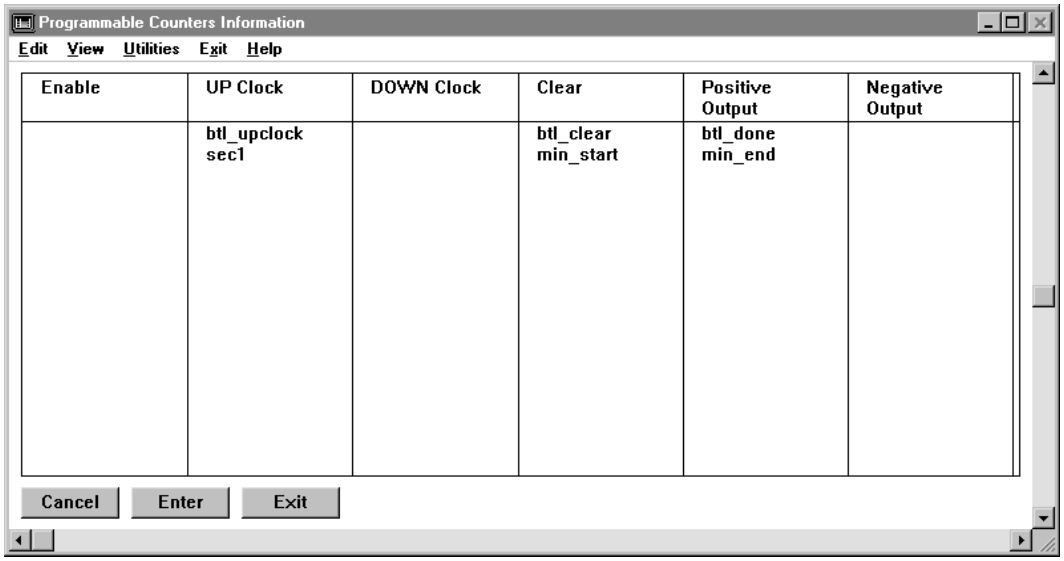
Valid Entry: numeric value between -32768 and 32767

Autoclear Indicator that a Clear should be performed each time the Terminal Value is reached. This can be one of the following:

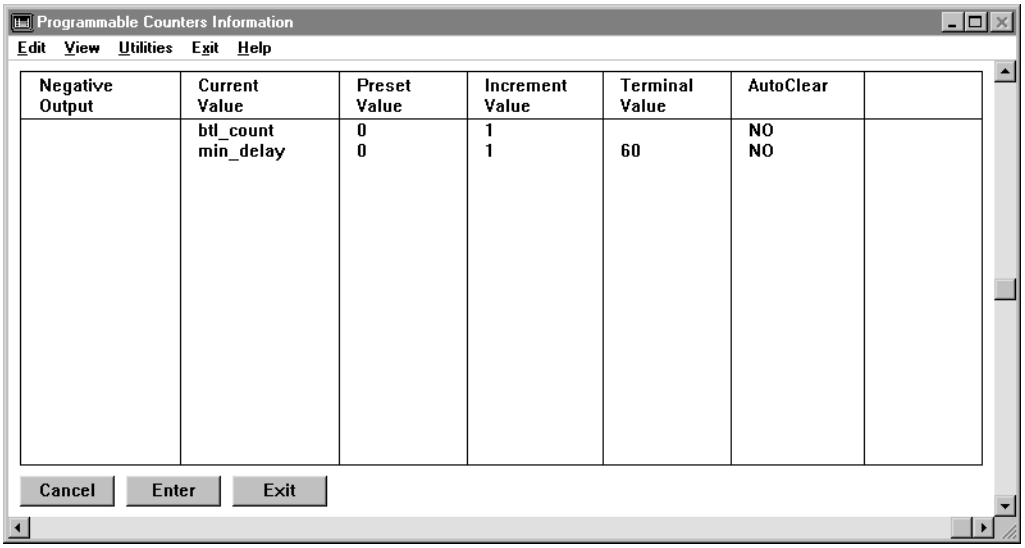
YES Clear is performed each time the Terminal Value is reached. This is the default.

NO Current Value remains equal to the Terminal Value until Clear is triggered.

The panel should resemble the following sample when all information has been specified .



Enable	UP Clock	DOWN Clock	Clear	Positive Output	Negative Output
	btl_upclock		btl_clear	btl_done	
	sec1		min_start	min_end	


Programmable Counters Information
Edit View Utilities Exit Help
Cancel
Enter
Exit

Negative Output	Current Value	Preset Value	Increment Value	Terminal Value	AutoClear
	btl_count	0	1		NO
	min_delay	0	1	60	NO

In the first example (first line on the panel), the counter, along with a Math & Logic procedure that saves the count and resets the counter, counts the number of bottles packed per minute. Since the Enable field is left blank, counting is always enabled. Each time a bottle is packed, a 1 (ON) is written to the Up Clock element btl_upclock. This triggers the Counters task to increase the Current Value (btl_count) by 1. Each minute, FactoryLink triggers a Math & Logic procedure to log the Current Value and trigger the Clear element btl_clear to reset the count for the next minute.

In the second example (second line on the panel), the counter is used to create a one-minute delay of an event, such as bottle capping. Since the Enable field is left blank, counting is always enabled. When the value of sec1 becomes 1 (ON), the Counters task increases the Current Value min_delay by 1. The task continues to increase this value once each second until the Current Value matches the Terminal Value of 60. At this time, counting stops and the Counters task writes a 1 (ON) to the Positive Output element min_end, indicating the end of the one-minute delay. Other FactoryLink tasks can monitor the min_end element to trigger another operation and then write a 1 (ON) to the Clear element min_start to reset the count.

PROGRAMMABLE COUNTERS ERROR MESSAGES

The following messages may be displayed in the STATUS field at the right of COUNTER on the Run-Time Manager screen:

Can’t start process ’COUNTER’

Cause: The default number of processes may be less than FactoryLink requires to start up because the operating system parameters were not set properly during FactoryLink installation and setup.

Action: Contact Customer Support.

Corrupt configuration table index

Cause: The /FLINK/CT/CNT.CT file is damaged.

Action: Delete the file. Restart the application to rebuild the file.

Corrupt data in information panel

Cause: The /FLINK/CT/CNT.CT file is damaged.

Action: Delete the file. Restart the application to rebuild the file.

Invalid CT record size

Cause: The /FLINK/CT/CNT.CT file has been damaged.

Action: Delete the file. Restart the application to rebuild the file.

No counter tag defined

Cause: You did not define an Up Clock, Down Clock, or Clear element.

Action: Define at least one of the elements listed above.

No counters defined

Cause: You have not defined any counters for the Programmable Counters task.

Action: Perform one of the following:
1. Choose Programmable Counters from the Configuration Manager Main Menu. Use the Programmable Counters Information panel to add one or more triggers.
2. Choose System Configuration from the Main Menu. If the Counters task will not be used, remove the R flag from the Counters task row in the System Configuration Information panel.

No tables configured for this task

Cause: FLINK/CT/CNT.CT does not exist or cannot be opened. The installation may not have completed successfully or the file may have been damaged.

Action: Delete the file. Restart the application to rebuild the file.

Out of RAM

Cause: No more memory is available.

Action: Close any unnecessary windows or programs, such as the Application Editor or any text editor. Add memory to the system if this error message occurs often.

Value tag must be analog

Cause: The data type of the Current Value element is invalid.

Action: Choose Programmable Counters from the Configuration Manager Main Menu. Ensure the Current Value element defined in the Programmable Counters Information panel is an analog element.

Chapter 23 . . . .

Defining the Report Format

Data FactoryLink collects or computes is stored as data elements in a real-time database. Each time data is collected or computed, the value stored in the real-time database for an element is overwritten by the new data.

If you want to report on the data, you can write the data to a report file as it is received using Report Generator. Report Generator is a flexible reporting tool that lets you define custom reports. The data included on the report can be generated as a disk file, a printed report, or exchanged with other programs that accept ASCII files.

Some typical uses for generating report data include the following:

- Predicting potential problems based on data patterns
- Reporting on productivity of shifts
- Generating hardcopy reports for management or specific agencies

This chapter covers the following topics:

- Reporting Methodology
- Components of a Format File
- Placement of Reported Data
- Trigger Actions
- Report Format Variations
- Complete Triggers
- Escape Sequence
- Configuring the Report Format File

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Reporting Methodology

This section describes and illustrates how memory-resident real-time data is logged to a report file for generating a report.

This task completes the following steps to generate a report:

1 The real-time database receives and stores data from various sources, such as a remote device, user input, or computation results from a FactoryLink task. When data is collected and stored in this database, other tasks can access and manipulate it.

2 When a report is triggered, Report Generator reads the values of real-time database elements included on the report and maps them to object names. Object names are used in defining the report format or template file.

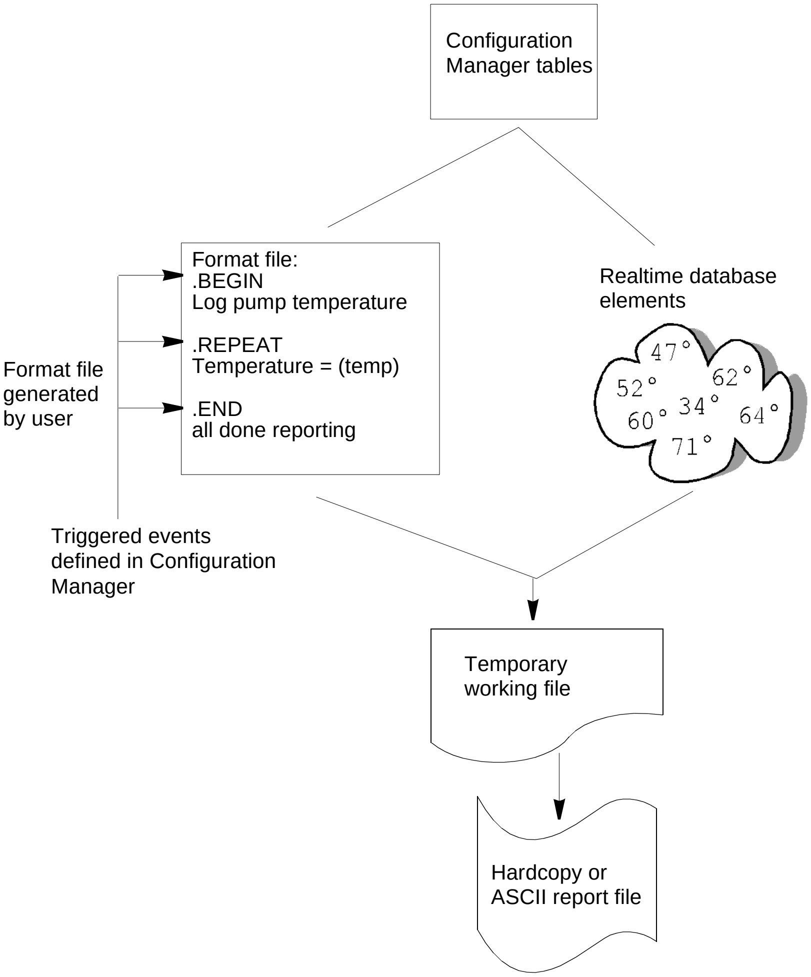
3 Report Generator checks the report format file to determine placement of text and objects in the report file. The format file contains keywords that trigger when the report starts, ends, and writes data. Each keyword represents a section. When the trigger executes, the associated section of the format file is processed and written to a temporary working file.

4 Report Generator uses the information in the report format file to create a temporary disk-based working file. This working file is a temporary file that remains open until the report completes and exists only until the report is completed.

The temporary file resides on disk, not in memory, to protect against loss of data. For example, if FactoryLink shuts down before Report Generator has created the report archive file, the report temporary file still exists on disk.

5 When the report is completed, the information in the temporary disk-based working file is sent to either a permanent file on disk, a printer, or a communication port.

The following illustration outlines the process of generating a report.


Configuration Manager tables
Format file:
.BEGIN
Log pump temperature
.REPEAT
Temperature = (temp)
.END
all done reporting
Realtime database elements
47°
52°
62°
34°
60°
64°
71°
Format file generated by user
Triggered events defined in Configuration Manager
Temporary working file
Hardcopy or ASCII report file

Components of a Format File

User-defined ASCII format files control the look and contents of the report. A unique format file is defined for every report generated by Report Generator. This section describes the components of the format file.

Keywords

Keywords are used in the format file to trigger an action. The associated section of the format file is processed and written to a temporary working file when the trigger executes. Three keywords are used in format files:

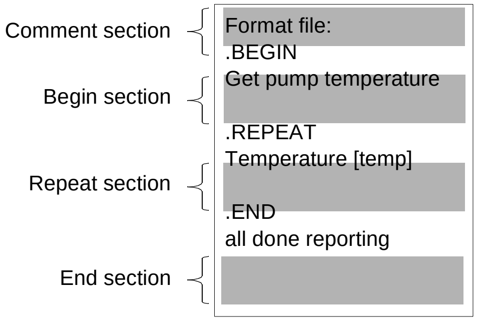
- .BEGIN
- .REPEAT
- .END

Keyword lines begin with a period (.), followed by a keyword and a line terminator such as LF (Line Feed) or CR, LF (Carriage Return, Line Feed) sequence.

Comment lines can also be included in the format file by starting the line with a period and following it with any text that does not represent a keyword. Text displayed in a comment line is not included on the report.

Sections of Format File

There are four distinct sections to the format file as shown in the following illustration.



```
Format file:
.BEGIN
Get pump temperature

.REPEAT
Temperature [temp]

.END
all done reporting
```

The sections and their associated keywords are:

- Comment section—First section in any format file. Any text displayed in this section is not included on the report. This section usually includes a description of the report purpose. Do not precede the text in this section with a period.
- Begin section—Header section is delineated by the keyword .BEGIN, which defines the report header. Any text displayed after the .BEGIN keyword and before the next keyword is included at the beginning of the report.
- Repeat section—Repeat section is delineated by the keyword .REPEAT. This section contains the object names of real-time database elements to include on the report. Each time the repeat section executes, element values are written to the temporary working file. This section can also include literal text included in the report.
- End section—End section is delineated by the keyword .END. This section ends the report and contains text to include at the end of the report.

> **Note:** In past releases, when reports were stopped and started before the end trigger, when the task is restarted and the begin (or repeat if no begin trigger) is activated, the working file from previous run is opened in append mode, and a new begin section is added. Now the system will check to see if a report file already exists. If it does, the system will not add another header. This software enhancement is now the default. If your process mandates the previous mode of operation, then add "-h" for backward compatibility.

Each format file is composed of one or more of these sections. The only required section is the end section; that is, every report format must have an end section. If you only include an end section in the format file, you generate a snapshot report. Refer to “Report Format Variations” on page 499 of this guide.

Placement of Reported Data

Data specified in the format file is collected from the real-time database and placed into the report. Placement of real-time database values is determined by the following:

- Location of its object name in the format file
- Format specifiers

Location of Object Name

Object names act as a placeholder for data and are linked to data elements in the real-time database. The value of the real-time database element it is linked to replaces the object name during report generation.

Braces {} or brackets [ ] identify object names within the format file.

- Enclose the object name in braces { } for data that may vary in length. This places the data relative to other text in that line because the position may change based on the length of the element value. A typical use may be to locate data within a sentence.
- Enclose the object name in brackets [ ] for fixed position data. The value of the element associated with the object name is displayed in the report exactly where the object name is displayed. The starting bracket is the anchor for the data. This is typically used for formatting data in columns.

The identifier (braces or brackets) is not displayed in the generated report file. Use an escape sequence identified in “Escape Sequences” on page 501 if you want a brace or bracket to be displayed in the report.

You can use object names in the begin, repeat, and end sections.

Format Specifiers

Format specifiers allow you to define a variable where a literal is expected. Format specifiers can consist of two types of objects:

- Ordinary characters, which are copied literally to the output stream
- Variable specifiers, which indicate the format variable information are displayed in

Format specifiers use the following form:

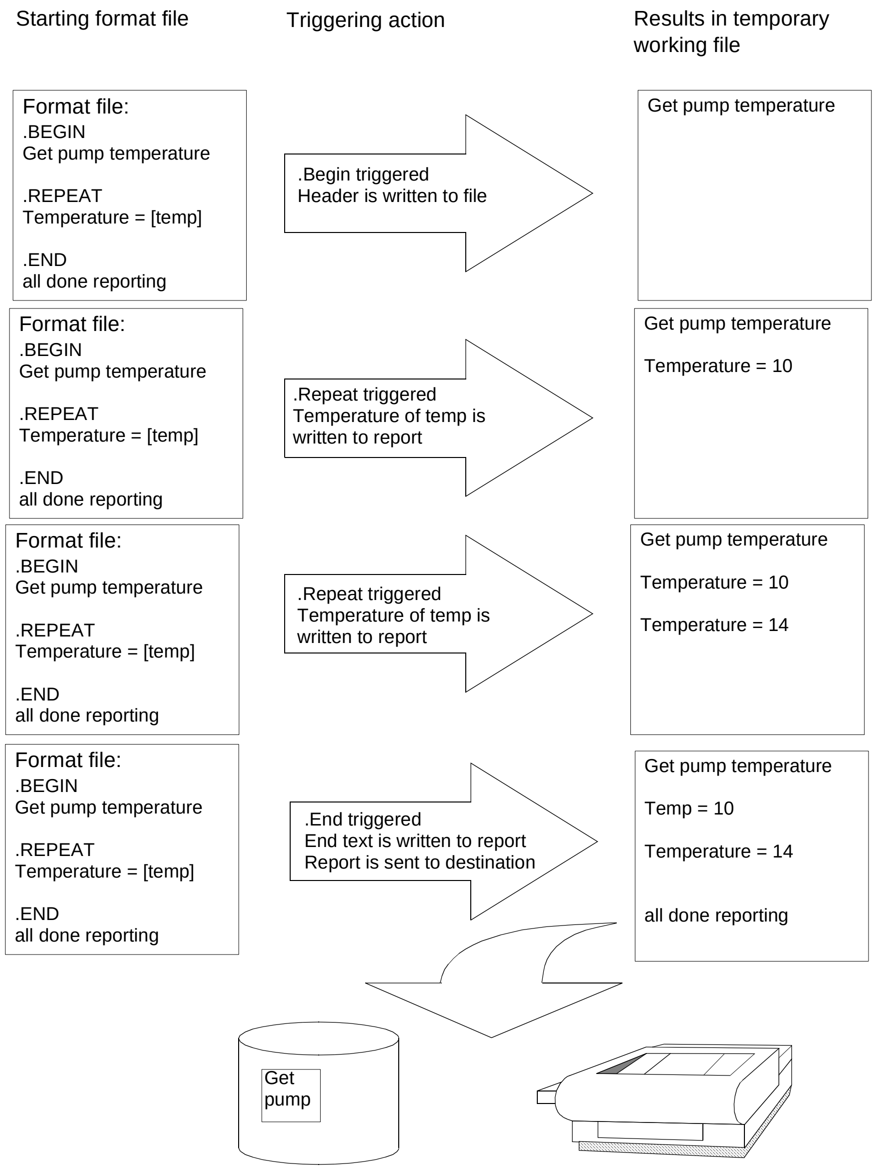
% [flags][width][.prec]type

The following table provides a list of the specifiers typically used with Report Generator.

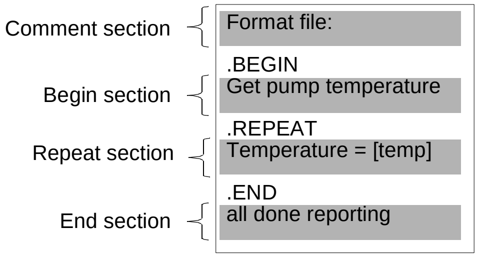
Sample Archive File	Report Archive File Tag	Value of Archive File Tag	Actual Archive File Path Generated
C:\USCO\REPORT.%03d	A_DOY	33	C:\USCO\REPORT.033
C:\USCO\%s.RPT	shift	“FIRST”	C:\USCO\FIRST.RPT
C:\USCO\PUMP%d\RPT.RPT	pump_no	1	C:\USCO\PUMP1\RPT.RPT

TRIGGER ACTIONS

When a .BEGIN, .REPEAT, or .END trigger executes, the associated section of the format file is processed and written to a temporary working file. The following figure illustrates what occurs when each keyword is triggered.


Starting format file
Triggering action
Results in temporary working file
Format file:
.BEGIN
Get pump temperature
.REPEAT
Temperature = [temp]
.END
all done reporting
.Begin triggered
Header is written to file
Get pump temperature
Format file:
.BEGIN
Get pump temperature
.REPEAT
Temperature = [temp]
.END
all done reporting
.Repeat triggered
Temperature of temp is written to report
Get pump temperature
Temperature = 10
Format file:
.BEGIN
Get pump temperature
.REPEAT
Temperature = [temp]
.END
all done reporting
.Repeat triggered
Temperature of temp is written to report
Get pump temperature
Temperature = 10
Temperature = 14
Format file:
.BEGIN
Get pump temperature
.REPEAT
Temperature = [temp]
.END
all done reporting
.End triggered
End text is written to report
Report is sent to destination
Get pump temperature
Temp = 10
Temperature = 14
all done reporting
Get pump

This example generates a report using the following format file, which includes all three sections.



```
Format file:

.BEGIN
Get pump temperature

.REPEAT
Temperature = [temp]

.END
all done reporting
```

This sample report format is used to generate an historical data log. A temporary working file is opened when the report is triggered. This file remains open until the end section is triggered.

The report header is written to the file when the begin section is triggered. In this example, Get pump temperature is written at the top of the report.

When the repeat section is triggered, the values of the data elements mapped to the object names included in this section are read from the real-time database and written to the file. In this example, the value of the real-time element containing the pump temperature is mapped to the object name temp and is written to the report.

Any literal text included in this section is also written to the file. In this example, the literal text Temperature = is written to the report in front of the element value.

The event that triggers the repeat can be a periodic sampling, a specific time, or an event driven trigger like a part meeting a photo-eye in a conveyor system.

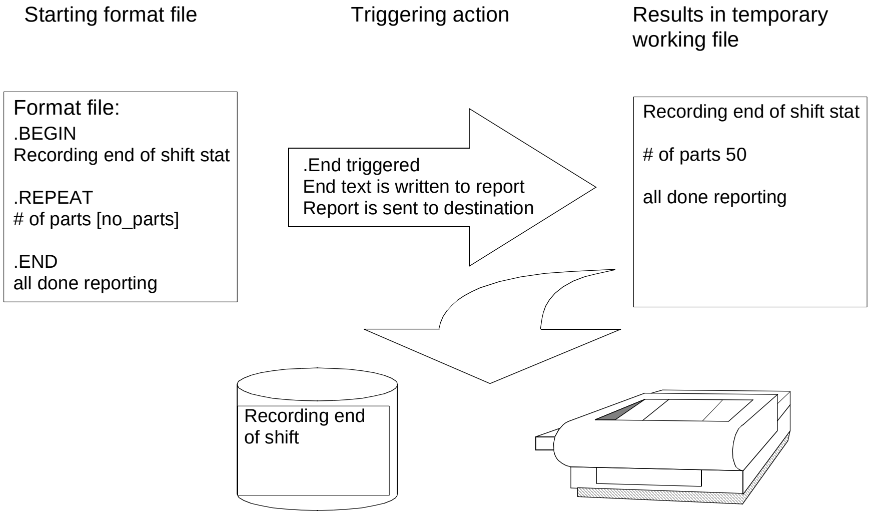
You can trigger the repeat section any number of times before ending the report. In this example, the pump temperature is written to the report twice. The first time its value is 10; the next time its value is 14.

The literal text in this section is written to the temporary working file when the end section is triggered; then, the entire report is sent to its configured destination. This can be a disk-based file, a printer, or across the network to another node. The temporary working file is deleted.

REPORT FORMAT VARIATIONS

A simple variation on the report used in the previous example can be generated by not specifying an event or trigger for the begin section. This is typically used if no header type information is necessary. An end section must always be specified.

Another common format for reports is a snapshot report. The purpose of this type of report is to gather information and to generate a printed report by triggering a single event. This is done by specifying only an end trigger. The begin and repeat keywords in the format file are ignored because no triggering event is specified. The end event causes all information in the format file to be sent instantly to the printer. The following figure illustrates this type of report.



Complete Triggers

FactoryLink returns a complete status for each of the triggered events once the operation has completed. The operation is considered completed for begin and repeat sections when the information is written into the temporary file. The operation is considered completed for the end section when the temporary file is sent to the specified device (printer, communication port, or disk file).

The complete status allows you to effectively coordinate report generator operations with other FactoryLink tasks and to display the status to the operator.

Typically the data reported on in the repeat section is generated from an external device (EDI task). In order to maintain data integrity, it may be necessary to coordinate operations between these two tasks because you do not want to log data to the report unless you are certain the data has been returned successfully from the EDI task. Likewise, you do not want to sample more data from the external device before the previous data is logged through the report generator.

Another application that may require coordination is if you want to read data from a relational database using Browser and write it to the printer. You can do this by using the complete trigger on the Browser to trigger the Report Generator repeat trigger and then have the Report Generator complete trigger generate a move to the next database row in the Browser task. This coordination takes place until all rows are fetched. Use Math & Logic to verify not only complete, but successful completion, with both tasks.

ESCAPE SEQUENCES

Escape sequences send instructions to the printer, such as backspaces, form and line feeds, carriage returns, or horizontal tabs. These sequences can also be used to change operating modes of printers to compressed versus standard print.

The following table lists and explains commonly used escape sequences.

Escape Sequence	Description
\b	Send backspace (0x08).
\f	Send form feed (0x0C).
\n	Send line feed (0x0A).
\r	Send carriage return (0x0A).
\t	Send horizontal tab (0x09).
\XX	Send 0xXX or any two uppercase hex digits (\9F).
\Z	Send Z, where Z is any character not previously listed.
\.	Send. (necessary to start a Report File line with a period.)
\[	Send [.
\{	Send {.
\\\\	Send a single \\.

CONFIGURING THE REPORT FORMAT FILE

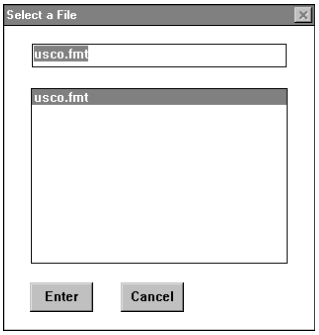
A format file is required to determine the placement of the generated data when a reporting operation is triggered for Report Generator. This format file is created in the Report Generator Format panel, a free-form text entry panel.

You must define a unique format file for every report. Format files are stored by default in the FLAPP/rpt directory as *filename*.fmt where *filename* is the name you assign to the format file.

Perform the following steps to define a format file:

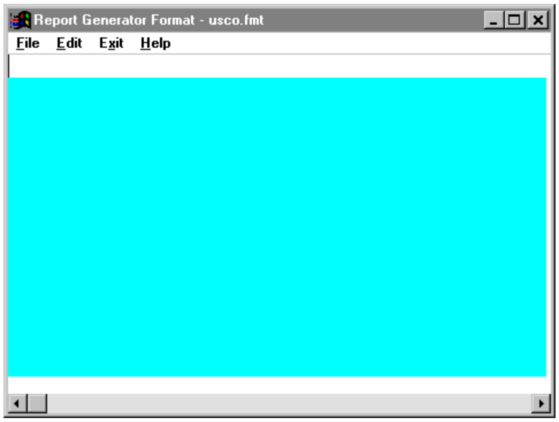
1 Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

2 Double-click Report Generator Formats to display a Select a File dialog. Any existing format files in the default directory are listed on this dialog.



3 Enter a unique format file name. FactoryLink automatically adds the .fmt extension. In this example, a format file named usco.fmt is created.

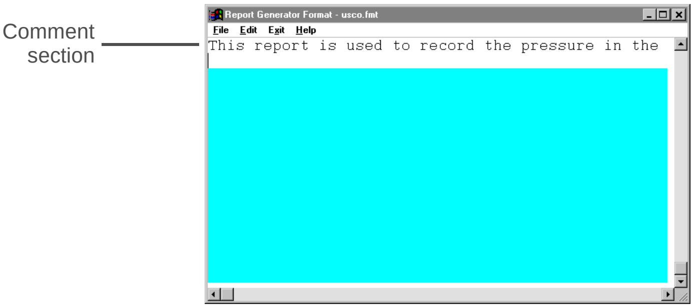
4 Click Enter to display a blank free-form text-entry panel.



The format file name is displayed at the top of the format file screen.

5 (Optional) Enter a comment in the comment section starting with the first line of the format file panel. The comment section extends to the first line starting with a keyword. Each line in the comment section cannot exceed 512 characters. It is not necessary to precede comments in this section with a period.

A comment can reference the format file or the report you are configuring. The example usco.fmt format file contains one line of comments.

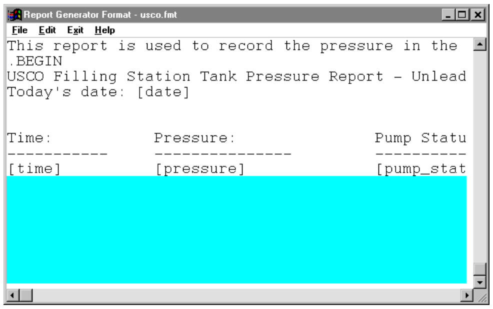


```
This report is used to record the pressure in the
```

6 (Optional) Define a begin section by entering the keyword .BEGIN followed by text you want as the header for the report. Enter the name of the report, column names, and any other fixed data in this section. You can also include object names, such as date and time.

It is not required to include a begin section.

The example usco.fmt format file has a begin section that includes the report name, the report date, column names, and initial data values. The date and data elements identified by object names are read from the real-time database and inserted into a fixed position on the report denoted by the brackets.

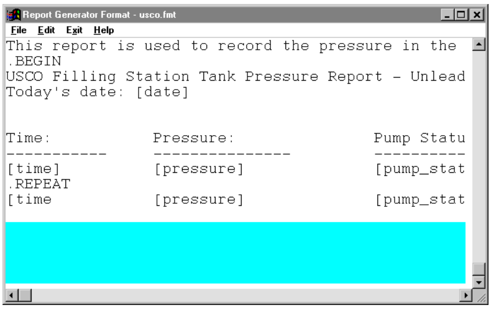


```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]


Time:           Pressure:                 Pump Statu
-----------     ----------------          ----------
[time]          [pressure]                [pump_stat
```

Begin section

7 Define a repeat section by entering the keyword .REPEAT followed by any text and names of objects you want included on the report. You can include both text and object names in this section. Use the conventions defined in Chapter 18, “Report Generator Task Definition," for referencing object names. The contents of this section can be repeated on the report any number of times. This section is repeated each time the repeat trigger is activated. It is not required to include a repeat section.

The example usco.fmt format file has a repeat section that includes data to be read from the real-time database and inserted into a fixed location on the report. In this example, the total number of gallons pumped in an hour is inserted into the corresponding columns.



```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]


Time:           Pressure:                 Pump Statu
-----------     ----------------          ----------
[time]          [pressure]                [pump_stat
.REPEAT
[time           [pressure]                [pump_stat
```

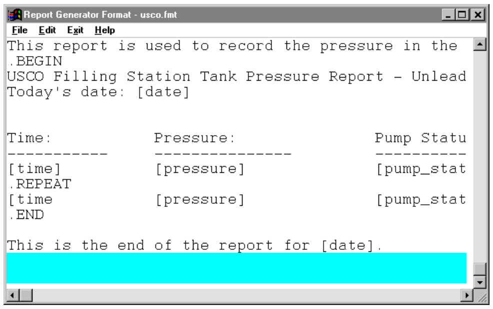
Repeat section

The repeat section is completed when the last object name is read and sent to the temporary file at the end of the first shift.

8 Define an end section by entering the keyword .END followed by text and object names you want included at the end of the report. Use the conventions defined in Chapter 18, “Report Generator Task Definition," for referencing object names.

At a minimum, a report format file must include an end section. If you include only an end section in the report format, you generate a snapshot report.

The example usco.fmt format file has a one line end section that includes literal text and an object name that places the date the report is completed.

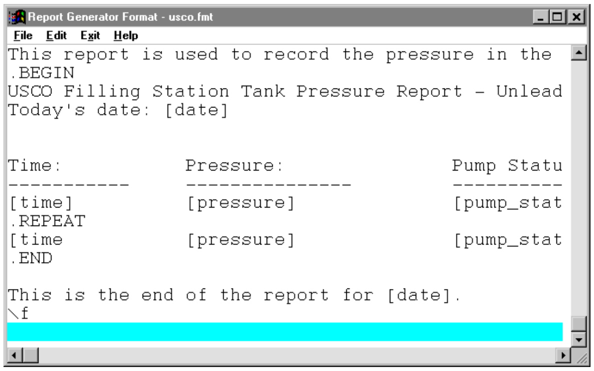


```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]


Time:            Pressure:              Pump Statu
-----------      ---------------        ----------
[time]           [pressure]             [pump_stat
.REPEAT
[time            [pressure]             [pump_stat
.END

This is the end of the report for [date].
```

End section

9 (Optional) Enter an escape sequence to specify instructions to the printer. If you do not enter an escape sequence, the report prints exactly as defined in this format file.

The usco.fmt format file example contains an escape sequence instructing the printer to form feed the paper when printing completes.



```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]


Time:            Pressure:              Pump Statu
-----------      ---------------        ----------
[time]           [pressure]             [pump_stat
.REPEAT
[time            [pressure]             [pump_stat
.END

This is the end of the report for [date].
\f
```

Escape sequence

10 Choose File>Save to save the file when you have completed formatting the report.

11 Choose Exit>Exit to return to the Main Menu.

Chapter 24 . . . .

Defining the Reporting Operation

Reporting operations read data from the real-time database and include them on a report. Reporting operations are defined in the two panels in the Report Generator configuration table:

- Report Generator Control panel—Defines the parameters of the report, such as the name of the temporary file, archive file name, report output device, and conditions that trigger the report.
- Report Generator Information panel—Defines the object names used in the format file and links them to data elements in the real-time database.

This chapter describes how to configure reporting information. The sample application reports pressure in the unleaded gas tank for the USCO filling station. The pressure is written to the report at 15 minute intervals spanning the 8:00 A.M. to 5:00 P.M. shift. The status of the pump is also recorded as ON or OFF when the pressure is written because this affects the validity of the pressure reading.

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

REPORT GENERATOR CONTROL PANEL

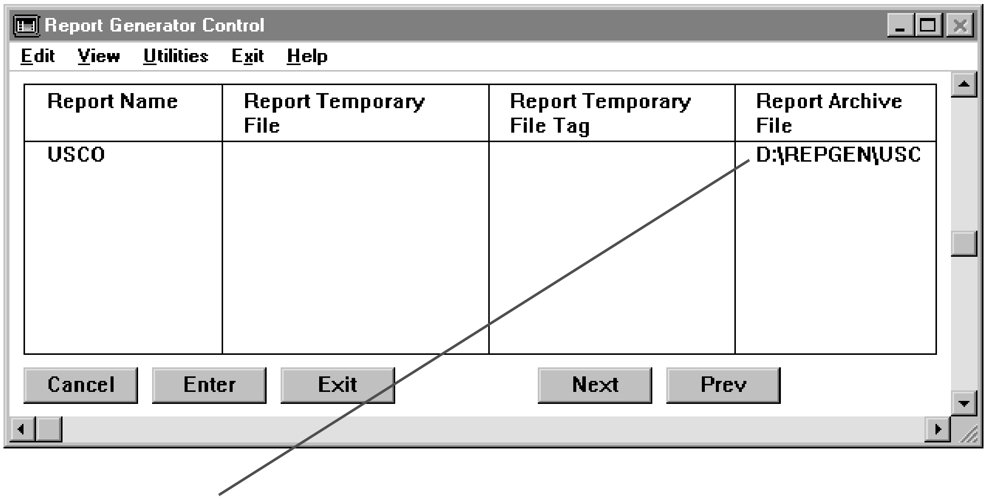
The parameters of the report, such as the name of the temporary file, archive file name, report output device, and conditions that trigger the report are defined on the Report Generator Control panel.

Ensure the current domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Report Generator from the Main Menu to display the Report Generator Control panel

> **Note:** In FactoryLink 7.0, launch Configuration Explorer by clicking the Configuration Explorer icon on your desktop. Expand the Enterprise View item, then the FactoryLink Servers item. Keep expanding the application tree until you see Reports (typically you will expand MyFactor Link Server and then MyStarterApp). Expand the Reports folder and then the Report Generator folder. Double-click the Report Generator Control table to open it to enter information.

.



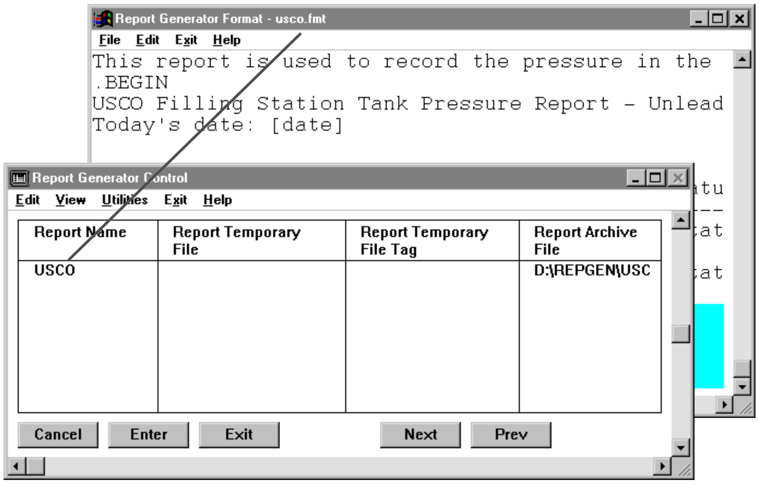
Report Name	Report Temporary File	Report Temporary File Tag	Report Archive File
USCO			D:\REPGEN\USC

The complete field contents are D:\REPGEN\USCO.%03D

Specify the following information in the Report Generator Control panel for each report you want generated. Each report is a line entry in this panel.

Report Name

Name of the report. This name must match the name entered in the File Name field of the format file. Do not include the .fmt extension.



```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]
```

Report Name	Report Temporary File	Report Temporary File Tag	Report Archive File
USCO			D:\REPGEN\USC

Valid Entry: report name

Report Temporary File

Leave this field blank unless it is necessary to recover temporary report files in the event of abnormal termination. Report Generator uses the name of the report defined in the Report Name field with an .rpt extension as the temporary file name. This file is placed in the following directory path:

FLAPP/FLNAME/FLDOMAIN/FLUSER/rpt

Enter the name to assign to the temporary working file created when the report is started if you need to recover temporary working files in the event of abnormal termination. Include this name in the directory path where you want the temporary file opened. This path cannot exceed 32 characters. The directory path must exist with proper permissions prior to running the report.

Use variable format specifiers as part of the path and file name. Using variable format specifiers in the definition allows you to create new temporary files without overwriting previously created temporary files.

The format specifier included in the definition is replaced by the value defined in the Report Temporary File Tag field when the report is triggered and the temporary file is created. You must define the Report Temporary File Tag field if you specify a variable specifier as part of the path or file name.

In this example, this field is left blank so the temporary file will be created in the default directory with the file name USCO.rpt.

Report Temporary File Tag

Name of a tag that contains the value to use to replace the variable specifier defined in the Report Temporary File field on this panel.

The variable specifier is interpreted as a literal if you leave this field blank and you used a variable specifier when you defined the temporary file name. Make the variable specifiers the same tag type as their corresponding data elements.

Valid Entry:	standard tag name (default = analog)
Valid Data Type:	digital, analog, longana, float, message

Report Archive File

Name to identify the permanent report file created when the report completes. The contents of the temporary working file are written to this file.

If you leave this field blank, Report Generator does not save the report and deletes the temporary file when the reporting operation completes. The report can no longer be accessed.

This name can include the directory path where you want the file created. The directory path must exist with proper permissions prior to running the report. If you do not define a directory path, the report is created in the following directory path:

FLAPP/FLNAME/FLDOMAIN/FLUSER/rpt

You can use variable specifiers as part of the path and file name. Using variable specifiers in the definition allows you to generate reports without overwriting previously generated reports.

The format specifier included in the definition is replaced by the value defined in the Report Archive File Tag field when the report completes and the permanent file is created. You must define the Report Archive File Tag field if you specify a variable specifier as part of the path or file name.

The file is overwritten the next time the reporting operation completes and the temporary file is written to this archive file if you configure the report archive file name without variable specifiers. In this example, the contents of the temporary file are written to D:\REPGEN\USCO.%03D, but the file name changes according to the value in the Report Archive File Tag field.

Valid Entry:	permanent report file name

Report Archive File Tag

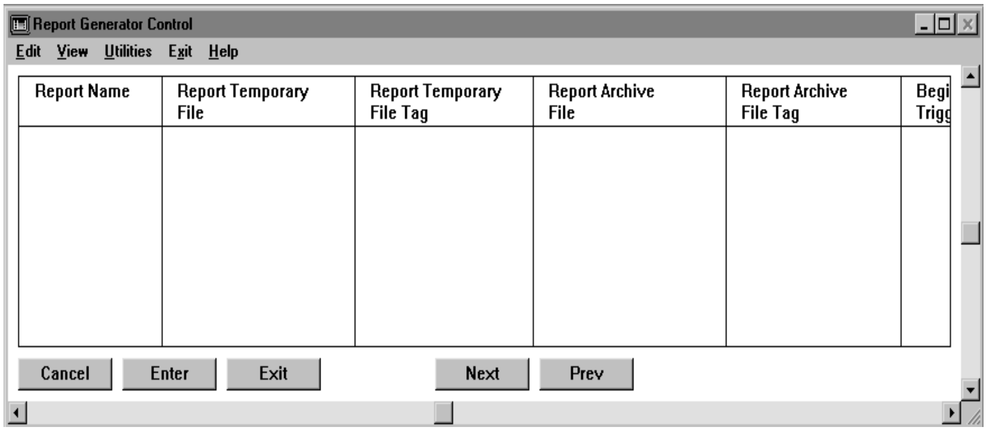
Name of a tag that contains the value to use to replace the variable specifier defined in the Report Archive File field.

The variable specifier is interpreted as a literal if you leave this field blank and you used a variable specifier when you defined the archive file name. Make the variable specifiers the same tag type as their corresponding data elements.

In this example, the format specifier %03d is used. At run time the value in the system tag A_DAY (representing the day of the year) is substituted as the extension for the archived file name.

Valid Entry: standard tag name (default = analog)
Valid Data Type: digital, analog, longana, float, message

The following panel shows the fields in the Report Generator Control panel displayed after the Report Archive File Tag field.



Report Name	Report Temporary File	Report Temporary File Tag	Report Archive File	Report Archive File Tag	Begi Trigg

Begin Trigger Name of a digital tag that triggers execution of the begin section of the format file. Leave this field blank if your report does not include a begin section.

The begin section is triggered by the end trigger if you leave this field blank and the format file contains a begin section.

When this tag value is forced to 1 (ON), data defined in the begin section of the format file is written to the temporary file defined in the Report Temporary File field.

In this example, the begin trigger is a time-stamping defined in the FactoryLink Event Timer task.

Valid Entry: standard tag name
Valid Data Type: digital

Note: In past releases, when reports were stopped and started before the end trigger, when the task is restarted and the begin (or repeat if no begin trigger) is activated, the working file from previous run is opened in append mode, and a new begin section is added. Now the system will check to see if a rpt file already exists. If it does, the system will not add another header. This software enhancement is now the default. If your process mandates the previous mode of operation, then add "-h" for backward compatibility.

Begin Complete

Name of a digital tag that contains the status of the begin operation. Report Generator force-writes this tag to 1 when the begin section of the report completes. Execution of the begin section is considered complete when the contents of the begin section are written to the temporary file.

Leave this field blank if your report does not include a begin section or if you do not want to maintain the status of the begin operation.

Valid Entry: standard tag name
Valid Data Type: digital

Repeat Trigger

Name of a digital tag that triggers the execution of the repeat section of the format file. Leave this field blank if your report does not include a repeat section.

The repeat section is triggered by the end trigger if you leave this field blank and the format file contains a repeat section.

When this tag value is forced to 1 (ON), data defined in the repeat section of the format file is written to the temporary file defined in the Report Temporary File field.

In this example, the trigger repeat is an interval timer of 15 minutes defined in the FactoryLink Interval Timer task.

Valid Entry: standard tag name
Valid Data Type: digital

Repeat Complete

Name of a digital tag that contains the status of the repeat operation. Report Generator force-writes this tag to 1 when the repeat section of the report completes.

Execution of the repeat section is considered complete when the contents of the repeat section are written to the temporary file.

You can use this tag to coordinate activities between Report Generator and other FactoryLink tasks. Leave this field blank if your report does not include a repeat section or if you do not want to maintain the status of the repeat operation.

Valid Entry: standard tag name
Valid Data Type: digital

End Trigger

Name of a digital tag that triggers the execution of the end section of the format file. You can never leave this field blank. All reports require an end trigger.

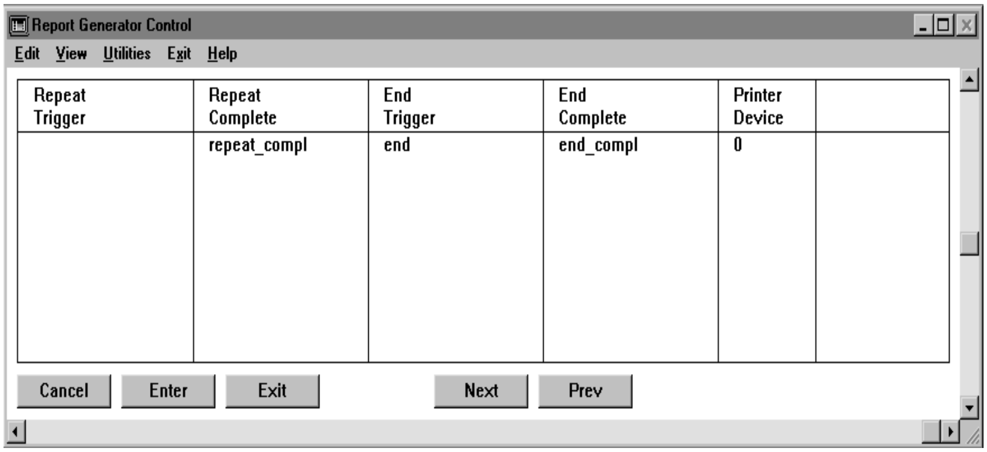
When this tag value is forced to 1 (ON), data defined in the end section of the format file is written to the temporary file defined in the Report Temporary File field. If the format file contains begin and repeat sections but begin and repeat triggers are not defined, the end trigger executes these sections before executing the end section.

Once the end section is executed, the contents of the temporary file are sent to its configured destination and the temporary file is deleted.

In this example, the trigger end is a time-stamping, defined in the FactoryLink Event Timer task.

Valid Entry: standard tag name
Valid Data Type: digital

The following panel shows the fields in the Report Generator Control panel displayed after the Report Archive File Tag field.



Repeat Trigger	Repeat Complete	End Trigger	End Complete	Printer Device	
	repeat_compl	end	end_compl	0	

End Complete

Name of a digital tag that contains the status of the end operation. Report Generator force-writes this tag to 1 when the repeat section of the report completes.

Execution of the end section is considered complete when the contents of the end section are written to the temporary file.

You can use this tag to coordinate activities between Report Generator and other FactoryLink tasks. Leave this field blank if you do not want to maintain the status of the end operation.

Valid Entry:	standard tag name
Valid Data Type:	digital

Printer Device

Enter a number between 1 and 5 that corresponds to the printer defined in the Print Spooler table where you want to print the report. You can direct reports to any of five different spooler devices specified in the Print Spooler Information panel.

Leave this field blank or enter a 0 if you do not want to print the report. This example does not send the report to a printer.

Valid Entry:	numeric value of up to 5

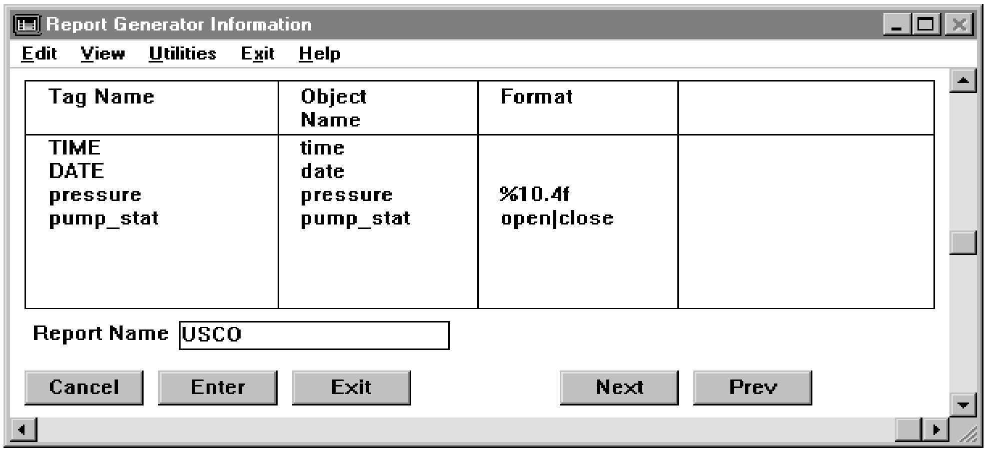
Note: In FactoryLink 7.0, click the Save icon on the toolbar to save the information. The FactoryLink TagEditor screen displays if you have entered undefined tag names. Enter data for any tags displayed on this screen by referring to the field description where the tag name is defined for details on valid tag types. Define the object names used in the format file and their association with data elements in the real-time database. When you are finished, click OK. When you are finished entering information in the Report Generator Control table, click the Save icon, and then click the Close button to exit the table.

REPORT GENERATOR INFORMATION PANEL

The object names used in the format file and their association with data elements in the real-time database are defined on the Report Generator Information panel.

Ensure the current domain selected is SHARED in the Configuration Manger Domain Selection box.

Choose Report Generator from the Main Menu to display the Report Generator Information panel.

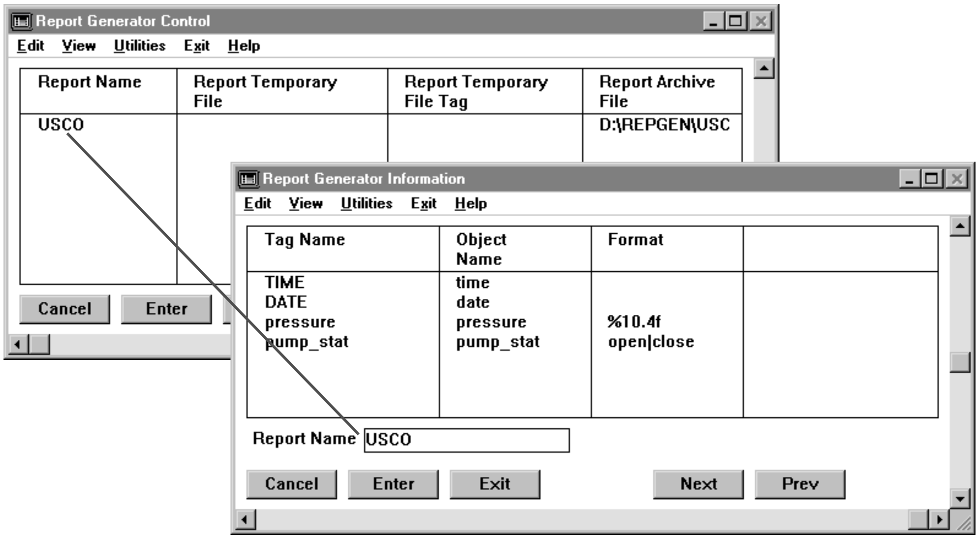


Tag Name	Object Name	Format	
TIME	time		
DATE	date		
pressure	pressure	%10.4f	
pump_stat	pump_stat	open|close	

Report Name: USCO

The name of the report you are configuring is displayed in the Report Name field at the bottom of the panel. Add an entry for each object you defined in the format file. You can configure up to 2,048 entries in this panel. Each row in this panel represents an entry. If you do not have any object names defined in the format file, you should define a placeholder record using any valid FactoryLink tag and any object name as the placeholder.

In this example, the usco.fmt file contains four object names. Tag name associations are required for each object.


Report Generator Control
Edit View Utilities Exit Help
Cancel
Enter
Report Generator Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

Report Name	Report Temporary File	Report Temporary File Tag	Report Archive File
USCO			D:\REPGEN\USC

Tag Name	Object Name	Format	
TIME	time		
DATE	date		
pressure	pressure	%10.4f	
pump_stat	pump_stat	open|close	

Report Name USCO

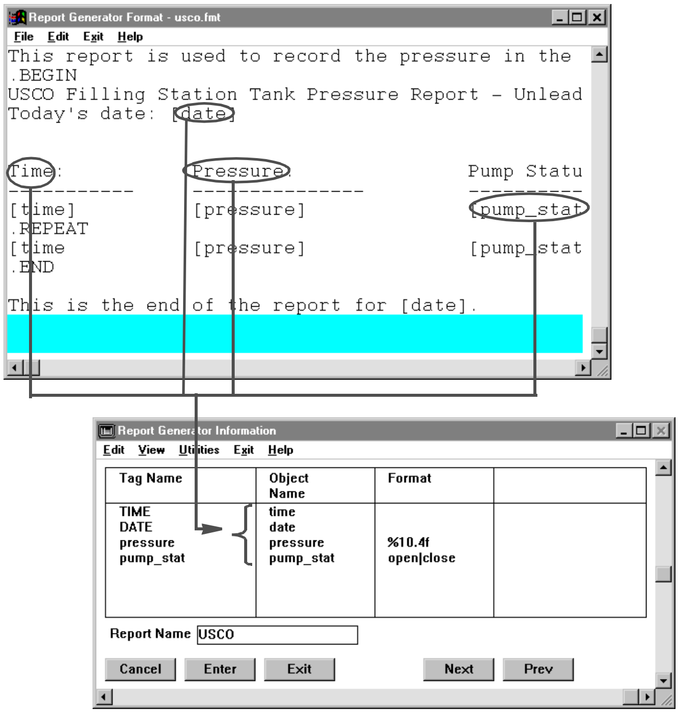
Note: You are limited to 256 characters when formatting a line in the report.

Specify the following information for this panel:

Tag Name Name of a data element you want included in the report. The value of this tag is written to the report in place of the object name holder defined in the format file. Tag names can be the same as the object names or they can be different.

Valid Entry: standard tag name (default = message)
Valid Data Type: digital, analog, longana, float, message

Object Name Name of the object exactly as defined in the report format file.


Report Generator Format - usco.fmt
File Edit Exit Help
Report Generator Information
Edit View Utilities Exit Help
Cancel
Enter
Exit
Next
Prev

```
This report is used to record the pressure in the
.BEGIN
USCO Filling Station Tank Pressure Report - Unlead
Today's date: [date]

Time:                  Pressure                  Pump Statu
------------           ----------------          ----------
[time]                 [pressure]                [pump_stat
.REPEAT
[time                  [pressure]                [pump_stat
.END

This is the end of the report for [date].
```

Tag Name	Object Name	Format	
TIME	time		
DATE	date		
pressure	pressure	%10.4f	
pump_stat	pump_stat	open|close	

Report Name USCO

Format Variable specifier to indicate how to format the data in the Tag Name field when written to the report. This field is limited to 12 characters. Valid formats depend on the tag type of the real-time element and the required output.

The value of the data element is displayed as it exists in the real-time database if you leave this field blank.

If the tag type of the data element is digital, you can specify a character string to be displayed depending on the digital value. A typical use might be to indicate valve status of on or off rather than a 1 or 0.

To do this, enter the desired character strings for each condition (one string for each possible value, 0 and 1) in the following format:

open|closed

where

open	specifies the message open to print when the tag value is 1 (ON)
closed	specifies the message closed to print when the tag value is 0 (OFF)

In the example, the objects date and time do not have associated formats specified, so the data is displayed as defined in the tag definition. The object pressure is formatted to 10 total characters with 4 significant digits after the decimal point. The object pump_stat indicates the current status of the pump draining the tank (open or closed).

Valid Entry: specifier of up to 12 characters

Note: In FactoryLink 7.0, click the Save icon on the toolbar to save the information. The FactoryLink TagEditor screen displays if you have entered undefined tag names. Enter data for any tags displayed on this screen by referring to the field description where the tag name is defined for details on valid tag types. Define the object names used in the format file and their association with data elements in the real-time database. When you are finished, click OK. When you are finished entering information in the Report Generator Control table, click the Save icon, and then click the Close button to exit the table.

Chapter 25. . . .

Scaling and Deadbanding

The Scaling and Deadbanding task (SCALE.EXE) is used to convert or scale incoming raw data to a different value range and to indicate a dead or nonrecalculating band around a scaled value.

This chapter covers the following topics:

- Scaling and Deadbanding Overview
- Principles of Operation
- Scaling and Deadbanding Information Panel
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Scaling and Deadbanding Overview

The linear scaling feature of the task is used to convert or scale the incoming raw data to a different value range. Many values read from a programmable logic controller (PLC) are in units other than those the user wishes to display, manipulate and/or archive. Use of the scaling task eliminates the need to process data through an intermediate routing mechanism and the need to write code to perform the scaling function when the scaling is linear. The scaling task, if given ranges for the incoming and desired data values, can derive the necessary conversion factor and/or offset and perform the linear scaling calculations automatically using the formula:

mx + b = y

where **x** is the raw value, **m** is the multiplier, **b** is a constant, and **y** is the result.

The Deadbanding task is used to indicate a band or area around a value small enough to be considered insignificant. In this case, the new value is stored and a new deadband recalculated, but the new value is not written to the program database. Since FactoryLink tasks process values upon every change, deadbanding provides a means of saving processing time and improving system efficiency.

> **Note:** The deadbanding portion of the function cannot be implemented without configuring the scaling portion of the function.

Principles of Operation

The scaling function only applies for tags with an analog, longana, or float data type.

Scaling is configured using a pair of ranges:

- One for raw values
- One for scaled values

These ranges can be specified as constants or tags. The scaling formula is adjusted accordingly if one or more of the range tags changes.

> **Note:** If Scaling and Deadbanding is configured from the Application Editor, the system automatically assigns default tag names for raw and scaled values deadbanding and scaling lock functions, even if entered as a constant. However, if Scaling and Deadbanding is configured from within the Configuration Manager, the designer creates only specified tags.

When a value is written to a raw value tag, its related scaled value tag is updated accordingly. This is a raw-to-scaled conversion.

When a value is written to a scaled value tag, its raw value tag is updated accordingly. This is a scaled-to-raw conversion.

Prior to changing a range tag, raw value tag or scaled value tag, the function should be disabled using the Scaling Lock Tag. When the Scaling Lock Tag has a non-zero value, changes made to the tag are not propagated to their related members. After the changes to that function are made and the function is re-enabled, the current raw value is scaled and written to the scaled value tag. Any changes to the ranges are applied to the scaled value as well.

Deadbanding, which applies to raw-to-scaled conversion but not to scaled-to-raw conversion, may be specified in one of two ways:

- As an absolute (ABS) number of Engineering Units (EUs)
- As a percentage (PCT) of the scaled range

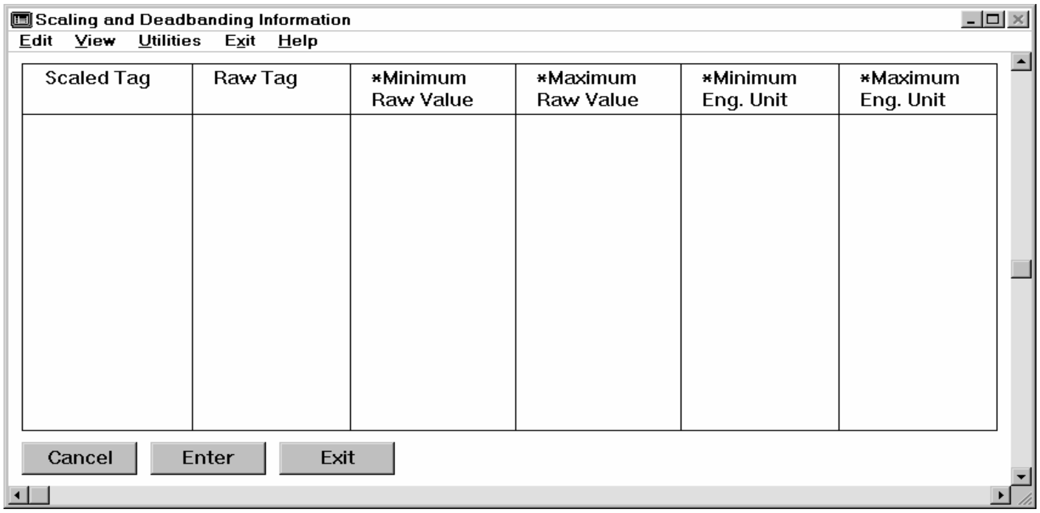
During raw-to-scaled conversion, a newly calculated scaled value that does not exceed the deadband is not written to the database. If deadbanding is being applied to a tag associated with scaling rather than a specific alpha-numeric range, deadbanding is specified by a percentage of a range rather than as an absolute value. If the deadband variance for a scaled tag is specified as an absolute value, then no deadbanding is applied to the associated raw tag.

SCALING AND DEADBANDING INFORMATION PANEL

The Scaling and Deadbanding Information table sets up the value ranges required to scale a value coming into the real-time database. These ranges can be either constants or tags.

Ensure the domain selected is SHARED in the Configuration Manager Main Menu Domain Selection box.

Choose Scaling and Deadbanding from the Main Menu and specify the following information:


Scaling and Deadbanding Information
Edit View Utilities Exit Help
Cancel
Enter
Exit

Scaled Tag	Raw Tag	*Minimum Raw Value	*Maximum Raw Value	*Minimum Eng. Unit	*Maximum Eng. Unit

Scaled Tag — Name of the tag scaled values will be written to. In this example, the tag is named tank_temp_f (for tank temperature in Fahrenheit scale)

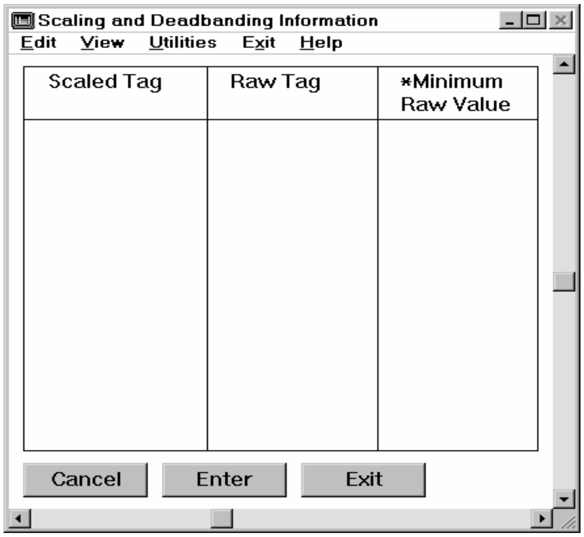
Raw Tag — The tag for the field raw values are read from. In this example, the tag is named tank_temp.

Minimum Raw Value — The lowest value for raw data. Either a constant value or a tag can be specified in this field. For this example, raw data is being read on the Celsius scale. Because the temperature never drops below freezing, this means a minimum raw value of 0 degrees on the Celsius scale.

Maximum Raw Value — The highest value for raw data. Either a constant value or a tag can be specified in this field. For this example, raw data is being read on the Celsius scale. The temperature never rises above boiling or a maximum raw value of 100 degrees on the Celsius scale.

Minimum Eng. Unit The lowest value for scaled data. Either a constant value or a tag can be specified in this field. For this example, scaled data is converted to a Fahrenheit scale. The temperature never drops below freezing or a minimum engineering unit value of 32 degrees on the Fahrenheit scale.

Maximum Eng. Unit The highest value for scaled data. Either a constant value or a tag can be specified in this field. For this example, raw data is read on the Fahrenheit scale. The temperature never rises above boiling or a maximum engineering unit value of 212 degrees on the Celsius scale.


Scaling and Deadbanding Information
Edit View Utilities Exit Help
Cancel
Enter
Exit

Scaled Tag	Raw Tag	*Minimum Raw Value

Deadband Value The amount, in either absolute value or percent of total value that, when applied, creates a range on either side of the value the recalculated value does not have to be written to the database in. For this example, temperature changes of less than 2% in a short period of time are insignificant for this process. This is reflected in a deadband value of 2 with PCT chosen for the Deadband Abs./Pct. field.

If a tag name is specified for the deadband value rather than an integer, no deadbanding occurs until a value is written to the specified tag from the database.

Deadband Abs./Pct. Enter Absolute or Percentage to indicate if the deadband value specified is an absolute number of engineering units (EUs) or a percentage of the scaled value range. For this example, a deadband value of 2 percent (PCT) is selected. Equivalently, since 2% of 180% Fahrenheit is 3.6 degrees, you could specify an absolute (ABS) deadband of 3.6.

Scaling Lock Tag Use this field to temporarily disable the scaling feature for the scaled tag. When the Scaling Lock Tag has a non-zero value, changes made to the tag are not propagated to their related members. After the changes to that function have been made and the function is re-enabled, the current raw value is scaled and written to the scaled value tag. In this example, if the incoming tank_temp data needs to be disabled temporarily in order to alter the temperature range, a scaling lock tag named disabl_temp can be specified. This tag has the function of disabling the tank_temp tag. Once tank_temp is changed, the user needs to come back to this table and remove disabl_temp from the Scaling Lock Tag field.

Scaling and Deadbanding Error Messages

This section lists all messages that can occur during Scaling and Deadbanding run time, describes their possible causes, and provides corrective actions.

Error reading CT record

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Error%d: Unknown signal%d received

Cause: This is a FactoryLink internal error.

Action: Operation will be unaffected by this error. Please report error to Customer Support.

Insert tag into DTP tag list failed

Cause: This is a FactoryLink internal error.

Action: Operation will be unaffected by this error. Please report error to Customer Support.

Invalid deadband tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid deadbanding lock tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid maximum raw tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid maximum scaled tax

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid minimum raw tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid minimum scaled tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid raw tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid scaled tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Invalid scaling lock tag

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No CT

Cause: The file SCALE.CT is missing

Action: Rebuild SCALE.CT with CTGEN.

No CT table #0

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No deadbanding lock tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No deadband tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No maximum raw tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No maximum scaled tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No minimum raw tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No records in CT table #0

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No minimum scaled tag or value.

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No raw tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No scaled tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No scaling lock tag or value

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

No tables in CT

Cause: The file SCALE.CT is corrupt.

Action: Rebuild SCALE.CT using CTGEN.

Out of memory

Cause: The system does not have sufficient memory to run the process.

Action: Free up memory by halting other running programs on the system and try running FactoryLink again.

Record%d: FPE 0x%04X occurred

Cause: There may be a problem with the hardware Floating Point Processor on the system.

Action: Have the Floating Point Processor evaluated.

Record%d: Raw range is zero

Cause: The record cannot be processed because the minimum and maximum raw values are equal, resulting in a range of 0(zero).

Action: Change one of the raw values to create a range greater than 0.

Record%d: Raw value is outside range

Cause: The raw data value received is less than the minimum or greater than the maximum specified. Scaling will continue, but the scaled value will be outside the range.

Action: Change the raw value range to allow encompassing values outside the range.

Record%d: Scaled range is zero

Cause: The record cannot be processed because the minimum and maximum scaled values are equal, resulting in a range of 0 (zero).

Action: Change one of the scaled values to create a range greater than 0.

Recorded: Scaled value is outside range

Cause: The scaled data value calculated is less than the minimum or greater than the maximum specified.

Action: Change the scaled value range to allow encompassing values outside the range.

Chapter 26 . . . .

Defining Schemas

In FactoryLink, the relational databases are configured in a table format consisting of rows and columns. The schema of the table defines the number, size, and content of the rows and columns.

Schema definitions are created in the Database Schema Creation table for Database Logging tables. This table has four panels:

- Schema Control panel—Assigns unique table structure names to log data.
- Schema Information panel—Defines the columns and table structure attributes.
- Index Information panel—Defines which columns the table structure uses as the index. Do not use this panel if you are not indexing the table.
- Security Event Logging Schema panel—Defines the table columns included in the Security Event Logging table.

Schema definitions are created in the Data Point Schema Logging table for the Data Point Logging tables. This table has two panels:

- Data Point Schema Control panel—Adjusts the database structure schema the Data Point Logging task uses.
- Data Point Logging Control panel—Assigns unique names and defines Data Point Logging table attributes.

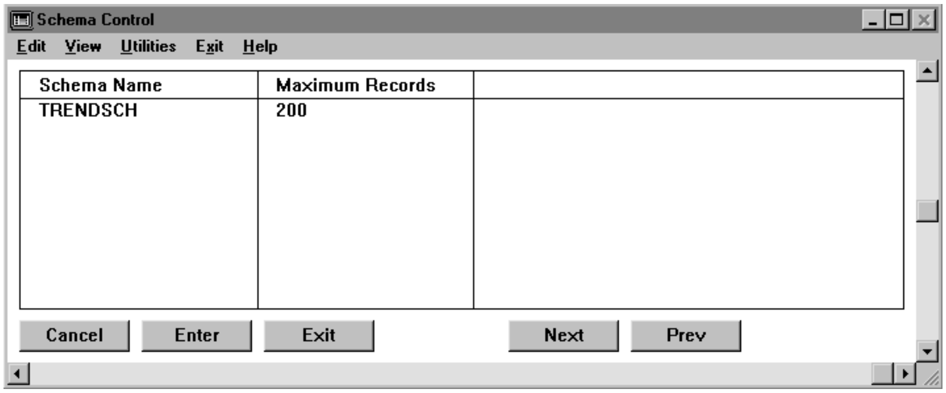
> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

SCHEMA CONTROL PANEL

The Schema Control panel sets up the names for each unique data table structure, or *schema*, you create. Optionally, you can set the maximum number of records a table using a schema can hold before FactoryLink starts overwriting records.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Schema Control panel from the Main Menu and specify the following information:



Schema Name	Maximum Records	
TRENDSCH	200	

Schema Name Alphanumeric name of up to 19 characters to reference a unique table structure. Limit the name to 10 characters for dBASE IV Historian. This sample application has three unique table structures:

nongrp_data For logging non-grouped, non-sequenced data. Table content is not grouped or ordered.

sequence_data For logging non-grouped, sequenced data. Table content reflects event order or time of occurrence, but is not grouped.

group_data For logging grouped data. Table content is grouped or sorted by a specified criterion.

Valid Entry: alphanumeric name of 1 to 19 characters

Maximum Records Number that defines the maximum number of records allowed if you are logging non-grouped data to a dBASE IV Historian and want to control the number of records in the tables using this schema. Record rollover occurs when the maximum is reached. Leave this field blank to use as many records as your disk space allows.

Leave this field blank if you are logging grouped data. This field should not be used for grouped data.

Valid Entry:	numeric value up to 9999999999

USDATA uses the Codebase 4.5 libraries to provide the basic functionality of the dBASE IV database software. The DB4_HIST Historian and the BH_SQL utility provide FactoryLink users with basic database functionality. This is an inexpensive alternative to purchasing a full relational database software from the database vendor.

In response to customer requests a few years ago, USDATA added the Maximum Records feature to the DB4_HIST Historian task. This functionality enables customers to avoid periodically purging the database in order to conserve hard disk space. The Maximum Records feature allows users to define a maximum limit on the number of records inserted into the database. From that point forward, the database would “roll over” and start updating at the location of the first record. This process is repeated in a circular fashion from that point on. DB4_HIST keeps track of only the records added to the database table and not the records deleted from the table.

In the recent years additional enhancements have been made to the database client products provided by USDATA. These enhancements require that customers perform their own maintenance of the database table according to their specific needs, precluding the use of the Maximum Records feature.

When designing your application, please note the following restrictions on use of the Maximum Records feature.

1) Do not delete records from a table for which Maximum Records have been specified.

2) Do not use DBBROWSE positional or logical delete, PowerSQL positional or logical delete or array delete, or DBLOG group delete feature, or BH_SQL delete, or any other delete function. Doing so may result in corrupted data when rollover occurs.

3) Do not browse ALL the records in the table where record rollover is taking place. This can end in DBBROWSE fetching garbage data. This happens in the following scenario:

- DBBROWSE “select” request is completed.
- DBLOG performs an insert which results in the “selected” record being overwritten (if it was the oldest record).
- DBBROWSE issues the “fetch” request for previously selected records, which are now corrupted by the insert action.

This can be avoided if the Maximum Records value is set well in excess of what you need to browse. For example, if you require that your browse operation criteria select the latest 1,000 records logged, set the Maximum Records value at 10,000. This way, the oldest record being overwritten is well removed from the records being browsed.

4) To ensure integrity of the database table, DB4_HIST starts a reindex of the table upon insert of a record with duplicate value in the unique index column. The inserted record is rejected with a “unique key error”; however, the CPU load for reindexing the table might be substantial for large tables. Unfortunately, the unique key error generally occurs at times of heavy CPU usage like application startup, heavy EDI read/write activity, heavy graph swapping activity by operators along with other heavy usage, etc. At such times, there might not be CPU cycles left to update the SECTIME tag for a few seconds, but DBLOG might go ahead and log this same value to a unique index table column more than once. If you have very large table and cannot control frequent occurrence of “unique key” errors during your application run, it is strongly recommended that you not use the Maximum Records feature, as it will seriously degrade performance.

5) Due to a bug in the Codebase 4.5 routines, the integer value “0” for a unique index integer type column is not handled correctly. When a reindex is done with such a column, the index file becomes corrupt. If you use “0” in your unique index column, you should designate this column of type “char” instead of “integer” or “smallint.” It is not necessary to change the type of the tag that logs to this column or reads from this column, as FactoryLink does data conversion automatically. You should only use unique index column of type integer also if you can guarantee that a value of “0” will never be logged to it. If a value of “0” is logged, at record rollover time the index file will become corrupt and the database useless.

Caution: This applies even if you do not use the Maximum Records feature. Having a “0” in a unique index integer column in your table, your index file will become useless if you ever do a reindex using BH_SQL or DBCHK or any other means in the future.

6) If the records for your different groups are logged non-sequentially over time, and you want to delete records based on the age of the groups, do not use the Maximum Records feature. After record rollover, DB4_HIST will overwrite the records starting from the oldest without considering its group ID. You should use Group Delete feature provided for this purpose. The Group Delete of records and Maximum Records feature are incompatible.

Click Next to go on to the Schema Information panel.

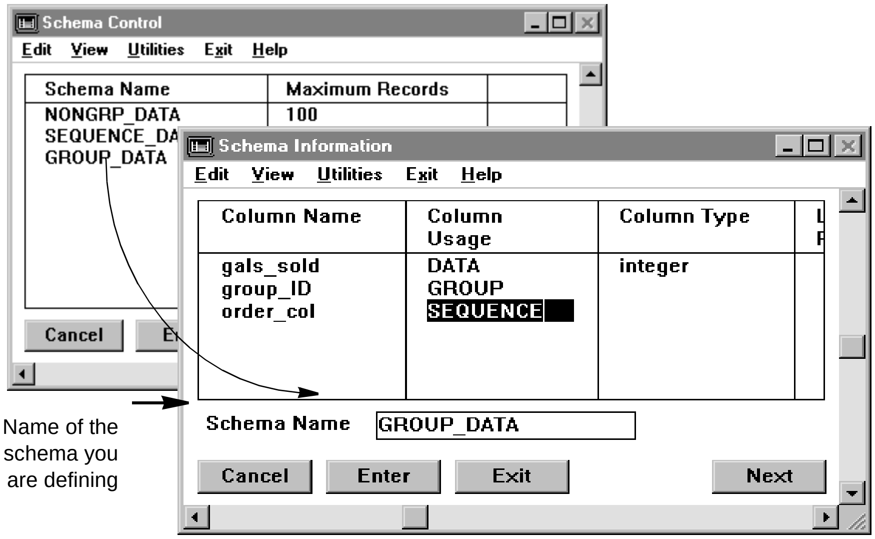
SCHEMA INFORMATION PANEL

The schema for each table structure you want to log data to is defined on the Schema Information panel. Whether or not the data is grouped or sequenced defines how this panel should be completed. The following example contains grouped and sequenced data. The sample application is for a gasoline station that uses sequence numbers to log the total gallons of gas pumped. The example data shown in the panel in this section creates a table that contains three columns:

- One to receive the identification assigned to the fuel storage tank the row of data was collected from
- One to receive the sequence number that reflects the logging order
- One to receive the number of gallons sold.

group_ID	order_col	gals_sold
r87	1	10.5
s93	1	12.2
r87	2	5

The schema you are defining is displayed in the Schema Name field at the bottom of the Schema Information panel.



Schema Name	Maximum Records
NONGRP_DATA	100
SEQUENCE_DA	
GROUP_DATA	

Column Name	Column Usage	Column Type
gals_sold	DATA	integer
group_ID	GROUP	
order_col	SEQUENCE	

Schema Name GROUP_DATA

Name of the schema you are defining

Column Name

Column name. Each name must be unique within a table structure and must conform to the standards for the relational database being used. FactoryLink does not support column names that begin with a number. The size of the column name for dBASE IV is up to 10 characters long. For specific naming conventions allowed, refer to the user guide for the database you are using. In this example, there are three column names:

group_id — Column receives the group identification assigned to the row of data.

order_col — Column receives the sequence number indicating the order the row of data was logged in.

gals_sold — Column receives the number of gallons sold.

Valid Entry: column name

Column Usage

What kind of information is sent to the column, which can be one of the following:

data — (Default) Use for columns not used for sequence, time, or group. In this example, gals_sold column qualifies for data usage.

sequence — Use for columns receiving a sequence number in integer form.

time — Use for columns receiving a number in time-stamp form. The time-stamp used is the value from the global tag SECTIME.

group — Use for columns receiving the group identification assigned to the data row.

For more information about column use and different ways of logging information, refer to the “Database Logger” chapter in this guide.

Column Type

Keyword that represents the data type contained in the column. This can be either a data type FactoryLink DB IV Historian supports or a data type the relational database receiving the data supports.

If you are using a data type specific to the relational database, refer to the relational database user guide for correct syntax.

Supported data types for FactoryLink DB IV Historian are small integer, integer, float, character, date, and number. Press Ctrl+K for the correct syntax for each data type. The one you use depends on how the column is defined in the Column Usage field.

The following table lists the dependencies.

Column Usage	Column Type
data	All supported types.
sequence	Do not specify a column type.
time	Do not specify a column type.
group	All supported types.

The default column type is character. If you do not know the data type when completing this panel, specify unknown as a placeholder and a reminder to define this data type before completing the configuration.

If you do not change unknown to a supported type before starting the application, Database Logging and Historian generate an error.

Valid Entry:	keyword name
Valid Data Type:	small integer, integer, float, character (default), date, or number

Length or Precision

Maximum number of characters the column can store if you defined a character data type in the Column Type field. This cannot exceed 64 if the Column Usage field is group. The data is truncated to the maximum size if you try to store more than the specified maximum (80 characters).

Length does not apply if you defined a data type other than character or number, so leave this field blank to assume the default 0 (zero). If you do not leave this field blank (or 0), an error occurs when you execute DBLOG at run time to create a database, and a database table is not created.

If the Column Type field is number or contains a data type the relational database supports, specify a precision qualifier, such as xxx or xxx,yyy, where x and y can be any number. The precision qualifier defines the number of digits (including the decimal) the column allows, and the accuracy of the number before rounding.

With the dBASE Historian, for a float data type, the maximum precision you can save is a five-digit integer with a precision of five (11,5).

A float data type with a value greater than 99,999 is not logged correctly, and is displayed as eleven asterisks. To circumvent this constraint, dBASE users can specify number as the Column Type. This allows larger numbers; for example, by using a precision of (13,3), you can log the number 123456789.123.

Valid Entry: alphanumeric string up to 80 characters

If Column Type is . . .	Length/Precision is . . .
integer	0 (not applicable)
small integer	0 (not applicable)
float	0 (Maximum float precision in FactoryLink is (11,5), which is the default precision for data values in a float-type column. dBASE IV users: To log values with precision greater than (11,5), use the number data type.
date	0 (not applicable)
character (length)	xxx where x can be any number. If Column Usage is group, the maximum length is 64. Maximum length for dBASE IV is 19 characters.
number (precision)	precision qualifier xxx,yyy where x and y can be any number. xxx = total characters, including decimal point, in the value character string and yyy = number of characters at the right of the decimal.

Click Next to go on to the Index Information panel.

INDEX INFORMATION PANEL

Table indices are defined in the Index Information panel. Complete this panel only if you are indexing a table.

The example data below defines two separate indices for a table: one by order_col and one by time_col.

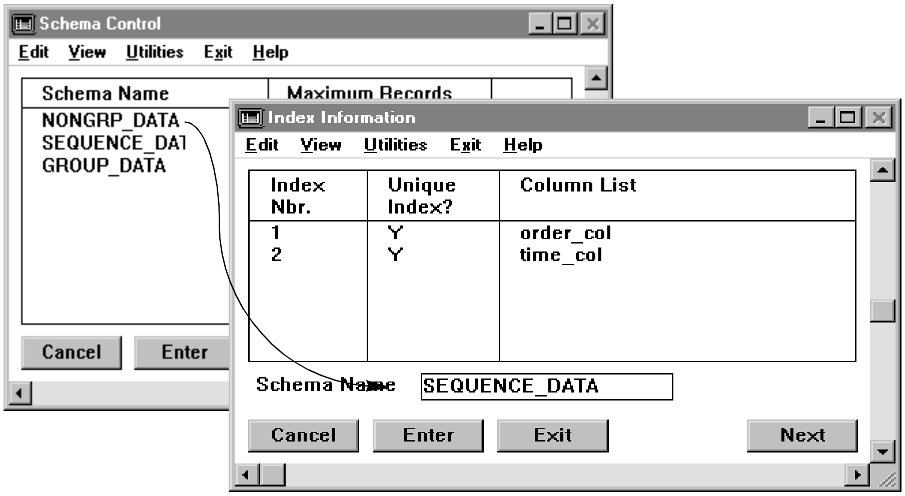
order_col	time_col	ugal_sold	dgal_sold

The example data below uses two columns, the group_ID and order_col columns, to index a table.

group_ID	order_col	gals_sold

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

In the Schema Index Information panel, specify the following information for each index key you want associated with the table structure. You can specify up to 99 different index keys for each schema, although a practical limit is between 6 and 9. Each index key is a separate line item on this panel.



Schema Name	Maximum Records
NONGRP_DATA	
SEQUENCE_DAT	
GROUP_DATA	

Index Nbr.	Unique Index?	Column List
1	Y	order_col
2	Y	time_col

Schema Name SEQUENCE_DATA

Index Nbr Number between 1 and 99 to uniquely identify the schema index key you are defining. Start with 1 and increment by one for each line item. The more indices, the more disk usage and time it takes to log data.

Valid Entry: index key number between 1 and 99

Unique Index Specify whether or not this index key represents a unique index. The value you enter in this field must be uppercase. This can be one of the following:

YES Duplicate record values are not permitted in the column(s) comprising this index key. If an attempt is made to log a duplicate value, FactoryLink displays an error message and the column of data is not logged.

NO Duplicate record values are permitted in the column(s) comprising this index key.

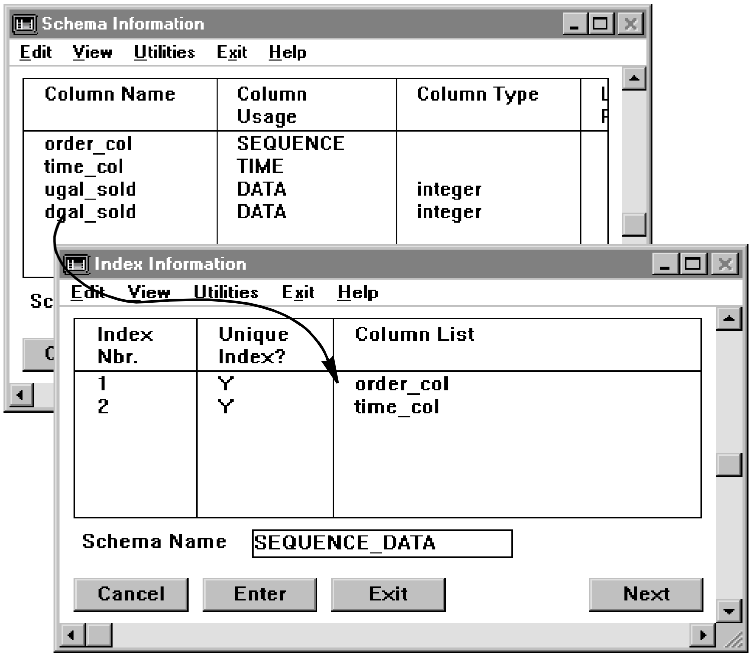
Column List Column name(s) in the table structure that comprises the index key. The name must match the name in the Column Name field of the Schema Information panel.

If you are creating a table using the dBASE IV Historian, observe the following constraints:

1. The total number of characters keyed in should not exceed 254, as characters over that limit will not be recognized as valid columns.

2. The width of the columns in bytes (which depends on column type; for example, a column of type char(4) has a width of 4 bytes) should be a number less than the maximum size (100 bytes) of the "key" field specified in the codebase 4.5 libraries.

Valid Entry: column name



Schema Information

Column Name	Column Usage	Column Type
order_col	SEQUENCE	
time_col	TIME	
ugal_sold	DATA	integer
dgal_sold	DATA	integer

Index Information

Index Nbr.	Unique Index?	Column List
1	Y	order_col
2	Y	time_col

Schema Name SEQUENCE_DATA

If you are using more than one column as part of the index key, use a plus sign(+) to separate each column name you specify; for example, group_ID+order_col. If multiple columns are specified, they are indexed in the column order they are displayed.

Click Next to go on to the Security Event Logging Schema panel.

SECURITY EVENT LOGGING SCHEMA PANEL

The Security function in FactoryLink allows you to control who has access to the functions within an application. Security also records information about who is accessing or attempting to access secure functions.

The Security Event Logging Configuration function indicates what security-related events are recorded to a Historian database table or file.

The Security Event Logging Schema indicates what information is recorded for each event logged to a table. By default, the following four columns of information are recorded for each security event logged:

- When the event occurred
- The operator name logged in when the event occurred
- The event type
- The event message displayed

Valid event types are:

RTGSTART	Graphics started (no event message displayed)
RTGSTOP	Graphics stopped (no event message displayed)
SECLOGIN	Operator logged in (no event message displayed)
SECLOGOUT	Operator logged out (no event message displayed)
FAILLOGIN	Operator failed to log in (no event message displayed)
SECVIOL	Operator attempted unauthorized operation
FAILTEXT	Update text field failed for unknown reason
UPDTEXT	Text field updated
FAILINP	Update input select failed for unknown reason
UPDINP	Input select updated

The operator name is the name of the current operator, except if the event type is a failed login. For this event, the operator name is the name used during the failed login attempt.

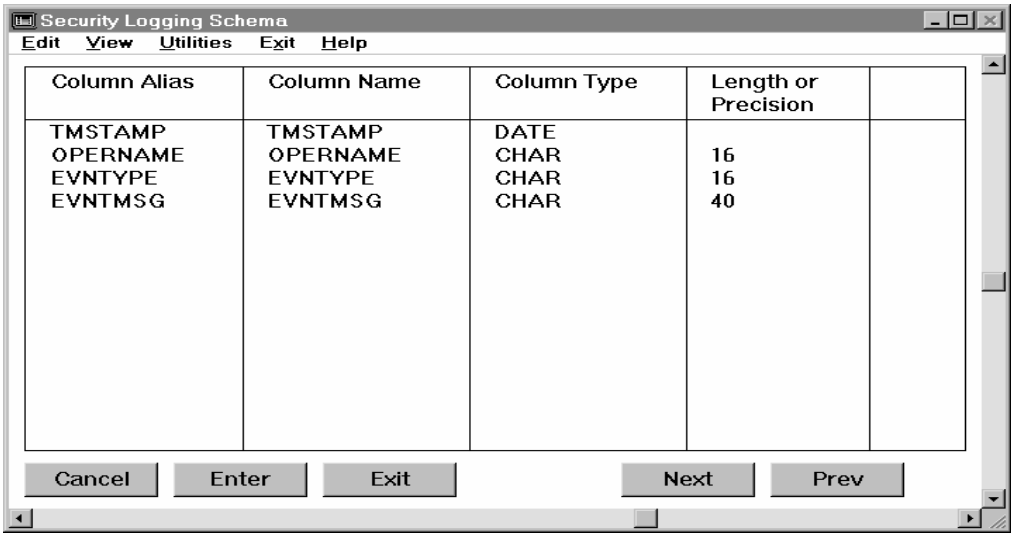
You must enter a row in the Schema Control panel if you wish to control the maximum number of records the Security Event Logging database table contains. The schema name entered must be SECURITY_LOG. You can then enter the maximum number of records for the Security Event Logging table.

The schema name SECURITY_LOG is reserved for setting Maximum Records for the Security Event Logging table. Any information records attached to this schema are ignored.

If you wish to have additional columns added to the Security Event Logging table, a Column Alias of Data must be assigned to each added column. The Historian task creates a Security Event Logging table with the name supplied in the Security Event Logging configuration in the Application Editor. The graphics task does not log the additional columns. They are used for additional data required by the customer application.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Specify the following information for each column in the security logging database. Each column is a separate line item on this panel. The information is preconfigured for the four default items in the database:



Column Alias	Column Name	Column Type	Length or Precision	
TMSTAMP	TMSTAMP	DATE		
OPERNAME	OPERNAME	CHAR	16	
EVNTYPE	EVNTYPE	CHAR	16	
EVNTMSG	EVNTMSG	CHAR	40	

Column Alias

Alias assigned to the column in the security logging database. This column alias associates security event data with a column name and column data type in a database table.

Information captured for the event is logged to this column in the database table. The data is not captured if an alias is not referenced in this column. Remove the Column Alias for that column.

Remove the Column Alias for that column if you wish to exclude a column of information from being logged to a table.

Assign a Column Alias of Data to each added column if you wish to have additional columns added to the Security Event Logging table. The Historian task creates a Security Event Logging table with the name supplied in the Security Event Logging configuration in the Application Editor. The Application Editor does not log additional columns. These additional columns are for customer use only and are used for additional data required by the customer application.

Columns with an alias of Data allow you to modify the schema to create a table including columns your application may use, for example, with the Browser task. The Application Editor does not send data to these columns.

These aliases define columns that contain the following data:

TMSTAMP	Time of event (time-stamp)
OPERNAME	Name of operator generating the event
EVNTYPE	Type of event (refer to “Security Event Logging Schema Panel” on page 542)
EVNTMSG	Message generated by event
DATA	This column is user-defined

Valid Entry: tmstmp, opername, evntype, evntmsg, data

Column Name

Name displayed as the column heading for the column in the security event table. Defaults are TMSTMP for the time column, OPERNAME for the operator name column, EVNTYPE for the event type column and EVNTMSG for the event message column. You can change this to any title.

Valid Entry: alphanumeric name of up to 32 characters

Column Type

Type of information contained in the column. For the TMSTMP, the data is in time-and-date format. For other columns, the information is in character format.

Valid Entry: keyword name
Valid Data Type: date, char

Length or Precision

Maximum number of characters the column can store if you defined a character data type in the Column Type field. The data is truncated to the maximum size (80 characters) if you try to store more than the specified maximum.

If you specified date as the Column Type, length does not apply, so leave this field blank to assume the default 0 (zero). If you do not leave this field blank (or 0), an error occurs when you execute DBLOG at run time to create a database, and a database table is not created.

Valid Entry: integer from 0 to 99,999 (default = 80 characters)

DATA POINT LOGGING

You must create a new database schema record in the Data Point Schema Control panel to reference a database schema not preconfigured in Data Point Logging. For more information on assigning schema names, see “Data Point Schema Control Panel” in the following. Before you use a new schema in Data Point Logging, however, you must reference it in the Data Point Logging Control panel. See “Data Point Logging Control Panel” for more information.

DATA POINT SCHEMA CONTROL PANEL

Use the Data Point Schema Control panel to control the structure or schema_default font of a Data Point Logging relational database.

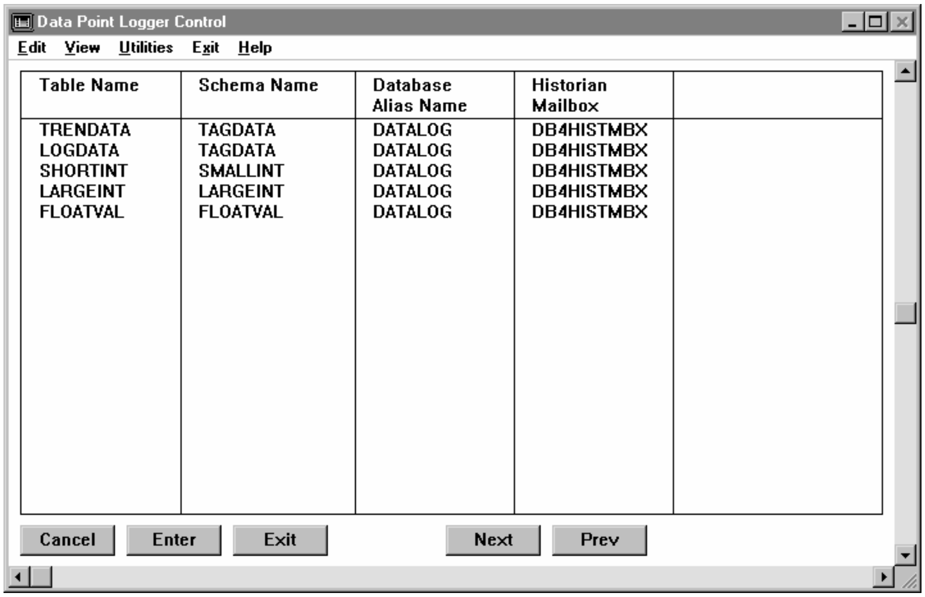


Table Name	Schema Name	Database Alias Name	Historian Mailbox	
TRENDATA	TAGDATA	DATALOG	DB4HISTMBX	
LOGDATA	TAGDATA	DATALOG	DB4HISTMBX	
SHORTINT	SMALLINT	DATALOG	DB4HISTMBX	
LARGEINT	LARGEINT	DATALOG	DB4HISTMBX	
FLOATVAL	FLOATVAL	DATALOG	DB4HISTMBX	

The Data Point Schema Control panel is preconfigured to contain the four default table schema records shown in the preceding sample screen. Each default schema defines a different Data Point Logging table structure.

On the Data Point Schema Control panel, you can:

- Change the storage space occupied by the tag name and tag value fields in Data Point Logging tables that use a default schema.
- Define additional Data Point Logging table schemas. Before using a new schema, however, you must also add a record (row) for it to the Data Point Logging Control panel.

To update a database schema record, edit the entry in the Maximum Records or Tag Name Maximum Width fields.

Choose Data Point Logging from the Main Menu and specify the following information to add a database schema record to this panel:

Schema Name

Unique alphanumeric character string of up to 19 characters that is the name of the schema that defines a unique Data Point Logging table structure. This schema must also be referenced on the Data Point Logging Control panel.

Valid Entry: alphanumeric character string of up to 19 characters

Maximum Records

Maximum number of records allowed in a Data Point Logging table governed by this schema in the dBASE IV database.

Only dBASE IV databases use this field.

You can use this parameter to automate table maintenance; when the maximum is reached, the oldest record is deleted.

As many records as disk space allows are logged if you leave this field blank.

Valid Entry: integer from 1 to 9999999999

Tag Name Maximum Width

Maximum width the Data Point Logging table column receiving the tag name may occupy. If the tag name contains dimension specifications, you must include it when calculating the tag name width. Use this parameter for efficient data space utilization. For example, if the logged tag name will never exceed 8 characters, reduce the width to 8.

Valid Entry: integer from 8 to 48 (default = 48)

Logged Value Data Type

Data types allowed for the tag being logged to the Data Point Logging table.

Valid Entry: float, integer, smallint, or a user-specified database-dependent data type, such as NUMBER for Oracle7

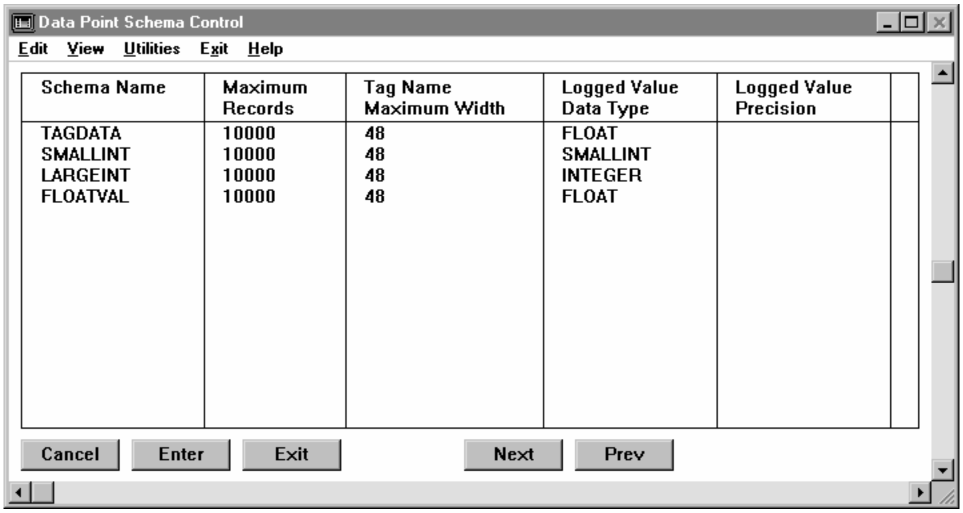
Logged Value Precision

Precision qualifier in the form of *xxx* or *xxx,yyy* where x and y can be any number. This defines the number of digits of desired accuracy for the number before rounding.

Click Previous to go to the Data Point Logging Control panel.

DATA POINT LOGGING CONTROL PANEL

Use the Data Point Logging Control panel to relate the database schema to the tables you are logging data to. This panel also supplies information to Data Point Logging about the Historian task it is transferring and receiving data through.



Schema Name	Maximum Records	Tag Name Maximum Width	Logged Value Data Type	Logged Value Precision
TAGDATA	10000	48	FLOAT	
SMALLINT	10000	48	SMALLINT	
LARGEINT	10000	48	INTEGER	
FLOATVAL	10000	48	FLOAT	

The Data Point Logging Control panel is preconfigured with the five Table Name and Schema Name entries shown on the preceding sample screen. All fields in the five preconfigured records are editable; however, never revise any Schema Name after you have logged data to a table using that schema. Edit the entry in one or more of the fields in the panel to update a preconfigured Data Point Logging table record.

Specify the following information to add one record (row):

Table Name
Unique alphanumeric name of up to 16 characters for the Data Point Logging table that receives the data.

If this table does not exist in the relational database, Historian creates it using the schema defined in the Schema Name field when you make a corresponding entry on the Data Point Schema Control panel.

Valid Entry: unique alphanumeric name up to 16 characters

Schema Name
Unique alphanumeric name of up to 19 characters for the table schema that defines the structure of the relational database tables receiving the data.

This entry must correspond with an entry in the Data Point Schema Control panel. An error message is generated if there is no corresponding entry.

Valid Entry: alphanumeric name of up to 19 characters

Database Alias Name String of up to 31 characters for the name of the relational database where Historian sends the data from Data Point Logging. This entry must match a database alias name entry on a database-specific Historian Information panel. See the applicable “Configuring... Historian” chapter for more information.

Caution: An invalid entry causes a fatal error and run-time termination.

Valid Entry: character string of up to 31 characters

Historian Mailbox Mailbox name Data Point Logging uses to transfer data to the Historian. This tag must match a mailbox tag entry on a database-specific Historian Information for... panel. See the applicable “Configuring ... Historian” chapter for more information.

Caution: An invalid entry causes a fatal error and run-time termination.

Valid Entry: standard tag name
Valid Data Type: mailbox

Chapter 27 . . . .

Print Spooler

The FactoryLink Print Spooler allows you to direct data to printers or other devices with parallel interfaces and also to disk files. The Print Spooler task also provides other features:

- File name spooling (loads file when print device is available, minimizing required memory)
- Management of printing and scheduling functions

Print Spooler receives output from other FactoryLink tasks, such as Alarm Supervisor or File Manager, and sends this output to a printer or disk file.

With Print Spooler, you can define up to five devices to receive output from other FactoryLink tasks. To send files to one of these devices, FactoryLink tasks reference the corresponding device number in a configuration table.

This chapter covers the following topics:

- Print Spooler Information Panel
- Error Messages

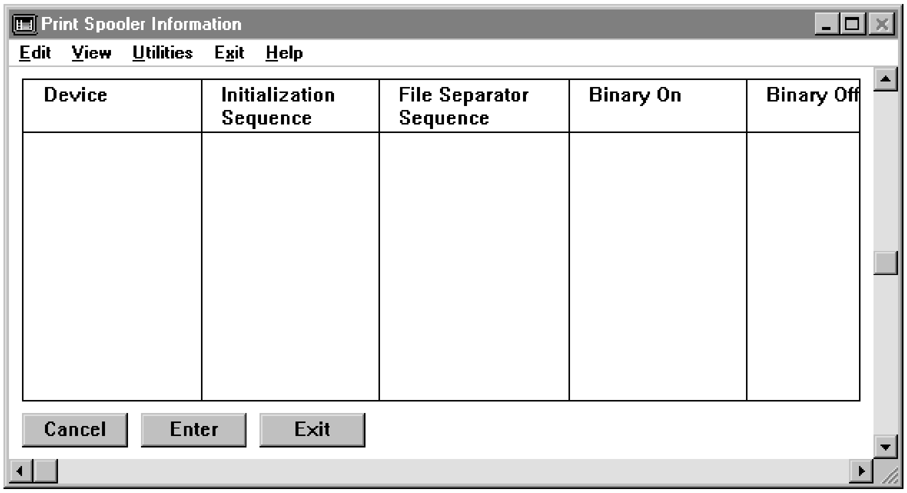
> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

Print Spooler Information Panel

Use the Print Spooler Table to specify the devices the Print Spooler task directs data to. The Print Spooler Table has one panel: Print Spooler Information.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Print Spooler from the Configuration Manager Main Menu and specify the following information:



Device	Initialization Sequence	File Separator Sequence	Binary On	Binary Off

Device Name of the output device. Each line corresponds to a specific device number. For example, line1 = device 1 and line 5 = device 5. With Print Spooler, you can define up to five devices (lines) to receive output from other FactoryLink tasks.

You can assign two or more device numbers to the same physical device. For example, if only one printer is installed and it is attached to parallel port 1, you can enter the same device name for both Device 1 (line 1) and Device 2 (line 2). Print Spooler then recognizes Devices 1 and 2 are the same physical device and it acts accordingly.

FactoryLink tasks use the first entry in the Print Spooler Information panel as the default output device. For example, when you request a print screen in Run-Time Graphics, the output goes to the first device defined the Print Spooler panel. You can change this default by moving the information for another defined device to the panel's first line using the cut and paste features.

You can also direct output to a file rather than to a port by specifying a path and file name. If Print Spooler writes to an existing file, the new values/text are appended to that file in the specified format.

If output is redirected to a disk file as opposed to a true device, the file opens in append mode before it receives output. If the file does not exist when Print Spooler is first started, it is created if any print jobs are directed to it. The characters written to it are precisely the same as if it were a true device, including all device command sequences. You can use such file redirection to capture output for later examination and/or printing at a time when FactoryLink is shut down.

The Print Spooler task can send output to multiple devices at once.

The following example contains valid entries:

Operating System	Printer Specifications	Path and File Name Format
Windows NT & Windows 95/98	lpt1, COM1 lpt2, COM2 lpt3	DRIVE:\DIRECTORY\ SUBDIRECTORY\FILE.EXT

Initialization Sequence/File Separator Sequence

The Initialization Sequence is defined by entering the action you want it to perform in the Initialization Sequence column of the Print Spooler Information panel. The Initialization Sequence performs the action(s) you define once at the beginning of a Spooler session.

The File Separator Sequence is defined by entering the action you want it to perform in the File Separator Sequence column of the Print Spooler Information panel. The File Separator Sequence performs the action(s) you define at the end of each file of a Spooler session.

Enter an alphanumeric string of 1 to 16 characters for use only with the Report Generator and File Manager, not for use with the Alarm Supervisor command sequences that automatically send characters to the printers to separate the output of different files.

These command sequences can consist of two types of characters:

Display characters—Printable ASCII characters, such as A, that can be printed between files.

Control characters—Codes that instruct a printer to perform an action. Control characters have ASCII values from 00 through 1F hexadecimal. Enter a backslash (\) followed by the two-character hexadecimal value of the control character to place a control character in a sequence, e.

For example, enter the command sequences as follows (form feed has the ASCII hex value 0C) to include a form feed command between files:

Initialization Sequence:'\0C'

File Separator Sequence:'\0C'

The backslash character itself can be entered as two backslashes (\\).

For information about control characters and their hexadecimal values, refer to the user manual for the appropriate printer.

Valid Entry: alphanumeric string of1 to 16 characters

Binary On/
Binary Off

Enter an alphanumeric string of 1 to 16 characters that specifies for use only with the Report Generator and File Manager; not for use with the Alarm Supervisor command sequences sent to the printers to print binary files. Represent ASCII control characters as two-digit hex values.

These command sequences can consist of two types of characters:

- Display characters—Printable ASCII characters, such as A, that can be printed between files
- Control characters—Codes that instruct a printer to perform an action. Control characters have ASCII values from 00 through 1F hexadecimal. Enter a backslash (****) followed by the two-character hexadecimal value of the control character to place a control character in a sequence. For example, the two-digit hex value for the ASCII ESCAPE character is 1B. If, on a particular printer, an ESCAPE character followed by G turns graphics mode ON and ESCAPE followed by g turns it OFF, fill in the command sequences as follows:

Binary On:\1BG

Binary Off:\1Bg

This sequence puts the printer in graphics mode before it begins the print job and takes the printer out of graphics mode upon completion of the print job.

If output is redirected to a disk file (as opposed to a true device), the file opens in append mode before it receives output. If the file does not exist when Print Spooler is first started, it is created if any print jobs are directed to it. The characters written to it are precisely the same as if it were a true device (including all device command sequences). You can use such file redirection to capture output for later examination and/or printing at a time when FactoryLink is shut down.

Valid Entry: alphanumeric string of 1 to 16 characters

Note: In printing active alarms online using WIN NT OS services, you may get a print page for every alarm line. This is because every printer becomes a file and NT adds the page break. To avoid this, define the printer as “generic text only,” and the page break will not be added between alarms. Then add a line feed (\OA) as the file separator on spooler to restore the line feeds between alarms.

Status Tag

Name of an element that contains one of three analog values representing the status of the printing device:

0	File print is complete
1	Device active
2	Error operating device

Be sure to distinguish between devices when assigning element names if you specify more than one device.

If the tag specified in this field is undefined, a Tag Definition is displayed when you click Enter with a tag type of analog in the Type field. Accept this default.

Valid Entry:	standard tag name
Valid Data Type:	analog

Message Tag

Name of an element that contains a message describing the status of the printing device. This element is useful if you want to display the status of a printing device on a graphics screen. To display the status of a printing device on a graphics screen, configure an output text object in the Application Editor to contain the value of this element. Be sure to distinguish between devices when assigning element names if you specify more than one device. If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of message in the Type field. Accept this default.

Caution: All Print Spooler job requests are routed through the /FLAPP/SPOOL directory. If all such requests are not effectively transferred (for instance, if the printer is offline), this directory can get backlogged. To ensure effective processing, check the directory periodically and delete any obsolete job requests.

Valid Entry:	standard tag name
Valid Data Type:	message

Use OS Print Services

Enables the spooler to use a print services configured network printer. (When submitting print jobs through the OS print services, ESCAPE sequences cannot be imbedded in the jobs.)

A Print Services dialog has been added to allow FactoryLink print spooler to run through your operating system print server.

If Print Services is set to NO (the default setting a converted application uses), the print spooler functions identically to the current print spooler. The additional fields, font name and font size, are ignored.

If Print Services is set to YES, the following points apply:

- Print spooler does not support DOS-type print capture mapping. Network printers need to be specified by name or by network device.
- Print spooler supports connection to printers by printer name or port name, where the port name is the actual physical port name of the printer; for example, LPT1 is the printer connected to the LPT1 port.
- Since multiple printers can be configured to use the same port, spooler reports an error if a printer port has multiple printers assigned.

Note: If the printer is a network printer using Microsoft Windows NT Print Services, its name must be

\\server\printer

where server is the server where the printer is located, and printer is the remote printer name.

For example, if in the Printers folder, a printer is shown as MyPrinter3 on MyServer, then the printer name for Print Spooler would be

\\MyServer\MyPrinter3

Printer Font Defines the font name to use for printing. This must be a valid printer font. Refer to your printer’s documentation for details.

Note: This applies only when the Printer Services is set to YES. Printer Font can be blank for the system printer font default.

Font Size Font size to be used for printing, in points.

Note: This applies only when the Printer Services is set to YES. Font Size can be blank for the system printer font default.

The completed panel resembles the following sample.

Sample Print Spooler Information Panel		
Field	**Sample Entry**	**Explanation**
File Separator Sequence	/0C	Is a command sequence consisting of control characters. The /0C control characters instruct printing device /dev/tty1 to insert a formfeed after each file it prints. This ensures that each file printed begins on a new page.
Status TAG	device1_status	Is an analog element containing the status of the printing device. Other tasks can read the value of device1_status to determine whether the printer is busy before they send output to it.
Message TAG	device1_msg	Is a message element containing a message about the status of the printing device. This message is displayed on a graphics screen by animating a Text object in Application Editor to display the value of this element.

Sample Print Spooler Configuration for Alarm Logger

Follow the steps below to configure Print Spooler for Alarm Logger:

1 Verify printer is configured in printer manager with a capture port assignment even if it is hooked up to LPT1.

2 Define printer in Spooler in either way:

LPT1
OS Services = NO

or

\\SERVICE\PRINTER_NAME OR PRINTER_NAME
OS Services = YES

3 Define printer device number = 1 in the alarm setup table.

PRINT SPOOLER ERROR MESSAGES

The following status and error messages can be displayed to the right of SPOOL on the Run-Time Manager screen:

Bad CT file *filename*

Cause: The task cannot access information in the Print Spooler Information panel. The specified table may be corrupt.

Action: Delete /FLAPP/CT/SPOOL.CT. Restart the application to recreate the file.

Bad device number *number* in flags

Cause: An incorrect device is specified in a request sent to the Print Spooler.

Action: Choose Print Spooler from the Configuration Manager Main Menu. Verify the entries in the Device field of the Print Spooler Information panel are correct. Check the printer device entries in the task configuration tables for any FactoryLink task sending requests to the Print Spooler.

Can’t open CT file *filename*

Cause: Either the /FLAPP/CT/SPOOL.CT file does not exist or is corrupt.

Action: Delete the file if it exists and restart the application to recreate the file. Create it by restarting the application if the file does not exist.

Can’t open input file *filename*

Cause: The input file may not exist or may be opened by another task.

Action: Check that the specified file exists.

Can’t open output device *device name*

Cause: If the data is being written to a file, an incorrect path may be specified. If the output device is a printer, the printer may be busy.

Action: Ensure the specified path is correct if the output device is a file. Check the specified output device (such as a printer) for problems.

Hard error on device *device name*

Cause: A problem exists with the specified output device.

Action: Check the specified output device for problems, such as if the printer is offline.

Illegal flags *flag* for output device *device name*

Cause: An incorrect option flag is specified in a request sent to the Print Spooler.

Action: Contact Customer Support.

Illegal printer sequence for device name *device name*

Cause: An incorrect sequence is entered in the Print Spooler Information panel for the specified device.

Action: Choose Print Spooler from the Configuration Manager Main Menu. When the Print Spooler Information panel is displayed, ensure the entries in the sequence fields (File Begin, File End, Binary On, Binary Off) are correct for the type of device specified in the Device field.

I/O error writing to device *device name*

Cause: The FLAPP/CT/SPOOL.CT file may be damaged or you may have a problem with the output device.

Action: Ensure the output device, such as a printer, is functional. When it is, delete FLAPP/CT/SPOOL.CT and restart the application to recreate the file.

No colon in flags

Cause: A colon was not included in a request sent to the Print Spooler.

Action: Contact Customer Support.

No output devices

Cause: No output device is specified in the Print Spooler Information panel.

Action: Choose Print Spooler from the Configuration Manager Main Menu. Specify a device in the Print Spooler Information panel. Rerun the application.

Not enough RAM

Cause: Not enough RAM is available to perform this task.

Action: Close any unnecessary windows or programs, such as the Application Editor or any text editor. Add RAM to the system if this error message occurs often.

Not enough RAM to continue task

Cause: Not enough RAM is available to perform this task.

Action: Close any unnecessary windows or programs, such as the Application Editor or any text editor. Add RAM to the system if this error message occurs often.

Spool: Task initialization failed

Cause: Either Print Spooler is already running, a key is not installed, the wrong key is installed, or you are not authorized to have the key.

Action: Check that the proper key is installed if you are authorized to have the key.

Spooler backup file too large. New data not saved.

Cause: The printer is out of paper or offline. Alarm logging data has been saved to a temporary file. This file holds up to 640,000 bytes of data, and the file has now exceeded this size. Any new alarm logging data is not saved.

Action: Put the printer back online or put paper in the printer. When the printer is ready, data saved in the temporary file is spooled to the printer, and the data in the temporary file is deleted. Alarm logging data is spooled to the printer.

Unknown flag *flag* for output device *device name*

Cause: An illegal entry is made in the Print Spooler Information panel for the specified output device.

Action: Choose Print Spooler from the Configuration Manager Main Menu. Ensure the entries are correct in the Print Spooler Information panel.

Chapter 28 . . . .

Event and Interval Timer

Event and Interval Timer allows you to define timed events and time intervals that initiate and control any system function in run-time mode. This task links timed events and intervals to real-time database elements used as triggers whenever the event or interval occurs. Use this task to signal the occurrence of specified events or intervals by writing to digital elements in the FactoryLink real-time database. There is no limit, except the amount of available memory, to the number of event and interval timers that can be defined.

This chapter covers the following topics:

- Principles of Operation
- Changing the Operating System Data and Time
- Event Timer Information Panel
- Interval Timer Information Panel
- Error Messages

> **Note:** The screen representations in this chapter reflect the FactoryLink 6.6 Configuration Manager user interface, rather than the Configuration Explorer view that comes with FactoryLink 7.0. The information to be entered is the same, whether you use Configuration Manager (6.6) or the form or grid view of Configuration Explorer (7.0).

PRINCIPLES OF OPERATION

The Event and Interval Timer task operates in synchronization with the system clock. For each defined interval or event, you must create a digital element in the real-time database. When the system clock matches the specified event or interval, the task forces the value of this digital element to 1 (ON).

The Event and Interval Timer task also updates global information used by FactoryLink such as the current time, the day of the week, and the month. Such global information is stored in predefined FactoryLink real-time database elements, known as reserved elements, each of which is one of the following data types: analog, long analog, or message.

While the Timer task is running, these reserved elements are constantly updated. In order for the Timer task to run, you must have entered an R flag for the Timer task in the System Configuration Table in the Configuration Manager Main Menu. The following table lists reserved elements that are updated by the Event and Interval Timer task.

Reserved Element	Data Type
A_SEC	Analog
A_MIN	Analog
A_HOUR	Analog
A_DAY (Day of month)	Analog
A_MONTH	Analog
A_YEAR	Analog
A_DOW (Day of week)	Analog
A_DOY (Day of year)	Analog
DATE (DOW MM-DD-YYYY)	Message
TIME (HH:MM:SS)	Message
DATETIME (DOW MM-DD-YYYY HH:MM:SS)	Message
YYMMDD (YY-MM-DD)	Message
SECDAY (Seconds since start of current day)	Long Analog
SECYEAR (Seconds since start of current year)	Long Analog
SECTIME (Seconds since January 1, 1980)	Long Analog

Changing the Operating System Date and Time

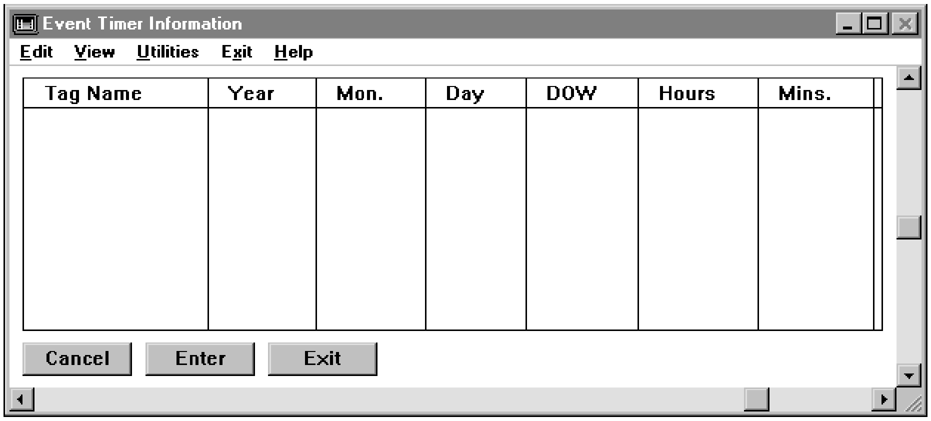
To change the operating system date and time while FactoryLink is running, shut down the Timer task, change the date and time, and restart the task. Otherwise, the Timer task tries to catch up by processing missed intervals.

Event Timer Information Panel

Use Event Timer to define events that only occur at least once every 24 hours. For example, use Event Timers to start or stop reports and as triggers to read and write recipe files.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Event Timer from the Configuration Manager Main Menu and specify the following information:



Tag Name — Element name (for example, time8am) to be assigned to the event. When the event occurs, the element is forced to 1 so its change-status bit is set to 1. The Timer task resets all event timers back to zero at midnight. You can assign more than one element to the same event.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry: standard tag name (default = digital)
Valid Data Type: digital

Year, Mon. Day DOW — Specify a period when an event is to occur. Enter a Year (Year), month (Mon), day (Day), day-of-the-week (DOW), or combination.

When using Day and Month, the event occurs only on this date in the specified month in the specified year. If you do not enter a month, the event occurs on this date every month. If you do not enter a month and year, the event occurs on this date every month of every year.

If you enter a month when using DOW, the event occurs on this day every week of that month only.

If you do not enter a month, the event occurs on this day every week.

If you enter a month and year, the event occurs on this day every week of the specified month during the specified year.

If you do not enter a month and year, the event occurs on this day every week of every year.

Year 4-digit year such as 1994.

Month 1-12 or MMM (Example: March is 3 or MAR for first three letters of the month’s name.)

Day 1-31 indicating the day of the month the event is to occur. If the event is to occur once every day, leave this field blank.

DOW MON - SUN First three letters of a weekday. Leave the field blank if the event is to occur once every day.

Hours Refer to the following discussion of Hours, Mins., and Secs.

Mins. Refer to the discussion of Hours, Mins., and Secs. that follows.

Hours, Mins. Secs.

Hours, Mins. (minutes), and Secs. (seconds) fields define the specific time in 24-hour format an event is to occur. The event timer assumes a default value of 0 for blank fields. The conventions for use are

Hours Hour the event is to occur (0 to 23).

Mins. Number of minutes (0 to 59) after the hour the event is to occur. Leave this field blank if the event is to occur on the hour.

Secs. Number of seconds (0 to 59) after the minute (or hour) the event is to occur.

Between midnight (00:00:00) and the time indicated in the Hours, Mins., and Secs. fields, the value of the element an event is linked to is 0 (OFF). The element value changes to 1 (ON) after the timed event occurs and stays this way until midnight when it changes back to 0 (OFF).

Hours 0 - 23 (0 is midnight and 23 is 11:00 P.M.)

Mins. 0 - 59

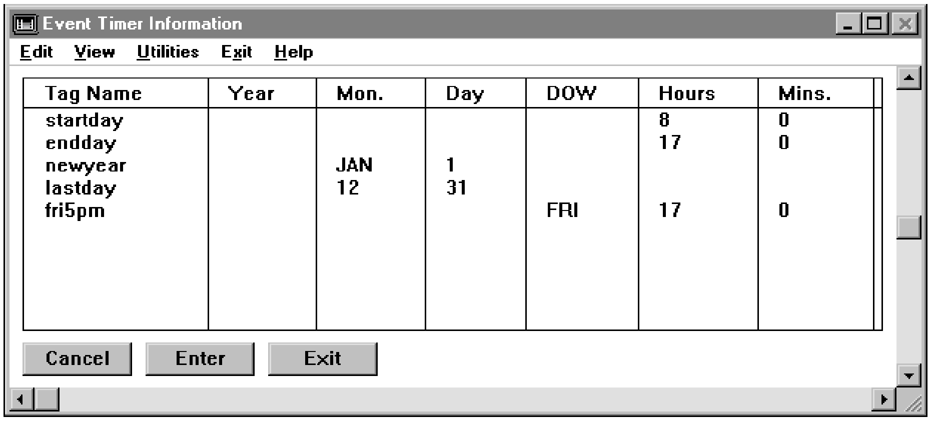
Secs. 0 - 59

First Value that determines the action taken upon system startup, if startup occurs after a timed event. Because this field only affects events scheduled for the current date, the system checks the date before changing any values.

YES The element value immediately changes to 1 (ON), indicating the timed event occurred for that date. The change-status flags are also set to 1 (ON).

NO Default—the element's value is left as is and does not change to 1 (ON) until the next occurrence of the timed event.

The Event Timer Information panel resembles the following sample when all information has been specified.



Tag Name	Year	Mon.	Day	DOW	Hours	Mins.
startday					8	0
endday					17	0
newyear		JAN	1			
lastday		12	31			
fri5pm				FRI	17	0

In this example, the startday element has a value of 0 between midnight and 8:00 A.M. and 1 between 8:00 A.M. and 11:59 P.M. and 59 seconds (23.59.59) each day of the year.

Similarly, the endday element has a value of 0 between midnight and 5:00 P.M and 1 between 5:00 P.M. and 11:59 P.M. and 59 seconds.

The newyear element value has a value of 1 on January 1 of each year and 0 on all other days.

Similarly, the lastday element value has a value of 1 on December 31 of each year and 0 on all other days.

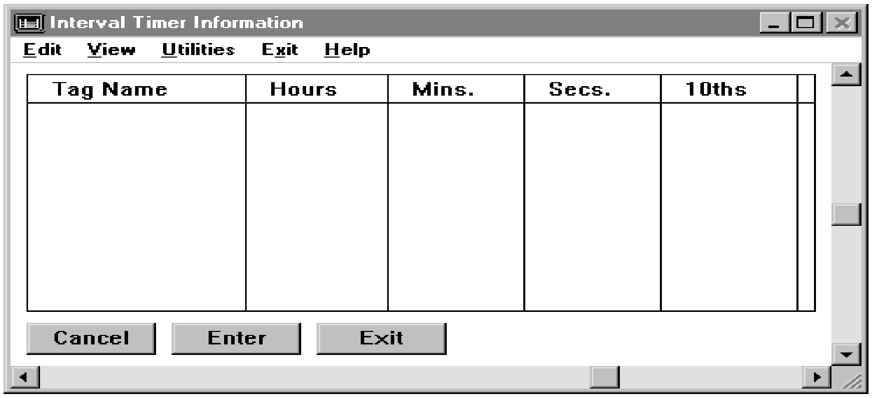
The fri5pm element has a value of 1 each Friday between 5:00 P.M. and midnight.

INTERVAL TIMER INFORMATION PANEL

Use Interval Timer to define events that occur at least once every 24 hours at regular intervals of the system clock, such as every second or every two hours. For example, use interval timers as triggers in Polled Read or Write PLC tables and in Send or Receive tables for FL/LAN Network configurations.

Ensure the domain selected is SHARED in the Configuration Manager Domain Selection box.

Choose Interval Timer from the Main Menu and specify the following information:



Tag Name

Name of the element (for example, sec5) to be assigned to the interval. You can assign the same interval to more than one element.

If the tag specified in this field is undefined, a Tag Definition dialog is displayed when you click Enter with a tag type of digital in the Type field. Accept this default.

Valid Entry: standard tag name
Valid Data Type: digital (default = digital)

Hours Mins. Secs. 10ths

Hours, Mins. (minutes), Secs. (seconds), and 10ths (tenths of a second) fields define the interval an event is to occur at. The interval timer assumes a default value of 0, if these fields are left blank. At least one of these fields must be filled in with a valid entry (not zero, as it is not considered a valid entry) or else the system does not allow the Interval Timer to start, but instead displays the error message:

“Bad data in ITimer record (record#), file (itimer.exe).”

Depending on the interval you specify, the timer starts at midnight or at system startup. If the interval can be divided evenly into 24 hours (86400 seconds or 1440 minutes), the timer runs as if it started at midnight. If the interval cannot be evenly divided into 24 hours, the timer starts at system startup.

Conventions for use include:

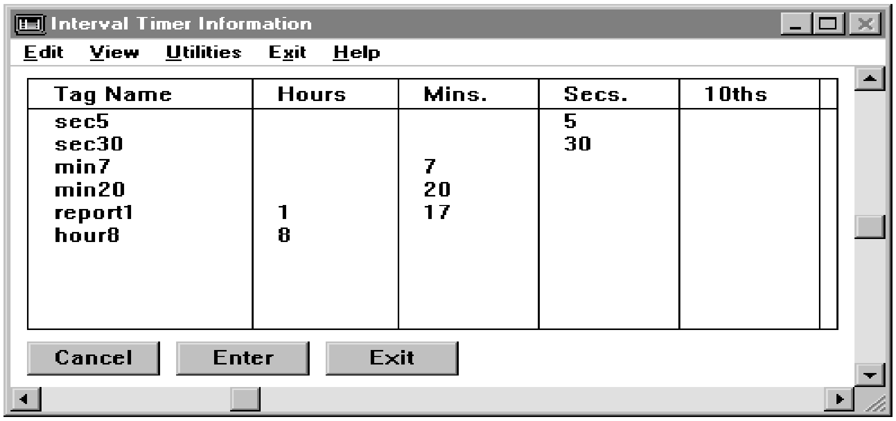
Hours A number between 0 and 23 that indicates the length, in hours, of the interval. Example: Every 2 hours (2), every 3 hours (3).

Mins A number between 0 and 59 that indicates the length, in minutes, of the interval. Example: Every 5 minutes (5), every 10 minutes (10).

Secs A number between 0 and 59 that indicates the length, in seconds, of the interval. Example: Every second (1), every 7 seconds (7).

10ths A number between 0 and 9 that indicates the length, in tenths of a second, of the interval. Example: Every tenth of a second (1), every half second (5).

The Interval Timer Information panel resembles the following sample when all information has been specified.



Tag Name	Hours	Mins.	Secs.	10ths
sec5			5	
sec30			30	
min7		7		
min20		20		
report1	1	17		
hour8	8			

In this example, the sec5 element change-status flags are set to 1 every 5 seconds; that is, when the reserved analog element A_SEC = 0, 5, 10, 15, ... 55. This timer runs as if it started at midnight; therefore, if system startup time is 9:39:18, the sec5 element's change-status flags are first set 2 seconds later, at 9:39:20, and every 5 seconds thereafter.

The sec30 element change-status flags are set to 1 every 30 seconds, when A_SEC = 0 and 30. This timer runs as if it started at midnight.

The min7 element change-status flags are set to 1 every 7 minutes after system startup, because 1440 is not evenly divisible by 7.

The min20 element change-status flags are set to 1 every hour, again at 20 minutes after the hour, and again at 40 minutes after the hour.

The report1 element change-status flags are set to 1 every hour and 17 minutes, after system startup.

The hour8 element change-status flags are set to 1 three times a day: at 8:00 A.M., 4:00 P.M., and midnight, regardless of system startup time.

When interval timers are used as triggers for other tasks, such as PLC read triggers or Report Generator triggers, these tasks automatically use the change-status flags associated with these timers.

EVENT AND INTERVAL TIMER ERROR MESSAGES

One of the following messages is displayed to the right of TIMER on the Run-Time Manager screen if an error occurs in the Timer task at run time.

Bad data in ETIMER record *record_number*, file *filename*

Cause: The Event Timer Table contains one or more invalid values.

Action: Open the Event Timer Information panel. Ensure the correct element name is entered.

Check the data type. Only digital data types are valid on the Event Timer Information panel. Choose View>Object List to check the data type specified for an element. Then, use the Search function from the View menu.

Choose View>X-ref List to display the Cross Reference List to locate all panels that reference a particular element name. Choose View>Search, enter the desired element name, and click Enter.

Bad data in ITIMER record *record_number*, file *filename*

Cause: The Interval Timer Table contains one or more invalid values.

Open the Interval Timer Information panel. Ensure the correct element name is entered.

Check the data type. Only digital data types are valid on the Interval Timer Information panel. Choose View>Object List to check the data type specified for an element. Choose View>Search.

Choose View>X-ref List to display the Cross Reference List to locate all panels that reference a particular element name. Choose View>Search, enter the desired element name, and click Enter.

Bad filename index record in file *filename*

Cause: The TIMER.CT file may not have the correct number of configuration tables archived in it. One of the following files may be damaged or missing:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB

FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Action: Ensure the following files exist:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB
FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Perform the following steps if the files are present and the problem still exists:

1. Delete FLAPP/TIMER.CT
2. Restart the application to rebuild the TIMER.CT file

Can’t close file *filename*

Cause: Either the operating system, third-party software, or hardware setup on your system is incorrect or incompatible or an internal error occurred. The FactoryLink real-time database may have been corrupted.

Action: Verify the following:
The operating system is set up to run FactoryLink (tuning parameters, resources).

All third-party software needed by ,such as X-Windows, is installed and set up correctly and you have the correct version for FactoryLink.

All hardware is correctly set up and all of the hardware is compatible.

Contact Customer Support if everything is compatible and set up correctly but the error persists.

Can’t find filename in file *filename*

Cause: The TIMER.CT file may not contain the correct number of configuration tables. One of the following files maybe damaged or missing:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB
FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Action: Ensure the following files exist:
FLAPP/ETIMER.MDX

FLAPP/ETIMER.CDB
FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Perform the following steps if the files are present and the problem still exists:

1. Delete FLAPP/TIMER.CT
2. Restart the application to rebuild the TIMER.CT file

Can't get FactoryLink ID errno *error_number*

Cause: The Timer task is unable to register with the FactoryLink kernel; the Timer task may already be running or more than 31 FactoryLink tasks not including Run-Time Manager may have been started.

Action: Check the Run-Time Manager screen to see if the Timer task is running. Also, check the number of tasks that have been started. The maximum number of tasks including Run-Time Manager is 32.

Can't open file *filename*

Cause: The specified file is either nonexistent or opened by another task. Incorrect editing may have caused the problem if the file is exported, edited with a text editor, and then imported.

Action: Ensure the specified file name exists. If it exists, check to see whether it was exported, edited with a text editor, and then imported. The file should be unformatted ASCII text.

Invalid tag type for Reserved Timer tag *element_name*

Cause: The specified reserved Timer element is the wrong data type. The RTDB may be damaged.

Action: Use the Configuration Manager Main Menu to correct the reserved timer element(s).

Read failed for ETIMER record *record_number* in file *filename*

Cause: An I/O error occurred during the reading of an Event Timer.CT record. The TIMER.CT file may not contain the correct number of configuration tables. One of the following files may be damaged or missing:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB

Action: Ensure the following files exist:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB

Perform the following steps if the files are present and the problem still exists:
Delete FLAPP/TIMER.CT.
Re-start the application to rebuild the TIMER.CT file.

Read failed for ITIMER record *record_number* in file *filename*

Cause: An I/O error occurred during the reading of an Event Timer.CT record. The TIMER.CT file may not have the correct number of configuration tables archived in it. One of the following files may be damaged or missing:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB

Action: Ensure the following files exist:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB

Perform the following steps if the files are present and the problem still exists:

1. Delete FLAPP/TIMER.CT
2. Restart the application to rebuild the TIMER.CT file

Reserved Timer tags not defined

Cause: Some or all of the reserved timer elements are not defined.

Action: The GLOBAL.CDB and/or GLOBAL.MDX files are damaged.

FLNEW did not run. FLNEW creates a blank application structure, including these two files.

Part of FLINK/BLANK may be missing.

Wrong Kernel version

Cause: Incompatible versions of FactoryLink software exist on the system.

Action: Reinstall the system.

Wrong number of CTs archived in file *filename*

Cause: The TIMER.CT file may not contain the correct number of configuration tables. One of the following files may be damaged or missing:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB
FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Action: Ensure the following files exist:
FLAPP/ETIMER.MDX
FLAPP/ETIMER.CDB
FLAPP/ITIMER.MDX
FLAPP/ITIMER.CDB

Perform the following steps if the files are present and the problem still exists:

1. Delete FLAPP/TIMER.CT.
2. Restart the application to rebuild the TIMER.CT file.

Chapter 29

Trending Task

The Trending task exists in a Client/Server architecture. Trend provides comprehensive programming capabilities for a dynamic run-time environment. Trend is composed of a Trend client, which is the Trend Control, a relational database, and a Trend Server. The components work together to take information and format it into a Trend chart.

Use the Trending task to chart data over time or a series of events. An event is sometimes referred to as a sample. There are two types of plotting on a Trend chart: time based and event based. A time-based chart shows a value changing over time and is useful for monitoring continuous processes. An event-based chart shows values against an event number and is useful for showing information per sample or batch. The trend chart is capable of plotting multiple data points concurrently.

You can perform almost any Trending operation at run time that you can perform at design time. As an exception, you can only perform the panning and zooming features at run time.

Trend offers other useful features such as:

- Panning & zooming
- Multiple pens
- Value cursor
- Multiple axes
- Delta T
- Tooltip information
- Custom programming capabilities, which is sometimes referred to as scripting

This chapter contains three sections:

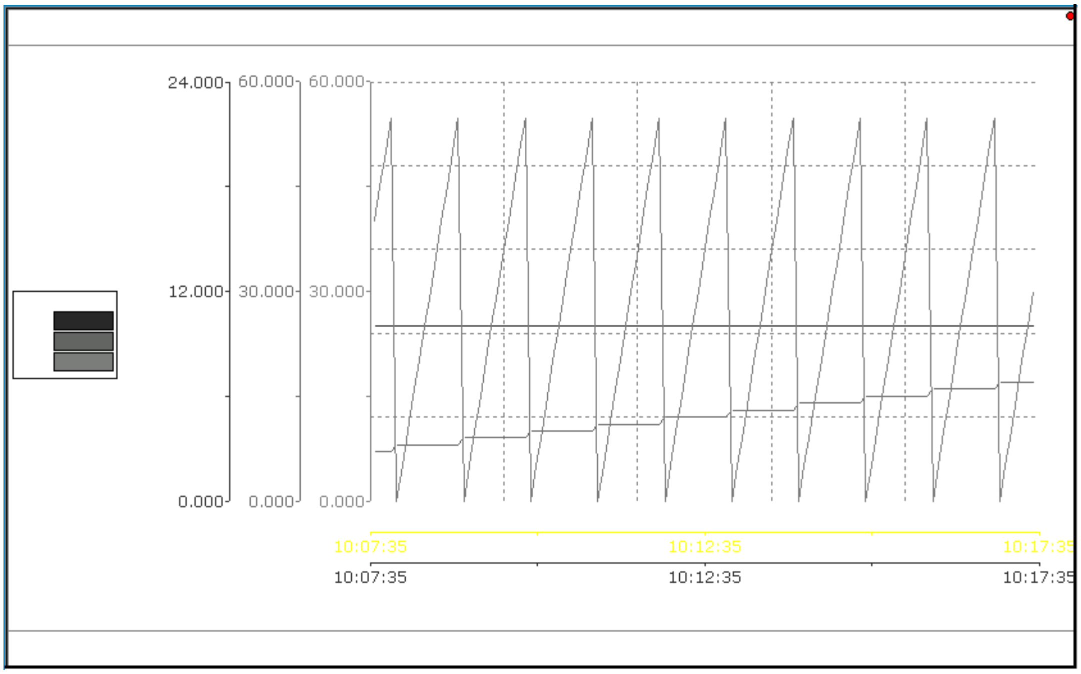
- Trend Operating Principles
- Configuring Trend
- Run-Time

Trending Operating Principles

As data is collected or computed by FactoryLink, it is stored as a data element in a real-time database. Each time data is collected, or computed, the new data overwrites the value stored in the real-time database for an element. To keep a listing of the data, you store the data in a relational database.

Using the Trend task, you can create animated graphs called trend charts that graphically show this numeric data. To show the data after the time or event has occurred, you create a Trend chart which will fetch data from a relational database. To show data in near real time, you create a Trend chart which will fetch data from a relational database as frequently as data is logged to it. A typical FactoryLink Trend chart is shown in Figure 29-1.

Figure 29-1 FactoryLink Trend Chart



This chapter introduces the operational concepts to configure Trending operations.

Historical Trending

Historical trending allows you to chart data from the relational database after the data is logged to the database.

The real-time database receives and stores data from various sources, such as a remote device, user input, or computation results from a FactoryLink task. When data is collected and stored in this database, other tasks can access and manipulate it. The older data is overwritten as new data is received.

FactoryLink Logger reads the value of specific data elements stored in the real-time database and maps the data elements to columns in a disk-based relational database table.

The database Logger sends the data from the real-time database to the disk-based relational database via a historian mailbox.

FactoryLink Historian inserts the data into the relational database. Once in this database, the data can be used by other applications.

Trend Control requests the data from the relational database via the Trend Server so it can be displayed on a trend chart.

Trend Components

The Trending task is comprised of the following software components:

- Trend Control
- Relational Database
- Trend Server

The Trending task is composed of software components in a client/Server architecture. A client/Server architecture is a common form of a distributed system in which software is split between Server tasks and client tasks. A client sends requests to a Server according to some protocol, and asks for information or an action. The Server responds.

Trend Control

The Trend Control component is a client of the client/Server software architecture. The Trend Control is an Active X Control. Its container is Client Builder. The Control’s properties are available for custom programming.

The Trend Control requests data from the Trend Server. The Trend Server sends the requested data back to the Trend Control. The Trend Control, the client, accepts the Trend Server’s responses.

Relational Database

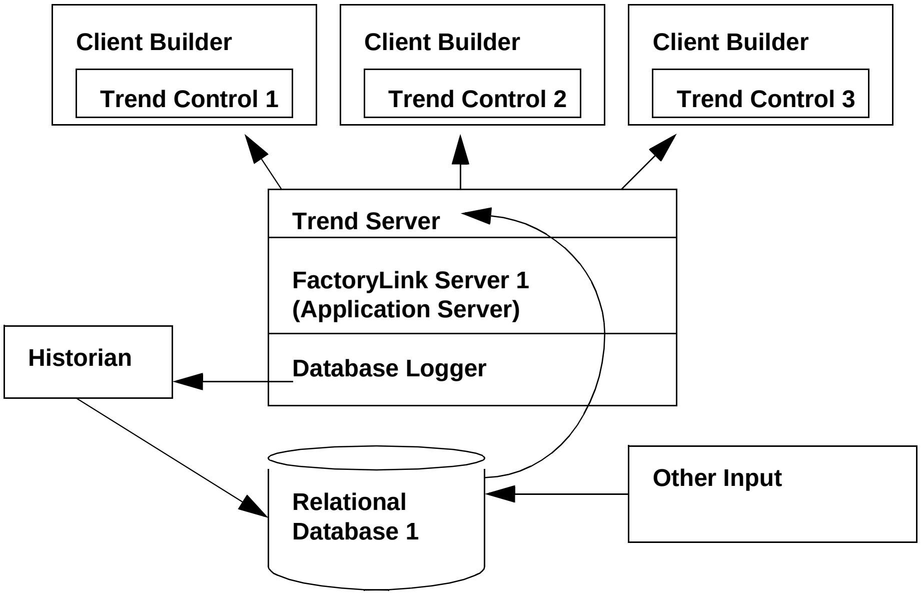
All Trend data is stored in a relational database, and this data is considered to be historical. Data in the relational database can come from sources other than FactoryLink's Real-Time Data Base (RTDB).

Trend Server

Trend Server is a program that provides a service to client programs. The client is the Trend Control. The Trend Server is a component of Trend that can query any relational database, or many databases, simultaneously.

For a diagrammatic view of the Trend components, refer to Figure 29-2.

Figure 29-2 Trend Component Interaction

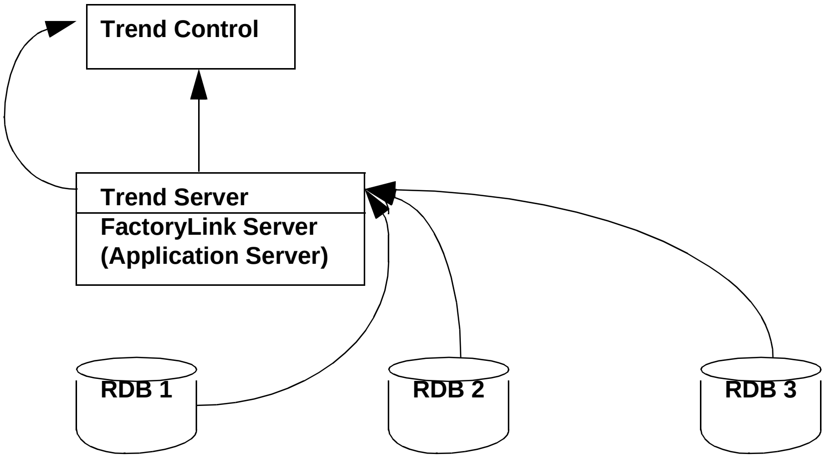


Trend Component Interaction

To understand how Trend components interact, refer to Figure 29-2. Since a client can make only one connection, clients can connect only to one Trend Server. Trend Servers, however, can serve multiple clients and connect to multiple relational databases. For information about a Trend Server query, refer to Figure 29-3. Trend Control contacts Trend Server and passes the data source information to the Trend Server. Trend Control passes this data to the Trend Server as pens are added to the chart. Trend Server returns the data. Trend Control takes that data and associates it with a pen. This interaction allows a pen to be modified at run time as well as design time. Trend Server gets the data from the relational database (RDB), and sends it back to the Trend Control. This data appears on the Trend chart.

A Trend Server can establish multiple database connections as shown in Figure 29-3. Trend Server can establish multiple database connections because the pens that appear on the Trend chart may come from more than one data source. A Trend Server establishes as many connections as needed to get the data as needed by the pens.

Figure 29-3 Trend Server Query



Trend Cluster

A Trend Cluster is a grouping of Trend Servers and their data sources. When you define a Trend Server, you also define a Trend Cluster. You can define multiple Servers. To see a diagram of a Trend Cluster, refer to Figure 29-4. The diagram shows three distinct process areas. Trend Server 1 is contained in the first process area, and is the primary Server connection in previous examples. A switch will be made to connect to Trend Server 2 or 3 if the primary connection fails. The functionality of this feature will be available in a future release.

Figure 29-4 Trend Cluster

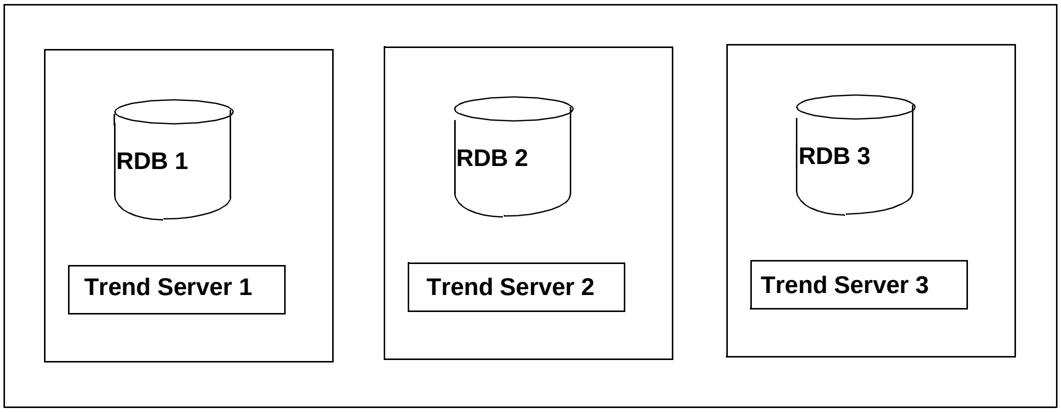


Chart Types

Two types of Trend charts can be produced:

- Time-based
- Event-based

The chart type to use depends on how the Key column is set up in the database table when configuring the pens. The key column can be set up according to the type of chart as follows:

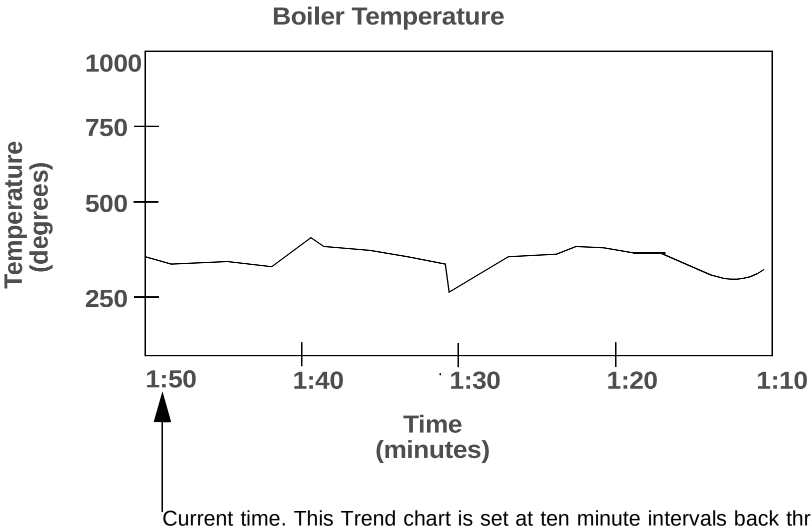
For a time-based chart, the key column is set up as a time field.

For an event-based chart, the key column is set up as a sequence or an ID field.

Time-Based Chart

Time-based charts are best suited for continuous types of data. For example, you can show trends or variances in a boiler temperature over time using a time-based chart. Because the boiler must maintain a particular temperature, the temperature is sampled every minute. To see a representation of a Time-based chart, refer to Figure 29-5.

Figure 29-5 Time-Based Trend Chart Showing Boiler Temperature



Current time. This Trend chart is set at ten minute intervals back through time. Chart direction can start on the right and flow to the left, or start on the left and flow to the right.

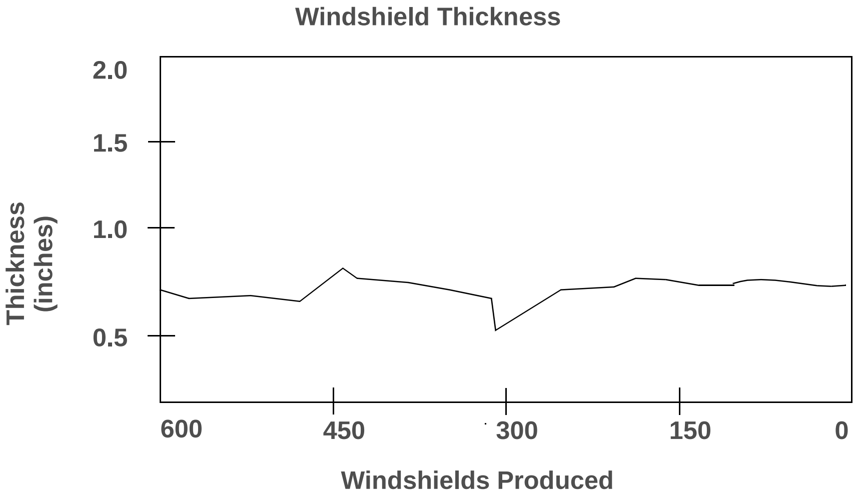
Event-Based Chart

Event-based charts are well-suited for two types of data:

- Per piece (sample)
- Batch (group)

Per-piece data is data collected for every item in a process. For example, a manufacturer of car windshields inspects the thickness of every completed windshield as it comes off the assembly line. Using an event-based chart, this manufacturer can graphically represent the thicknesses of the windshields produced, regardless of time. To see an example of an event-based chart, refer to Figure 29-6.

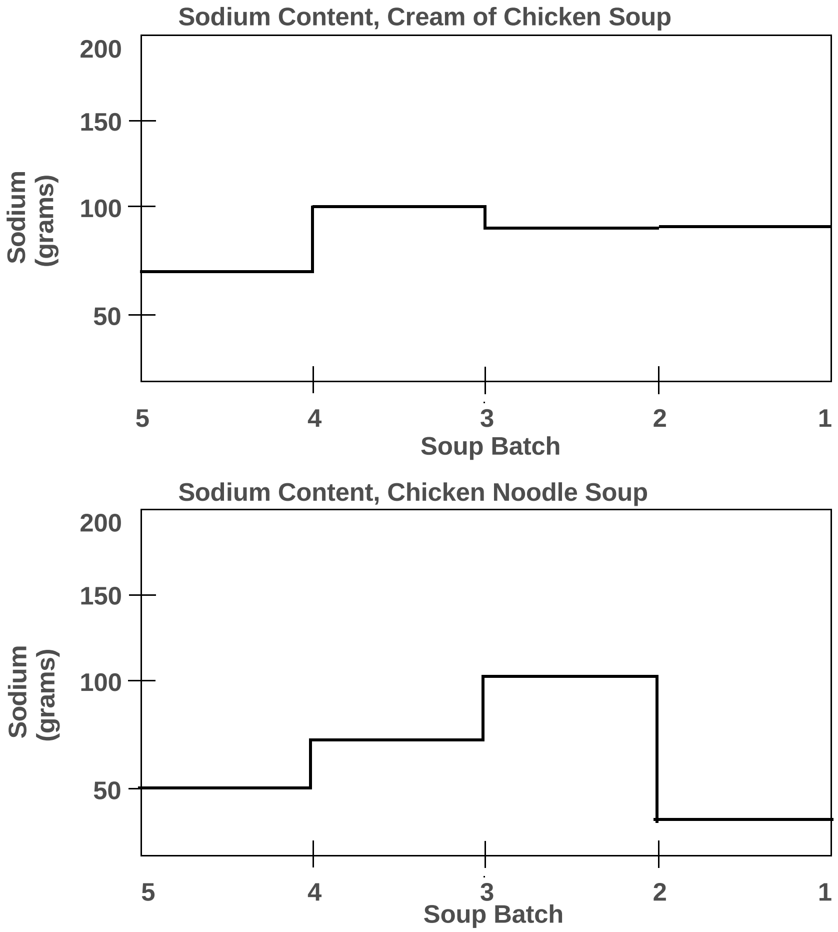
Figure 29-6 Event-Based Trend Chart Showing Per Piece Type of Data



Group data is data that logically belongs together and is categorized or grouped in that manner. For example, a soup manufacturer that makes two flavors of soup may want to track different batches of both flavors. Using an event-based chart with groups (soup flavors), this manufacturer can graphically represent the differences in sodium content for each group by batch. At the end of the batch cycle, a trigger initiates the sampling of the sodium content for the batch. This sample is written to the database and the sequence number increments to prepare for the sampling of the next batch. The differences can be shown as separate Trend charts for each soup flavor: cream of chicken or chicken noodle.

For example of an event-based chart showing batch type of data, refer to Figure 29-7.

Figure 29-7 Event-Based Trend Chart Showing Batch Type of Data



Panning & Zooming

Because all historical Trend data is written to a relational database, you can arrange it to show different data ranges. These ranges can be expanded or collapsed. Panning allows you to select the time span of data to display in a historical Trend chart. You pan to move a window of time to a new starting point. When you pan, you keep the same chart duration, which is units of time or samples. Using this feature, you can move forward or backward through historical data and you can move to a specific time or sample.

Zooming is the ability to look at small or large chunks of data by changing the chart duration. Zooming either increases the amount of data displayed or decreases the amount displayed by half. You see the same number of points, but you zoom in for a narrower start/end range or zoom out for a wider range.

Multiple Pens

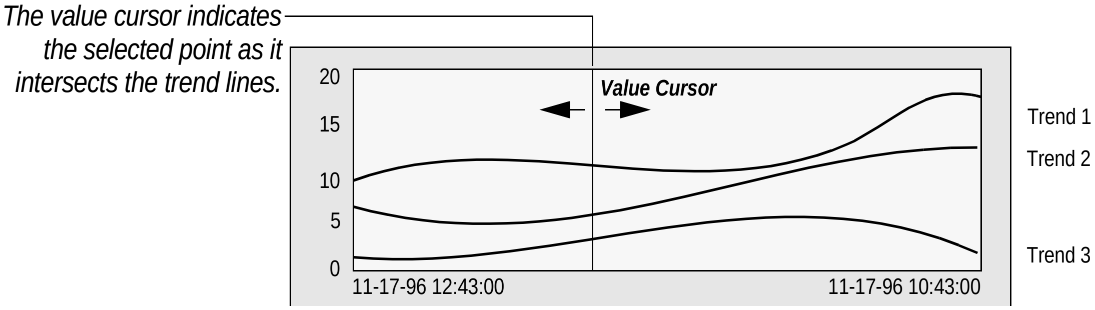
Using FactoryLink, you can create different types and numbers of pens. You can configure fixed pens at design-time to allow you to permanently assign a database table column to a particular pen. You can assign the column to a pen at run time, and you can assign multiple pens to a Trend chart at both design and run time.

> **Note:** We recommend you configure no more than eight pens to a chart for good readability.

Value Cursor

A value cursor allows you to display the value associated with a point on a Trend chart. When you click anywhere in the chart at run time, the value cursor, which looks like a vertical bar, is displayed. You can write custom programs for pen cursor values. For an example of a value cursor, refer to Figure 29-8.

Figure 29-8 Value Cursor



Multiple Axes

As mentioned earlier, you can configure multiple pens with FacotryLink. FactoryLink creates an X and Y axis to correspond to each pen as each pen is created. To see an example of the placement of multiple axes, refer to Figure 29-1. In this example, the chart shows three pens. Each pen has its own corresponding axis.

Delta T

Delta T refers to an offset in time. In FactoryLink, for example, you can have two pens showing data simultaneously. FactoryLink's Delta T feature allows you to associate an offset in time for one of the pens. You could find this feature useful in conducting a comparison between spans of time on a pen. This feature allows you to shift and line up one span of time over another to conduct such a comparison.

Tooltip Information

When you hold your cursor over a point in the Trend chart, information about that value appears in a text box over the point. Tooltip information includes the name of the pen, the value of the X-field, the value of the Y-field, and ID. The ID field shows information about the point in the ID/Key field of the database, if the database contains this field.

Custom Programming Capabilities

FactoryLink provides everything that you need to construct your Trend charts. FactoryLink allows, however, custom programming capabilities for the Trend task. You can write a custom program for the Trend task in conjunction with the properties, methods, and events included with FactoryLink. These properties, methods, and events are specifically for the Trend Control. You can find them through a separate online help file which can be accessed through Client Builder online help.

Configuring Trend

FactoryLink 7.0 trending consists of these components for configuration:

- Trend Server
- Trend Control
- Pen Configuration

Trend Server

The FactoryLink Trend Server will allow the user to display Trend data collected by FactoryLink or another data source into a database and display it in the Trend Viewer Active X Control.

The FactoryLink Trend Server component supports an ODBC Data Source along with native connectivity to Oracle, SQL Server, and Access 2000 databases, as well as dBASE IV and Sybase for locating the application data. The Trend Server loads the configuration file at startup and connects to the database using the data source name (DSN). The DSN stores information about how to connect to an indicated data provider. The Trend Server reads Trend data from the database, and updates the Trend viewer in Client Builder.

FactoryLink provides flexibility in choosing where to run Trend Server. We recommend that the best place to run Trend Server is on the same node as the FactoryLink Server application, but it can be run on any node. You can choose to put a Trend Server on each client node, or on the node where FactoryLink Server resides. If you choose to put Trend Server where FactoryLink Server resides, point the client nodes to this location.

Trend Control

The Trend Control property screens are accessed from the Properties pop-up menu in Client Builder. The Control page has three tabs: Graph, Pens, and Fonts. The Graph and Pens tabs have dialog boxes that are invoked by buttons. All of the properties available on these pages are accessible in the custom programming environment.

Graph Tab

The Graph tab allows the user to choose how the chart will look. By selecting minimum and maximum plot values, legend position, and colors for all aspects of the chart, users can customize the chart for their particular application. The Graph Tab contains the Chart Duration field, which you use to create Trend charts for data in near real time.

Pens Tab

The Pens tab contains all of the pens that are currently defined for this chart. Pens may be added and deleted from the pen list. All of the properties on this tab may be changed at either design or run time. These options include line style, plot type, interpolation style, axis properties, as well as other list and check boxes. The Pens tab contains the Pen Data Source field, which you use to access the Pens Configuration.

Pen Configuration

The Pen Configuration is the component that links the data source to the Pen. Access the Pen Configuration from the Trend Control's properties Pens tab. You select a new pen, and browse for a data source through the Pen Configuration Component.

Fonts Tab

The Fonts tab contains all of the fonts available for this chart.

Predesign, Design & Run Time Phases

Trend consists of three phases: predesign, design, and run time.

During the predesign phase, you set up a data source name (DSN) so that the database table can be linked to a pen in your Trend chart. In addition, you set up a Trend Server and add it to the configuration. At the end of the predesign phase, you set up a Trend cluster. You work through a series of wizards and dialog boxes to prompt you through the predesign phase.

At design-time, you work through the Trend Control property screens to design your Trend chart. The Trend Control property screen contains three tabs: Graph, Pens, and Fonts. All of the properties available on these property pages are accessible in the custom programming environment. The Graph and Pen Tabs contain dialog boxes that are invoked by command buttons. You define the pens of your Trend chart from the Pens tab. In the process of defining these pens, you use the Pens Configuration screen to associate each pen with a data source that you configure during the predesign phase of the process.

At run time, you can use all of the functionality of the Trend task that you can use in design time. Additionally, you can perform the panning and zooming functions during run time in the offline mode only.

Predesign

The predesign phase of the Trend task consists of the following sections:

- Adding an ODBC Data Source
- Configuring an ODBC Data Source to use with dBASE IV
- Setting up a Trend Server
- Setting up a Trend Cluster

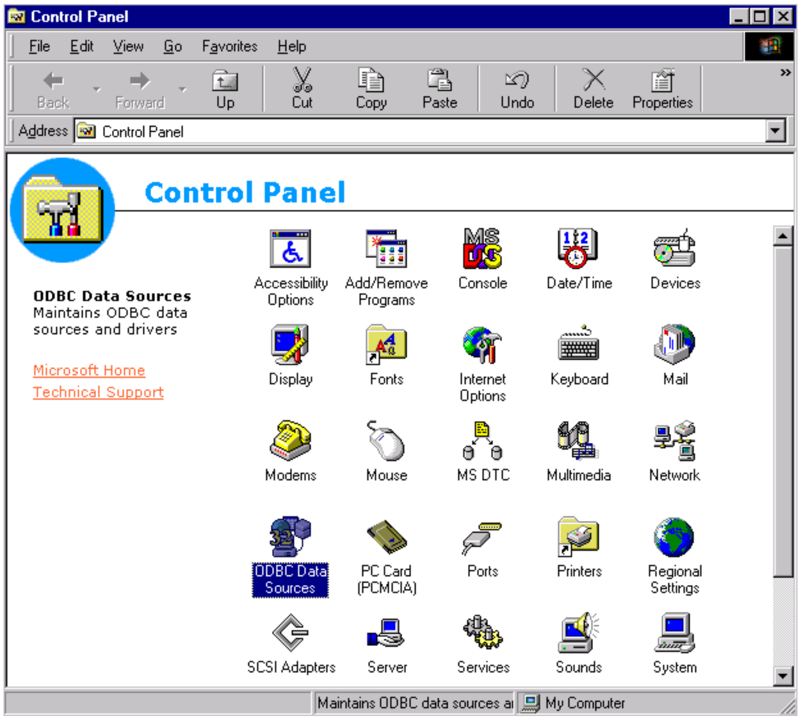
Adding an ODBC Data Source

You need to create a DSN by adding or configuring a data source. The next section shows you how to add an ODBC Data Source. This example assumes you have the FactoryLink Starter Application installed. For more information about the Starter Application, refer to “Working with the MyStarterApp Context Menu” in the FactoryLink Configuration Explorer User’s Guide.

The database used in the following steps is the SQL Server. This database is only one of many different data sources from which you can choose.

1 Double-click Control Panel from the Windows Start/Settings menu as shown in Figure 29-9.

Figure 29-9 Control Panel

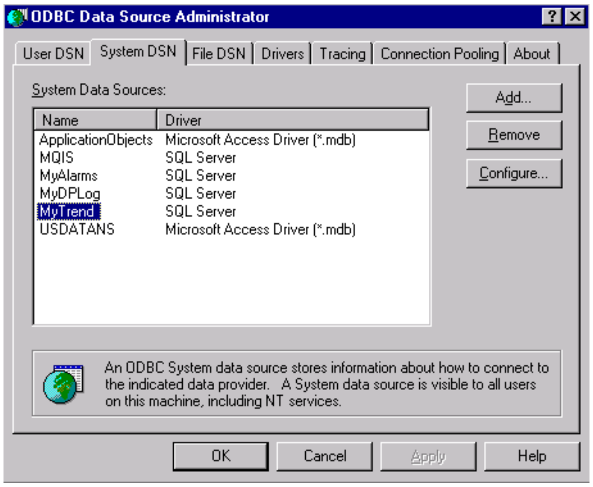


ODBC Data Sources
Maintains ODBC data sources and drivers

Maintains ODBC data sources ai

2 Double-click ODBC Data Sources. Click the System DSN tab as shown in Figure 29-10. If you have installed the Starter Application, MyTrend is a preconfigured DSN displayed on the screen. Click Add.

Figure 29-10 ODBC Data Source Administrator



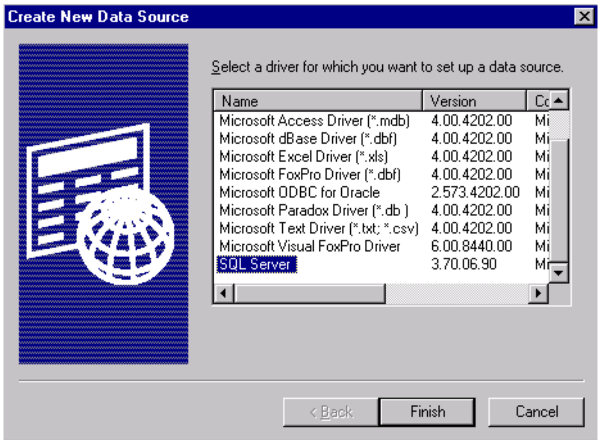
System Data Sources:

Name	Driver
ApplicationObjects	Microsoft Access Driver (*.mdb)
MQIS	SQL Server
MyAlarms	SQL Server
MyDPLog	SQL Server
MyTrend	SQL Server
USDATANS	Microsoft Access Driver (*.mdb)

An ODBC System data source stores information about how to connect to the indicated data provider. A System data source is visible to all users on this machine, including NT services.

3 Select the appropriate driver for which you want to set up a data source in the Create New DataSource dialog box as shown in Figure 29-11. In this example, it’s the SQL Server. This will only work if SQL Server is installed and available. Otherwise, pick the driver available for the database. Click Finish.

Figure 29-11 Create New Data Source

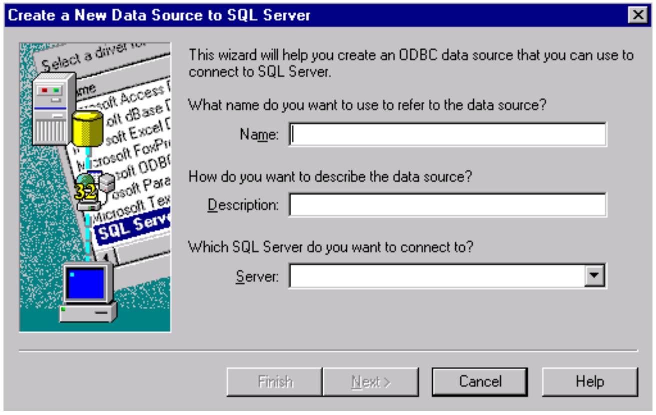


Select a driver for which you want to set up a data source.

Name	Version	Cc
Microsoft Access Driver (*.mdb)	4.00.4202.00	Mi
Microsoft dBase Driver (*.dbf)	4.00.4202.00	Mi
Microsoft Excel Driver (*.xls)	4.00.4202.00	Mi
Microsoft FoxPro Driver (*.dbf)	4.00.4202.00	Mi
Microsoft ODBC for Oracle	2.573.4202.00	Mi
Microsoft Paradox Driver (*.db)	4.00.4202.00	Mi
Microsoft Text Driver (*.txt; *.csv)	4.00.4202.00	Mi
Microsoft Visual FoxPro Driver	6.00.8440.00	Mi
SQL Server	3.70.06.90	Mi

4 Complete the fields in the Create a New Data Source to SQL Server dialog box as shown in Figure 29-12. Field explanations are described in Table 29-1.

Figure 29-12 Create a New Data Source to SQL Server, Screen 1 of 4



Create a New Data Source to SQL Server

This wizard will help you create an ODBC data source that you can use to connect to SQL Server.

What name do you want to use to refer to the data source?

Name:

How do you want to describe the data source?

Description:

Which SQL Server do you want to connect to?

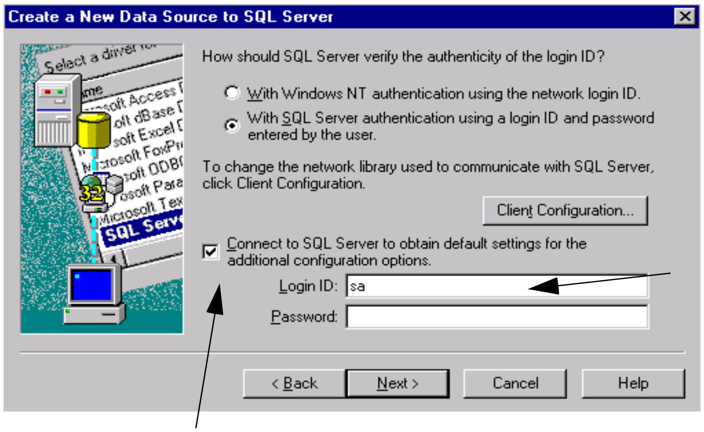
Server:

Table 29-1 Create a New Data Source to SQL Server, Screen 1 Field Explanations

Field Name	Question	Action
Name	What name do you want to use to refer to the data source?	Type the name you wish to call the data source. This name must be unique. It will appear in the Database Setup field on the Pens Configuration screen.
Description	How do you want to describe the data source?	Type the name of the data source. Do not confuse with the field above.
Server	Which SQL Server do you want to connect to?	Select a Server from the drop-down list, or type it in. This Server could be on a remote station. Click local to select the SQL Server on your machine, or select an SQL Server from the network.

5 Click Next. Create a New Data Source to SQL Server, Screen 2 of 4 appears as shown in Figure 29-13. For field descriptions, see Table 29-2.

Figure 29-13 Create a New Data Source to SQL Server, Screen 2 of 4



Create a New Data Source to SQL Server

How should SQL Server verify the authenticity of the login ID?

○ With Windows NT authentication using the network login ID.

● With SQL Server authentication using a login ID and password entered by the user.

To change the network library used to communicate with SQL Server, click Client Configuration.

☑ Connect to SQL Server to obtain default settings for the additional configuration options.

Login ID: sa

Password:

Use your user name and password that is set up on your SQL Server.

Check this box

Table 29-2 Create a New Data Source to SQL, Screen 2 Server Field Descriptions

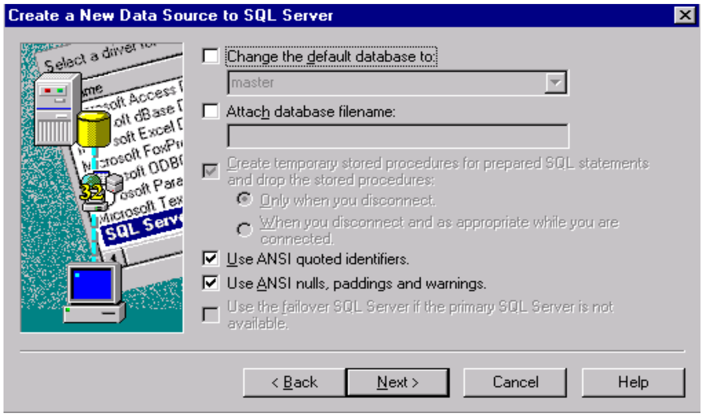
Field Description	Type	Response	Action
How should SQL Server verify the authenticity of the login ID?	Radio Button	With Windows NT authentication using the network login ID	Click to accept default login information.
	Radio Button	With SQL Server authentication using a login ID and password entered by the user	Click to modify the login information.
Login ID	Text Box		Type user name you use on your SQL Server.
Password	Text Box		Type password you use on your SQL Server.

Table 29-2 Create a New Data Source to SQL, Screen 2 Server Field Descriptions

Field Description	Type	Response	Action
Client Configuration	Button		Click if you need to change the network library used to communicate with SQL Server.

6 Click Next. Create a New Data Source to SQL Server - Screen 3 of 4 appears as in Figure 29-14.

Figure 29-14 Create a New Data Source to SQL Server - Screen 3 of 4



Create a New Data Source to SQL Server

☐ Change the default database to:

master

☐ Attach database filename:

☑ Create temporary stored procedures for prepared SQL statements and drop the stored procedures:

● Only when you disconnect.

○ When you disconnect and as appropriate while you are connected.

☑ Use ANSI quoted identifiers.

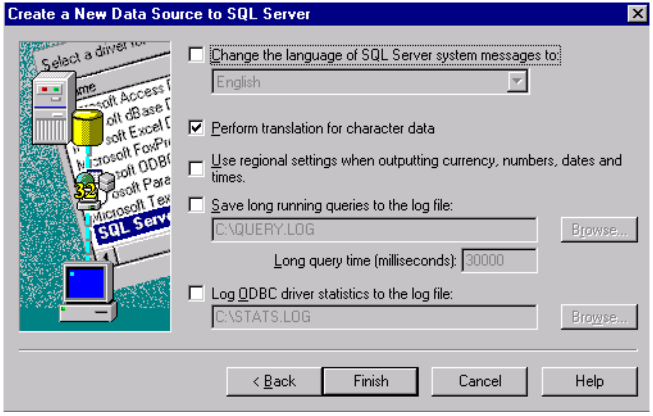
☑ Use ANSI nulls, paddings and warnings.

☐ Use the failover SQL Server if the primary SQL Server is not available.

The default database will be whatever is listed first under your SQL Server. Change this to the database you just added in the SQL Server for FactoryLink

7 Click Next. Create a New Data Source to SQL Server, Screen 4 of 4 appears as in Figure 29-15.

Figure 29-15 Create a New Data Source to SQL Server - Screen 4 of 4



Create a New Data Source to SQL Server

☐ Change the language of SQL Server system messages to:

English

☑ Perform translation for character data

☐ Use regional settings when outputting currency, numbers, dates and times.

☐ Save long running queries to the log file:

C:\QUERY.LOG

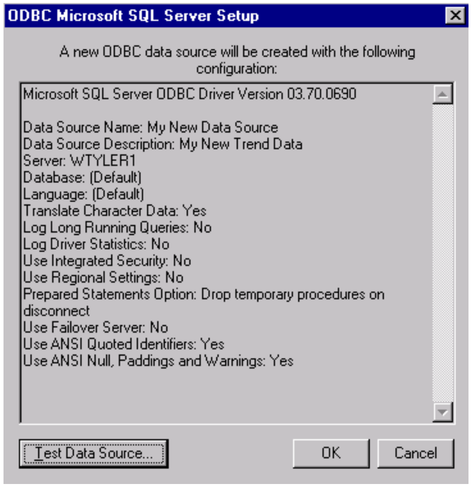
Long query time (milliseconds): 30000

☐ Log ODBC driver statistics to the log file:

C:\STATS.LOG

8 Click Finish. The ODBC Microsoft SQL Server Setup screen appears as shown in Figure 60-16.

Figure 29-16 ODBC Microsoft SQL Server Setup



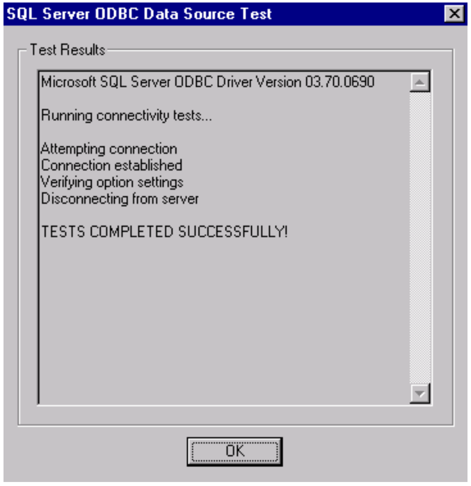
ODBC Microsoft SQL Server Setup

A new ODBC data source will be created with the following configuration:

```
Microsoft SQL Server ODBC Driver Version 03.70.0690

Data Source Name: My New Data Source
Data Source Description: My New Trend Data
Server: WTYLER1
Database: (Default)
Language: (Default)
Translate Character Data: Yes
Log Long Running Queries: No
Log Driver Statistics: No
Use Integrated Security: No
Use Regional Settings: No
Prepared Statements Option: Drop temporary procedures on
disconnect
Use Failover Server: No
Use ANSI Quoted Identifiers: Yes
Use ANSI Null, Paddings and Warnings: Yes
```

9 Click the Test Data Source button as shown in Figure 29-16. The SQL Server ODBC Data Source Test screen appears as shown in Figure 29-17. If you do not receive the message TESTS COMPLETED SUCCESSFULLY!, you have configured the data source incorrectly, or your SQL Server is not online.

Figure 29-17 SQL Server ODBC Data Source Test



```
Microsoft SQL Server ODBC Driver Version 03.70.0690

Running connectivity tests...

Attempting connection
Connection established
Verifying option settings
Disconnecting from server

TESTS COMPLETED SUCCESSFULLY!
```

10 Click OK to close the SQL Server ODBC Data Source Test screen. Click OK to close the ODBC Microsoft SQL Server Setup screen. Click OK to close the ODBC Data Source Administrator screen.

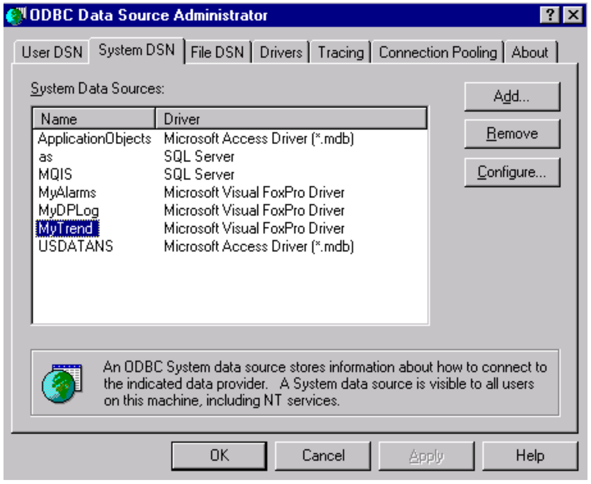
Configuring an ODBC Data Source to use with dBASE IV

The FactoryLink Starter Application contains a system data source called MyTrend. The following steps show you how to configure this data source to use with dBASE IV.

1 Double-click Control Panel from the Windows Start/Settings menu as shown in Figure 29-9 on page 589.

Double-click ODBC Data Sources. Click the System DSN tab as shown in Figure 29-18.

Figure 29-18 ODBC Data Source Administrator



System Data Sources:

Name	Driver
ApplicationObjects	Microsoft Access Driver (*.mdb)
as	SQL Server
MQIS	SQL Server
MyAlarms	Microsoft Visual FoxPro Driver
MyDPLog	Microsoft Visual FoxPro Driver
MyTrend	Microsoft Visual FoxPro Driver
USDATANS	Microsoft Access Driver (*.mdb)

An ODBC System data source stores information about how to connect to the indicated data provider. A System data source is visible to all users on this machine, including NT services.

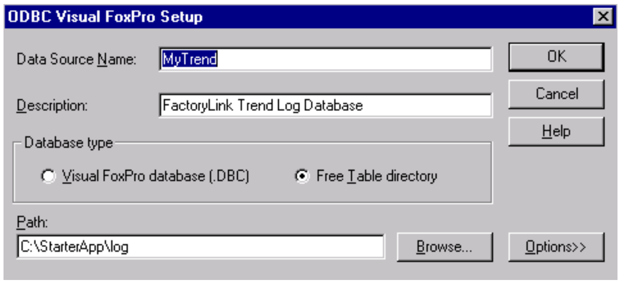
Note: Do not use the Microsoft ODBC dBASE IV driver. Instead, use the Microsoft Visual FoxPro Driver. Since the Microsoft Visual FoxPro Driver does not support dBASE IV index files, FactoryLink 7.0 users will have "view only" access to dBASE IV files.

2 Click Configure. The ODBC Microsoft Visual FoxPro Setup screen appears as shown in Figure 29-19. If you have installed the Starter Application, MyTrend, the DSN is already configured, and the field information is completed.

If you are not using the Starter Application, type a data source name in the Data Source Name field. Type the path where you want to locate the database file in the Path field.

Click the Free Table Directory radio button in the Database Type section.

Figure 29-19 ODBC Visual FoxPro Setup



Data Source Name: MyTrend

Description: FactoryLink Trend Log Database

Database type
○ Visual FoxPro database (.DBC) ● Free Table directory

Path:
C:\StarterApp\log

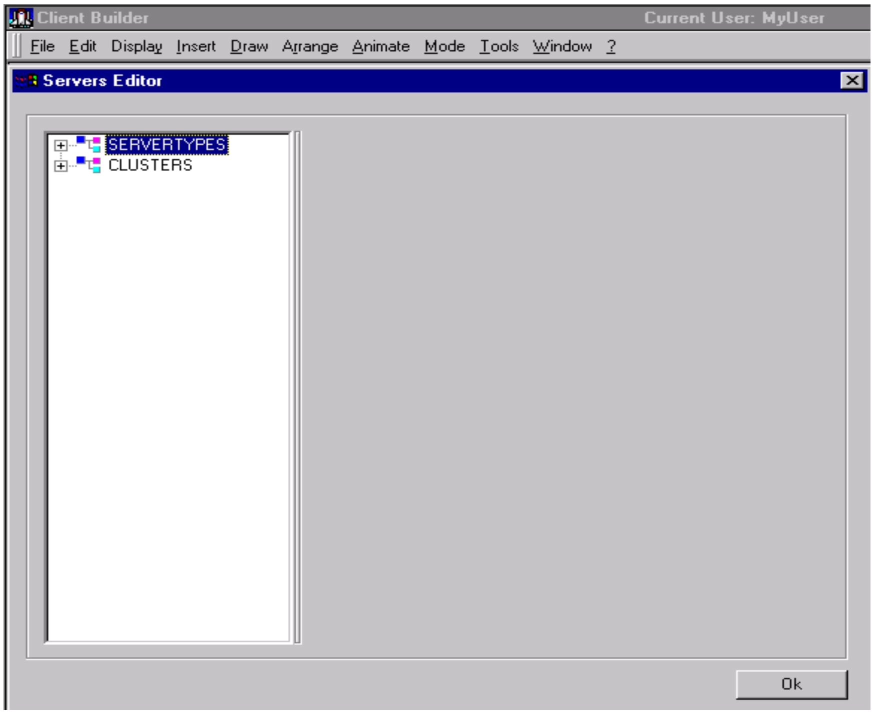
3 Click OK to close the ODBC Microsoft Visual FoxPro Setup screen. Click OK to close the ODBC Data Source Administrator screen.

Setting up a Trend Server

In the predesign phase, you also need to set up a Trend Server. This section tells how to set up a Trend Server.

1 Open Client Builder. Select Servers from the Tools menu. The Servers Editor screen appears as shown in Figure 29-20.

Figure 29-20 Servers Editor - Screen 1 of 3



2 Right-click ServerTYPES . Click New in the pop-up menu. You need to name the new Trend Server. In this example, type AnyName in the tree list. Select type Trend FW10 from the drop-down list to configure the Trend Server.

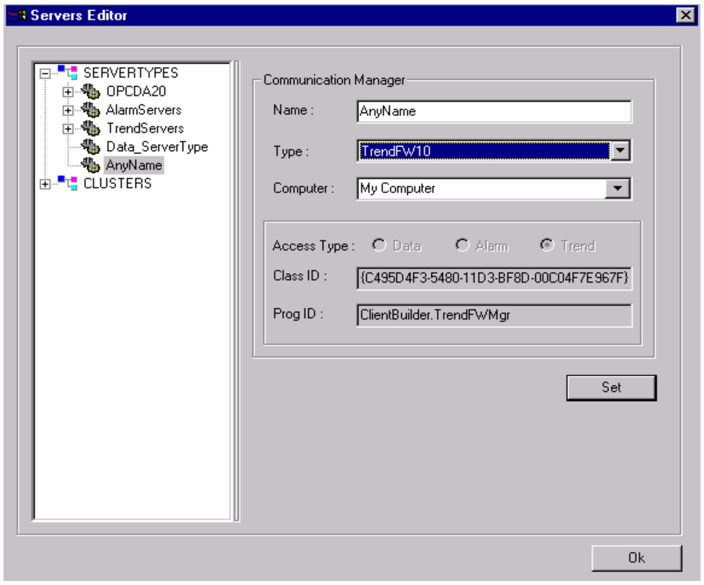
The Class ID and the Prog ID fields are preconfigured as shown in Figure 29-21:

- Class ID: {C459D4F3-5480-11D3-EF8D-00C04F7E967F}

- Prog ID: ClientBuilder.TrendFWMgr

Click the Set button. The new Trend Server, AnyName, appears under ServerTYPES in the tree.

Figure 29-21 Servers Editor Screen 2 of 3



Name : AnyName

Type : TrendFW10

Computer : My Computer

Access Type : ○ Data ○ Alarm ● Trend

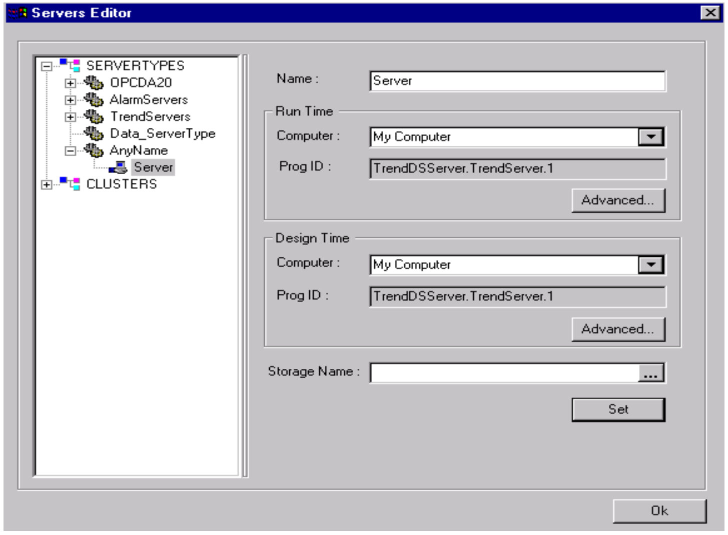
Class ID : {C495D4F3-5480-11D3-BF8D-00C04F7E967F}

Prog ID : ClientBuilder.TrendFWMgr

3 Right-click on the new Server type name to display a menu. Click the Add Server option. The Server name appears under the AnyName Server name you just created in the tree as shown in Figure 29-22.

Set up the current workstation for run-time use of the Trend Control. If design functions are performed on this workstation, then the design section must also be configured.

Figure 29-22 Servers Editor - Screen 3 of 3



Name : Server

Run Time
Computer : My Computer
Prog ID : TrendDSServer.TrendServer.1

Design Time
Computer : My Computer
Prog ID : TrendDSServer.TrendServer.1

Storage Name :

4 Find the node on the network you wish to add in the Computer drop-down list box in the Run Time section, as shown in Figure 29-22. Click the + by the name you select in the drop-down list. The Trend Server Prog ID appears in the box. Double-click the Prog ID name to add it to the Server. Repeat this step in the Design Time section. Click the Set button.

Table 29-3 Servers Editor

Field/Section		Description	Action
Name		The user determines a name for this field.	Type a name for the Server to designate it as a Trend Server.
Run Time		This section is used to establish this workstation as a FactoryLink client.	
	Computer	The default is My Computer. Point to where the FactoryLink Server station is located.	Click drop-down arrow. Expand the local host listing. Double-click the nested Prog. ID.

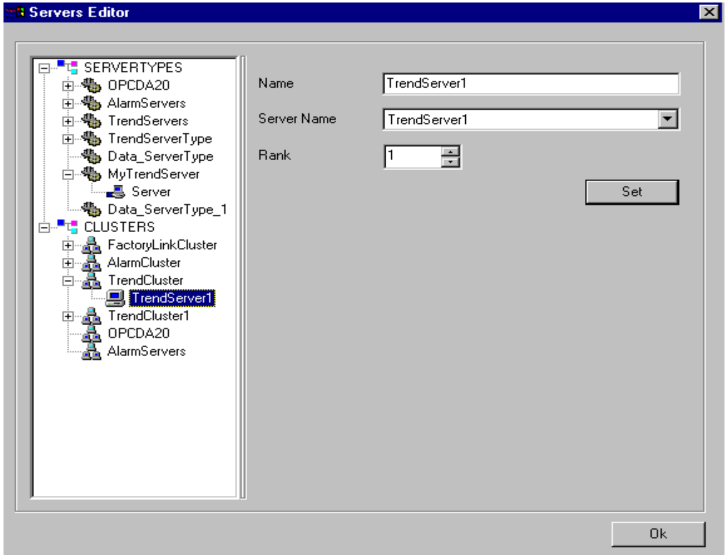
Table 29-3 Servers Editor

Field/Section		Description	Action
	Class ID	The Class ID is preconfigured for all installations: {B3C554D0-B6FA-11D3-8FFC-00105A8B4212} Note: Braces are included with the number.	This field is populated when the Computer field is configured.
	ProgID	The Prog ID is preconfigured for all installations: ClientBuilder.TrendFWMgr	This field is populated when the Computer field is configured.
Design Time		This section is used to establish this workstation with Client Builder design privileges.	No action is needed if no design is to be done.
	Computer	The default is My Computer. Point to where the FactoryLink Server station is located.	Click drop-down arrow. Expand the local host listing. Double-click the nested Prog. ID.
	Class ID	The Class ID is preconfigured for all installations: {B3C554D0-B6FA-11D3-8FFC-00105A8B4212} Note: Braces are included with the number.	This field is populated when the Computer field is configured.
	ProgID	The Prog ID is preconfigured for all installations: ClientBuilder.TrendFWMgr	This field is populated when the Computer field is configured.
Storage Name		Not used at this time.	No action is needed.

Setting Up a Trend Cluster

1 Right-click CLUSTERS in the tree and select New. Select the Trend Server you added in the previous step from the Server Type Name drop-down list box. Click the Set button.

Figure 29-23 Servers Editor - Screen 1 of 2



Name: TrendServer1

Server Name: TrendServer1

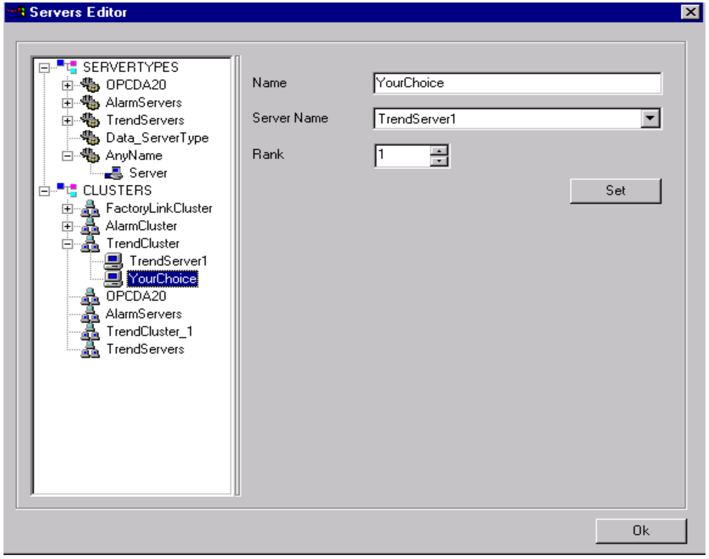
Rank: 1

2 Right-click Trend Cluster. In this example, select Add Member and change the name to *your choice*. Select the Server name from the drop-down list. Click the Set button.

The Name, Server Name and Rank are filled in automatically. The Name field can be changed if desired. At this release, a value of 1 is the only valid entry for the Rank field.

3 The Trend Server and Trend Cluster setup functions are complete. Click the OK button to close the Servers Editor dialog box.

Figure 29-24 Servers Editor - Screen 2 of 2



Name: YourChoice

Server Name: TrendServer1

Rank: 1

Design

Design time is the phase in which you construct your Trend chart. You begin by adding Trend Control to the Active X Controls configuration in Client Builder. After adding Trend Control to the Active X Control configuration, you insert the Trend Control into the Client Builder container. Next, select a Trend cluster. This will be the same Trend cluster that you set up in the predesign phase.

Once the Trend Control is set up as described above, you begin to design your chart through the Trend Control properties screens. These screens are marked with tabs, and each tab represents a different area of configuration of the Trend chart. For example, the Graph tab is the first tab of these screens. The Graph tab controls the look of the chart, as well access to the Tooltip configuration and the Trend Server. Adjusting the Update Rate on the Graph tab allows you to match the rate at which data is logged to the database. This action produces a near real-time Trend chart.

The Pens tab follows the Graph tab on the Trend Control properties screen. Configure the pens for the Trend chart from this screen. The screen contains all of the pen’s properties, as well as the capability to import or export pens, copy, delete, or add new pens. You can access the Axis properties from the Pens tab, as well. Launch the pen data source from the Pens tab in order to add a database, table, or pen to the pen configuration.

The Font tab is the last tab of the Trend Control properties screen. You select a font, style, and size for items such as the caption of your Trend chart from a drop-down list box on the screen.

The design phase of the Trend task consists of the following sections:

- Adding Trend Control to the Active X Controls Configuration
- Inserting Trend Control into Client Builder
- Selecting A Trend Cluster
- Using the Trend Control Properties Graph Tab
- Producing a Trend Chart of Near Real-Time Data
- Configuring the Pens for the Trend Chart
- Adding a Database to Pen Configuration
- Adding a Table to Pen Configuration
- Adding a Pen to the Pen Configuration
- Configuring Pens Using the Setup Wizard
- Using the Trend Control Properties Fonts Tab
- Adding a New Pen to the Trend Chart
- Custom Programming for the Pen Cursor Values
- Creating a Dynamic Pen through Custom Programming

Adding Trend Control to the Active X Controls Configuration

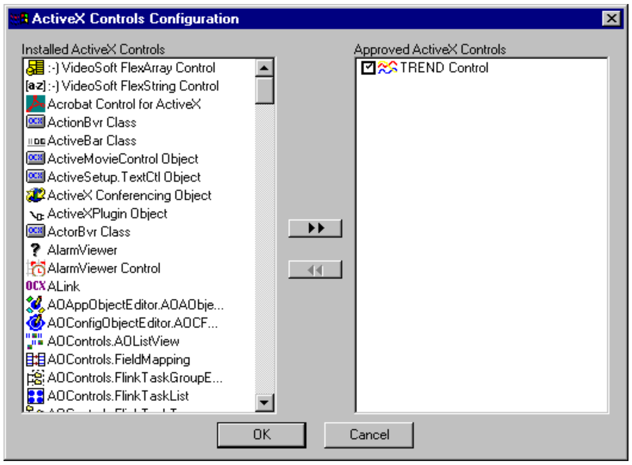
Once you have completed the predesign phase, you need to add Trend Control to the Approved ActiveX Controls list box in the ActiveX Controls Configuration screen to begin to construct your Trend chart in Client Builder. If you are working from the FactoryLink Starter Application, TREND Control is already added to the ActiveX Controls Configuration for you so you do not need to perform this procedure.

1 Open Client Builder. Click Tools, Preferences, and ActiveX Controls.

2 Scroll down the Installed ActiveX Controls list and select TREND Control.

3 Click >> as shown in Figure 29-25. The ActiveX Controls Configuration screen appears. TREND Control appears in the Approved ActiveX Controls section.

Figure 29-25 ActiveX Controls Configuration


ActiveX Controls Configuration
Installed ActiveX Controls
:-) VideoSoft FlexArray Control
:-) VideoSoft FlexString Control
Acrobat Control for ActiveX
ActionBvr Class
ActiveBar Class
ActiveMovieControl Object
ActiveSetup.TextCtl Object
ActiveX Conferencing Object
ActiveXPlugin Object
ActorBvr Class
AlarmViewer
AlarmViewer Control
ALink
AOAppObjectEditor.AOAObje...
AOConfigObjectEditor.AOCF...
AOControls.AOListView
AOControls.FieldMapping
AOControls.FlinkTaskGroupE...
AOControls.FlinkTaskList
Approved ActiveX Controls
☑ TREND Control
OK
Cancel

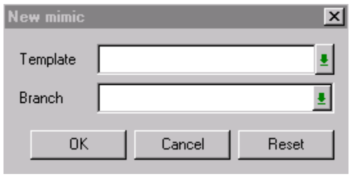
4 Click OK. You have added TREND Control to the Approved ActiveX Controls configuration, and are ready to drop TREND Control into Client Builder.

Inserting Trend Control into Client Builder

After adding TREND Control to the Approved ActiveX Controls list, you need to add the Control to a screen in Client Builder to begin to construct the Trend chart.

1 Click File from the menu bar, then New to create a New Mimic as shown in Figure 29-26.

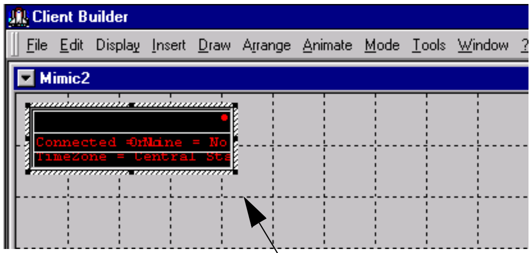
Figure 29-26 New Mimic



2 Click OK. Maximize the Mimic window.

3 Click Insert. Click Favorite ActiveX Controls to insert the TREND Control into the window as shown in Figure 29-27.

Figure 29-27 Insert Favorite ActiveX Control - Trend


Client Builder
File Edit Display Insert Draw Arrange Animate Mode Tools Window ?
Mimic2

Connected =OnLine = No
TimeZone = Central Sta

Click and drag corner to make the TREND Control larger.

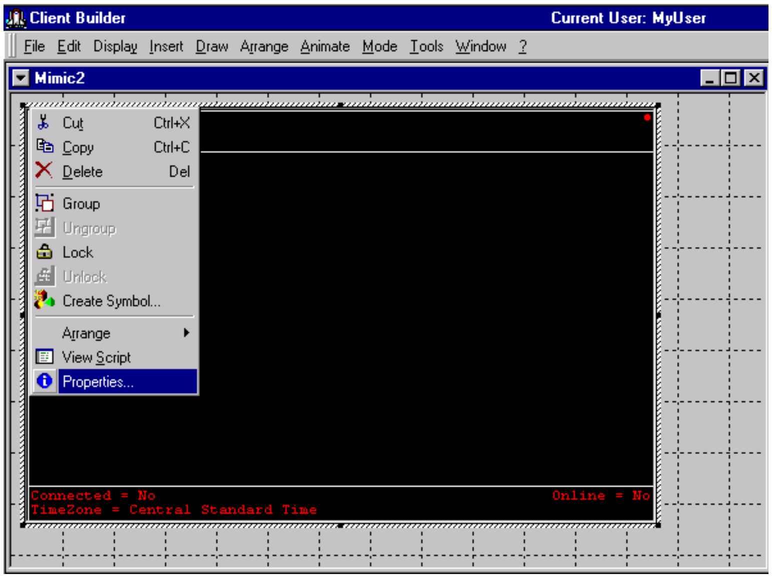
4 Adjust the size of the TREND Control by clicking and dragging the lower right corner of the TREND Control as shown in Figure 29-27 to make it larger.

Selecting A Trend Cluster

Once you insert the Trend Control into Client Builder, you are ready to select a Trend cluster.

1 Right-click inside the TREND Control. Select Properties from the pop-up menu as shown in Figure 29-28.

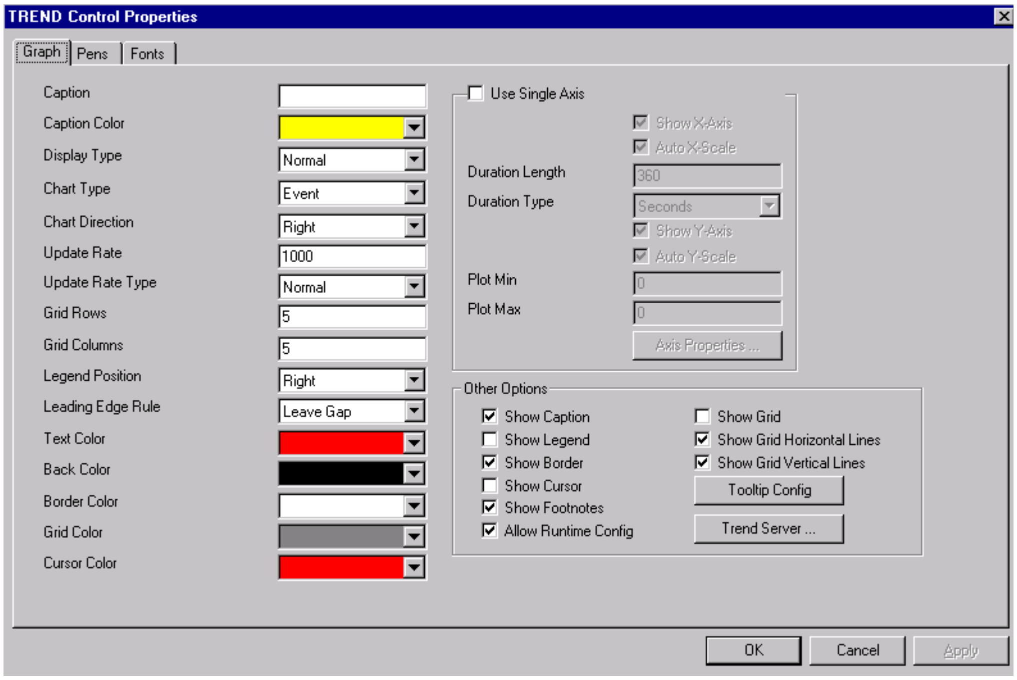
Figure 29-28 Properties



Connected = No
TimeZone = Central Standard Time
Online = No

2 The TREND Control Properties Graph tab appears as shown in Figure 29-29. For more information about the Trend Control Properties Graph tab, see "Using the Trend Control Properties Graph Tab" on page 609. Click the Trend Server button in the Other Options section on the TREND Control Properties screen.

Figure 29-29 TREND Control Properties Graph Tab, Trend Server Button



TREND Control Properties

Caption	
Caption Color	🟨
Display Type	Normal
Chart Type	Event
Chart Direction	Right
Update Rate	1000
Update Rate Type	Normal
Grid Rows	5
Grid Columns	5
Legend Position	Right
Leading Edge Rule	Leave Gap
Text Color	🟥
Back Color	⬛
Border Color	⬜
Grid Color	▨
Cursor Color	🟥

□ Use Single Axis

☑ Show X-Axis
☑ Auto X-Scale

Duration Length	360
Duration Type	Seconds

☑ Show Y-Axis
☑ Auto Y-Scale

Plot Min	0
Plot Max	0

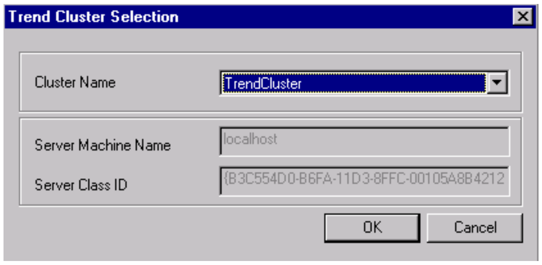
Other Options

☑ Show Caption
□ Show Legend
☑ Show Border
□ Show Cursor
☑ Show Footnotes
☑ Allow Runtime Config

□ Show Grid
☑ Show Grid Horizontal Lines
☑ Show Grid Vertical Lines

3 The Trend Cluster Selection Box appears as shown in Figure 29-30. Select Trend Cluster from the Cluster Name drop-down list and click OK.

Figure 29-30 Trend Cluster Selections



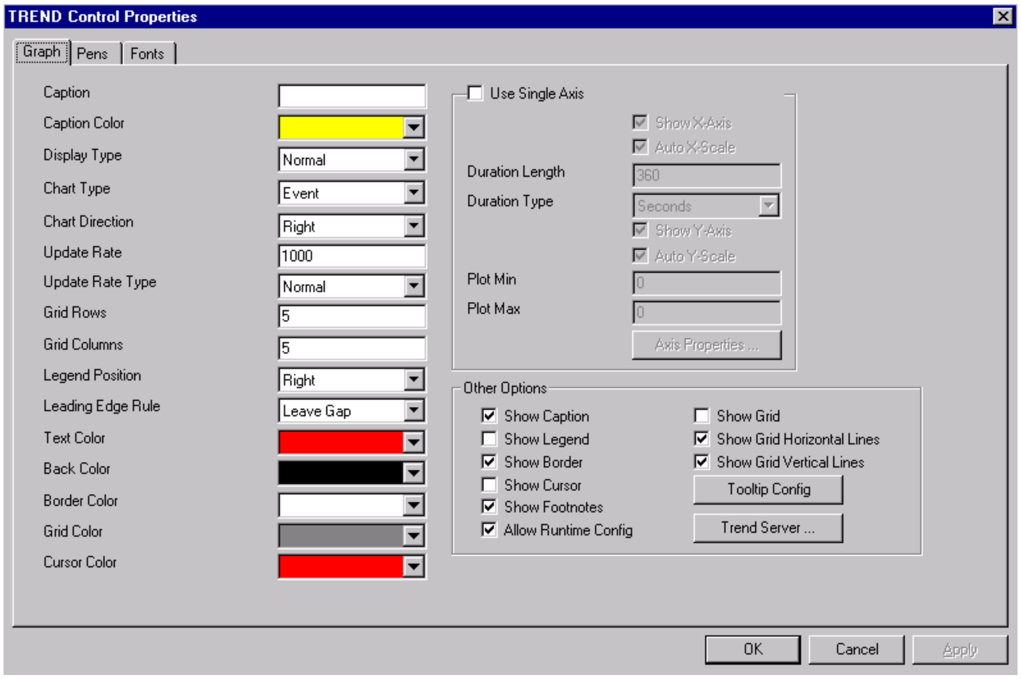
Trend Cluster Selection

Cluster Name	TrendCluster
Server Machine Name	localhost
Server Class ID	{B3C554D0-B6FA-11D3-8FFC-00105A8B4212

Using the Trend Control Properties Graph Tab

Customize the contents and appearance of the Trend chart by using the TREND Control Properties Graph tab as shown in Figure 29-31.

Figure 29-31 TREND Control Properties, Graph Tab



Caption:
Caption Color: 🟨
Display Type: Normal
Chart Type: Event
Chart Direction: Right
Update Rate: 1000
Update Rate Type: Normal
Grid Rows: 5
Grid Columns: 5
Legend Position: Right
Leading Edge Rule: Leave Gap
Text Color: 🟥
Back Color: ⬛
Border Color: ⬜
Grid Color: ▨
Cursor Color: 🟥

☐ Use Single Axis
☑ Show X-Axis
☑ Auto X-Scale
Duration Length: 360
Duration Type: Seconds
☑ Show Y-Axis
☑ Auto Y-Scale
Plot Min: 0
Plot Max: 0

Other Options
☑ Show Caption
☐ Show Legend
☑ Show Border
☐ Show Cursor
☑ Show Footnotes
☑ Allow Runtime Config
☐ Show Grid
☑ Show Grid Horizontal Lines
☑ Show Grid Vertical Lines

For descriptions of the fields contained in the TREND Control Properties Graph tab, refer to Table 29-4.

Table 29-4 TREND Control Properties Graph Tab, Field Descriptions

Field Name		Definition	Options
Caption	Text Box	Enter text that will appear at the top of the Trend Chart Window.	
Caption Color	List Box	Click the color of the chart’s caption text.	

Table 29-4 TREND Control Properties Graph Tab, Field Descriptions

Field Name		Definition	Options
Display Type	List Box	Enter a value scaling for the chart.	Normal (unscaled).
			Log10 (log base 10).
			Ln (natural log).
Chart Type	List Box	Click the type of information on which the Trend chart will be based.	Time or event.
Chart Direction	List Box	Enter direction older data will move.	Left, right, up, down.
Update Rate	Text Box	Type a unit of time to correspond with the Update Rate Type. Determines how fast a pen gets data from the database. Applies to all pens.	
Update Rate Type	List Box	Click the Trend Chart redraw rate. All data received between and during the Update Rate will be used to update the Trend chart. Should not exceed logging rate to database.	Normal or % of Duration
Grid Rows	Text Box	Specify number of horizontal grid rows.	Lines-1.
Grid Columns	Text Box	Enter the number of vertical grid columns.	Lines-1.
Legend Position	List Box	Click the location of legend containing pen names and their respective line styles.	Left or right of the chart.
Leading Edge Rule	List Box	Click an extrapolation mechanism in case the newest data is not on the newest edge of the trend chart.	Leave Gap Use Last Slope Horizontal Line

Table 29-4 TREND Control Properties Graph Tab, Field Descriptions

Field Name		Definition	Options
Text Color	List Box	Click color for the chart's legend, axis, label, etc., except for the chart's caption.	
Back Color	List Box	Click the background color of the chart.	
Border Color	List Box	Click the border color of the chart.	
Grid Color	List Box	Click the color of the chart's grid lines.	
Cursor Color	List Box	Click the color of the chart's vertical value cursor.	

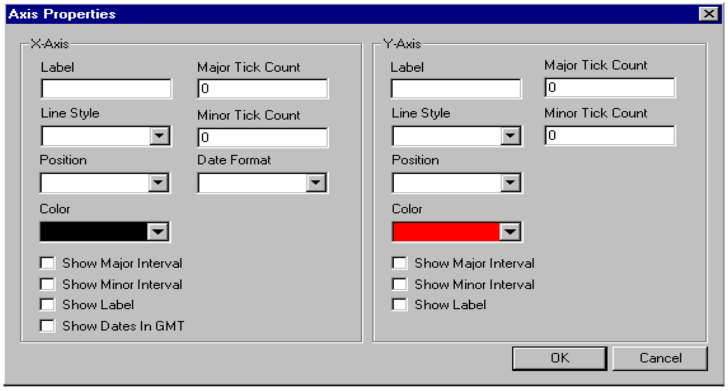
Table 29-5 TREND Control Properties Graph Tab, Use Single Axis

Field Name		Definition	Options
Show X-Axis	Check Box	Check to reveal the value of X.	
Auto X-Scale	Check Box	Check to activate auto scaling of the X-axis to fit all points within the specified Duration.	
Duration Length	Text Box	Enter the number of units representing how long the chart will remain on the screen.	Ignore this field if Auto X-Scale check box is selected.
Duration Type	List Box	Click the type of unit the duration length is expressed in, such as seconds, days, or quarters.	Ignore this field if Auto X-Scale check box is selected.
Show Y-Axis	Check Box	Check to reveal the value of Y.	
Auto Y-Scale	Check Box	Check to activate auto scaling of the Y-axis (Value) to fit all point values.	

Table 29-5 TREND Control Properties Graph Tab, Use Single Axis

Field Name		Definition	Options
Plot Min	Text Box	Enter the minimum value that will be plotted on the Trend chart.	Ignore this field if Auto Y-Scale check box is selected.
Plot Max	Text Box	Enter the maximum value that will be plotted on the Trend chart.	Ignore this field if Auto Y-Scale check box is selected.
Axis Properties	Command Button	Click to access Axis Properties Dialog Box	

Figure 29-32 Axis Properties



Axis Properties

X-Axis

Label:

Major Tick Count: 0

Line Style:

Minor Tick Count: 0

Position:

Date Format:

Color:

□ Show Major Interval
□ Show Minor Interval
□ Show Label
□ Show Dates In GMT

Y-Axis

Label:

Major Tick Count: 0

Line Style:

Minor Tick Count: 0

Position:

Color:

□ Show Major Interval
□ Show Minor Interval
□ Show Label

Table 29-6 TREND Control Properties Graph Tab, Axis Properties

Field Name		Definition	Options
Label	Text Box	Enter Label of Axis.	
Line Style	List Box	Click Line Style.	Solid, Dash, Dot, Dash-Dot, Dash-Dot-Dot
Position	List Box	Click the position of the axis.	Left, Right, Top, Bottom

Table 29-6 TREND Control Properties Graph Tab, Axis Properties

Field Name		Definition	Options
Color	Select Grid	Click the color of the axis.	
Major Tick Count	Text Box	Type the number of major tick marks.	
Minor Tick Count	Text Box	Type the number of minor tick marks.	
Date Format	List Box	Enter the format, such as MM DD and YYYY.	Pertains to X-axis only.
Show Major Interval	Check Box	Check to show major interval.	
Show Minor Interval	Check Box	Check to show minor interval.	
Show Label	Check Box	Check to show label.	
Show Dates in GMT	Check Box	Check to show date in Greenwich Mean Time as opposed to local time.	Pertains to X-axis only.

Table 29-7 TREND Control Properties Graph Tab, Other Options

Field Name		Definition
Show Caption	Check Box	Check to show caption in chart.
Show Legend	Check Box	Check to show legend in chart.
Show Border	Check Box	Check to show border around chart.
Show Cursor	Check Box	Check to show cursor in chart.
Show Footnotes	Check Box	Check to show footnotes.

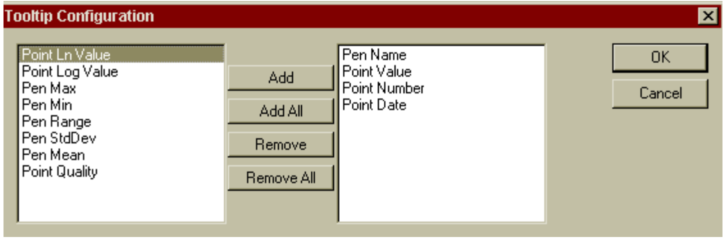
Table 29-7 TREND Control Properties Graph Tab, Other Options

Field Name		Definition
Allow Run-time Config.	Check Box	Check to allow run-time configuration.
Show Grid	Check Box	Check to show grids.
Show Grid Horizontal Lines	Check Box	Check to show the horizontal grid lines only.
Show Grid Vertical Lines	Check Box	Check to show the vertical grid lines only.

Table 29-8 TREND Control Properties Graph Tab, Tooltip Config

Field Name		Definition	Options
Tooltip Config	Command Button	Click measuring tools and information for viewing in the chart point tool tips. Focus the trend chart window and place the pointing device near a point for the tooltips to appear.	Various

Figure 29-33 Tooltip Configuration



Tooltip Configuration

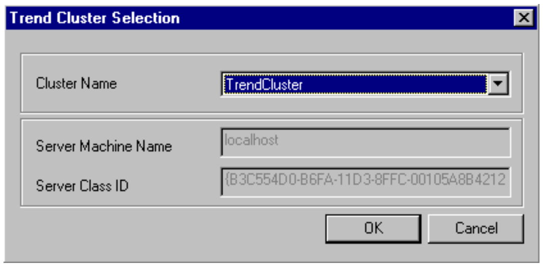
Point Ln Value
Point Log Value
Pen Max
Pen Min
Pen Range
Pen StdDev
Pen Mean
Point Quality

Pen Name
Point Value
Point Number
Point Date

Table 29-9 TREND Control Properties Graph Tab, Trend Server

Field Name		Definition	Options
Trend Server	Command Button	Click to specify the Trend Server that will supply data for the Trend Control. The Trend Cluster Selection screen appears as shown in Figure 29-34.	Third party Servers.
Trend Cluster Selection	Cluster Name	Click previously defined name.	
	Server Machine Name	Click to define the machine on which the Server is running.	
	Server Class ID	Click to define the automation class ID of the Trend Server.	

Figure 29-34 Trend Cluster Selection



Trend Cluster Selection

Cluster Name: TrendCluster

Server Machine Name: localhost

Server Class ID: {B3C554D0-B6FA-11D3-8FFC-00105A8B4212

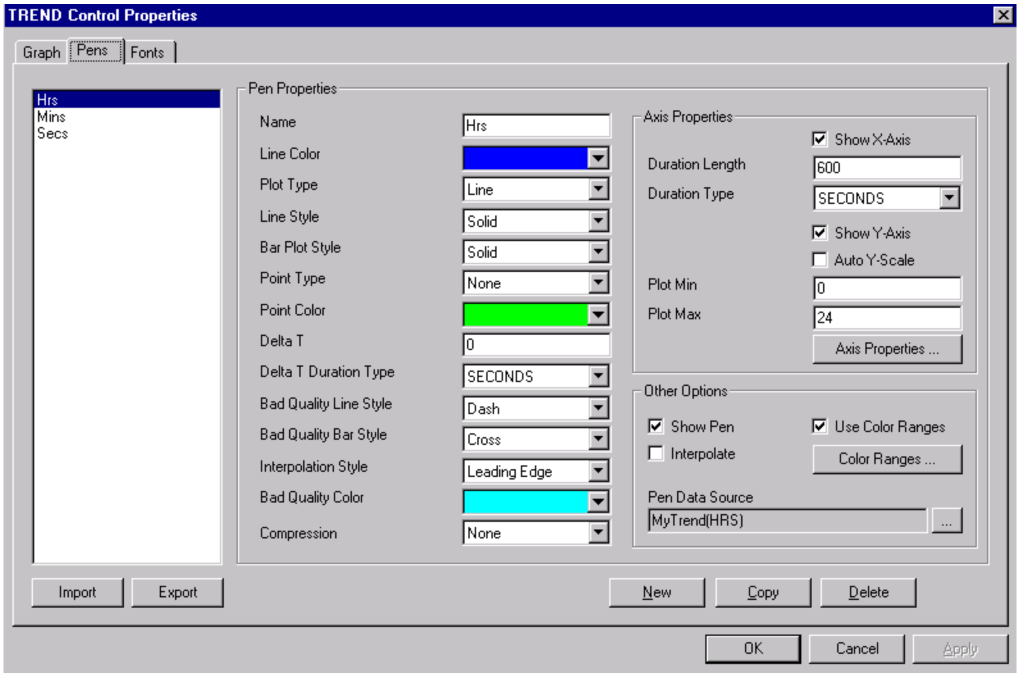
Producing a Trend Chart of Near Real-Time Data

The update rate determines how fast the pens are getting the data from the database. The Update Rate on the Graph tab as shown in Figure 29-31 applies to all of the pens. You can set the update rate so that the data on the Trend chart updates as near as possible to real time. How you set the update rate depends on how fast you want the data to come into the chart so it's readable. For example, you can set the Update Rate to 1000 milliseconds, which is one second. Using the date function, you can produce charts that show data in as near-real time as possible. Normally, the update rate should match the logging rate to the database to simulate real-time trending.

Trend Control Properties Pens Tab

To invoke the TREND Control Properties screens, right-click on the Trend Control on the mimic, and click Properties.

Figure 29-35 TREND Control Properties, Pens Tab



Hrs
Mins
Secs

Pen Properties

Name: Hrs
Line Color:
Plot Type: Line
Line Style: Solid
Bar Plot Style: Solid
Point Type: None
Point Color:
Delta T: 0
Delta T Duration Type: SECONDS
Bad Quality Line Style: Dash
Bad Quality Bar Style: Cross
Interpolation Style: Leading Edge
Bad Quality Color:
Compression: None

Axis Properties

☑ Show X-Axis
Duration Length: 600
Duration Type: SECONDS
☑ Show Y-Axis
☐ Auto Y-Scale
Plot Min: 0
Plot Max: 24

Other Options

☑ Show Pen
☑ Use Color Ranges
☐ Interpolate
Pen Data Source: MyTrend(HRS)

Table 29-10 TREND Control Properties Pens Tab, Pen Properties Section

Field Name		**Definition**	**Options**
Name	Text Box	Assign a pen label. Used in the Pens list box, the legend, and the tool tips of the actual chart.	
Line Color	Select Grid	Click line color.	Use alternative line style for poor quality and extrapolated data. See Bad Quality Color, Line Style, and Bar Style.
Plot Type	List Box	Click the type of plot.	Select Line or Bar.

Table 29-10 TREND Control Properties Pens Tab, Pen Properties Section

Field Name		Definition	Options
Line Style	List Box	Click the type of line.	Select information such as Solid, Dashed, or Dotted. Use alternative line style for poor quality and extrapolated data. See Bad Quality Color, Line Style, and Bar Style.
Bar Plot Style	List Box	Click style of bar chart bars.	Use if bar is chosen as the Plot Type.
Point Type	List Box	Click the data point marker type.	Select information such as Marble, Box, or Triangle.
Point Color	Select Grid	Click the color of the data points.	
Delta T	Text Box	Determine if a pen should run in an offset of time as specified in Delta T or real-time. Example: An operator can see data from today & yesterday trended in real-time.	
Delta T Duration Type	List Box	Click the unit of measurement for Delta T.	Select information such as seconds, minutes, years.
Bad Quality Line Style	List Box	Click type of line for plotting Bad Quality data.	Select information such as solid, dashed, or dotted.
Bad Quality Bar Style	List Box	Click the bar style used to plot Bad Quality data.	Select information such as solid, horizontal, or vertical.
Interpolation Style	List Box	Click location of where step chart plots will rise.	Select Trailing Edge, the oldest data edge, or Leading Edge, the newest data edge.

Table 29-10 TREND Control Properties Pens Tab, Pen Properties Section

Field Name		Definition	Options
Bad Quality Color	Select Grid	Click the color for data of Bad Quality or extrapolated data.	
Compression	List Box	Will be implemented in a future release.	

Table 29-11 TREND Control Properties Pens Tab, Axis Properties Section

Field Name		Definition	Options
Show X-Axis	Check Boxes	Check to show X-Axis. Each pen can have its own axis. Account for screen size when displaying each pen's axis.	Consider using for pens plotting in Delta T mode or for pens that have different value ranges.
Duration Length	Text Box	Enter the amount of data to be plotted for this pen.	
Duration Type	List Box	Click the unit of measurement for the duration.	Select information such as seconds, minutes, or years.
Show Y-Axis	Check Boxes	Check to show Y-Axis. Each pen can have its own axis. Account for screen size when displaying each pen's axis.	Consider using for pens plotting in Delta T mode or for pens that have different value ranges.
Auto Y-Scale	Check Box	Check to ignore all Plot Max & Plot Min Data.	
Plot Min	Text Box	Enter the minimum value to be plotted for this pen.	Ignore this field if the Auto Y-Scale check box is checked.
Plot Max	Text Box	Enter the maximum value to be plotted for this pen.	Ignore this field if the Auto Y-Scale check box is checked.

Table 29-11 TREND Control Properties Pens Tab, Axis Properties Section

Field Name		Definition	Options
Axis Properties	Command Button	Invokes a dialog box to configure Axis properties. For more information about this dialog box, refer to Figure 29-32 on page 612.	

Table 29-12 TREND Control Properties Pens Tab, Other Options Section

Field Name		Definition
Show Pen	Check box	Check to show a pen on the chart.
Interpolate	Check Box	Check to enable the step-type charting.
Use Color Ranges	Check Box	Check to enable chromatic data value plotting.
Color Ranges	Command Button	Invokes the Color Ranges Dialog Box.

Figure 29-36 Color Ranges

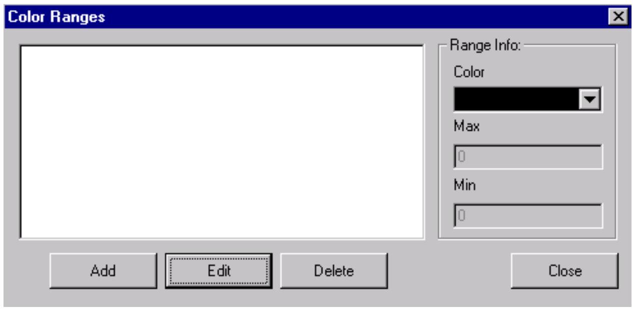


Table 29-13 TREND Control Properties Pens Tab, Other Options Section, Color Ranges

Field Name		Definition
Color Ranges	Command Button	Click to invoke the dialog used to configure Color Ranges.

Table 29-13 TREND Control Properties Pens Tab, Other Options Section, Color Ranges

Field Name		Definition
	New Command Button	Specify a color, and minimum & maximum value.
	Add Command Button	Click to add the range to the collection of ranges for this pen.
Color Ranges	List Box	Click on a current configured range for editing or deleting.

Figure 29-37 Trend Control Properties Pen Tab, Other Options Section, Pen Data Source

Field Name		Definition
Pen Data Source	Ellipsis Button	Click to connect to Configuration of Pens screen. Select a pen data source. For more information, refer to Figure 29-38.

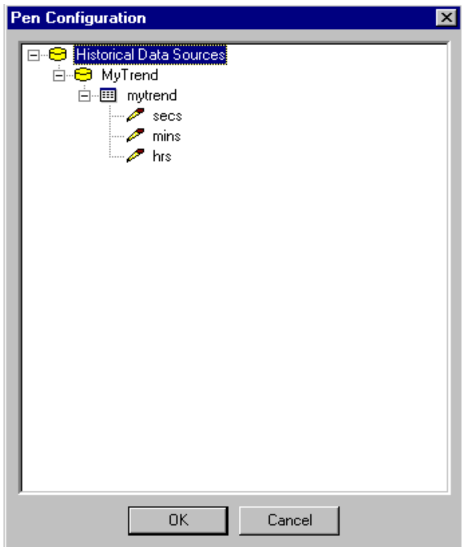
Configuring the Pens for the Trend Chart

Configuring the Pens for the Trend chart is a multistep process. First, you add a database to the configuration. Next, you select the tables and then the field columns you wish to associate with the pens.

Adding a Database to Pen Configuration

1 Click the ellipsis button on the Pen Data Source field of the of the TREND Control tab as shown in Figure 29-35. The Pen Configuration screen appears as shown in Figure 29-38. Different menus are associated with each item in the tree.

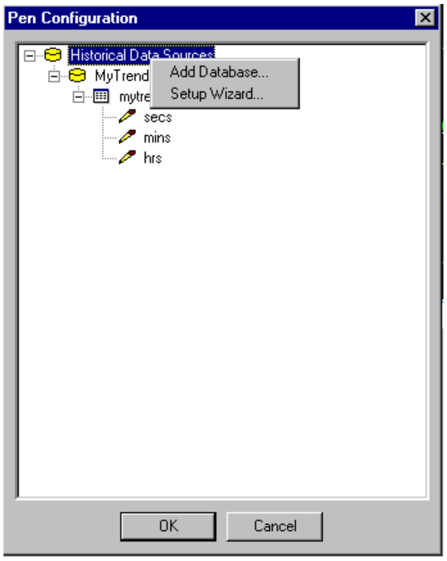
Figure 29-38 Pen Configuration



For example, Add Database in Figure 29-39 means to add a new database to the Pen Configuration. You can choose Setup Wizard instead, which will prompt you through the entire configuration. For more information about the Setup Wizard, refer to “Configuring Pens Using the Setup Wizard” on page 634.

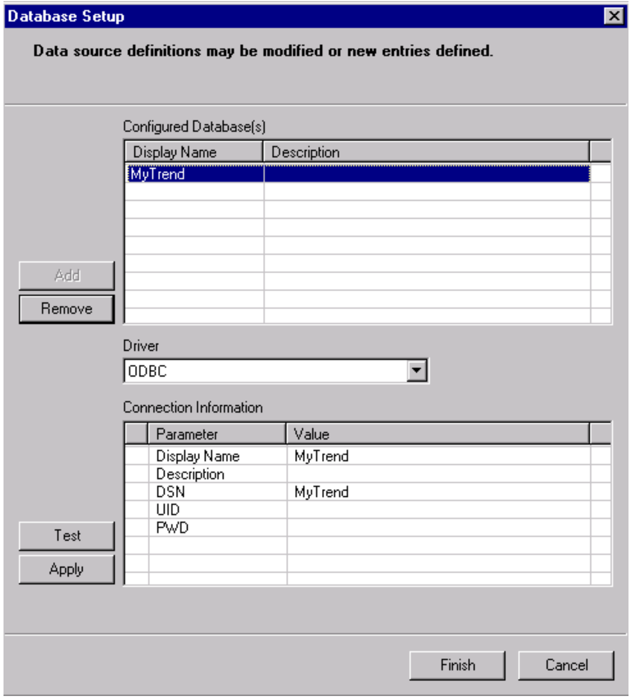
2 Right-click Historical Data Sources. A pop-up menu appears as shown in Figure 29-39.

Figure 29-39 Historical Data Sources Pop-up Menu



3 Click Add Database. The Database Setup screen appears as shown in Figure 29-40. Select the driver from Driver drop-down list. Type in the display name in Display Name field.

Figure 29-40 Database Setup



Database Setup

Data source definitions may be modified or new entries defined.

Configured Database(s)

Display Name	Description
MyTrend	

Driver: ODBC

Connection Information

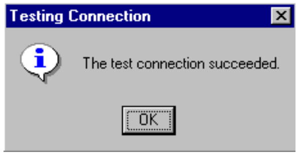
Parameter	Value
Display Name	MyTrend
Description	
DSN	MyTrend
UID	
PWD	

Table 29-14 Database Setup Field Definitions, Connection Information

Field Name	Definition
Display Name	Type display name the same as the one you choose from the Database Display Name under Configured Database(s).
Description	Type information that is helpful to you in identifying this database.
DSN	Type the same DSN you set up for your driver. For more information about creating a DSN, refer to "Predesign" on page 588.
UID/PWD	Type the same User ID and Password you use for your database access.

4 Click Test. Database Test Connection Succeeds screen appears as shown in Figure 29-41.

Figure 29-41 Testing Connection Screen 1 of 2

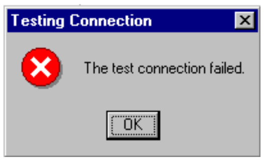


Testing Connection

The test connection succeeded.

If your connection fails, you will receive the message, Database Test Connection Failed as shown in Figure 29-42. Check to see if the Server is online, and if the DSN is configured properly.

Figure 29-42 Testing Connection Screen 2 of 2



Testing Connection

The test connection failed.

5 Click OK on the Test Connection screen. Click Finish.

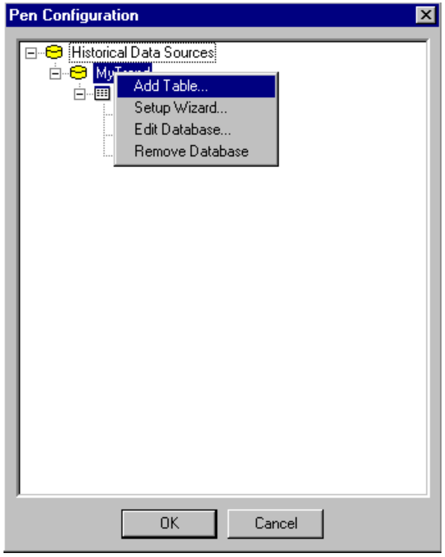
Removing a Database from the Pen Configuration

Expand Historical Data Sources and right-click the database you wish to remove. A pop-up menu appears as shown in Figure 29-43. Click Remove Database. The database is removed from the Configured Database(s) field in the Database Setup.

Adding a Table to Pen Configuration

In this example, MyTrend is a database that was added by the Starter Application, and it appears under Historical Data Sources in the tree as shown in Figure 29-43. If you right-click MyTrend, or a database you have added, a pop-up menu appears.

Figure 29-43 Pen Configuration, Add Table



1 Click Add Table. The Table Setup screen appears as shown in Figure 29-44. Select a table from the list of Unconfigured Tables. Click the Add button. The table will appear in the list under Trending Tables.

Figure 29-44 Table Setup, Single Point

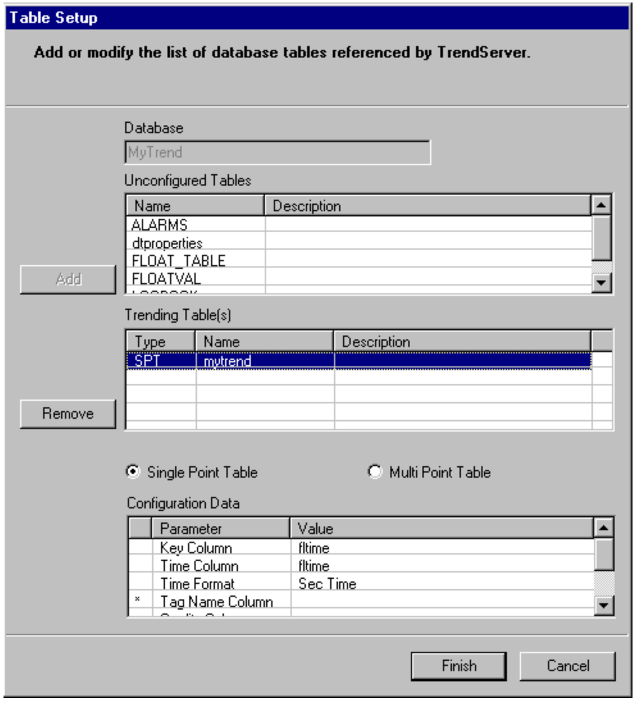


Table Setup

Add or modify the list of database tables referenced by TrendServer.

Database: MyTrend

Unconfigured Tables

Name	Description
ALARMS	
dtproperties	
FLOAT_TABLE	
FLOATVAL	

Trending Table(s)

Type	Name	Description
SPT	mytrend	

● Single Point Table ○ Multi Point Table

Configuration Data

	Parameter	Value
	Key Column	fltime
	Time Column	fltime
	Time Format	Sec Time
*	Tag Name Column	

2 Select the radio button that corresponds to the type of table you have set up: Single-Point Table or Multipoint Table. Fields that contain an asterisk (*) must be completed.

Single-Point Table

A Single-Point Table (SPT), is a database table that has a single value column per row. To see an example of a Single-Point Table, refer to Table 29-15. In the table, each row has a single value column called Pressure. The rows are denoted by a group in the Tank column. For these types of tables, configure most of the information in the Pen Configuration Table Setup. Include the value column since it never changes. You need to specify only the tag name in the Pen Configuration Pen Setup. In the table, the Tag Name Column is Tank, and the tag name is 1, 2, or 3. To see a representation of the Pen Configuration Pen Setup, refer to Figure 29-47 on page 632.

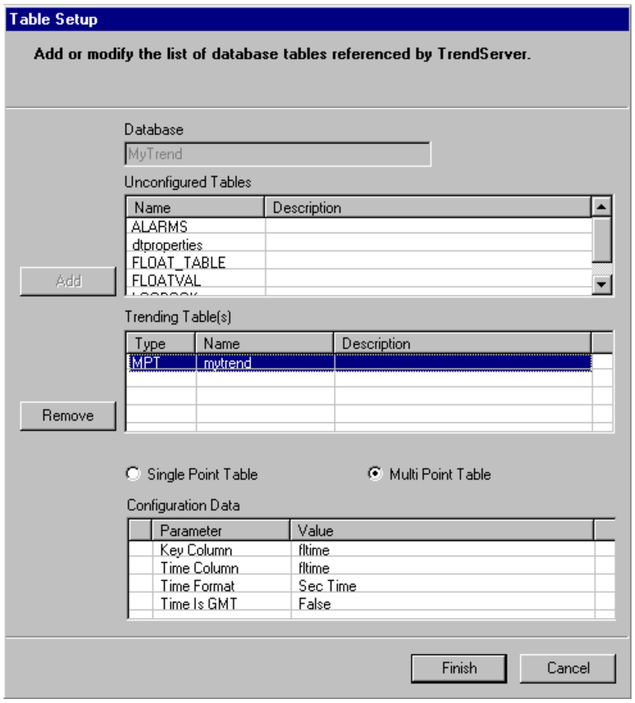
Table 29-15 Single-Point Table

ID	Time	Tank	Pressure
1232	3/9/00 12:30:00	1	75.2334
1233	3/9/00 12:35:00	2	76.4621
1234	3/9/00 12:40:00	3	75.3245
1235	3/9/00 12:45:00	3	76.2545
1236	3/9/00 12:50:00	2	74.5322

Table 29-16 Table Setup Field Definitions, Single-Point Table Configuration Data Parameters

Field Name	Definition
Key Column	Uniquely identifies a row in the database. Can be numeric or time/date.
Time Column	Contains the time stamp for the row. This field is required if you are viewing a Trend chart with time as the X-Axis.
Time Format	Identifies the format of the Time column. It is either FactoryLink Sec time, or the normal database time.
Time is GMT	Shows whether the time is stored in Greenwich Mean Time.
Tag Name Column	Holds the tag name.
Value Column	Represents the value.
Quality Column	Specifies whether the value is of good quality. Not required

Figure 29-45 Table Setup, Multipoint



Add or modify the list of database tables referenced by TrendServer.

Database: MyTrend

Unconfigured Tables

Name	Description
ALARMS	
dtproperties	
FLOAT_TABLE	
FLOATVAL	

Trending Table(s)

Type	Name	Description
MPT	mytrend	

○ Single Point Table ● Multi Point Table

Configuration Data

Parameter	Value
Key Column	fltime
Time Column	fltime
Time Format	Sec Time
Time Is GMT	False

Multipoint Table

A Multipoint Table (MPT) is a database table that has multiple value columns per row. To see an example of how a database is structured to contain a Multipoint Table, see Table 29-17. The table shows that each row contains four different value columns called Temp, Pressure, Weight, and Length for trending. For these types of tables, configure most of the information in the Pen Configuration Table Setup. You need only specify which column represents value for the Pen Configuration Pen Setup. To see a representation of the Pen Configuration Pen Setup, refer to Figure 29-47.

Table 29-17 Multipoint Table

ID	Time	Temp	Pressure	Weight	Length
1232	3/9/00 12:30:00	102.2	75.2334	132	12.6

Table 29-17 Multipoint Table

ID	Time	Temp	Pressure	Weight	Length
1233	3/9/00 12:35:00	100.5	76.4621	113	11.8
1234	3/9/00 12:40:00	109.7	75.3245	123	12.0

Table 29-18 Table Setup Field Definitions, Multipoint Table Configuration Data Parameters

Field Name	Definition
Key Column	Uniquely identifies a row in the database. Can be numeric or time/date.
Time Column	Contains the time stamp for the row. This field is required if you are viewing a Trend chart with time as the X-Axis.
Time Format	Identifies the format of the Time column. It is either FactoryLink Sec time, or the normal database time.
Time is GMT	Shows whether the time is stored in Greenwich Mean Time.

3 Click Finish.

Editing a Table

Once in the Table Setup screen, you can edit the tables that appear under Trending Table(s). Click the Trending Table you wish to edit. This action enables and populates the Configuration Data fields so you can type the values into these fields, and edit them.

You may choose to edit the table by selecting the table as it appears under the database next to the Table icon as shown in Figure 29-46. Right-click the table. A pop-up menu appears. Click Edit Table. The Table Setup screen will appear as shown in Figure 29-45.

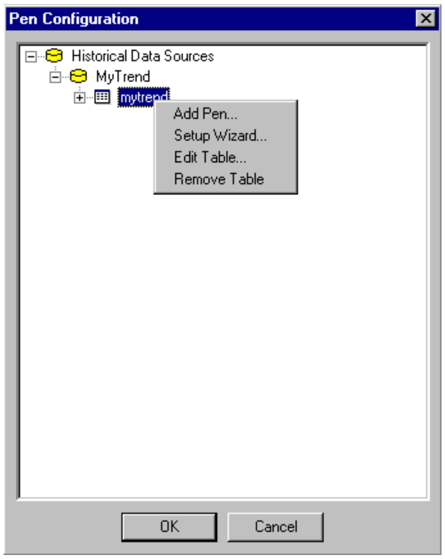
Removing a Table from the Pen Configuration

Right-click the table you wish to remove. A pop-up menu appears as shown in Figure 29-46. Click Remove Table. The table and pens associated with this configuration will be deleted.

Adding a Pen to the Pen Configuration

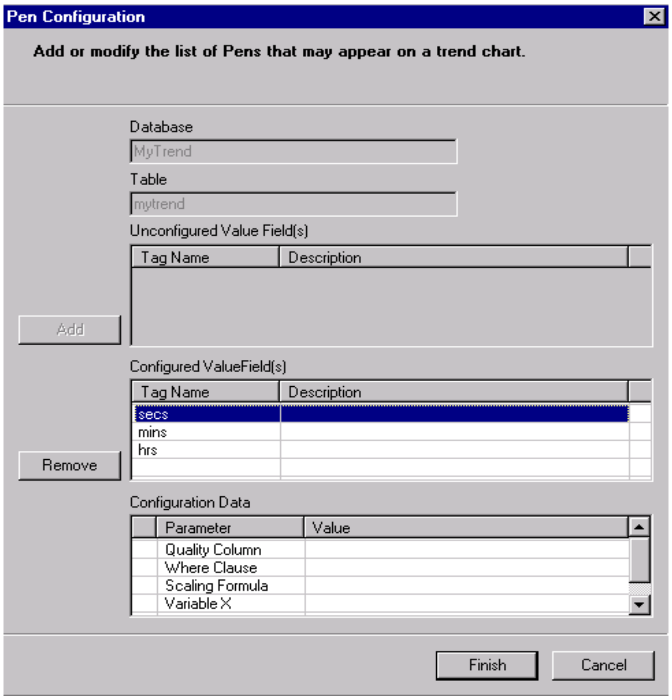
Right-click the table in which you want to add the pens. A pop-up menu appears as shown in Figure 29-46.

Figure 29-46 Adding a Pen to the Configuration



1 Click Add Pen. Pen Setup screen appears as in Figure 29-47. Select a pen from the list of Unconfigured Pen(s). Click Add. The pen appears in the list of Configured Pen(s).

Figure 29-47 Pen Setup



Pen Configuration

Add or modify the list of Pens that may appear on a trend chart.

Database: MyTrend

Table: mytrend

Unconfigured Value Field(s)

Tag Name	Description

Configured ValueField(s)

Tag Name	Description
secs	
mins	
hrs	

Configuration Data

Parameter	Value
Quality Column	
Where Clause	
Scaling Formula	
Variable X	

Table 29-19 Pen Setup Field Definitions, Configuration Data Parameters, Single Point

Field Name	Definition
Where Clause	Allows for additional filtering to be added to the WHERE clause of the SQL statement passed to the database by the Trend Server.
Scaling Formula	Not yet used. Specifies how to use the X & Y variables
Variable X	Not yet used. X value to plug into the scaling formula.
Variable Y	Not yet used. Y value to plug into the scaling formula.

Table 29-20 Pen Setup Field Definitions, Configuration Data Parameters, Multipoint

Field Name	Definition
Quality Column	Specifies whether the value is of good quality. It is not a required field.
Where Clause	Allows for additional filtering to be added to the WHERE clause of the SQL statement passed to the database by the Trend Server.
Scaling Formula	Not yet used. Specifies how to use the X & Y variables
Variable X	Not yet used. X value to plug into the scaling formula.
Variable Y	Not yet used. Y value to plug into the scaling formula.

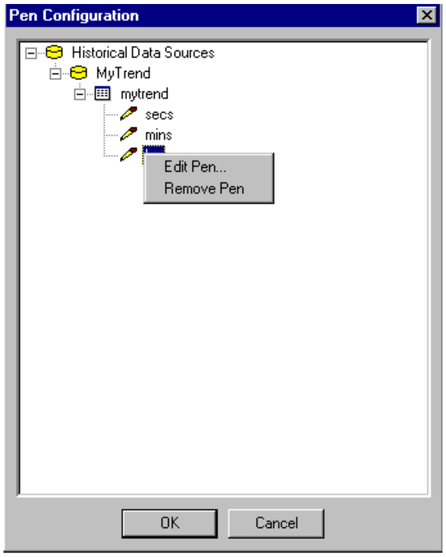
2 Click Finish.

Editing a Pen in the Pen Configuration

The Pen Setup screen allows you to edit the pens that appear under the Configured Pens Section of the screen. Click the configured pen you wish to edit. This action enables and populates the Configuration Data fields so that you can type the values into these fields, and edit them.

At the Pen Configuration screen, select a pen and right-click. A pop-up menu appears as shown in Figure 29-48.

Figure 29-48 Configuration Screen, Editing a Pen



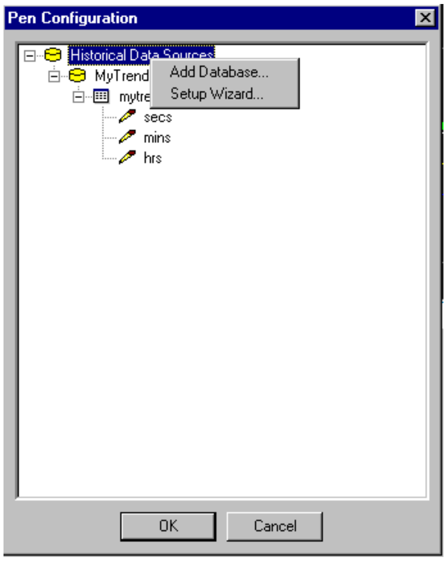
Removing a Pen from the Pen Configuration

Right-click on the pen you wish to remove from the Pens Configuration screen. A pop-up menu appears as shown in Figure 29-48. Click Remove Item, and the pen will be deleted.

Configuring Pens Using the Setup Wizard

You can access the Pen Configuration Setup Wizard by right-clicking on any item in the tree. For example, if you right-click Historical Data Sources, a pop-up menu appears. If you access Setup Wizard from the Historical Data Sources as shown in Figure 29-49, the Wizard guides you from the beginning of the process until the end. You begin by adding a data source, and end with adding a pen. Clicking Setup Wizard from an existing setup database brings you to the Table Setup, and clicking Setup Wizard from an existing Table Setup brings you to the Pen Setup.

Figure 29-49 Pen Configuration Screen, Setup Wizard

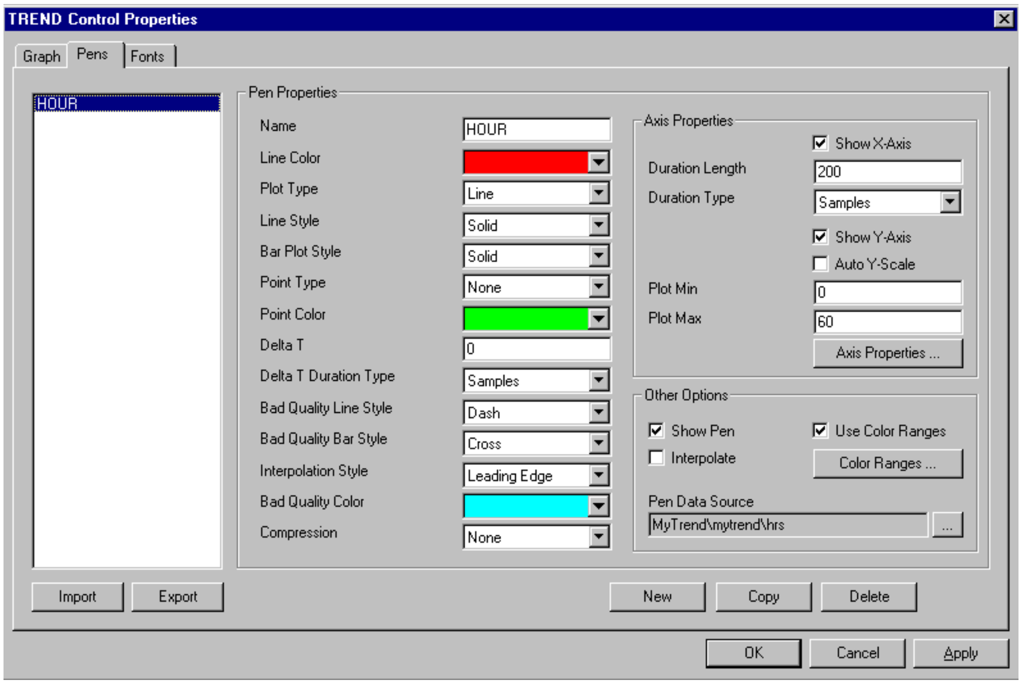


Adding a New Pen to the Trend Chart

The example in the following steps shows how to add a new pen called Seconds to the Trend chart created from the MyTrend database in the Starter Application.

1 Select the Pens tab from the Trend Control Properties screen as shown in Figure 29-50.

Figure 29-50 TREND Control Properties Pens Tab, Screen 1 of 3



Pen Properties

Name	HOUR
Line Color	🟥
Plot Type	Line
Line Style	Solid
Bar Plot Style	Solid
Point Type	None
Point Color	🟩
Delta T	0
Delta T Duration Type	Samples
Bad Quality Line Style	Dash
Bad Quality Bar Style	Cross
Interpolation Style	Leading Edge
Bad Quality Color	🟦
Compression	None

Axis Properties

☑ Show X-Axis

Duration Length	200
Duration Type	Samples

☑ Show Y-Axis

☐ Auto Y-Scale

Plot Min	0
Plot Max	60

Other Options

☑ Show Pen

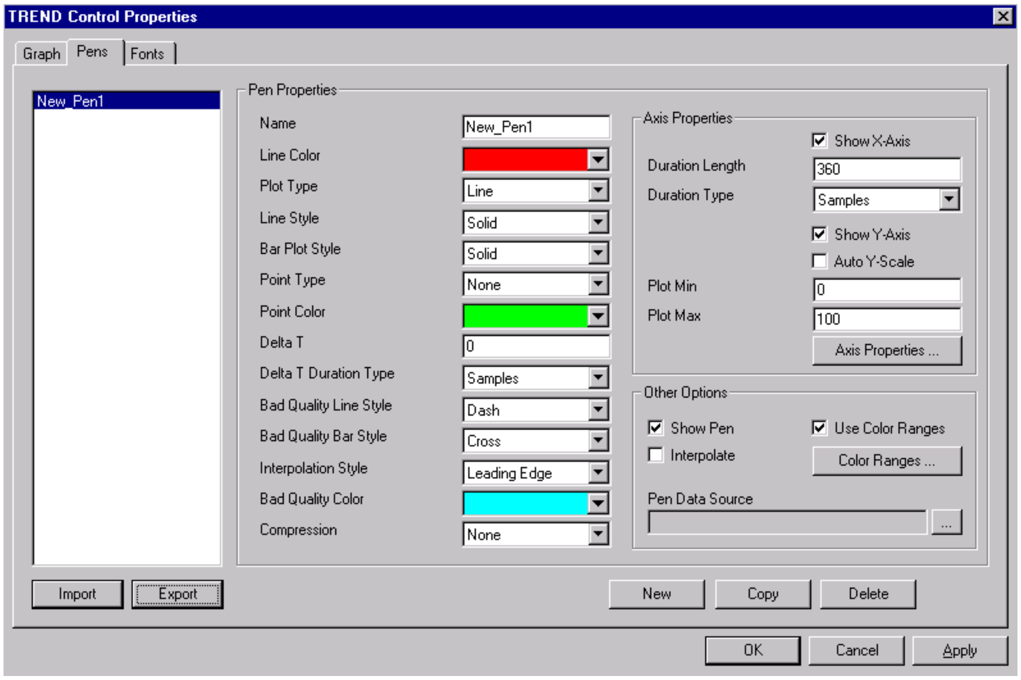
☑ Use Color Ranges

☐ Interpolate

Pen Data Source: MyTrend\mytrend\hrs

2 Click New and change the name field to Seconds as shown in Figure 29-51.

Figure 29-51 TREND Control Properties Pens Tab, Screen 2 of 3



New_Pen1

Pen Properties

Name: New_Pen1
Line Color: 🟥
Plot Type: Line
Line Style: Solid
Bar Plot Style: Solid
Point Type: None
Point Color: 🟩
Delta T: 0
Delta T Duration Type: Samples
Bad Quality Line Style: Dash
Bad Quality Bar Style: Cross
Interpolation Style: Leading Edge
Bad Quality Color: 🟦
Compression: None

Axis Properties

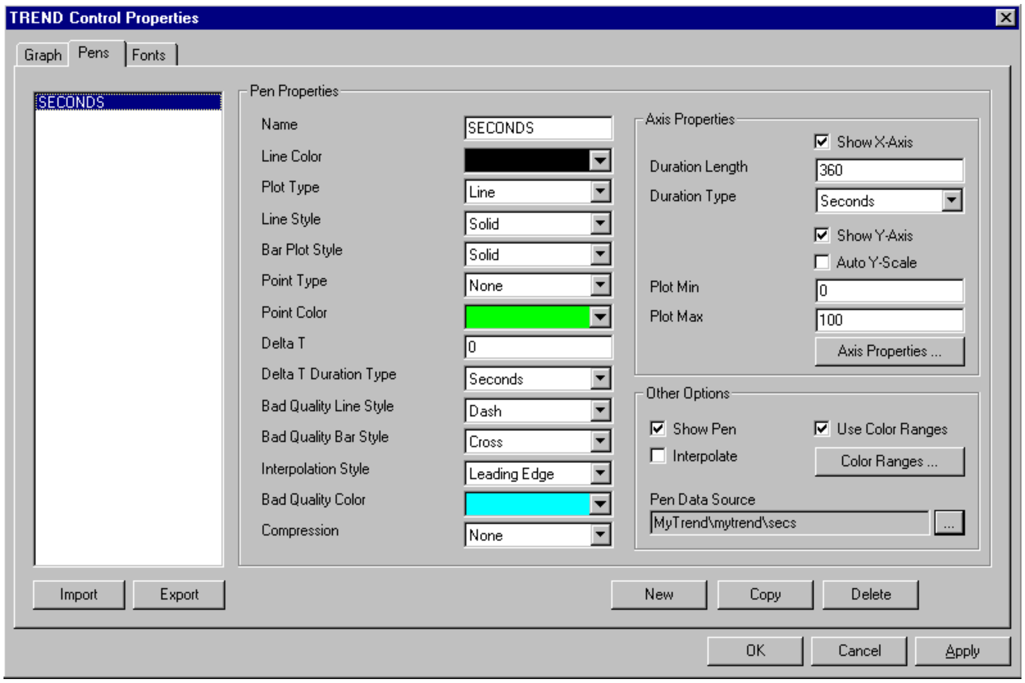
☑ Show X-Axis
Duration Length: 360
Duration Type: Samples
☑ Show Y-Axis
☐ Auto Y-Scale
Plot Min: 0
Plot Max: 100
Axis Properties ...

Other Options

☑ Show Pen
☐ Interpolate
☑ Use Color Ranges
Color Ranges ...
Pen Data Source: ...

3 Click the ellipsis button and navigate to the secs pen, which has already been configured.

Figure 29-52 TREND Control Properties Pens Tab, Screen 3 of 3



TREND Control Properties

Graph | Pens | Fonts

SECONDS

Pen Properties

Name: SECONDS
Line Color: ■
Plot Type: Line
Line Style: Solid
Bar Plot Style: Solid
Point Type: None
Point Color: 🟩
Delta T: 0
Delta T Duration Type: Seconds
Bad Quality Line Style: Dash
Bad Quality Bar Style: Cross
Interpolation Style: Leading Edge
Bad Quality Color: 🟦
Compression: None

Axis Properties

☑ Show X-Axis
Duration Length: 360
Duration Type: Seconds
☑ Show Y-Axis
□ Auto Y-Scale
Plot Min: 0
Plot Max: 100

Other Options

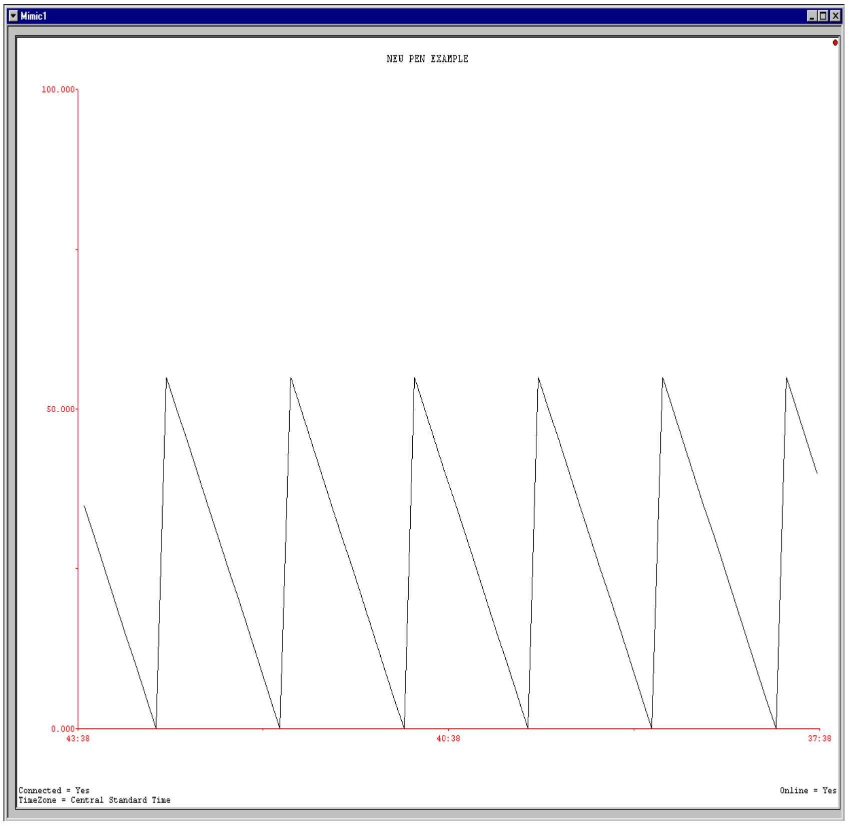
☑ Show Pen
☑ Use Color Ranges
□ Interpolate
Pen Data Source: MyTrend\mytrend\secs

4 Change the Duration length to 360 and plot max to 100.

5 Click Save and click OK.

6 Click Run on the toolbar. The new pen appears on a Trend chart as shown in Figure 29-53.

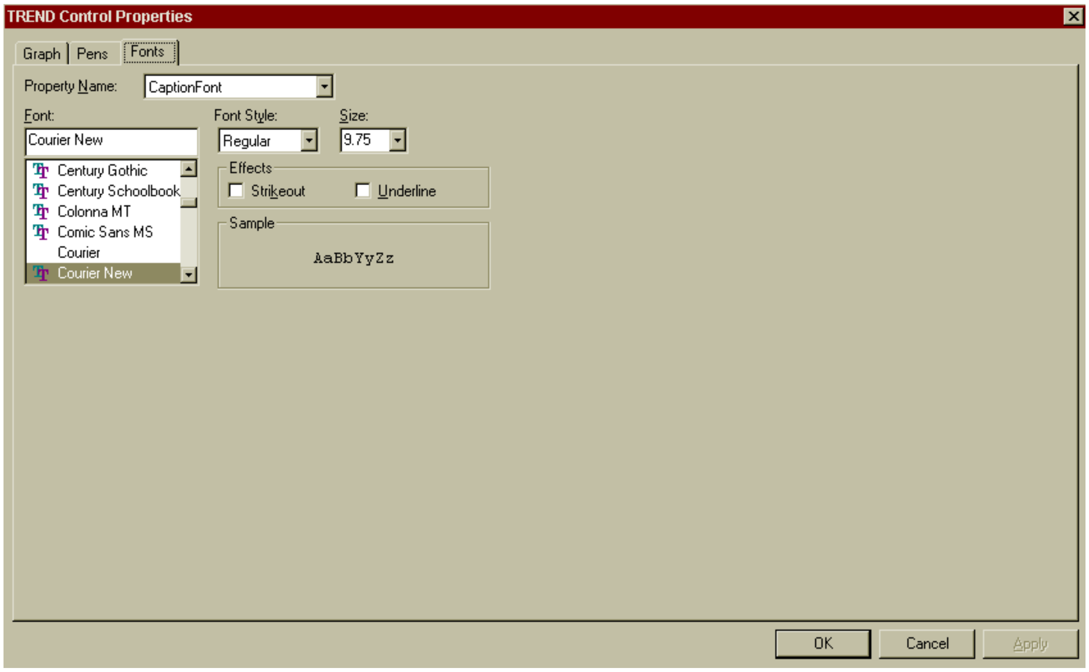
Figure 29-53 New Pen Example



Using the Trend Control Properties Fonts Tab

Configure the fonts for the Trend chart using the TREND Control Properties Fonts tab. Select the Property name from the drop-down list box, and select the font type, style, and size. To see the TREND Control Properties Fonts tab, refer to Figure 29-54.

Figure 29-54 TREND Control Properties Fonts Tab



Property Name: CaptionFont

Font: Courier New

Font Style: Regular

Size: 9.75

☐ Strikeout ☐ Underline

Sample: AaBbYyZz

Table 29-21 Trend Control Fonts Tab, Field Descriptions

Field		Description	Options
Property Name	List Box	Click appropriate font type.	Select CaptionFont or TextFont.
Font	List Box	Click name of font.	Various
Font Style	List Box	Click font style	Select Regular, Bold, Italic, or Bold Italic.
Strikeout	Check Box	Check to place line through text.	
Underline	Check Box	Check to Underline text.	
Sample	Display Box	Displays effects of Strikeout & Underline check boxes.	

Custom Programming for the Pen Cursor Values

You can create applications for the pen cursor values through custom programming. The following is the programming code for the pen cursor values. It is written in Client Builder Visual Basic for Application.

`MyPen.Seriesname tells MyPen.Value which value to show in Text20.Text, such as, the value for hour at that instance (MyValues.Count).`

```
Private Sub TRENDCtrl1_CursorDataChanged(Values As Variant)

Dim MyValues As Variant

Dim MyPenNum As Integer

Dim MyPen As Variant

Set MyValues = Values

For MyPenNum = 1 To MyValues.Count

   Set MyPen = MyValues.Item(MyPenNum)

   If MyPen.Seriesname = “Hrs” Then

         Text20.Text = MyPen.Value

   End If

   If MyPen.Seriesname = “Mins” Then

         Text21.Text = MyPen.Value

   End If

   If MyPen.Seriesname = “Secs” Then

         Text23.Text = MyPen.Value

   End If

   Set MyPen = Nothing

Next MyPenNum

End Sub
```

Creating a Dynamic Pen through Custom Programming

Below is a custom programming routine written in Visual Basic that creates a new pen and then sets its data source.

```
Private Sub CreateNew Pen()

   Dim newPen As TRENDLib.TRENDPen


   TRENDCtrl1.TurnOffRealtime


   ‘Create a new pen

   Set newPen = TRENDCtrl1.PenSet.Add(“MyNewPen”,vbRed)


   ‘Set the datasource

   newPen.DataSouceName = “MyTrend\mytrend\hrs”


   Set newPen = Nothing

   TRENDCtrl1.TurnOnRealtime

End Sub
```

Below is a custom programming routine written is Visual Basic that changes the data source of an existing pen.

```
Private Sub ModifyingExistingPen()

   Dim newPen As TRENDLib.TRENDPen


   TRENDCtrl1.TurnOffRealtime


   ‘Get existing pen
   Set newPen = TRENDCtrl1.PenSet.Item(1)

   ‘Set to a different datasource

   newPen.DataSourceName =”MyTrend\mytrend\secs”


   Set newPen = Nothing


   TRENDCtrl1.TurnOnRealtime

End Sub
```

RUN TIME

This section demonstrates how to get around in a Trend chart during run time. FactoryLink comes with a Trend chart preconfigured in the Starter Application. This section assumes the Starter Application has been installed. For more information about the Starter Application in general see “Working with the MyStarterApp Context Menu” in the Configuration Explorer User Guide.

This section is comprised of the following topics:

- Using a Trend Chart
- Panning and Zooming

Using a Trend Chart

The Trend chart in this section comes from the FactoryLink Starter Application. The Trend chart is a time-based chart. To see this Trend chart, start the FactoryLink application. MyStarterApp.

1 Double-click the Configuration Explorer icon on your desktop.

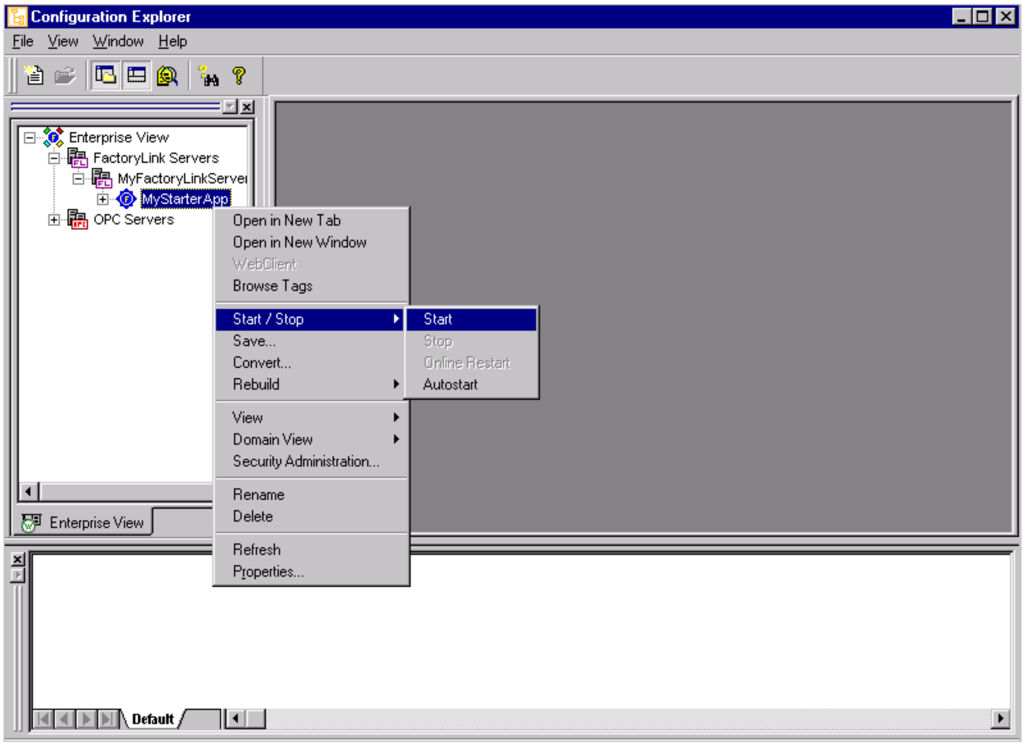
2 Expand FactoryLink Servers.

3 Right-click MyStarterApp.

4 Select Start/Stop.

5 Click Start. To see the Configuration Explorer screen, see Figure 29-55.

Figure 29-55 Configuration Explorer



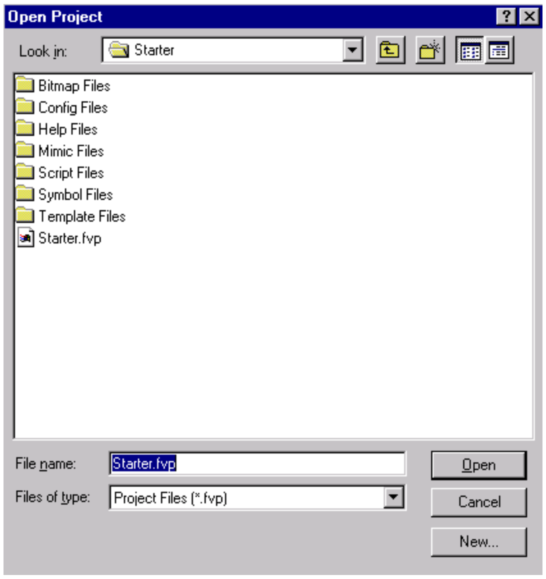
Open MyStarterApp from Client Builder.

1 Double-click the Client Builder icon on your desktop.

The Open Project screen appears as shown in Figure 29-56.

2 Click or type Starter.fvp in the File Name text box. Click Open.

Figure 29-56 Open Project



Open Project

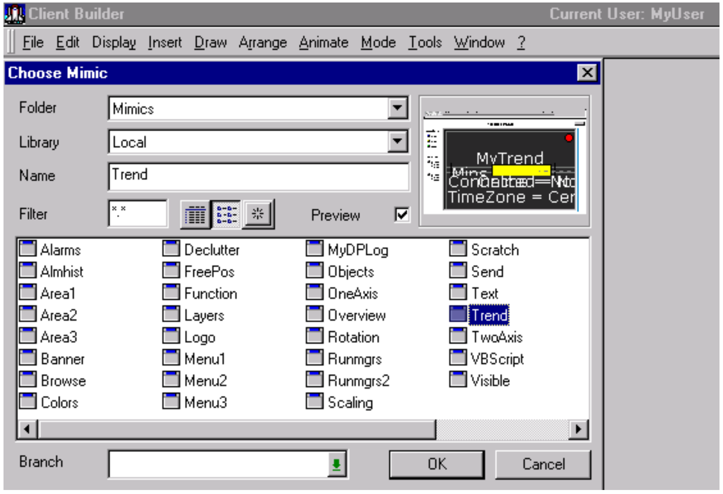
Look in: Starter

File name: Starter.fvp

Files of type: Project Files (*.fvp)

3 The Client Builder window appears. Click Open from the File menu. The Choose Mimic window appears as shown in Figure 29-57. Select Trend and Click OK.

Figure 29-57 Choose Mimic



Client Builder Current User: MyUser

Choose Mimic

Folder: Mimics

Library: Local

Name: Trend

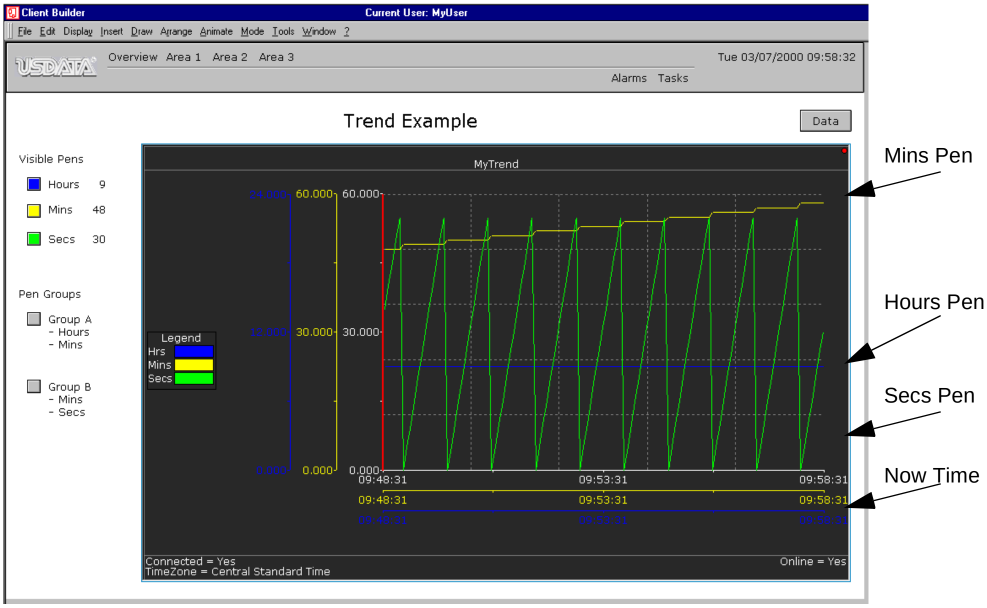
Filter: *.*

Preview ☑

Branch:

MyTrend example appears inside the Client Builder window as shown in Figure 29-58. This example is a time-based Trend chart.

Figure 29-58 Trend Example - MyTrend



Mins Pen

Hours Pen

Secs Pen

Now Time

The pens are labelled Hours, Mins, and Secs as shown in the legend. An X-axis and a Y-axis exist for each pen; therefore, there are three X and Y axes on the chart. An axis is also called a scale. The Y-axis is set from 0 to 24 for Hours, 0 to 60 for Mins, and 0 to 60 for Secs. The X-axis is divided into five minute intervals. Now-time is the time appearing on the right of the X-axis. The chart direction is set from right to left. You may set it from left to right. The three pens scroll across the chart.

Click a Pen button from the Visible Pens section as shown in Figure 29-58 to see a particular pen on the Trend chart. Click a Pen Group button to see a group of pens.

4 Right-click inside the area of the Trend screen. A pop-up menu appears as shown in Figure 29-59.

Figure 29-59 Trend Screen Pop-up Menu

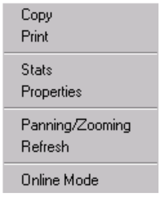
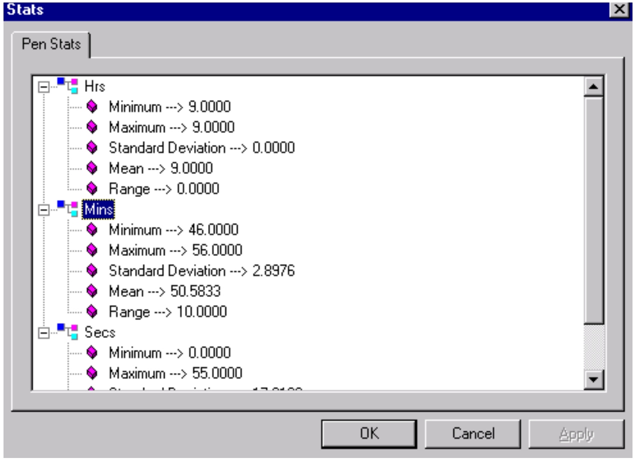


Table 29-22 Definitions for Trend Screen Pop-up Menu, Table 1 of 2

Menu Item	Action
Copy	Click to copy the Trend chart.
Print	Click to print the Trend chart.
Stats	Click to open Stats screen. Expand Pen Name to view statistics for each pen. To see the Stats Screen, refer to Figure 29-60.

Figure 29-60 Stats Screen



```
Hrs
    Minimum ---> 9.0000
    Maximum ---> 9.0000
    Standard Deviation ---> 0.0000
    Mean ---> 9.0000
    Range ---> 0.0000
Mins
    Minimum ---> 46.0000
    Maximum ---> 56.0000
    Standard Deviation ---> 2.8976
    Mean ---> 50.5833
    Range ---> 10.0000
Secs
    Minimum ---> 0.0000
    Maximum ---> 55.0000
```

The Stats Screen is informational only and cannot be edited. Click OK to close the screen.

Table 29-23 Definitions for Trend Screen Pop-up Menu, Table 2 of 2

Menu Item	Action
Properties	Click to bring up the Trend Control Properties tabs: Graph, Pens, and Fonts.

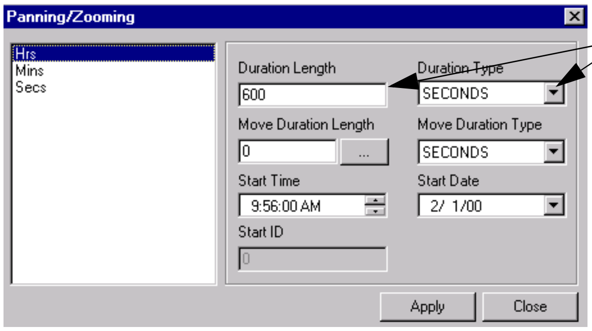
Table 29-23 Definitions for Trend Screen Pop-up Menu, Table 2 of 2

Menu Item	Action
Panning/ Zooming	Click Offline to enable Panning & Zooming. Click Panning/Zooming to open the Duration-Calculation screen. Panning & zooming are run-time functions. To see the Panning & Zooming Screen, refer to Figure 29-61.
Refresh	Click to refresh data resulting from Panning/Zooming.
Offline Mode	Click to stop data from entering the Trend chart. Click again to have data enter the chart during Online Mode.

Panning and Zooming

Panning and zooming allow you to make visual modifications to the Trend chart. The capabilities of panning and zooming have been combined to allow both capabilities to work in conjunction with each other. You select the pen to be panned/zoomed and then modify the panning and zooming properties. Like all Trend Control properties, these properties are exposed to custom programming.

Figure 29-61



Duration Length: 600
Duration Type: SECONDS
Move Duration Length: 0
Move Duration Type: SECONDS
Start Time: 9:56:00 AM
Start Date: 2/ 1/00
Start ID: 0

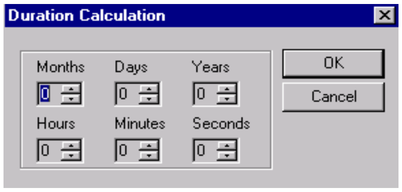
Duration length is 600 seconds, or ten minutes.

You are defining the X-axis. Complete the fields in the Offline Mode. Click Apply and Close to close the Panning/Zooming screen.

Table 29-24 Panning/Zooming Screen Field Descriptions, Table 1 of 3

Field Name	Description
Duration Length	Type in a time that coincides with the Duration Type you select.
Move Duration Length	Click the Ellipsis button. The Duration Calculation screen appears as shown in Figure 29-62. Click to the desired time. This feature allows you to move a block of data by shifting the X-Axis to a new time span. Click OK.

Figure 29-62 Duration Calculation



Ranges
Months 0-12
Hours 0-24
Days 0-31
Minutes 0-60
Years 0-50
Seconds 0-60

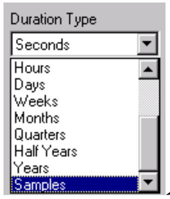
Table 29-25 Panning/Zooming Screen Fields and Descriptions, Table 2 of 3

Field Name	Description
Start Time	Enter the oldest time you want pan/zoom to focus. Default time is the last time entered on the chart.
Start ID	Type the name of the sample where you want to begin in an event-based chart. Since this is a time-based chart, Start ID is greyed out.

Table 29-25 Panning/Zooming Screen Fields and Descriptions, Table 2 of 3

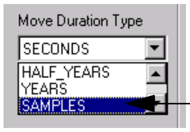
Field Name	Description
Duration Type	Select information such as seconds, days, or an event. The information coincides with time entered in Duration Length. To see the Duration Type List Box, refer to Figure 29-63.
Move Duration Type	Select the format in which you want to see the past data. To see the Move Duration Type list box, refer to Figure 29-64.

Figure 29-63 Duration Type List Box



Use samples only for event-based charts.

Figure 29-64 Move Duration Type List Box

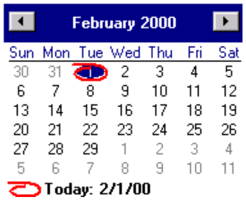


Use samples only for event-based charts.

Table 29-26 Panning/Zooming Screen Fields and Descriptions, Table 3 of 3

Field Name	Description
Start Date	Click date on calendar for the oldest date to pan/zoom. To see the Start Date Calendar, refer to Figure 29-65.

Figure 29-65 Start Date Calendar



February 2000

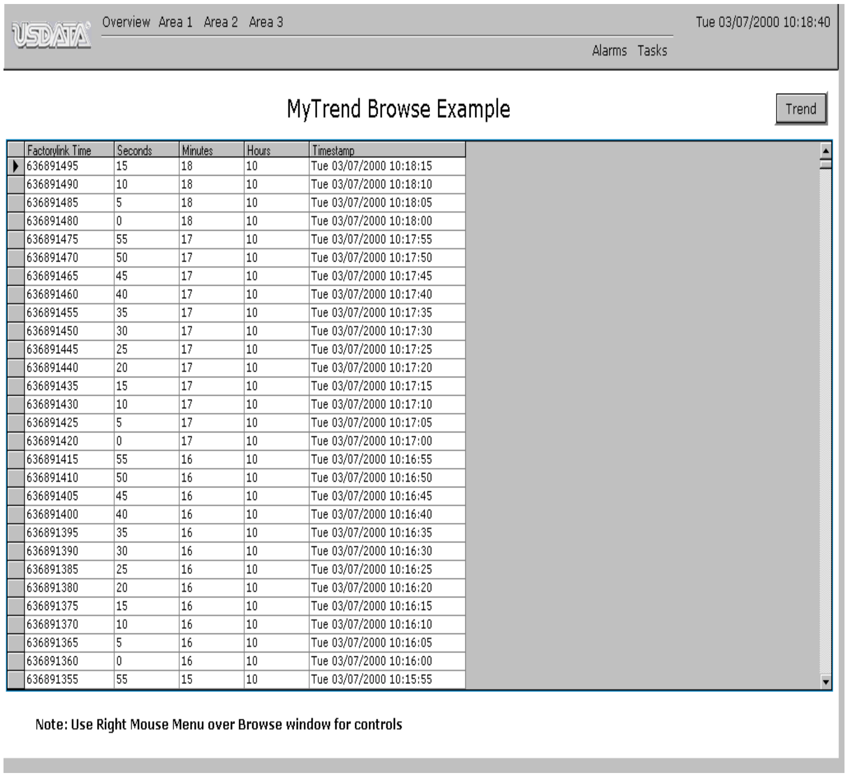
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	1	2	3	4
5	6	7	8	9	10	11

Today: 2/1/00

Click Apply if you have changed the information. Click the drop-down list box to close the calendar.

Click the Data button. My Trend Browse Example screen appears as in Figure 29-66. This screen shows the table of information from the database that is plotted on the Trend chart. Data from the column named FactoryLink Time showing time-stamping sequence numbers is not used in the time-based Trend chart. Time-stamping sequence numbers are used for event-based charts only. The columns named Seconds, Minutes, an Hours are the columns tied to the pens. The Time-stamp column shows the date and time the data is logged.

Figure 29-66 My Trend Browse Example



Factorylink Time	Seconds	Minutes	Hours	Timestamp
636891495	15	18	10	Tue 03/07/2000 10:18:15
636891490	10	18	10	Tue 03/07/2000 10:18:10
636891485	5	18	10	Tue 03/07/2000 10:18:05
636891480	0	18	10	Tue 03/07/2000 10:18:00
636891475	55	17	10	Tue 03/07/2000 10:17:55
636891470	50	17	10	Tue 03/07/2000 10:17:50
636891465	45	17	10	Tue 03/07/2000 10:17:45
636891460	40	17	10	Tue 03/07/2000 10:17:40
636891455	35	17	10	Tue 03/07/2000 10:17:35
636891450	30	17	10	Tue 03/07/2000 10:17:30
636891445	25	17	10	Tue 03/07/2000 10:17:25
636891440	20	17	10	Tue 03/07/2000 10:17:20
636891435	15	17	10	Tue 03/07/2000 10:17:15
636891430	10	17	10	Tue 03/07/2000 10:17:10
636891425	5	17	10	Tue 03/07/2000 10:17:05
636891420	0	17	10	Tue 03/07/2000 10:17:00
636891415	55	16	10	Tue 03/07/2000 10:16:55
636891410	50	16	10	Tue 03/07/2000 10:16:50
636891405	45	16	10	Tue 03/07/2000 10:16:45
636891400	40	16	10	Tue 03/07/2000 10:16:40
636891395	35	16	10	Tue 03/07/2000 10:16:35
636891390	30	16	10	Tue 03/07/2000 10:16:30
636891385	25	16	10	Tue 03/07/2000 10:16:25
636891380	20	16	10	Tue 03/07/2000 10:16:20
636891375	15	16	10	Tue 03/07/2000 10:16:15
636891370	10	16	10	Tue 03/07/2000 10:16:10
636891365	5	16	10	Tue 03/07/2000 10:16:05
636891360	0	16	10	Tue 03/07/2000 10:16:00
636891355	55	15	10	Tue 03/07/2000 10:15:55

Note: Use Right Mouse Menu over Browse window for controls

Click the Trend button to get back to the Trend Example chart.

Chapter 30 . . . .

FactoryLink Utilities

FactoryLink provides utilities for general maintenance and troubleshooting:

CDBLIST	Lists the binary CDB files in ASCII representation.
CTGEN	Rebuilds CT files.
CTLIST	Lists the binary CT files in ASCII representation.
DBCHK	Fixes FactoryLink dBASE IV database index files.
FLCONV	Updates an application from its current version to a newer version.
FLNEW	Creates a new FactoryLink application with a baseline configuration.
FLREST	Restores a saved FactoryLink application.
FLRUN	Initiates the FactoryLink software program and the ONLINMGR utility that coordinates run-time updates.
FLSAVE	Saves a FactoryLink application to diskette or to another directory on the hard drive.
FLSETLNG	Sets FactoryLink applications to run in a specified language.
FLSHM	A memory display utility that lists existing FactoryLink real-time database memory areas. You can use this information to clean up memory if FactoryLink aborts.
FLSTATE	Scans the state of the application for anomalies.
NAMESPACE	Namespace is a wizard that enables redirecting the FactoryLink Client to a remote or local namespace.
RTDEBUG	Modifies the FLAPP functions or data for testing and debugging.
UKEY	Displays license options.

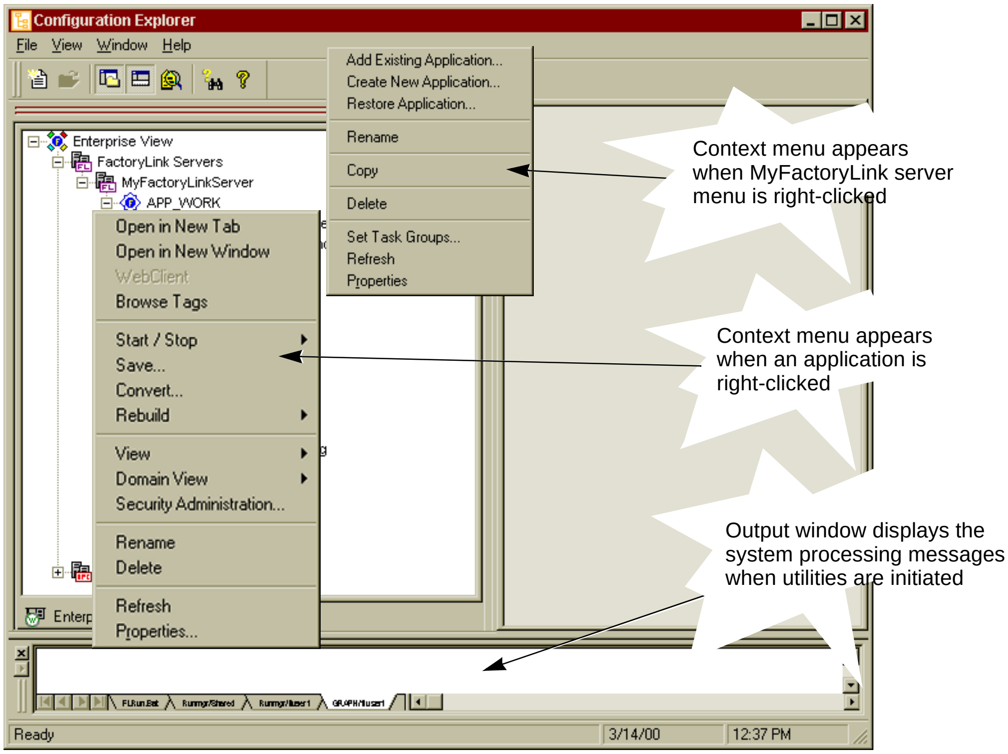
This chapter describes how to use these utilities and when to use two databases provided to return the application to an empty state or test the FactoryLink components:

FLBLANK This application is restored, it provides a minimum application structure useful only to advanced FactoryLink users.

FLTEST A minimized application supplied for testing the integrity of the installation and demonstrating FactoryLink functionality.

All the utilities can be launched from a Command Prompt window and, where indicated, from Configuration Explorer. There are two main context menus that launch utilities as shown in Figure 30-1.

Figure 30-1 Configuration Explorer Context Menus Launch Some Utilities



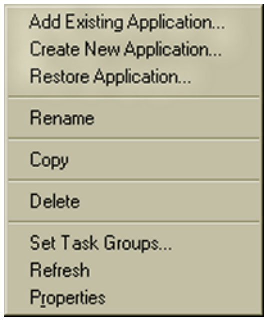
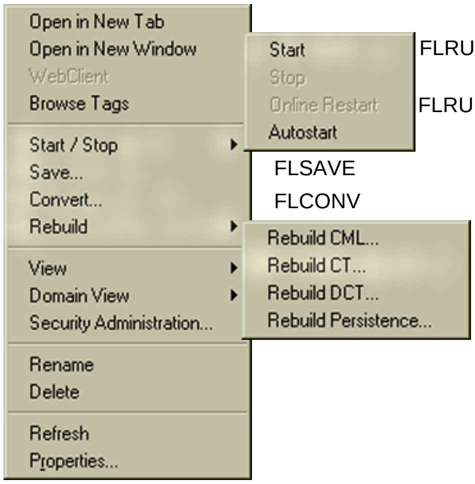
Context menu appears when MyFactoryLink server menu is right-clicked

Context menu appears when an application is right-clicked

Output window displays the system processing messages when utilities are initiated

The utilities explained in this chapter that are initiated from Configuration Explorer are shown in Table 30-1.

Table 30-1 Location of Utility Commands in Configuration Explorer

Menu	Corresponding Utility
 Add Existing Application... Create New Application... Restore Application... Rename Copy Delete Set Task Groups... Refresh Properties	FLNEW FLREST
 Open in New Tab Open in New Window WebClient Browse Tags Start / Stop Save... Convert... Rebuild View Domain View Security Administration... Rename Delete Refresh Properties... Start Stop Online Restart Autostart Rebuild CML... Rebuild CT... Rebuild DCT... Rebuild Persistence...	FLRUN FLRUN -o FLSAVE FLCONV MKCML* CTGEN -c -r Driver DCT**

* For information about MKCML refer to the Math and Logic Configuration chapter in this guide.

** For information about the Driver DCT, refer to the Device Interface Guides.

CDBLIST

The cdblist utility enables debugging at the database configuration level. When used, it creates .cdb (configuration database) files in readable ASCII format.

FactoryLink returns a command line format of

cdblist file [indexfile] [indexname]

where

file	the .cdb file
[indexfile]	the .mbx file
[indexname]	the index name to use as a sort key

CTGEN

The CTGEN utility compiles configuration databases into representative binary files known as configuration tables also called CTs. CTGEN assigns tags to physical locations within the real-time database, and these locations are written by CTGEN into both the CT and graphic files. Run-time tasks use these assigned physical locations to quickly read and write data to tags which improves performance. Upon system startup, the run-time tasks each load their appropriate CT and graphics files.

> **Note:** Graphics files created with Client Builder are not affected by this utility.

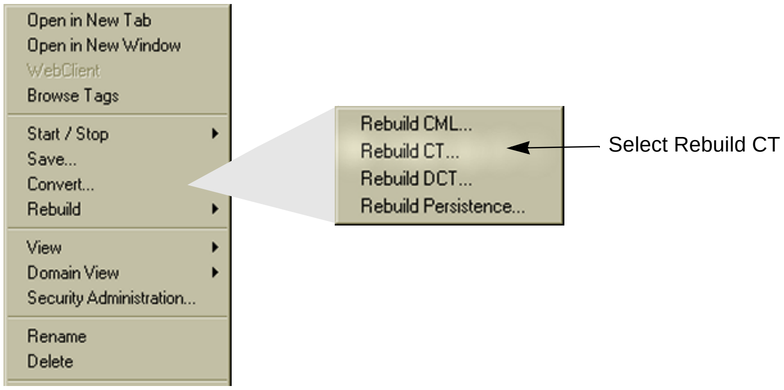
As CTGEN is invoked as part of normal system start-up, users normally have no need to directly invoke this utility. However, if the system does not seem to be reading configuration tables correctly, using CTGEN together with the -c and the -r arguments may clean up or detect anomalies in the application files.

CTGEN in Configuration Explorer

The CTGEN utility, when launched from Configuration Explorer, should be invoked when FactoryLink is not running. The -c and -r switches are automatically set when launched. Other options can be set with this utility using the Command Prompt window as shown in the next section.

To invoke CTGEN in Configuration Explorer right-click the utility name, Rebuild CT, in the Enterprise View tree as shown in Figure 30-2. CTGEN runs and the resulting messages are displayed in the Configuration Explorer output window.

Figure 30-2 Launch CTGEN in Configuration Explorer



CTGEN in the Command Prompt Window

Initiate the CTGEN utility from a Command Prompt window with the appropriate options as listed. Executing CTGEN without any parameters updates any out of date CTs and graphics files. Specifying a particular CT or graphic file limits the updating the files specified on the command line.

The syntax is:

```
ctgen [-a<flapp>] [p<flink>] [-v[#]] [–c [-r]] [-o|-f] [<CT>] [-d<CT>] [<Graphic>]
```

where normal use parameters are:

-a<flapp> Sets the application directory. Uses the FLAPP environment variable as default.

-p<flink> Sets the FactoryLink system software directory. Uses the FLINK environment variable as default.

-v[#] Turns on verbose output for debugging purposes, along with optionally setting a verbose level (1-6).

-r Causes all CTs and G files to be regenerated, regardless as to whether these files are “out of date”.

-c Causes all tag physical locations to be reassigned from scratch. This switch is useful for removing unused space from the real-time database that result from the deletion or editing of tags.
This switch should always be used in conjunction with the –r switch.

where advanced use parameters are:

<CT> Name of a particular CT file to generate

-d<CT> Name of a particular CT file to generate only if its timestamp indicates that it is older than the configuration data from which it was compiled.

<Graphic> Name of a particular graphic file to update with physical tag locations. This does not affect Client Builder graphics.

-o Generate CTs for online configuration integration. CTs generated by this switch do not become visible to running tasks until the ONLINMGR is invoked.

-f Forces the generation of CTs while the system is running. These CTs are immediately visible to running tasks. Negative results can occur since this allows online changes to be integrated into the system without their introduction having been orchestrated by the ONLINMGR.

CTLIST

The CTLIST utility is used to debug at the binary level. It is recommended only for advanced level users.

The ctlist utility is used to check that a .cdb file was correctly converted to a .ct file.

CTGEN uses the CTLIST file to build or rebuild all CTs whose database tables have changed.

Initiate this utility from a Command Prompt window. The syntax is:

```
ctlist <file.ct>
```

where

<file.ct>   the configuration tables generated by ctgen from the .cdb files

DBCHK

The Database Checking (DBCHK) utility enables you to:

- Check databases for corrupted index files
- Remove duplicate entries
- Rebuild index files

Initiate this utility from a Command Prompt window. The syntax is:

dbchk [-a{FLAPP}] [-t*titlefil]e*] [-V*number*] [-wac_file.AC] [*options*] > *filename*.out

where

options controls how dbchk executes. If you do not specify any command line parameters, the utility reports on potential problems for the entire application without trying to correct them. *Options* can be one of the following:

-a{FLAPP} defines the name of the application directory to check where {FLAPP} is the full path to the directory. If you do not specify the {FLAPP}, the default {FLAPP} directory is used. Be sure not to use a space between the -A option and {FLAPP}.

-t*titlefile* defines the files to check, where *titlefile* is the name of the file containing the names of the AC files to check. *titlefile* can be the name of any file you created using a text editor. AC files are text files that function as attribute catalogs to inform the Main Menu of the format of the configuration tags. They also control entry criteria.

{FLINK}\AC*titles*—path of the file that contains the names of all AC files accessible from the Configuration Manager Main Menu. Use this option if you want to check all the files.

{FLINK}\AC*titles*—name of the file that contains the names of all AC files not directly accessible from the Main Menu, like the object and cross-reference databases. Be sure not to use a space between the -T option and *titlefile*.

-v*n* activates verbose mode where *n* indicates the level of verbosity. This can be one of the following:

1– provides only record number messages

2– provides text messages

-w*ac_file*.AC is the name of the AC file or list of files to check. You can specify up to 200 AC files. Each name must be on a separate line.

filename.out redirects the output to *filename*.out where *filename*.out is the name of the file to receive the output.

options controls execution of the utility

- -c reports potential problems but does not try to correct them. If this option is chosen, only reporting occurs even if other options are specified.
- -d removes duplicate entries from the database files and generates a new index if any are found. Do not specify a file that permits duplicate entries or they are removed.
- -d0 same as -d
- -d1 deletes records which have equivalent index fields.
- -i generates a new index for the database files
- -h provides syntax
- -w checks the entire application. This means all AC files listed in *titlefile* plus OBJECT.AC, XREF.AC, DOMAIN.AC, and TYPE.AC are checked.

FLCONV

This utility is used after restoring a FactoryLink application on a new system platform or installing a new FactoryLink version. The application must be converted using the FLCONV utility. Once the application is converted, it is not compatible with the previous version of FactoryLink.

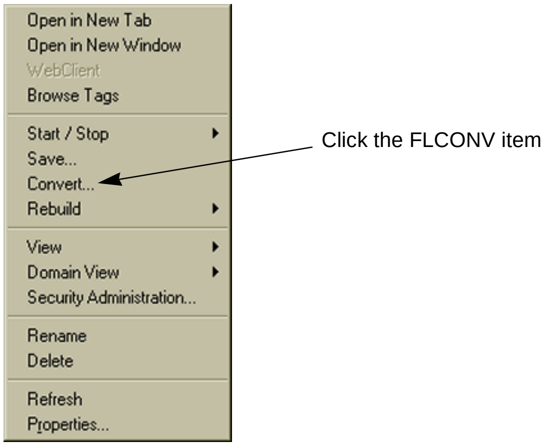
FLCONV in Configuration Explorer

Before performing a file conversion, back up the application using a platform-specific FLSAVE. Refer to FLSAVE on page 674 in this section for more information.

5 Launch the FLCONV utility in Configuration Explorer: Right-click the utility name item in the tree and a context menu appears as shown in Figure 30-3.

6 Initiate the conversion: Click the FLCONV item in the menu. The conversion process is launched and completes when the Output box reads: FLCONV successfully completed.

Figure 30-3 Restore Application Dialog Box



Caution: Do not abort the FLCONV conversion during processing as this corrupts the application.

FLCONV in a Command Prompt Window

The default source for this command is the current {FLAPP} environment. There is one command line option for this utility. The syntax is:

```
flconv [application dir]
```

where

application dir	the source file location and name

FLNEW

After installing FactoryLink a new application structure can be created using the FLNEW utility. FLNEW provides an application structure that contains all of the directories, configuration tables and associated files to provide configuration of the FactoryLink data. FLNEW also supplies a set of libraries. These libraries are a collection of application components used to perform graphical, logical, process, and communication operations. Therefore, using FLNEW to create an application results in many preconfigured common tables and tasks.

FLNEW overwrites any FactoryLink application in the destination directory. To preserve an existing application, back it up by performing an FLSAVE on page 674 before executing the FLNEW utility or ensure the new application is in an empty or new directory.

Initiate this utility from a Configuration Explorer or Command Prompt window.

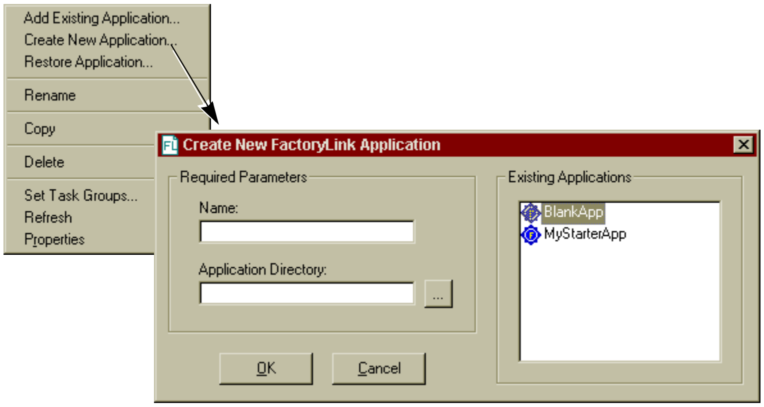
FLNEW in Configuration Explorer

The addition of a new application using Configuration Explorer requires that the destination directory is a shared directory. Before launching the FLNEW utility, determine the directory you will use to contain the new application and ensure that it is set to the shared mode.

Launch the FLNEW utility in Configuration Explorer: Right-click the MyFactoryLink Server item in the tree and a context menu appears as shown in Figure 30-4.

Select the Create New Application item. The Create New FactoryLink Application dialog box appears.

Figure 30-4 Create New Application Dialog Box



In the Required Parameters box area, type the database name in the Name box. Use the ellipsis button ... to browse for the destination directory. Click the directory name and the directory displays in the Application Directory box. Click the OK button. FactoryLink sets up the new application.

FLNEW in the Command Prompt Window

There is one command line option for the FLNEW utility.

The syntax is:

```
flnew <application directory>
```

The application directory default is the current {FLAPP} and the default application installed is:

```
{FLINK}\lang\flnew.mps
```

FLREST

The FLREST utility enables restoring saved FactoryLink application files. There are two primary reasons to restore an application: to reinstall an archived copy: when a hardware or software failure occurred to damage the working application and to transfer an application to a different system.

FLREST overwrites existing files. Do not restore to the root directory, the {FLINK} directory, or any other directory that contains open files. The safest option is to have an independent directory for the restored application.

FLREST restores FactoryLink applications by one of two methods:

- Native—Multiple file restore (previously known as a Platform Specific restore)
- Compressed—Single file restore (previously known as a Multiplatform restore)

Native File Restore Method

The Native file method restores an application to workstations with the same operating system. The source application must have been saved using the Native file save format. The source directory can be on the local hard drive, any shared drive accessible from the source computer, or one or multiple diskettes.

Use the Native file restore method to restore platform-specific files or backed-up applications.

This method restores all files in the application.

Compressed File Restore Method

The Compressed file restore method enables transferring an application to a different operating system. The source application must have been saved using the Compressed file save method. Applications must be restored to the same FactoryLink version to avoid losing data.

This method expands the saved FactoryLink application from a single image file.

FLREST in Configuration Explorer

The same steps are required to restore an application saved in Native file or Compressed file mode.

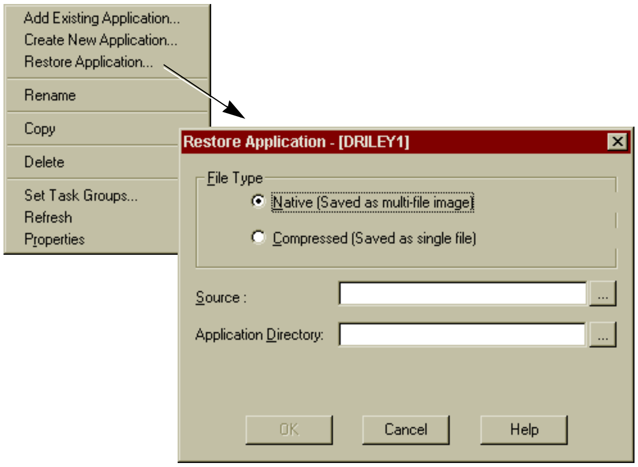
1. Insert the source diskette into the drive.

2. Create a shared directory to receive the restored file.

3 Right-click the MyFactoryLink Server item in the tree and a context menu appears as shown in Figure 30-5.

4 Select the Restore Application.. item. The Restore Application dialog box appears.

Figure 30-5 Restore Application Dialog Box


Add Existing Application...
Create New Application...
Restore Application...
Rename
Copy
Delete
Set Task Groups...
Refresh
Properties
Restore Application - [DRILEY1]
File Type
● Native (Saved as multi-file image)
○ Compressed (Saved as single file)
Source :
...
Application Directory:
...
OK
Cancel
Help

In the Required Parameters box area the database name in the Name box. Use the ellipsis button ... to browse for the destination directory. Click the directory name and the directory displays in the Application Directory box. Click the OK button. FactoryLink sets up the new application.

5 In the File Type area, select the radio button to indicate the type of restore to process.

6 Type the file name and path if known. Or, click the ellipsis button ... to browse for the source file: An Open dialog box displays. Click the file name and then the OK button. The file name and path appear in the Source box.

7 Type the directory name and path if known. Or, click the ellipsis button ... to browse for the application directory. A Browse for Folder dialog box displays. Click the directory name and click the OK button. The directory name and path appear in the Application Directory box.

> **Note:** FLREST spans diskettes for only the Native file save method. The Compressed file save method does not span diskettes.

8 Click the OK button to start the restore process.

Restore Binary, Log or Recipe Files

Some file types require additional instructions to be restored.

Compressed file restore

Restore CML-binary, Log or Recipe files that are not saved by the Compressed file restore method by copying them manually from the backup diskette.

The following files are restored by both Native and Compressed file restore methods:

- Configuration tables (*.cdb, *.mdx)
- Graphics files (drw/*.g, *.gc, *.gs, *.gp, *.gpc, *.gps, *.pl, *.pls, *.plc)
- Report Format files (rpt/*.fmt)
- Math & Logic source field (procs/ *.prg, *.inc)
- CML source files (cml/*.c, *.h, *mak)
- Network configuration files (net/*.*)
- Application Object files (*.mdb)
- Prolink 3rd Party Product files (dbt/*.dbt; etm/*.run, *.txt, *.dat, *.cat, mmi/*.txt)
- Schneider Add-On files (.txt, .dll, .run, .dat, .mm, .exe .cdb, .mdx)

Native File Restore

Additional files restored by the Native file restore method are:

- CML binary files (cml/*.obj, *.exe)
- Log files (log/*.*)
- Recipe files (rcp/*.*)

Codepage Conversions

The Windows platform uses codepages consistent with the 1252 codepage. Therefore, MPS type files saved with these operating systems use the 1252 codepage.

The 850 and 1252 codepages are identical with respect to the first 128 characters, but they differ with many of the characters above 128. Many of the European characters are above 128 and are codepage sensitive.

To provide a solution, the utility FLREST converts an 850 codepage to a 1252 codepage and a 1252 codepage to an 850. This conversion is performed by supplying a codepage command line argument to FLREST initiated in a Command Prompt window.

Only conversions between 850 and 1252 are currently supported.

FLREST in a Command Prompt Window

There are command line switches and options for this utility in addition to the -h option that returns some general help information.

The syntax is:

```
flrest <save source> <application dir>[/850|/1252] [/loc] [/y] [/rcp]
```

where

save source	location of the file to be restored
application dir	location of the application destination
/850	converts 1252 codepage to an 850 codepage
/1252	converts an 850 codepage to a 1252 codepage
/loc	indicates the that the file is compressed as the default is native
/y	suppresses the display of the dialog box and immediately executes the command
/rcp	remote node indicator

FLRUN

The FLRUN utility initiates the FactoryLink software program.

Initiate this utility from a Command Prompt window. The syntax is:

flrun [-aFLAPP] [-p*pgmdir*] [-l*logfile*] [-i*appname*] [-n*domainname*] [-u*username*] [-t*timeout]*
[-f*flags*] [*options*]

where

-aFLAPP	sets the drive and directory for the application
-p*pgmdir*	set the drive and directory for programs to *pgmdir*
-l*logfile*	log errors and other information to *logfile*
-i*appname*	set the application invocation name
-n*domainname*	set the domain name
-u*username*	set the user instance name
-t*timeout*	set the timeout to seconds specified
-f*flags*	set *flags* to flags
option	controls execution of the utility

-w	Warm start
-d	turn debug mode ON
-h or ?	returns help information on syntax
-s	single domain, always create the RTDB
-v	turn verbose mode ON (for CT generation)
-o	apply on-line changes using the ONLINMGR utility

Note: Options and parameters that cannot be used with the -o option are -n, -u, -f, -w and -s.

The ONLINMGR is a utility that orchestrates online updates. It is executed by the FLRUN.BAT file when the -o program argument is passed to FLRUN.

ONLINMGR is started after the necessary configuration file updates have been generated by the various utility programs such as CTGEN. ONLINMGR then evaluates the scope of the changes and begins the process of promoting them to the application. The steps taken to perform the online update are:

1 Determine the new tag list for the RTDB and make the necessary adjustments to add new tags and modify the parameters for existing tags. Default values and message lengths are set for newly created tags. Where possible, the runtime values for tags that are edited are preserved, but this is not always possible. If preserving the value is not possible, edited tag values and message lengths are set to default values.

2 Determine what running tasks must be bumped by referencing the RTM files and stopping the affected tasks. RTM files are in the {FLINK}\CTGEN directory that and list all the file/task dependencies that, if changed, would require a task to be bumped. See the *Programmer's Access Kit* for a detailed description of the .rtm files.

3 ONLINMGR stops tasks in the reverse order of the startup order designated in the SYS.CT file, stopping all user tasks first and then stopping all shared tasks. Once the affected tasks are all stopped, the .cto files are copied to the .ct files and the tasks are restarted or signaled, as appropriate. The shared tasks are started first and the user tasks are started in the designated startup order.

4 Monitor and report the changes made and status of online update process. The output can be directed to the console window and/or to a log file. Log files are in the directory {FLAPP}\{FLNAME}\shared\{FLUSER}\log and are named ONmmddyy.log.

FLSAVE

The FLSAVE utility is used to save or backup FactoryLink application files. There are two primary reasons to backup an application: to provide an archive copy in the event of a hardware or software failure and to provide a mechanism to move an application to a different system.

It is recommended to archive a copy of the application during application development and after development is complete. Periodic archival is also recommended. Applications are restored using the FLREST utility. For more information refer to FLREST on page 668.

FLSAVE overwrites existing files so care should be taken when defining the target file or directory. Do not save to the root directory, the {FLINK} directory, or any other directory that contains open files. Create an independent directory for archived applications or save to a separate disk or partition.

The two formats used by the FLSAVE utility are:

- Native (saved as multifile image)—Multiple file save format (previously known as a Platform Specific save)
- Compressed (Saved as single file)—Single file save format (previously known as a Multiplatform save)

Native File Save Method

The Native file method saves the application files in a directory structure similar to the FLAPP directory structure. Files are copied to the target directory unaltered from the source FLAPP directory. The target directory is on the local hard drive or any shared drive accessible from the source computer or a diskette. The Native save spans multiple diskettes if necessary. Since application files are not altered during a Native file save it is the most secure method for archival. However it is not the most convenient method for transporting an application from one system to another due to the size and multiple file formats.

Compressed File Save Method

The Compressed file save method is particularly convenient for transporting an application from one type of system to another.

This method concatenates all application files into a single file. The FLSAVE utility was developed to recognize the application files which are not ASCII (such as the Configuration Database files and graphics screen files) and export them to an ASCII format before concatenating them. A Compressed file save does not span multiple diskettes if the file does not fit on a single diskette.

Since application files are altered during the save process, the Compressed file save is not the most secure method to create an archive copy of an application. It is a recommended to create a Native file save prior to creating a Compressed file save or before destroying the original FLAPP directory copy of the application.

FLSAVE in Configuration Explorer

Similar steps are performed for the Native or Compressed file save method.

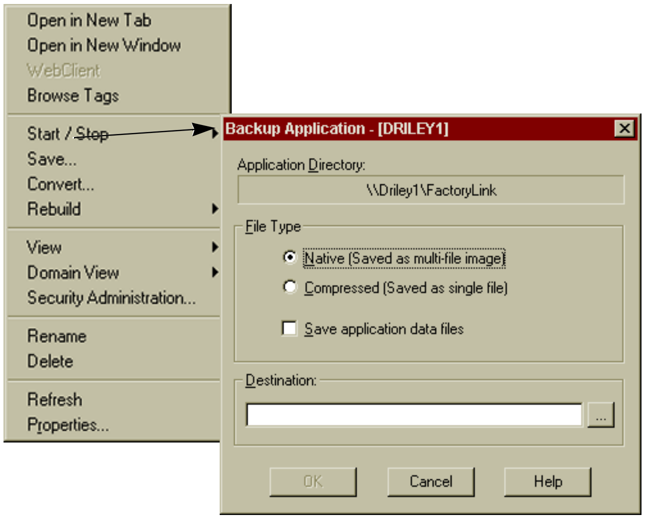
1 If the file save media is a diskette, format (initialize) the target diskette before starting FLSAVE. Use a blank diskette because FLSAVE destroys any applications existing on the diskette.

2 If saving to a diskette, insert the target diskette into the drive.

3 Launch the FLSAVE utility in Configuration Explorer, right-click the utility name in the Enterprise View tree. A context menu displays as shown in Figure 30-6

4 Select the Save. . . item on the menu. The Backup Application dialog box appears as shown in Figure 30-6.

Figure 30-6 The Backup Application Dialog Box



Backup Application - [DRILEY1]

Application Directory: \\Driley1\FactoryLink

File Type

● Native (Saved as multi-file image)

○ Compressed (Saved as single file)

☐ Save application data files

Destination:

5 Choose the type of save to perform. This can be one of the following:

Native (saved as a multi-file image)	Performs a Native file save.

Compressed (Saved as a single file)	Performs a Compressed file save

FLSAVE spans multiple diskettes only for the Native file save method. The Compressed file save method does not span diskettes.

6 Click the OK button to start the save process.

Save CML-binary, Log or Recipe files

Some file types require additional save instructions.

Compressed and Native File Save

The following files are saved by both Native and Compressed FLSAVE functions.

- Configuration tables (*.cdb, *.mdx)
- Graphics files (drw/*.g, *.gc, *.gs, *.gp, *.gpc, *.gps, *.pl, *.pls, *.plc)
- Report Format files (rpt/*.fmt)
- Math & Logic source field (procs/ *.prg, *.inc)
- CML source files (cml/*.c, *.h, *mak)
- Network configuration files (net/*.*)
- Application Object files (*.mdb)
- Prolink 3rd Party Product files (dbt/*.dbt; etm/*.run, *.txt, *.dat, *.cat, mmi/*.txt)
- Schneider Add-On files (.txt, .dll, .run, .dat, .mm, .exe .cdb, .mdx)

Native File Save

Additional files are saved by the Native FLSAVE function are:

- CML binary files (cml/*.obj, *.exe)
- Log files (log/*.*)
- Recipe files (rcp/*.*)

FLSAVE in the Command Prompt Window

There are no command line switches or options for this utility. The syntax is:

```
flsave [application dir] [save destination] </loc> </y> </rcp>
```

where

application dir location of the application source The default is {FLAPP}.

save destination location to save the file

/loc indicates the that the file is compressed as the default is native

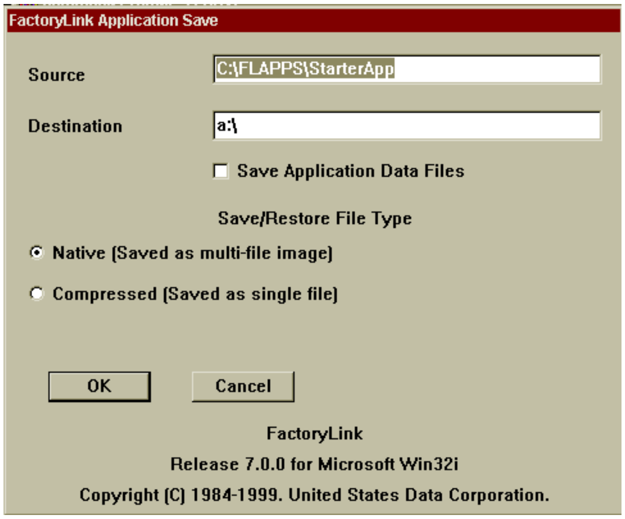
/y suppresses the display of the dialog box and immediately executes the command

/rcp remote node indicator

Initiate this utility from a Command Prompt window and the FactoryLink Application Server dialog box displays as shown in Figure 30-7.

Use the same steps listed above to save an application.

Figure 30-7 FactoryLink Application Save Dialog Box



FactoryLink Application Save

Source C:\FLAPPS\StarterApp

Destination a:\

□ Save Application Data Files

Save/Restore File Type

● Native (Saved as multi-file image)

○ Compressed (Saved as single file)

FactoryLink
Release 7.0.0 for Microsoft Win32i
Copyright (C) 1984-1999. United States Data Corporation.

Controlling the Files Included in Saves

Users can control some of the files that are saved with the two file save methods. This is useful for archiving and moving specialized files that are used by the application but are not standard FactoryLink application files. The file DIRCNTRL.INS controls the file types to save. It is located in the {FLINK}/BLANK directory. This file also controls file restores by controlling which files are removed from a target FLAPP directory structure before restoring the saved application. Edits to this file modify the list of files included in a save. The first few lines of the standard file as delivered with the product are shown:

DIRCNTRL.INS file

```
    ▪  .-Fflapp.id,flapp.his,webfiles.lst -m -s
admin  -f*.dat -m -s
  asc  -f*.asc -m
  cml  -f*.c,*.h,*.mak -m
  cml  -f* -s
```

Initiate DIRCNTRL.INS from a Command Prompt window. The syntax description is:

- An entry that starts with a "." refers to the root directory of the application. The first entry for other lines refers to the directories directly off the FLAPP root directory or specific instances of those directories within the FLAPP directory structure. For instance, the asc entry is directly off the root. In contrast, the cml entry would refer to the cml directory on the root and the {FLAPP}/shared/cml and {FLAPP}/user/cml directories.
- The -f means include files based on the naming convention that follows.
- The -s means include in Native file save and the -m means include in Compressed file save.
- A **Q** means to prompt for a Yes/No reply as to whether to save application log files from that directory.
- File names can be spelled out completely, specified as a wild card with extension (for example, .asc) or all files wildcard (for example, -F*).
- Following the syntax rules we can see that for both a Native and a Compressed file save that the flapp.id, flapp.his, and webfiles.lst are included in the save. The .dat files are also save for both type saves. In contrast we see that all files in the cml directory are included in a Native file save but not a Compressed file save. The files in the asc directory are only included in a Compressed file save (these are text delimited exports of the application Configuration Database files, {FLAPP}/.CDB files).

The guidelines to follow when editing this file are:

- Make a backup in the event the edited file doesn't function successfully.
- Make a archive copy of the application using the standard FactoryLink Native save file method and the standard DIRCNTRL.INS file prior to initiating the modified DIRCNTRL.INS.
- Native file save can include all file types but the Compressed file save can only include ASCII format files. Binary files would have to exported to an ASCII format in order to be included in a Compressed save. The graphics drawing files and Configuration Database are examples of files which require this process. The save utility exports *.G files to *.GX and {FLAPP}/*.CDB files to {FLAPP}/ASC/*.ASC files and the *.GX and *.ASC files are included in the Compressed save file. Customers must create their own exporting utilities

and export any binary type files to be included in a Compressed file save prior to initiating FLSAVE.

- Any exported ASCII type binary files included in Compressed file save also need to be manually imported at the conclusion of a restore.
- It is recommended that any nonstandard FactoryLink files in either save format are placed in special customer-created directories. Do not mix these files with the FactoryLink standard application files. This safeguards against possible loss or corruption of the standard application files during FLSAVE and FLREST processing.

FLSETLNG

The FLSETLNG utility allows the user to specify the runtime language for the FactoryLink Configuration Manager and some nonoperating system run-time modules.

The FactoryLink server supports an arbitrary number of languages including English (EN), French (FR), and German (DE). Languages are referred to by their international two character abbreviations. This allows all host users to recognize all languages.

To run FLSETLNG in standalone mode, ensure that no other FactoryLink task or configuration file is open.

There are no command line switches or options for this utility. The syntax is:

```
flsetlng
```

Initiate this utility from a Command Prompt window.

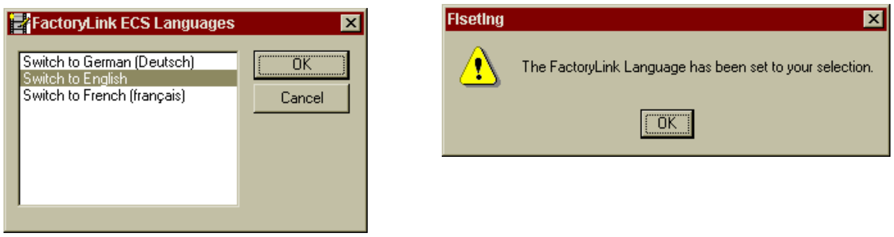
Initiate FLSETLNG

Type the following command at the system prompt:

```
flsetlng
```

The FactoryLink ECS Languages dialog box appears with the available languages listed as shown in Figure 30-8. Select the language and click the OK button. An information box appears to indicate the change has been completed.

Figure 30-8 FactoryLink ECS Language Dialog Box



FactoryLink ECS Languages

Switch to German (Deutsch)
Switch to English
Switch to French (français)

Flsetlng

The FactoryLink Language has been set to your selection.

Check the current language setting by viewing the file: {FLINK}\install\fllang.lst.

Language Conversion Exceptions

Language-specific characters do not convert. For example, a change in the security password in one language does not work in another if language-specific characters are used.

If it is necessary to have unique national characters, type the compatible ASCII code (Mapping Microsoft® Windows Latin-1 (Code Page 1252) ASCII) using the ALT key and the keyboard numbers.

To use a character not supported in the current language set, press the <ALT> key and type the ASCII character representation in the decimal format. This process functions with any FactoryLink dialog box.

Internationalization Considerations

The following restrictions and constraints apply to the internationalization of FactoryLink.

- Languages are not bit protected. All are available on the installation media.
- Running multiple languages simultaneously (FR in the USER domain and DE in the SHARED or another USER domain) is not supported because of conflicts with shared code and code page issues.
- All networked workstations are restricted to the same language and using compatible codepages. This restriction is required to ensure compatibility of messages and tags within a network.
- User-defined strings in user applications are not translated.
- FactoryLink reserved names, such as FLOAT, ANALOG, and LONG ANALOG, are considered universally understood FactoryLink key words and are not translated.
- Localization issues, such as the tags of DATE, DATETIME, and money symbols, are not addressed.
- Internal messages used by USDATA personnel for debugging purposes remain in English.

FLSHM

The FLSHM utility performs two functions:

- List memory areas used by multiuser FactoryLink real-time databases.
- Clean up locked memory areas caused by abnormal shutdown of FactoryLink. This is only necessary in a multiuser environment.

Initiate this utility from a Command Prompt window. The syntax is:

```
flshm [option] <rtdb_name> [-a{FLAPP}]
```

where

option controls how flshm executes. If no options are specified a list of available real-time databases appears.

Options include one or more of the following:

-l	Lists existing real-time databases.
-u	Lists all domain and user names for each real-time database.
-m	Lists all shared memory segments for each domain.
-d	Deletes the real-time database. Before using this option, halt the Run-Time Manager.
-c	Clears the active flag for one or more user names for the indicated application and allows the user to start again without shutting down FactoryLink. Use this option only when an abnormal shutdown of a single domain occurs.
-h	returns the syntax and usage
-e	flshm verifies a FactoryLink kernel exists. The presence of a kernel is indicated by an OS error level.
-a{FLAPP}	Constrains FLSHM operations to the application corresponding to the {FLAPP} environment variable.

rtdb_name is the name of the real-time database on which to act. This field is required if you are using the -d option and optional with all the other options. If you do not specify *rtdb_name*, the actions are taken on the database defined in the FLNAME environment variable.

FLSTATE

The FLSTATE utility is a continuous background task that monitors the state of the FactoryLink application. The Run-Time manager at system start-up automatically starts FLSTATE, at which time, FLSTATE reads the file {FLINK}/BIN/FLSTATE.RUN to determine its operating mode. The FLSTATE utility appears in the Windows NT Task Manager List as a process.

FLSTATE performs various functions:

- A diagnostic utility that continuously scans the application checking for anomalies. Examples of anomalies include a task holding a database lock for too long or an aborted task showing an active status.
- Output archival of the information about these anomalies if any are detected. Forward output files to Customer Support for analysis.
- Reports routine outputs to establish baseline status and events, for example, user instance startups.
- A repair utility, keeping an application running if anomalies have occurred and reports the repair actions. Examples of repair actions include modifying the state information in the real-time database for an aborted task and terminating orphaned application processes if RUNMGR terminates.

FLSTATE does not make any attempt to restart aborted tasks or update the global tags used to reflect task status on the RUNMGRU and RUNMGRS screens. There are also fatal situations that cannot be repaired. FLSTATE may terminate the entire application in the event a fatal situation is detected.

It is recommended that FLSTATE.RUN is used as configured until users are familiar with its functions and parameters. Contact Customer Support when considering changes prior to implementing them. For example, the most common change is for performance reasons, such as reducing the scan frequency using the -sn parameter if FLSTATE consumes too much CPU time.

If an application executes without kernel activity (for example, reading a tag) within a 30-second interval, FLSTATE kills the application. A work around is force at least some activity to occur within 30 seconds, such as having the TIMER task maintain a 15 second interval timer. The FLBLANK application is an example of an application that exhibits this behavior. Contact Customer Support if this problem persists.

On some highly stressed systems, it may be necessary to increase the Maximum Lock Time allowed. The default is three seconds. Some tasks may be terminated for locking the Real-Time Database (RTDB) for too long. Increasing the value of the -l parameter in FLSTATE.RUN invokes this change. FLSTATE cannot kill a process that it does not have permission to kill or kill a process that has not been shut down properly.

For a complete description of FLSTATE and its options, refer to the file {FLINK}\bin\flstate.inf.

Initiate this utility from a Command Prompt window. The command and help syntaxes are:

flstate -h[*]

where

-h[*]	-h[*] help [help on option ’*’ (listed below)]

and

flstate [-daqrtk] [-l#] [-w#] [-f[#]] [-c[#]] [-b#] [-s[#]] [-x[#] ext |*dumpfile*]

-d	display applications being scanned/repaired
-a	scan only application %FLAPP% with name %FLNAME%
-q	quit when applications quit running
-r	repair broken applications, if possible
-t	timestamp application data read from Kernel
-k.	kill tasks that violate max lock time (requires -r)
-l#	set max lock time to # seconds (default = 5)
-w#	wait # seconds before first scan (default = 0)
-f[#]	force # dumps of applications, broken or not (default = 1)
-c.	continue running indefinitely
-c#	continue until # consecutive bad scans occur
-b#	break when a total of # bad scans is reached
-s.	scan applications, stop on first bad scan
-s#	set scan rate to # seconds (default = 5) to improve performance
-x[#] ext	keep # dumps before and after bad scans (default = 5) in files named ’########.ext’, where ’########’ is the scan number (requires -c[#] or -b#)
dumpfile	append dump output to file *dumpfile*

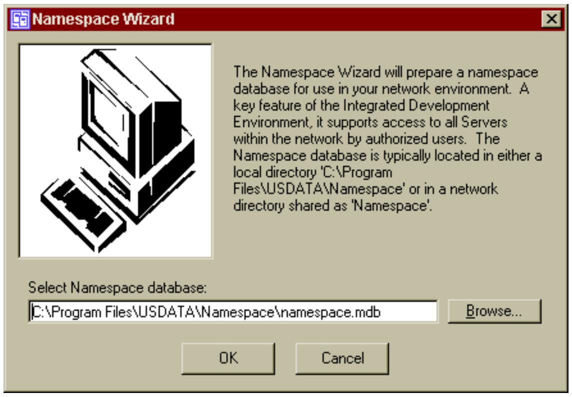
NAMESPACE WIZARD

The Namespace wizard enables redirecting the FactoryLink Configuration Explorer client to a remote or a local Namespace. The Namespace stores the properties of a particular server and its associated application(s).

Selecting a remote namespace file enables FactoryLink clients on a network to share a common namespace. This ensures that the clients have a consistent view of the available FactoryLink servers and applications.

Launch the Namespace Wizard from its desktop icon. The Namespace Wizard dialog box appears as shown in Figure 30-9.

Figure 30-9 Namespace Wizard



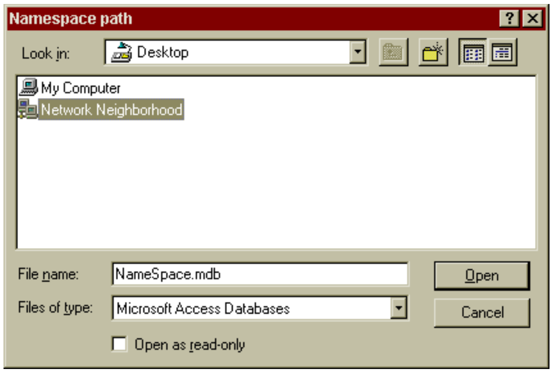
The Namespace Wizard will prepare a namespace database for use in your network environment. A key feature of the Integrated Development Environment, it supports access to all Servers within the network by authorized users. The Namespace database is typically located in either a local directory 'C:\Program Files\USDATA\Namespace' or in a network directory shared as 'Namespace'.

Select Namespace database:

C:\Program Files\USDATA\Namespace\namespace.mdb

Click the browse button to locate the local Namespace or browse your network to locate a remote Namespace as shown in Figure 30-10. A Namespace is always indicated by a file named namespace.mdb.

Figure 30-10 Namespace Path Dialog Box



Look in: Desktop

File name: NameSpace.mdb

Files of type: Microsoft Access Databases

□ Open as read-only

Locate and click the appropriate Namespace file to select it.

The Open as Read-Only checkbox is not functional at this time and should be ignored.

Click the Open button. To complete the redirection, click the OK button on the Namespace Wizard dialog box.

RTDEBUG - Database Debugger

The RTDEBUG utility modifies the FLAPP functions or data for testing and debugging purposes.

Initiate this utility from a Command Prompt window.

The syntax is:

rtdebug

There are no command line options for this utility. However, once the utility has been launched, type h or ? to list all of the available debug options. The command options and their descriptions are:

h or ?	help message
h <x>	help for command <x>
c <anything>	comment, echoed to output
d <tag> <count>	dump/display tag values
e	end of command file
f <filename>	save commands in file
i <filename>	take commands from file
l <count> <filename>	loop; do command file count times
o <filename>	redirect output to file
p <tag>	pause for change
q	quit program
r <tag>	read
s <tag> <count> <value>	set/fill range of tags with value
s <tag> <count> <value>	set/fill using forced writes
w <tag> <value>	write value to tag
w <tag> <value>	forced write value to tag
t <name>	set termination flag for task <name>
ad <attr. name>	define attribute

al <tag>	list tag attributes
as <tag> <attr. list>	set attributes
ac <tag> <attr. list>	clear attributes
at <tag> <attr. list>	toggle attributes
n	list all known tag names
#<anything>	comment

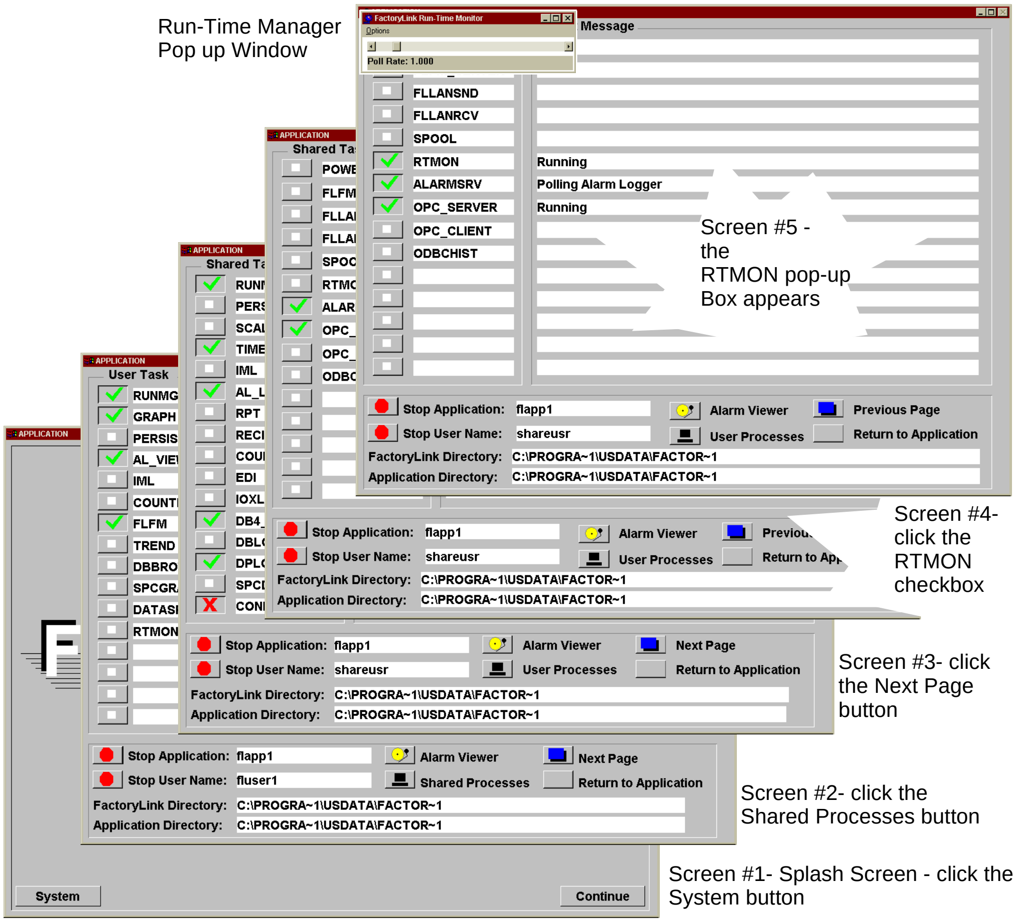
<Tag> may be specified as a tag name or may be a tag number in the form segment: index.

RTMON

The FactoryLink Run-Time Monitor, also known as RTMON, is a utility that enables monitoring processes, commands and global values. In addition, it enables you to read or write tag values, perform a system shutdown of all processes, and adjust the Poll Rate.

The StarterApp automatically initiates the Run-Time Monitor for you. When running other applications the utility is launched using the Run Manager start up screens or from a Command Prompt window using the command RTMON. Figure 30-11 shows the sequence of screens to launch the Run-Time Manager from the Run Manager start up screens.

Figure 30-11 Launch the RTMON Utility at FactoryLink Startup



RTMON — Running
ALARMSRV — Polling Alarm Logger
OPC_SERVER — Running

Stop Application: flapp1
Stop User Name: shareusr
FactoryLink Directory: C:\PROGRA~1\USDATA\FACTOR~1
Application Directory: C:\PROGRA~1\USDATA\FACTOR~1

Stop Application: flapp1
Stop User Name: fluser1
FactoryLink Directory: C:\PROGRA~1\USDATA\FACTOR~1
Application Directory: C:\PROGRA~1\USDATA\FACTOR~1

Screen #5 - the RTMON pop-up Box appears

Screen #4- click the RTMON checkbox

Screen #3- click the Next Page button

Screen #2- click the Shared Processes button

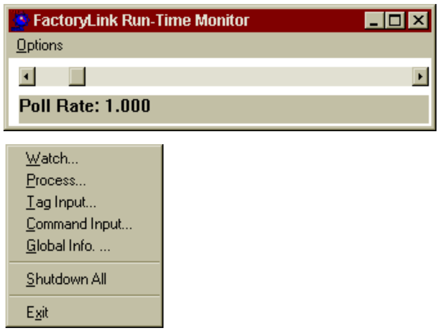
Screen #1- Splash Screen - click the System button

Run Time Monitor Options Menu

Figure 30-12 shows the Run-Time Monitor Pop-up window and the Options pull-down menu items:

- Watch
- Process
- Tag Input
- Command Input
- Global Info
- Shutdown All
- Exit

Figure 30-12 FactoryLink Run-Time Monitor Pop-Up Window



Poll Rate: 1.000

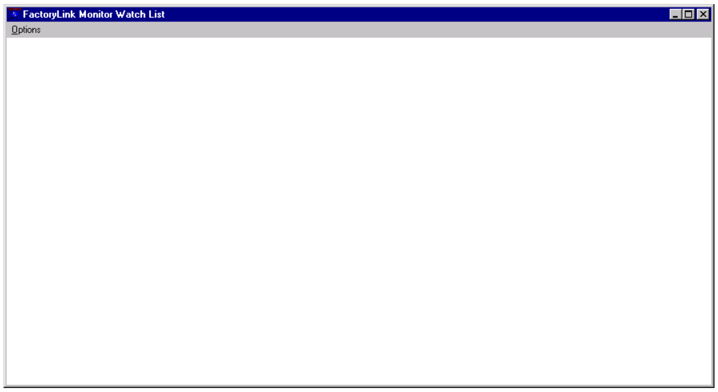
The Poll Rate is an additional function that can be adjusted using this pop-up window.

Watch

The Watch item enables saving and retrieving tag lists of elements that require monitoring. In addition, this item provides saving and retrieving the values associated with these tags.

To initiate the Watch item, click the Options menu and select Watch. The FactoryLink Monitor Watch List window appears as shown in Figure 30-13.

Figure 30-13 FactoryLink Monitor Watch List Window



This window includes one menu bar item, Options. When you click Options, the menu shown in Figure 30-14 appears.

Figure 30-14 FactoryLink Run-Time Monitor Pop-up Window—Options Menu

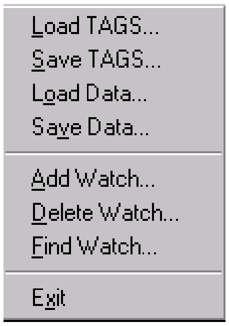
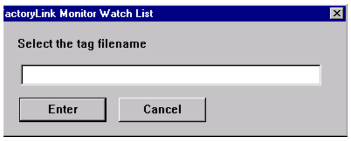
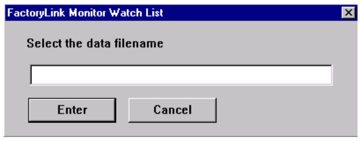
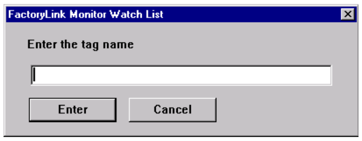


Table 30-2 details the describes each of the items that appear on this FactoryLink Monitor Watch List Options menu.

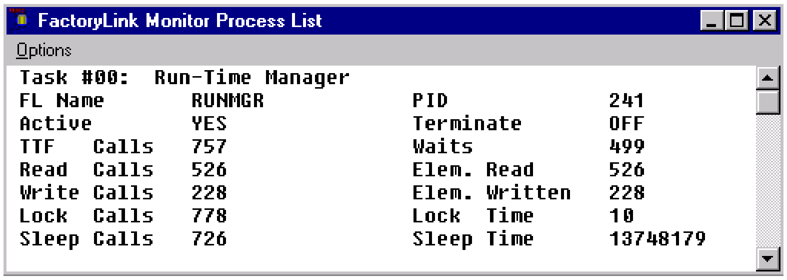
Table 30-2 FactoryLink Monitor Watch List Options

Menu Item	Pop-up window	If you select . . .
Load TAGS	Both of these items display this pop-up window.  actoryLink Monitor Watch List Select the tag filename Enter Cancel Type the filename of the tag list into the Select the tag filename field and press Enter.	Load TAGS: Retrieves a file listing the tag names of the elements saved to a file when you selected the Save Tags menu item. This item writes the tag names to the watch list. The values of these elements display as they currently exist in the real-time database.
Save TAGS		Save TAGS: Saves the tag name elements that are defined in the watch list to a file. This item enables you to see the values of tags as they currently exist in the real-time database when you restore this list.
Load Data	Both of these items display this pop-up window.  FactoryLink Monitor Watch List Select the data filename Enter Cancel Type the filename of the tag into the Select the tag filename field and press Enter.	Load Data: Retrieves the tag names of the elements saved to a file when you selected the Save Data menu item. This item also writes the tag names to the watch list. The values of these elements display as they currently exist in the real-time database.
Save Data		Save Data: Saves the tag name elements that are defined in the watch list. You also save the elements' values.
Add Watch	These items displays this pop-up window.  FactoryLink Monitor Watch List Enter the tag name Enter Cancel Type the tag name into the Enter the tag name field and press Enter.	Add Watch: Displays a specific tag name and its current value on the FactoryLink Monitor Watch List window.
Delete Watch		Delete Watch: Removes the name of a tag and its value from the FactoryLink Monitor Watch List window.
Find Watch		Find Watch: Searches through the tags displayed on the FactoryLink Monitor Watch List window and finds the first instance of the intended tag.
Exit	Closes the FactoryLink Monitor Watch List window.	

Monitoring Processes

To monitor processes, click the Options menu and select Process. The FactoryLink Monitor Process List window appears as shown in Figure 30-15.

Figure 30-15 FactoryLink Monitor Process List Window



```
Task #00:  Run-Time Manager
FL  Name      RUNMGR          PID           241
Active        YES             Terminate     OFF
TTF   Calls   757             Waits         499
Read  Calls   526             Elem. Read    526
Write Calls   228             Elem. Written 228
Lock  Calls   778             Lock  Time    10
Sleep Calls   726             Sleep Time    13748179
```

This window includes one menu bar item Options with the items as shown in Table 30-3.

Figure 30-16 The FactoryLink Monitor Process List Window Menu

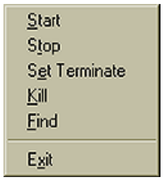
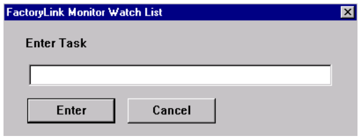


Table 30-3 FactoryLink Monitor Process List Menu Bar Options (Sheet 1 of 2)

Item	Description
Start	Starts the task that is displayed in the FactoryLink Monitor Process List window.
Stop	Stops the task that is displayed in the FactoryLink Monitor Process List window.
Set Terminate	Stops the task that is displayed in the FactoryLink Monitor Process List window when the task next checks its terminate flag. Tip: USDATA recommends that you use this method to stop a task.

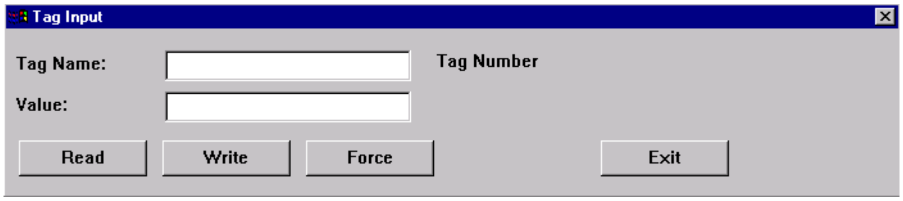
Table 30-3 FactoryLink Monitor Process List Menu Bar Options (Sheet 2 of 2)

Item	Description
Kill	Force stops a task. Use this option only if both Set Terminate and Stop could not stop a task. When Set Terminate and Stop are unable to stop a task, this usually indicates that a task is caught in an infinite loop and is not reading its terminate flag. If you use Kill and the selected task has the real-time database locked, then other tasks will be unable to access the database. If this happens, reboot the computer.
Find	Displays this pop-up window  FactoryLink Monitor Watch List Enter Task Enter Cancel Finds the first occurrence of a task that is displayed on the FactoryLink Monitor Process List window.
Exit	Closes the FactoryLink Monitor Process List window.

Working with Tag Values

To read the value of a tag or to write a new value to a tag, click the FactoryLink Run-Time Monitor Options menu and select Tag Input. The Tag Input dialog box appears as shown in Figure 30-17.

Figure 30-17 Tag Input Dialog Box



To read a value of a tag, type the name of the tag in the Tag Name field and press Read.

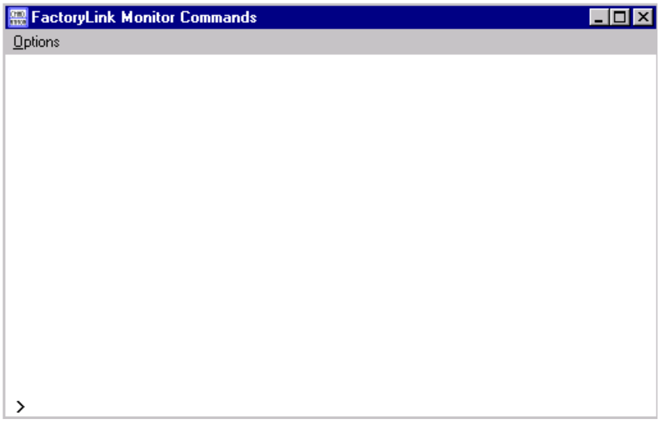
To write a value to a tag, type the name of the tag in the Tag Name field and tab to the Value field. Type the value that you want to assign to this tag and press Write. If you want to force write the value, press Force.

Press Exit to close the Tag Input dialog box.

Using Commands to Monitor a Process

To use commands to monitor a process, click the FactoryLink Run-Time Monitor Options menu and select Command Input. The FactoryLink Monitor Commands window appears, as shown in Figure 30-18:

Figure 30-18 FactoryLink Monitor Commands Window



You use this window to enter various monitoring commands. When entering commands in the FactoryLink Monitor Commands window, use these guidelines.

- To recall previous commands, use the ↑ and ↓ keys.
- To scroll through the output, use the scroll bar.
- To execute a command in real-time mode, press Enter.
- To exit the FactoryLink Monitor Commands window, select Exit.

See Table 30-4 for a description of the commands that you can use in the FactoryLink Monitor Commands window.

Table 30-4 FactoryLink Monitor Commands (Sheet 1 of 3)

Command	Description	The syntax is:
c	Echoes comments as output to a terminal screen	c [comment] where comment is the text that you want displayed in the output. If you want to send this comment to a file, precede this command with the o command.
d	Displays the values for multiple elements of an array tag	d tag count where tag identifies the first element in the array. The element can be either the element name or the element number and where count identifies the number of elements in the array. These elements are displayed beginning with the element identified by tag.
e	Indicates, in a batch file, that the end of this file has been reached	e If the e command is followed by no more batch files or if the e command is executed from the keyboard, then the FactoryLink Monitor Commands window closes.
f	Creates a batch file that contains keyboard input	f [filename] where filename is the name of the file to receive the input. If you don't include filename, then your input is not saved to a file; this input (commands) is executed upon input.
h or ?	Opens Help	h [cmd] or ? [cmd] where cmd is the command for which you need help. If you do not use cmd, then the Help displays information about all commands.
i	Executes a batch file one time	i [filename] where filename is the name of the batch file to be executed. If you want to execute this same batch file multiple times, use the 1 command, which is described later on in this table.
o	Redirects output to a file	o [filename] where filename is the name of the file to which the output is sent.

Table 30-4 FactoryLink Monitor Commands (Sheet 1 of 3)

Command	Description	The syntax is:
q	Closes the FactoryLink Monitor Commands window	q
r	Displays the value for a single element	r tag where tag is the element that you want to read. The element can be either the element name or the element number. This command's output appears on the FactoryLink Monitor Commands window, unless you redirect the output to a file using the o command.
s	Writes the same value to multiple elements in an array	s tag count value where tag identifies the first element in the array. The element can be either the element name or the element number. where count identifies the number of elements in the array. These elements are displayed beginning with the element identified by tag. where value identifies the value that is to be written to each tag. You can use numerical values as hexadecimal numbers by preceding the value with 0x.
S	Force writes the same value to multiple elements in an array. A force write sets the Change-status flag to 1 (on)	S tag count value where tag identifies the first element in the array. The element can be either the element name or the element number. where count identifies the number of elements in the array. These elements are displayed beginning with the element identified by tag. where value identifies the value that is to be written to each tag. You can use numerical values as hexadecimal numbers by preceding the value with 0x.
t	Terminates a FactoryLink task	t name where name is the name of the task that you want to terminate.

Table 30-4 FactoryLink Monitor Commands (Sheet 1 of 3)

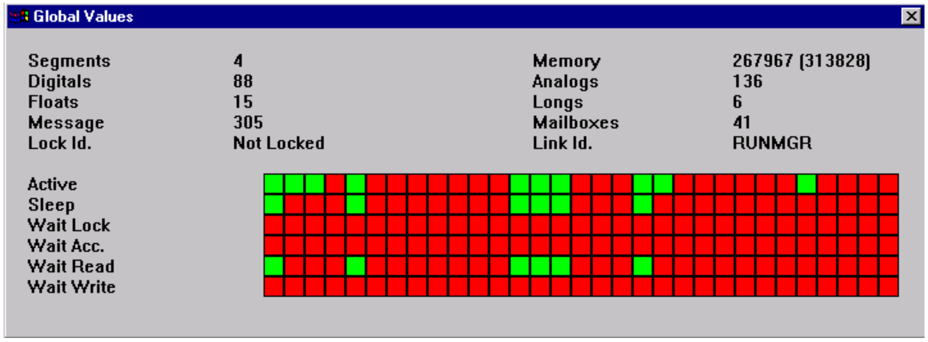
Command	Description	The syntax is:
w	Writes a value to a single element	w tag value where tag identifies the element that will receive the value. The element can be either the element name or the element number. where value identifies the value that is to be written to a tag. You can use numerical values as hexadecimal numbers by preceding the value with 0x.
W	Force writes a value to a single element. A force write sets the Change-status flag to 1 (on)	W tag value where tag identifies the element that will receive the value. The element can be either the element name or the element number and where value identifies the value that is to be written to a tag. You can use numerical values as hexadecimal numbers by preceding the value with 0x.
#	Adds a remark to a batch file	# [remark] where remark is the text that you do not want interpreted as a command. Terminate the remark with either a new line or a semicolon. Use this tag only in batch files.
1	Executes the same batch file multiple times	1 count filename where count is the number of times that you want the file to be executed and where filename is the name of the file to be executed.

The FactoryLink Monitor Commands window includes one menu bar item, Options. Click Options\Exit to close this window.

Monitoring the Real-Time Database

To monitor the Real-time Database (RTDB), click the FactoryLink Run-Time Monitor Options menu and select Global Info. The Global Values window appears as shown in Figure 30-19:

Figure 30-19 Global Values Window



Segments	4	Memory	267967 (313828)
Digitals	88	Analogs	136
Floats	15	Longs	6
Message	305	Mailboxes	41
Lock Id.	Not Locked	Link Id.	RUNMGR

Active	🟩	🟩	🟩	🟥	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟥	🟥	🟥	🟩	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟩	🟥	🟥	🟥	🟥
Sleep	🟩	🟥	🟥	🟥	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟥	🟥	🟥	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥
Wait Lock	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥
Wait Acc.	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥
Wait Read	🟩	🟥	🟥	🟥	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟩	🟩	🟩	🟥	🟥	🟥	🟩	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥
Wait Write	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥

This window shows the status of all of the tasks that are displayed on the FactoryLink Monitor Process List window. On the Global Values window, the first column on the left is synonymous with the first task displayed on the FactoryLink Monitor Process List window. The next column matches the second displayed task, and so forth.

These columns appear in one of two colors: green and red. If the color green is displayed, then this task is running. If the color red is displayed, then this task is not running.

To close this window, click the Close button (which looks like a small x) in the upper-right portion of the window.

Understanding the Poll Rate Bar

A scroll bar is displayed at the bottom of the FactoryLink Run-Time Monitor pop-up window. This is the Poll Rate bar. This bar indicates the rate at which RTMON polls the processes that it is monitoring.

Next to the name Poll Rate, you see a number. This is the number that indicates the rate at which a process is being monitored. This rate can range from between .10 of a second up to 10 seconds. Move the scroll bar to the right to set the rate at a higher monitoring level; move the bar to the left to indicate a lower level.

Exiting the Run-Time Monitor

To close the Run-Time Monitor and its associated window, click the Options menu and select Exit.

UKEY

Use the UKEY utility to:

- List licensed options
- List all configured options
- Check licensed options

Initiate this utility from a Command Prompt window. The syntax is:

```
ukey [option]
```

where

option controls how ukey executes

-l	list all configured options
-lp	list w/o pause
-d	display all available options
-dp	display without pause
-c	checks list of options

FLTEST APPLICATION

After FactoryLink is installed, the FLTEST application can be used to test the FactoryLink installation. FLTEST provides a limited number of examples of common tasks.

Restore FLTEST (Windows NT operating system only) using the FLREST on page 668 utility.

Refer to Table 30-5 for a list of the minimum tasks provided by FLTEST that are required to run FactoryLink.

Table 30-5 FLTEST Minimum Tasks

FLTEST	
Alarm Supervisor	Persistence
Configuration Manager	Batch Recipe
Run-Time Color Graphics	Report Generator
Database Browser	SPR
Database Logger	Statistical Process Control (SPC)
DB4 Historian	Print Spooler
File Manager	Timer
Interpreted Math & Logic	Trending
Counter	

FLBLANK APPLICATION

FLBLANK is an application that has no preconfigured modules or examples and a reduced set of tags. It is selected by highly knowledgeable FactoryLink users who prefer to configure all the tasks, modules, and tables themselves.

FLBLANK is restored to FactoryLink using the FLREST utility and is found in the directory {FLINK}\MPS\xx where xx is the two digit representation of the current language.

UTILITY MESSAGES

If errors occur while FactoryLink is executing a utility, error messages are displayed on the Configuration Explorer Output screen if the utility is initiated from Configuration Explorer. If launched from a Command Prompt window, the error message appears in the window. This section lists these messages, describes their cause, and provides suggested actions.

Can't open file *filename*

Cause: The system is unable to open an output file. The disk may be full, or the path may not exist.

Action: Delete any unnecessary files if the disk is full. Create the path if it does not exist.

Can't create file *filename*

Cause: Either the operating system, third-party software, or hardware setup on your system is incorrect or incompatible, or an internal error has occurred.

Action: Verify these functions:

1. The operating system is set up to run FactoryLink (for example, tuning parameters and resources).
2. All third-party software needed by FactoryLink (such as X-Windows) has been installed and set up correctly and the correct FactoryLink version is installed.
3. All hardware is correctly set up and is compatible.
   Contact Customer Support if everything is compatible and set up correctly, but the error continues to occur.

Can't create directory *directory name*

Cause: Either the operating system, third-party software, or hardware setup on your system is incorrect or incompatible, or an internal error has occurred.

Action: Verify these functions:

1. The operating system is set up to run FactoryLink (for example, tuning parameters and resources).
2. All third-party software needed by FactoryLink (such as X-Windows) has been installed and set up correctly and you have the correct version for FactoryLink.
3. All hardware is correctly set up and all of the hardware is compatible.

Contact Customer Support if everything is compatible and set up correctly, but the error continues to occur.

Error writing to file *filename*

Cause: Either the operating system, third-party software, or hardware setup on your system is incorrect or incompatible, or an internal error has occurred.

Action: Verify the following:

1. The operating system is set up to run FactoryLink (for example, tuning parameters and resources).
2. All third-party software needed by FactoryLink (such as X-Windows) has been installed and set up correctly and you have the correct version for FactoryLink.
3. All hardware is correctly set up and all of the hardware is compatible.

Contact Customer Support if everything is compatible and set up correctly, but the error continues to occur.

Out of RAM

Cause: No more memory is available.

Action: Close any unnecessary windows or programs. Add more memory to the system if this error occurs often.

FLNEW

The following error messages may occur during an FLNEW:

ERROR: FLINK environment variable is not set.
ERROR: Unable to find FactoryLink directory tree.

Cause: Either you have not set the FLINK environment variable or you have to set the FLINK environment variable to an invalid directory structure.

Action: Set the FLINK environment variable to a valid directory structure.

FLNEW aborted!

Cause: The FLNEW utility has stopped at your request.

Action: No action required.

The specified path, *path* does not exist.

Cause: The path you specified for the starter application does not exist or is invalid.

Action: Create a directory for the starter application and/or rerun FLNEW using the correct path.

EXPLODE

The following error messages may occur during an EXPLODE:

Error *number* in compressed file *filename*

Cause: An error was encountered during the file decompression process. The number in the message specified a particular system call to the compression library.

Action: This type of error is unrecoverable by the user. Contact Customer Support and provide the error message and number.

No RAM. Remove resident software and try again.

Cause: The decompression algorithm could not access enough buffer space due to memory used by the resident software.

Action: Remove any TSRs and try again. Contact Customer Support if this problem recurs.

Unable to open *filename* for compression/decompression.

Cause: The filename specified does not exist and cannot be opened for processing

Action: Verify the correct filename was specified. Reenter the command.

Unable to open temporary file for compression/decompression.

Cause: The directory structure is full and a temporary file for the compression/decompression operations cannot be created.

Action: Remove unused files from the system. Reenter the command.

FLSAVE

The following error messages may occur during an FLSAVE:

An error occurred while extracting application files*. FLTOOLS*

Cause: The multiplatform file may be corrupt or the hard disk may be out of space.

Action: The utility FLTOOLS provides an error message of its own. Follow the FLTOOLS onscreen instructions.

Backup failed!

Cause: FLXCOPY was unable to copy the application files to the destination path. Either you entered an invalid application file, or the files were corrupted.

Action: Check the usage to see if you have entered an invalid application filename. If so, re-enter the command using the correct filename. If you entered a valid application filename, manually save all application files to the \FLAPP directory by performing an X-COPY.

Backup to *filename* FAILED!

Cause: Either you entered an invalid destination path, or there may be a network error.

Action: Check the usage to see if you have entered an invalid destination path. If so, re-enter the command using the correct destination path. If you entered a valid destination path, there may be a network error. For network errors, use the remote copy program (rcp) provided with TCP/IP software to copy the application to the desired node.

The directory *directory path* does not exist.

Cause: You specified a source path that does not exist.

Action: Reenter the command with a valid source path.

Unknown third parameter

Cause: You have chosen an invalid third parameter.

Action: Reenter the command using one of the following valid parameters:
- /RCP — to save to a remote node.
- /LOC — to save to a local drive.

Verification of remote copy capability failed.

Cause: FactoryLink is unable to remote copy to the destination file.

Action: Verify the network is configured to use the remote copy program (rcp) provided with TCP/IP software to perform a remote copy to the specified host.

FLREST

The following error messages may occur during an FLREST:

A problem was found with file(*s)* by the file copy program *FLXCOPY*.

Cause: The files or application you are trying to restore may be corrupt or you may have entered an invalid filename.

Action: Retry the FLREST. Copy the application to the \FLAPP directory manually if that does not solve the problem.

An error occurred while extracting application files. *FLTOOLS*

Cause: The multiplatform file may be corrupt or out of hard disk space.

Action: The utility FLTOOLS provides an error message of its own. Follow the FLTOOLS onscreen instructions.

Cannot open Configuration file *source specification* /FLCONFIG.$$$ for reading

Cause: You entered an incorrect source path.

Action: Retry the FLREST with a correct source path and a /LOC parameter to restore a multiplatform save.

Destination path is not full. Include drive with directory *i.e. C:\FLAPP*.

Cause: You did not enter a full path.

Action: Reexecute FLREST using a complete destination path (parameter 2).

Error # 7
Designated FLTAR file not in FLTAR format — FLTAR aborted.

Cause: The FactoryLink file-extraction utility, FLTAR (FLTOOLS) (a transparent utility hidden within the FLREST utility) was given a file either corrupt or not a multiplatform-save file. The file might be a platform-specific save.

Action: Retry the FLREST without specifying a third parameter.

File FLINK *environment variable*\ac\titles missing from FactoryLink system!

Cause: A FactoryLink IV file is missing.

Action: Verify the FLINK environment variable contains the correct directory name. If so, obtain a copy of the file from the FactoryLink IV disk set.

Multiplatform application file *file* not found.

Cause: The system could not find the source file.

Action: Verify the filename of the first parameter is correct. Correct it if it is incorrect.

Restore failed!

Cause: Either a problem exists in the source or destination drive or the FLCONFIG.$$$ list for FLXCOPY was lost.

Action: Check the usage to make sure the source and destination drives for the FLREST are correct. If either is incorrect, retry the FLREST using the correct source and destination drives. If both are correct, check that FLCONFIG.$$$ exists in the FLAPP directory. If that file does not exist, copy it to the FLAPP directory. Then, manually X-COPY all application files to the FLAPP directory. FLREST need not be re-run.

Unable to copy application save file from remote node.

Cause: FactoryLink is unable to remote copy the source file.

Action: Verify that the rcp remote copy program (rcp) provided with TCP/IP software can be run with the designated host and that the source file exists.

Unknown third parameter

Cause: You have chosen an invalid third parameter.

Action: Reenter the command using one of the following valid parameters:
- /RCP — to save to a remote node.
- /LOC — to save to a local drive.

Chapter 31

Glossary

A

AC file See attribute catalog.

ActiveX ActiveX is the name Microsoft has given to a set of strategic object-oriented program technologies and tools. The ActiveX environment creates a component, a self-sufficient program, that can be run anywhere in the ActiveX network.

ADS Active Directory Service, a directory service that FactoryLink 7.0 uses. A directory service is a fundamental service for distributed applications and provides the following minimum features: location transparency; rich query; information on people and services; and high availability. The Active Directory offers more capabilities, for example, support for Internet standards; tightly integrated and flexible security; scriptable interfaces for easy access; directory-enabled system services; key application integration; rich and extensible schema.

alarm Abnormal condition that prompts a system notification.

alarm group Set of alarm conditions having similar characteristics that you configure in the Alarm Groups table.

Alarm Summary screen On-line display of alarm information.

Alarm Supervisor FactoryLink task that identifies alarm conditions and records events that occur during run-time FactoryLink operation.

alphanumeric Alphabetical or numeric; an alphanumeric symbol is upper- or lower-case letters, or a digit (0 - 9).

analog (1) Data type supported by FactoryLink; an analog element may assume any integer value from -32768 to 32767. (2) Signal of continuously variable voltage used as a measurement of some infinitely variable quantity, such as temperature, water salinity, or blood pressure.

AND Binary logical operator that yields a value of 1 (TRUE) if both of its arguments are non-zero and 0 (FALSE) otherwise.

animate To define a graphics object so that it changes color and/or shape, or it displays numeric values or text messages.

animation object Graphically displayed input field, output field, or symbol created using the FactoryLink Application Editor. An animation object may be defined to change color or shape, accept various types of operator inputs, or display alphanumeric data. See Application Editor, display object, and input object.

animation testing Feature in FactoryLink that enables the testing of each animation component in a drawing within the Application Editor and provides validation of complex animation types.

API (Application Programmer's Interface)

Set of utilities and/or procedures that allow an application-level program to access application-level functions.

application

Collection of information from configuration tables that is generated from the configuration databases and graphics for a set of FactoryLink tasks.

application object

An application object is a block of related configuration data that can be selected and manipulated. Each application object contains one or more configuration or file objects. Configuration objects map directly to the records in FactoryLink's configuration tables. File objects map to the text files (like the Math& Logic .PRG files) that are used to store scripts, report layouts, network initialization, and more.

archiving

Creating a file of data records by logging information to a specified archive device, such as a disk drive.

argument

Numeric or string expression (operand) passed to an operator.

ASCII (American Standard Code for Information Interchange)

A seven-bit standard code used for information interchange among data processing systems, communication systems, and associated equipment.

assignable cause (of variation)

Cause of reoccurring variations with identifiable source in a process.

assignment statement

Mathematical expression that specifies a calculation to be performed with the results written to a FactoryLink real-time database element.

attribute

Assigned characteristic for a group of data points used in evaluating statistical information.

attribute catalog

ASCII text file that describes the database tables and the configuration information entered through the Configuration Manager and the Application Editor; also called an AC file.

attribute data (quality)

Data coming from yes/no, pass/fail determinations of whether the units conform to standards. May or may not include weighting by seriousness of defect.

average

See mean.

B

background display

Graphics display created with the FactoryLink Application Editor that contains static (non-moving) graphics images.

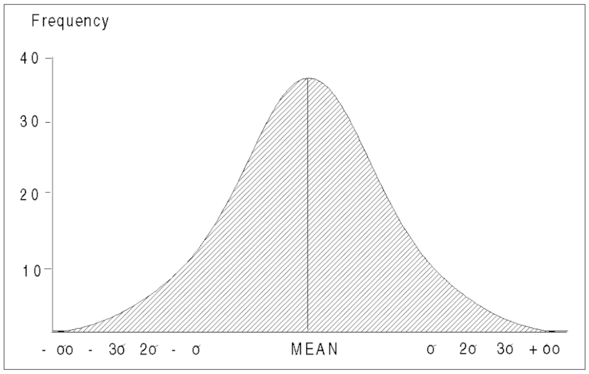
background task

Non-interactive FactoryLink task that performs a specific set of functions that operate on FactoryLink data.

banner line
Single line display of information about a sorted alarm group.

Batch Recipe
Optional FactoryLink task that allows operators to transfer sets of values between the FactoryLink real-time database and disk files.

bell-shaped curve
A curve or distribution showing a central peak and tapering off smoothly and symmetrically to tails on either side. The following example is a normal curve.



Bell-Shaped Curve

binary number system
Numeric system used in computers with a base of 2; two digits (0 and 1) represent numerical quantities.

bit
Abbreviation for binary digit. The smallest unit of information, consisting of only two possible states, which may be 1 or 0, ON or OFF, TRUE or FALSE, or YES or NO, depending on the context.

block key
Hardware component plugged into a FactoryLink key ring that contains information used by FactoryLink to enable licensed software options. See button, keyring, protection device.

block read (triggered)
Triggered read operation in which the EDI task directs the protocol module to read the values of all external device addresses specified in a single table and write them to the real-time database.

Block Read Complete
Digital element with a value force-written to 1 (ON) by the EDI task whenever any block read operation for the read table is completed. If this element is defined when the EDI task initializes, its value is force-written to 1 (ON).

Block Read Disable
Digital element of 1 (ON) that disables the block read of the elements specified in a read table.

Block Read Priority
Priority that influences the order in which the EDI task handles the queuing of block read requests. The highest priority (lowest number) is processed first.

Block Read State
Digital element with a value of 0 (OFF) when a block read of the elements specified in a read table is in progress and 1 (ON) when the table is inactive. When the EDI task initializes, the Block Read State element is force-written to 1 (ON).

Block Read Trigger
Digital element of 1 (ON) that initiates a block read of the values specified in a Read/Write Information panel. See trigger.

Block Write Complete
Digital element with a value force-written to 1 (ON) by the EDI task whenever any block write operation for the write table is completed. If this element is defined when the EDI task initializes, its value is force-written to 1 (ON).

Block Write Disable
Digital element of 1 (ON) that disables the block write of the elements specified in a write table.

Block Write Priority
Priority that influences the order in which the EDI task handles the queuing of block write requests. The highest priority (lowest number) is processed first.

Block Write State
Digital element with a value 0 (OFF) when a block write of the elements specified in a write table is in progress and 1 (ON) when the table is inactive. When the EDI task initializes, the Block Write State element is force-written to 1 (ON).

Block Write Trigger
Digital element with a value, when forced to 1 (ON), initiates a block write of the values specified in a Read/Write Information panel. See trigger.

block write (triggered)
Write operation in which the EDI task directs the protocol module to transfer the values of all the elements specified in a Read/Write Table to an external device.

boolean
(1) Digital. (2) A value of 0 or 1 represented internally in binary notation.

boot
Load an operating system onto a computer.

browse table
A configuration table specifying the correlation between elements and database information.

BUFSIZE
The size of a data buffer in networking.

button
Hardware component plugged into a FactoryLink button holder that contains information used by FactoryLink to enable licensed software options. See button holder, protection device.

button holder
Hardware device that contains information about the licensed FactoryLink options. See block key, button, key ring, protection device.

byte

Unit of storage consisting of eight bits. Because each bit has two possible states, a byte has 256 (2 to the 8th power) possible states.

C

CAL

Client access license.

cascading tables

Configuration method where the complete or state tag from one block read or write table triggers the next.

c-chart

For attribute data: A control chart of the number of defects found in a subgroup of fixed size. Use the c-chart when each unit typically has a number of defects.

centerline

For control charts: The horizontal line marking the logical center of the chart indicating the expected value of the quantity being charted.

change-read call

Read operation that, when called, checks the change-status flags of a list of elements in the real-time database.

change-status flag

Bit that indicates a change in the value of an element or whether the value has changed since the last time it was read. See exception processing.

change-wait call

Read operation that, when called, checks the change-status flags of a list of elements in the real-time database.

client

A computer system or process that requests a service of another computer system or process (a “server”) using some kind of protocol and accepts the server’s responses. A client is part of a client-server software architecture. For example, a workstation requesting the contents of a file from a file server is a client of the file server.

client

Any program that accesses or uses a service provided by another component (server).

Client Builder

Client Builder is the development tool used to create a graphic user interface for a FactoryLink application (FLAPP). It runs on the FactoryLink client computer. Client Builder supports an integrated design- and run-time environment that allows the user to switch application windows between design mode and run mode, minimizing development time. Client Builder connects to the FLAPP on the server through OPC.

Client Builder project

Opening a project in Client Builder provides the user with a workspace and several tools to aid in developing a client interface.

client/server architecture

A common form of system design in which software is split between server tasks and client tasks. A client sends requests to a server, according to some protocol, asking for information or action, and the server responds.

See configuration table.

client-server model A task operates as the client when it sends requests for action to another task (the server). The receiving task acts as the server when it responds to a request for action and sends a reply.

cluster An elementary unit of allocation of a disk made up of one or more physical blocks.

coil register Binary output unit in a PLC.

cold start When starting a domain instance, the initialization of all elements including persistent elements to their default values found in the Configuration Manager. See persistence, persistent elements, and warm start.

column (1) Part of a relational database record (a record is composed of one or more columns). Also called a field. (2) A vertical group of data entry fields of the same type.

COM See Component Object Model.

command table A table in the GPI driver that is configured to issue commands to an external device.

common causes Those sources of variability in a process that are truly random or inherent in the process itself.

communication adapter The hardware adapter through which communication occurs.

communications port The hardware interface for communicating with external devices or other computers.

completion trigger Element that is force-written to a 1 (ON) when an operation is complete. See trigger.

Component Object Model The programming model and binary standard on which OLE is based. It defines how OLE objects and their clients interact within a process or across process boundaries.

composite object Two or more graphic objects combined so the system treats them as a single object. See simple object, subobjects.

condition Named state of an object, server, or client.

conditional Depending on or relating to a condition(s).

conditional statement See control statement.

configuration database Relational database that stores FactoryLink configuration data.

Configuration Explorer

Configuration Explorer is a FactoryLink development-time environment that enables you to create, maintain, and manage FactoryLink applications (FLAPPs). Configuration Explorer uses a graphical representation called the *Configuration Explorer* window, which resembles Microsoft Windows Explorer. The Configuration Explorer tools allow the user to set up the tables that are used to configure various tasks within a FLAPP. When these tables are set up, the configuration is performed.

Configuration Manager

FactoryLink development tool that allows you to define the functionality of each task in an application by specifying information in a configuration table(s).

configuration mode

Mode of operation that the FactoryLink system is in when you set up an application. In the configuration mode, you use the Application Editor or the Configuration Manager.

configuration table

Binary file, or CT file, that the CTGEN utility produces at run time that contains data extracted from the configuration database table.

configuration table generator script

Script file, or CTG file, that tells the CTGEN utility how to extract data from a database table and combine the extracted values to produce a binary configuration table (CT) file at run time; found in /**{**FLINK**}**/CTGEN.

constant

An unchanging quantity, or any numeric or string expression that contains no variables.

container

An application or object that can contain other objects.

continuous data

Data for a continuous variable.

continuous variable

A variable that can assume any of a range of values; an example would be the measured size of a part.

control (of process) (manufacturing)

A process with variations within specified control limits. (Not related to statistical control.)

control (of process) (statistical)

A process that exhibits only random variations.

control chart

Graphic representation of a parameter of process performance used to determine if parameter is within acceptable quality limits.

control limits

The limits within which the product of a process is expected (or required) to remain. If the process exceeds the limits, it is said to be out of control. (Not the same as tolerance limits.)

control panel

See panel.

control statement

Mathematical expression that includes instructions about the circumstances under which a block of code is to be executed. Also called conditional statement.

Cp For process capability studies: *Cp* is a capability index that may range in value from 0 to infinity with a larger value indicating a more capable process. A value near 1.33 is normally considered acceptable.

$$Cp = \frac{Total\ Tolerance}{6 \times Sigma} = \frac{USL - LSL}{6\sigma}$$

Cp Formula

where

USL = Upper specifications limit

LSL = Lower specification limit

σ = Standard deviation

Cpk For process capability studies: Capability index that measures how capable a process is of producing units within the specifications or tolerance limits. If the process is centered on the mean specification, Cpk has a value equal to Cp. If Cpk is negative, the process mean is outside the specification limits; if Cpk is between 0 and 1, some of the 6σ spread falls outside the tolerance limits. If Cpk is larger than 1, the 6σ spread is completely within the tolerance limits.

$$Cpk_l = \frac{\bar{x} - LSL}{3\sigma}$$

$$Cpk_u = \frac{USL - \bar{x}}{3\sigma}$$

$$Cpk = min(Cpk_l, Cpk_u)$$

Cpk Formula

where

USL = Upper specifications limit
LSL = Lower specification limit
$\bar{\chi}$ = Grand average from control chart (X-Bar)

CT file See configuration table.

CTG file See configuration table generator script.

CTGEN At run time the utility that generates the binary configuration tables (CT files) from the configuration databases.cell (of frequency distribution and/or histogram).

An interval of the variable for which all the elements falling in that interval are summed together. Usually the full range of the variable is divided into cells of equal size and only the total number of elements falling into each cell is used in working with the frequency distribution and/or histogram. This greatly reduces the amount of information.

cursor Light indicator on a monitor that shows where the next character is to be generated. The cursor can be moved across the screen by the use of a key on the keyboard or with a pointing device. Also refers to the chart cursor which points to a specified instant in time on a Trend or SPC plot. The chart cursor retrieves the numeric value or values which are plotted for that instant in time.

cycle Recurring pattern.

D

daisy chaining A configuration method where the complete or state tag from one block read or write table triggers the next.

Database Browser FactoryLink task that uses SQL statements to communicate with a Historian; sends and retrieves data to and from external database tables, including tables created outside of FactoryLink.

database element See element.

database file Group of related database records.

Database Logger
FactoryLink task that enables other FactoryLink tasks to send element information to a database historian.

database table
FactoryLink configuration database table that stores information generated by a task from the Main Menu or data in the task’s panels.

dataset
A contiguous area of memory or registers in an external device.

data type
Digital, analog, long analog, floating-point, message, or mailbox data types supported by FactoryLink.

DCM
Device Control Module. A software module contained within an EDI driver.

deadband, deadbanding
The deadbanding task is used to indicate a band, or area, around a value small enough to be considered insignificant.

decimal number system
Conventional base-10 numbering system.

default
Choice made by a program in the absence of a specific selection.

developer
Person who designs and configures a FactoryLink application.

device
Hardware such as a PLC with which FactoryLink communicates.

Device Control Module (DCM)
A software module contained within an EDI driver

Device Name
Name of an external device FactoryLink uses to communicate through a particular logical port.

digital
Numeric data type supported by FactoryLink; each digital element holds one bit of information of two values: 1 (ON/TRUE) or 0 (OFF/FALSE).

directory
List of files found in a particular area of the operating system.

discrete
Consisting of unconnected, distinct parts.

display object
Graphically displayed output field using the Application Editor that provides an area on a screen where the FactoryLink real-time database displays information output. See animation object.

Distributed interNet Architecture (DNA)
A collection of Microsoft technologies that enable the Windows platform and the Internet to work together.

DLL
Dynamically Linked Library. A library that is linked to application programs when they are loaded or run rather than as the final phase of compilation. This means that the same block of library code can be shared between several tasks rather than each task containing copies of the routines it uses. The executable is compiled with a library of “stubs” that allow link

errors to be detected at compile-time. Then, at run-time, either the system loader or the task's entry code must arrange for library calls to be patched with the addresses of the real shared library routines, possibly via a jump table.

DNA See Distributed interNet Architecture.

domain Characteristics of elements in the real-time database in either the USER or SHARED domain. See shared domain, user domain.

dynamic Characterized by continuous change, activity, or progress.

E

EDI (External Device Interface) A family of device drivers all sharing the EDI task

EDI architecture Layered communication interface that supports communication links with COMM ports, terminal servers, and coprocessors.

EDI base module An EDI architectural layer that insulates the application from the device and monitors and controls external processes.

editor Computer program that creates, changes, manipulates, and deletes objects of a given kind.

Electrical Interface Signals Standard signal names for the RS232/RS422 interface.

electronic key See button, block key.

electronic protection device See protection device.

element Data structure occupying memory in the FactoryLink real-time database.

element name Name you assign to a real-time database element used during development of an application.

error message Display of ASCII text or numeric code indicating that the system has detected an abnormal situation or incorrect data.

ethernet adapter An interface card used to connect to an ethernet network.

ethernet card An interface card used to connect to an ethernet network.

event Detectable occurrence that is significant to a server, a device being represented by a server, to a client, or to an operator. An event may or may not be associated with a condition. For example, a change from one named condition (such as HighAlarm) to another named condition (such as Normal) is an event associated with conditions. However, operator actions, system configuration changes, and system errors are events that are not related to specific conditions. Clients may subscribe to be notified of the occurrence of specified events.

event timer

Digital element that initiates or controls a system function at run time whose value is forced to 1 (ON) no more than once every twenty-four hours (for example, Monday at 8:00 am).

EWMA Chart

Graphic display of a statistic that gives less and less weight to data as the data gets older and older. A plotted point on an EWMA chart can be given a long memory, thus providing a chart similar to the ordinary CUSUM chart; or it can be given a short memory, thus providing a chart analogous to a Shewhart (X-Bar) chart.

$$EWMA = \hat{y}_t + \lambda(y_t - \hat{y}_t)$$

where

y_t = Observed value at time t

$\hat{y}_t$ = Predicted value at time t (old$EWMA$)

$e_i = y_t - \hat{y}_t$ = Observed error at run-time of$t$

$\lambda = (0 < \lambda < 1)$ = Depth of memory of EWMA

exception processing

Basic FactoryLink architecture whereby a real-time database element is read/written only when its value has changed. See change-status flag.

exception write

Write operation that transfers only the values of elements that have changed since the last time a task scanned the real-time database. See exception processing.

exponential constant

Mathematical expression consisting of an optional minus sign (-) followed by consecutive digits (0 - 9), an exponential operator (E), an optional minus sign (-), and another group of consecutive digits. Exponential constants are interchangeable with floating-point constants.

expression

Mathematical statement that is resolved to a value.

external converter

A device external to the PC used to convert one type of communication media to another.

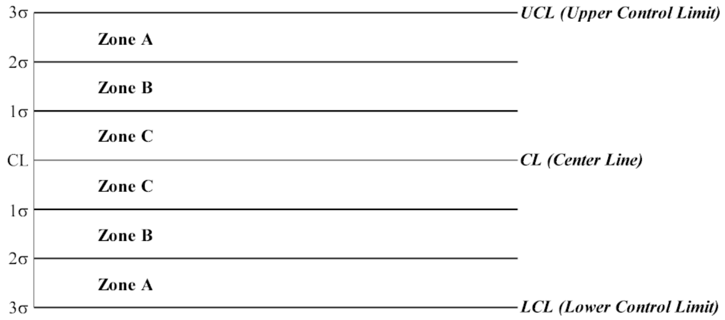
F

FactoryLink application

See application.

FactoryLink kernel See kernel.

FactoryLink SPC Run Rules Tests that the SPC Data Monitor process uses to detect patterns of quality-level variations over time. The following shows the chart zones on which the FactoryLink SPC Run Rules are based.



Rule	Definition
2 OF 3	2 out of 3 points lie on one side of the Center Line in Zone A or beyond
4 OF 5	4 out of 5 points lie on one side of the Center Line in Zone B or beyond
TREND	7 points in a row are rising or falling
8CONJ	8 points in a row lie on one side of the Center Line
3SIGMA	one or more points lie outside of control limits
15CONS_IN_C	15 consecutive points lie within either upper or lower Zone C on the same side of the Center Line
90%25_IN_C	of 25 points, at least 90 percent of these (or 23) lie within Zone C (Upper or Lower) and all 23 are on the same side of the Center Line
8CONS_OUT_C	8 consecutive points lie outside either Zone C and are all on the same side of the Center Line
60%25_OUT_C	of 25 consecutive points, at least 60 percent (or 15) lie outside Zone C and are all on the same side of the Center Line

FactoryLink task See task.

FALSE Logical level associated with the numeric value of zero; logical operators return a zero when the result of their operation is FALSE.

field
Space in a configuration table or on a display that may or may not contain data; part of a record (a record is composed of one or more fields).

file
Specific set of data defined by the operating system.

File Manager
FactoryLink task that performs basic file-management operations, such as copying, printing, renaming, typing, and deleting files locally or remotely.

file name
Name of a specific set of data.

file-transfer operation
Transmitting the contents of a file from one FactoryLink station on a network to another FactoryLink station on the same network using the File Manager task.

FIRST
Option for displaying an on-line alarm; displays the first (oldest) alarm on the system.

flag
Attribute that has only two possible states: ON or OFF.

FLAPP, {FLAPP}
FactoryLink environment variable that corresponds to the name of the directory structure containing the application-related files. If you use **{**FLAPP**}** in the pathname with its **{ }**, the system uses the default environment variable.

FLCONV
FactoryLink utility that converts older applications to run under the current version.

FLDOMAIN, {FLDOMAIN}
FactoryLink environment variable specified during installation as the name of the domain under which the application is designed to run. There is no default for this variable.

FLINK, {FLINK}
FactoryLink environment variable that corresponds to the name of the directory structure containing the FactoryLink software system program files. If you use **{**FLINK**}** in the pathname with its **{ }**, the system uses the default environment variable.

FLNAME, {FLNAME}
FactoryLink environment variable specified during installation as the name of the application. There is no default for this variable.

FLNEW
FactoryLink application utility that creates the user-specified directory structure and copies files required for development of a new application to this directory structure.

FLOAT
See floating-point.

floating-point
Data type supported by FactoryLink; each floating-point value occupies 10 bytes of storage in the real-time database and holds numeric values in the range +/- 1E-308 to +/- 1E308 with a precision of 15 decimal digits (all figures approximate). Abbreviated FLOAT.

floating-point constant
Mathematical expression consisting of an optional minus sign (-) followed by consecutive digits (0 - 9), a decimal point, and another group of consecutive digits. Floating-point constants may be used interchangeably with exponential constants.

FLOPT, {FLOPT}
FactoryLink environment variable that points to the location of the license information directory **{**FLINK**}**\OPT. The **{**FLOPT**}** directory contains the files FL.DEV (key type) and FL.KEY (options and license information). If you use **{**FLOPT**}** in the pathname with its { }, the system uses the default environment variable.

FLREST
FactoryLink application utility that restores and creates application files into a platform-dependent application.

FLSAVE
FactoryLink application utility that backs up graphics files, symbols, configuration tables, recipes, logs, and other files and creates a backup of the specified application.

FLUSER, {FLUSER}
FactoryLink environment variable specified during installation as the name of the domain instance. There is no default for this variable.

font
Complete set type of one size and style.

forced-write
Write operation that writes a new value (even if it is the same as the old value) to an element and sets all of that element's change-status flags to 1 (ON).

formula
See statement.

frequency distribution
Number of times each outcome of a statistical population is observed.

FUNACK
Option for displaying an alarm on-line; displays the first (oldest) unacknowledged alarm.

function
Subroutine that performs a specified operation or calculates a specified result. Frequently activated by a keyboard input; hence, function key. See mathematical function.

Function Key
An animation object in the FactoryLink Application Editor that animates a key on the keyboard so it causes an action to occur when pressed at run time.

function key
(1) A key used to send a signal to the computer program controlling the display; (2) a key that performs a specific set of operations.

G

GFIRST
Option for displaying an on-line alarm; displays the first (oldest) alarm in a selected alarm group.

GHIGH Option for displaying an on-line alarm; displays the oldest and highest priority alarm in a selected alarm group.

GLAST Option for displaying an on-line alarm; displays the last (most recent) alarm in a selected alarm group.

global data word A register in a PLC where the data contained in this register can be made available or broadcast across a network.

global element See pre-defined element, reserved element.

GMT See Greenwich Mean Time.

GPI See General Purpose Interface.

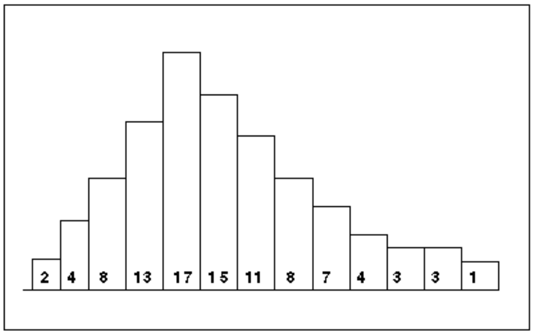
General Purpose Interface (GPI) A generic device driver where you define the protocol.

Greenwich Mean Time Mean solar time for the meridian in Greenwich, England. Basis for calculating time throughout most of world.

H

hexadecimal number system Numeric system used in computers with a base of 16 in which the letters A-F represent numerical quantities equal to 10 through 15 in the decimal numbering system.

Histogram A graphic representation of a frequency distribution plotted by ranges of variables divided into equal intervals along with the number of observations accumulated in each.



Histogram

Historian FactoryLink task that provides a common interface with one or more database managers.

holding register
A register in a PLC where data can be written to hold or store until it is needed.

I

I/O translator task
Receives data from a RAPD driver through a mailbox, converts and parses it into tags, and converts and sends data to a RAPD driver through a mailbox.

IOX task
See I/O translator task.

icon
Graphical symbol representing a function that can be performed.

Individual
Type of real-time and historical control chart found in FactoryLink SPC. See X-Bar, EWMA.

information message
Onscreen display of ASCII text or numeric codes that describe normal system status, usually during system startup or shutdown that requires no user or operator action. Also called status message.

information panel
See initialize, panel.

initialize
Set up a system for use.

input object
Graphically displayed input field created using the FactoryLink Application Editor. See animation object, input text field, pushbuttons.

input text field
Area on a graphics display defined in the Application Editor to accept operator input in the form of text or numeric values. See input object.

instability (of a process)
A process that exhibits variations larger than its control limits or a systematic pattern of variation.

instance
A copy of a FactoryLink application that can be executed at run time. The number of instances allowed is the number of users that can simultaneously interact with the run-time system. See domain.

integer constant
Mathematical expression consisting of an optional minus sign (-) followed by consecutive digits (0 - 9).

interval timer
Element whose value is forced to 1 (ON) at least once every twenty-four hours at regular intervals of the system clock (for example, every 60 seconds). An interval timer can be used to initiate or control a system function at run time.

K

K For process capability studies: a measure of difference between the process mean and the specification mean.

$$K = \frac{(Mean - Midpoint)}{(Tolerance/2)}$$

K Index Formula

kernel FactoryLink software module that creates the real-time database when the FactoryLink Run-Time system is started. It provides security for the FactoryLink System and exchanges data among tasks.

key See block key.

key ring Part of an electronic protection system that plugs into a FactoryLink key ring. Contains information used by FactoryLink to enable the licensed software options. See option key, protection device, button.

keyboard cursor See text cursor.

Keystroke Keyboard key or button that is being animated using the Application Editor.

keyword files ASCII text files that tell the Configuration Manager how to translate text table entries into binary values; also referred to as key files found in the /**{FLINK}**/KEY directory.

L

ladder logic Language used to configure programmable logic controllers; industry standard for representing relay-logic control systems.

LAN See Local Area Network.

LCL Lower Control Limit. For control charts: the limit below which the quality of a process is out of control.

library Collection of utility functions that primarily interface application and system programs to the FactoryLink kernel.

inking Process of associating an object and its animation attributes to elements in the FactoryLink real-time database.

Local Area Network (LAN) In-house data-communications system connecting a number of microcomputers. See node, node name.

LOCAL file ASCII file in which you define a local station name. The LOCAL file resides in the /**{**FLAPP**}**/NET directory.

local station
Current station on a network.

log
Set of data files, error messages, or alarms spooled to a printer or archived to disk.

logical operator
Symbols in expressions that test operands for TRUE (non-zero) or FALSE (zero) values and return a result of 1 (TRUE) or 0 (FALSE).

logical port
Number you enter in the FactoryLink External Device Definitions Table to represent the physical port. When using an IBM RIC/ARTIC card, this number represents a combination of the physical card and the physical port.

logical station
Number that you enter in a Read or Write Table representing the combination of a logical port with a physical station.

long analog
Data type of a 32-bit signed integer supported by FactoryLink. Abbreviated LONGANA.

LONGANA
Abbreviation for long analog.

LSL
Lower Specification Limit. The lowest value of a product dimension or measurement which is acceptable.

M

mailbox
Data type supported by FactoryLink; a mailbox element is organized as a queue of mailbox messages and associated message data and consists of variable length and variable structure.

mask
Prevents an alarm from being activated.

Master
Device that initiates a data request. FactoryLink is usually the master in a master/slave relationship.

Math & Logic
FactoryLink task that performs mathematical and logical calculations and assigns the results to elements.

mathematical function
(1) A mathematical expression describing a relationship between two or more variables. (2) A function that implements a mathematical operation, such as square root or cosine. For a list of mathematical functions, refer to the *FactoryLink Configuration Guide*.

Mean (of a statistical sample)
The average value of some variable. The mean is given by the following formula where *x* is the value of the variable to the *i*th element and *n* is the number of elements in the sample.

$$\overline{x} = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

Mean

menu
Set of choices for functions displayed together overlaying the present contents of the screen without disrupting them.

message
Data type of string or binary data having a total length of 64K supported by FactoryLink.

monochrome
Type of monitor that displays information in only one color.

mouse cursor
Small arrow or shape in the Application Editor representing a selected option that indicates the point on the screen where the next keyboard input or mouse click is displayed. A pointing device moves the mouse cursor.

moving average/moving range
Same as X-Bar and range calculation except that a circular buffer of Moving Size is used instead of Subgroup Size.

moving average/moving range chart
A chart used in FactoryLink SPC having points that are averages or ranges of previous data carried forward with the current data. Used to dampen the effects of a single reading when only one reading is made per time period or when a process is strongly linked to a previous data output. See range, X-Bar.

N

namespace
The area of the Configuration Explorer window that displays the tree structure, which includes the icons, *FactoryLink Servers* and *OPC Servers*. The namespace stores the properties of the servers and their associated application(s).

NETBIOS
Software standard used for local area networks or optional FactoryLink task used for communicating between FactoryLink systems over a local area network.

network
Group of terminals and one or more computers connected for the purpose of moving information from place to place.

node — Station or general junction point on a Local Area Network (LAN). See Local Area Network.

node name — Unique name for a node on a specific Local Area Network (LAN). See Local Area Network.

NOT — Unary logical operator that yields a value of 1 (TRUE) if its argument is 0 (FALSE) and 0 (FALSE) if its argument is TRUE (nonzero).

np-Chart — For attribute data: a control chart of the number of defective units in the subgroups with fixed subgroup sizes.

NT Service — An executable program (.exe) that runs as a background task, and whose lifetime is controlled by the Service Control Manager (SCM). Services may be run at system startup, or may be started (via the SCM) by the interactive user, or by a process that a user is running.

NUMBUFS — Number of data buffers in which data can be queued in networking.

numeric constant — Integer or floating-point (or exponential) constant.

numeric input field — Area on a graphics display defined in the Application Editor to accept operator input in the form of a number. See input object, input text field.

O

object — See animation object.

OBJECT database table — Configuration Manager-maintained database table that stores the real-time database definition and other related information.

octal number system — Numeric system with a base of 8 used in computers.

OLE — Object link embedding.

OLE for Process Control — A standard interface that allows servers and clients from different vendors (both software and hardware) to communicate with each other.

OPC — See OLE for Process Control.

Open Software Bus architecture — Operating principle whereby modular software programs run concurrently and communicate through a global real-time database.

operand — See argument.

operating characteristics curve — For acceptance sampling: curve showing the percent defective in a lot vs. the probability that the lot will be rejected for a specified lot size and sampling plan.

operator (1) The person who operates the finished application. (2) Mathematical function. The operators supported by Interpreted Math & Logic include the most common arithmetic, logical, relational, and conditional operators used in computer science and related disciplines.

option key See block key, button.

OR Binary logical operator that yields a value of 1 (TRUE) if at least one of its two arguments is TRUE (non-zero), and 0 (FALSE), otherwise. See operator.

out of control Variations larger than the quality control limits.

overtrigger To trigger a read or write table faster than the operation can be completed by the external device.

P

pan The ability to move a trend chart forward in time to a new starting point keeping the same chart duration.

panel Screen display that provides pre-defined entry fields for information required by a configuration table.

PAK See Programmer's Access Kit.

Pareto analysis An analysis of the frequency of occurrence of various possible concerns. This is a useful way to decide quality control priorities when more than one concern is present. The Pareto Principle states that 20% of concerns cause 80% of the problems.

Pareto diagram A bar graph showing the frequency of occurrence of various concerns. The most frequently occurring ones are shown first, and a line chart shows cumulative data vs. data type.

path name Route of a sequence of file names or directory names for an operating system to follow to locate information stored in a computer.

p-chart (percent defective) For control charts: the percentage of defective units in which the subgroup size varies. Used for attribute quality control.

pen Element whose value represents a particular combination of attributes for trending activity. Contains values used in an on-line trending chart the same way values recorded by a pen are used in a strip-chart recorder.

pen trace Graphic representation of a record of trending activity associated with a particular pen. On an on-line trend chart, resembles the line drawn by a pen on a strip-chart recorder.

percent defective For acceptance sampling: the percentage of defective units or units of unacceptable quality in a lot.

percent specifier	See sprintf string, variable specifier.
persistence	Ability of an element to maintain its value over an indefinite period of time.
persistent elements	Real-time database elements that maintain their value when a domain instance is closed, either deliberately or inadvertently (from a power loss or faulty process). This is possible because the values of the persistent elements are written to permanent storage and are not affected by a system shut down.
physical station	Physical address of an external device on a network.
pin	Single hardware connection point in an interface connector.
pixel	A group of light phosphors that can be stored, addressed, or displayed by a computer. Abbreviation for picture element.
PLC	See Programmable Logic Controller
point-to-point communications	Communications between FactoryLink and a single external device through a single port.
pointing device	Device, such as a keyboard or a mouse, that allows control over movement of the cursor during the creation of graphics images and displays.
polygon	Closed-plane figure bounded by three or more line segments.
Power Edit	An editing tool that enables you to select and directly edit subobjects, including their animation, within a composite object without breaking apart the composite. See composite object, simple object, subobject.
Power Objects	User-extensible, animated compound objects that contain template variables for the animation features. See Power Packs.
Power Packs	Libraries of drawings where you can store Power Objects for reuse in creating new instances of similar objects in the same or in other applications. See Power Objects.
pre-defined element	Convenient element configured for internal system use. Sometimes called reserved element or global element.
Print Spooler	FactoryLink task that extends the printing capabilities of the system by providing multiple print buffers and the ability to use serial or parallel printers. Also allows output to be directed to a disk file.
priority	(1) Three-digit hexadecimal number, such as 201, that specifies the processing priority for a FactoryLink task. where

the first number (2 in 201) specifies the operating system class of priority. The second number (01 in 201) specifies the priority within the class listed above. The higher the number, the higher the priority within the class. (2) Rank or position of an operation in a sequence of operations.

process capability — The level of uniformity of product that a process is capable of yielding expressed by the percent of defective products or the range or standard deviation of some product dimension. Process capability is usually determined by performing measurements on product units produced by the process.

process control — Maintaining the performance of a process at its capability level by sampling the process product, charting its performance, determining causes of any problems, and taking corrective actions.

Programmable Counters — FactoryLink task that provides triggered up/down counters with terminating triggers.

Programmable Logic Controller (PLC) — Special purpose computer programmed to control process or machine operation. The programmable logic controller consists of five basic components: processor, memory, input/output, power supply, and programming device. A PLC is designed as an industrial control system.

Programmer's Access Kit (PAK) — Collection of optional FactoryLink software tools, programming libraries, and keys-related documentation for use by programmers in their design and construction of FactoryLink-compatible programs.

prompt — Character or message on a video display indicating the system is ready to accept a command.

protocol — Defined set of rules for communicating between devices.

protocol module — An EDI architectural layer that insulates the EDI base module from the type of external device you are using and provides the flexibility to support many different types of external devices.

pushbutton — Input object used with a pointing device or function key that performs an operation, such as shutting down a task.

Q

quality characteristic — Particular aspect of a product that relates to its ability to perform its intended function.

R

range

(1) The difference between the highest and lowest of a group of values. (2) Type of real-time and historical control chart found in FactoryLink SPC. See X-Bar, moving range.

$$R = \begin{array}{c}\textit{(Largest value in Subgroup)}\\ \textit{minus}\\ \textit{(Smallest value in Subgroup)}\end{array}$$

R-Chart

A control chart of the range of variation among the individual elements of a sample or the difference between the largest and smallest elements as a function of time, lot number, or similar chronological variable.

read call

Operation that returns the value of an element regardless of the value of the element’s change-status flag.

read complete

See Block Read Complete.

read disable

See Block Read Disable.

read priority

See Block Read Priority.

read state

See Block Read State.

read trigger

See Block Read Trigger.

real-time

Immediate software response to an event.

real-time database

Memory-resident array of information that acts both as an in-memory storage device and an interprocess communication mechanism for FactoryLink tasks. All FactoryLink tasks share the information in the real-time database by reading from or writing to real-time database elements.

Real-Time Database Debugger

FactoryLink task that allows you to modify the real-time database during run time and to monitor process access to the real-time database; used to develop and debug applications. (RTMON).

real-time database element

See element.

reboot

Boot again. See boot.

Recipe

See Batch Recipe.

record

In a relational database, a unit or set of data that is the basic component of a file. Also called a row.

relational operator Mathematical function that yields a TRUE or FALSE result that depends on the signs and relative magnitudes of its arguments. The FactoryLink Interpreted Math & Logic program recognizes six relational operators:

< <= > >= = !=

relational subgrouping For control chart: subgroup of units selected to minimize the differences because of assignable causes. Samples taken consecutively from a process operating under the same conditions usually meet this requirement.

relay Electrically operated device that mechanically switches electrical circuits.

relay logic Representation of a program or other logic in a form normally used for relays.

remote station Other station on a network.

remote terminal unit (RTU) External device where the information contained within the device is available through a communication port.

Report Generator FactoryLink task that formats real-time database information into a predefined, field-printed report.

reserved element See predefined element.

response table Table in the GPI driver configured to receive responses from an external device.

result table Temporary table containing data selected from an external database.

row See record.

run A set of consecutive units sequential in time.

run time Period during which a FactoryLink application is operating.

Run-Time Graphics The FactoryLink Graphics task. Animated displays with which the operator interacts when the application is running. For this task to be available, the Application Editor must be installed.

Run-Time Manager FactoryLink task that supervises all other FactoryLink tasks as they operate.

run-time mode State of the FactoryLink system when an application is operating.

S

sample (statistics) A representative group selected from a population used to determine the properties of the population.

sample size The number of elements, or units, in a sample.

sampling
The process of selecting a representative sample of a population and determining the properties of the sample.

sampling variation
The variation of a sample’s properties from the properties of the population from which it was drawn.

scaling
Resize a drawing element according to the value of a register.

self-triggering
Configuration method where the complete or state tags for a given block read or write table trigger the table again immediately after completing an operation.

server
(1) Computer that provides a shared hard disk and possibly other resources in a local area network. (2) Program that provides a service to another component (client).

SHARED domain
Collection of elements in the real-time database that contain publicly-owned data and tasks available to all users at run time. See domain, USER domain.

shared memory
Memory set aside for EDI and device drivers to pass data between them.

Sigma
(1) Standard deviation of a statistical population. Represented by the symbol σ. (2) Type of real-time and historical control chart found in FactoryLink SPC. See X-Bar, moving averages.

sigma limits
For histograms: lines marked on the histogram showing the points *n* standard deviations above and below the mean.

For control charts: control lines evenly spaced on either side of the center line.

signals
Notifications of events used to affect process control.

simple object
Single objects, such as lines, circles, and text, not composed of any other objects. The basic building blocks of a graphics display. See composite object, subobject.

sprintf string
Group of ASCII characters that specify a standard format for one or more variables to be inserted in a character string preceded by the % symbol.

SQL
See Standard Query Language.

stability (of a process)
A process showing no recognizable pattern of change. See control (process-statistical).

standard deviation — A measure of the variation among the members of a statistical sample. If a sample of *n* values has a mean of x, its standard deviation is given by the formula shown.

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Standard Deviation Formula

Standard Query Language — An industry-standard language for creating, updating and querying relational database management systems.

start trigger — Element whose value, when forced to 1 (ON), initiates an action in a FactoryLink task.

statement — Mathematical expression or formula that may contain any of the following components:

- Directives
- Expressions, including operators, variables, and/or constants
- Comments
- Functions

station — Any PLC, computer, or data terminal connected to and communicating through a network.

station name — Name given to a device connected to a network.

statistical control (of a process) — A process that exhibits only random variations.

status message — See information message.

string constant — ASCII numeric expression consisting of an opening double quotation mark followed by zero or more printable characters and a closing double quotation mark.

subdirectory — Directory contained within another directory.

subgroup — For control charts: sample of units taken at or near the same time from a given process.

subobject — Each object in a composite object is called a subobject. Subobjects can contain simple and/or composite objects. See composite object, simple object.

symbol
A graphic object exchanged with another object during runtime.

T

table
See configuration table, database table.

tag name
See element name.

tag number
A two-part number FactoryLink assigns to an element and uses to refer to that element when writing a value to it or reading its current value. For example, the tag number

```
0:177
```

where

0 is the segment (block of space in the real-time database that stores elements of one datatype). 177 is the offset (location of the bits in the segment that contain the element).

task
FactoryLink program that reads from and writes to the real-time database and performs a specific function.

task-specific database table
Database table that stores information related solely to a specific task.

text cursor
Flashing vertical bar that indicates the point on the screen where the next keyboard input will be displayed.

Timer
FactoryLink task that updates real-time database information based on the chronological events and time intervals specified in its configuration tables.

toggle
To switch between two states or values.

tolerance
The permissible range of variation in a particular dimension of a variable. Tolerances are often set by engineering requirements to ensure components will function together properly.

Transport Service Access Points (TSAPs)
Communication points that link the Siemen’s ethernet interface PLC with the device interface in FactoryLink.

trend
A gradual, systematic change with time or another variable.

Trending
FactoryLink task that displays data stored in a relational database as a strip chart on a real-time graphics display.

trending chart — FactoryLink graphics display that resembles a strip-chart recorder. Composed of a chart object and pen objects that function in combination with real-time database values for on-line display of real-time and/or historical data.

trigger — Digital element that causes an event to occur when its value is forced to 1 (ON).

triggered read operation — See block read.

triggered write operation — See block write.

TRUE — Logical level associated with any non-zero numeric value, usually 1 (ON).

TSAP — See Transport Service Access Points.

type — See data type.

TYPE database table — Database table that defines segments where a data type used is stored in the real-time database.

U

u-Chart — For attribute data: a control chart of the percentage of defects in one inspection subgroup of non-fixed size.

UCL — Upper Control Limit. For control charts: the limit above which the quality of a process is out of control.

UKEY — The FactoryLink utility with which a person can view information in the software security mechanism.

unary operator — Mathematical function that takes one argument, usually placed after it. For instance, in the expression NOT Overflow, the logical negation operator NOT has Overflow as its argument.

unsolicited read — Command issued by an external device, independently of FactoryLink, to write information to the real-time database without requesting the data.

USER domain — Collection of elements in the real-time database that contain data and tasks available locally to a specific user at run time. In a multiuser system, each user owns a copy of all the elements in the USER domain. See domain, SHARED domain.

USL — Upper Specifications Limit: the highest value of a product dimension or measurement that is acceptable.

V

variable A quantity subject to change or variability.

variable data Data concerning the values of a variable as opposed to attribute data.

variable specifier ASCII character that represents a replaceable value in a character string. See sprintf string.

variance The square of the standard deviation.

VERBOSE A command-time option that flags the process to provide debugging information.

W

warm start When starting a domain instance, the initialization of all non-persistent elements to their default value. Similar to a cold start and restores all persistent elements to their previously saved values. See cold start, persistence, persistent elements.

where clause SQL (Structured Query Language) statement part that specifies a filter for accessing data in a relational database.

wild-card character Symbolic character, usually an * (asterisk), taken to mean any character in a character string.

window Area occupying either part or all of a screen on which program information is presented.

write call Operation that writes a new value to an element and, if the new value is different from the previous value, sets all of that element's change-status flags to 1 (ON).

write complete See Block Write Complete.

write disable See Block Write Disable.

write priority See Block Write Priority.

write state See Block Write State.

write trigger See Block Write Trigger.

X

$\bar{x}$ and R Chart For variable data: control charts for the average and range of subgroups of data.

$\bar{x}$ and Sigma Chart For variable data: control charts for the average and standard deviation (sigma) of subgroups of data.

X-Bar (1) Mean or average represented by the symbol $\bar{x}$ and the formula shown:(2) Type of real-time and historical control chart found in FactoryLink SPC. See “Sigma,” “EWMA,” etc.

$$\bar{X} = \frac{\sum x}{n} = \frac{\textit{Sum of the values in subgroup}}{\textit{Total number of values in subgroup}}$$

XOR Abbreviation for the Exclusive OR, a binary logical operator that yields a value of TRUE (1) if one, but not both, of its two arguments is TRUE (non-zero).

XREF (cross-reference) database table Configuration Manager-maintained database table that contains a record for each occurrence of an element in any task-specific database table or graphics animation.

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