GE Industrial Systems

Innovation Series
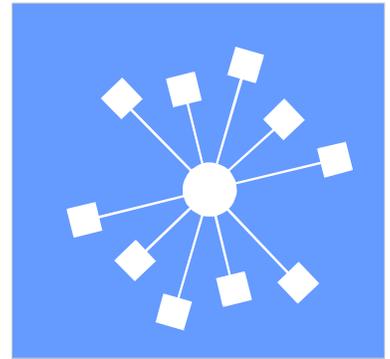
Control System Toolbox

For Configuring the Trend Recorder

Innovation Series
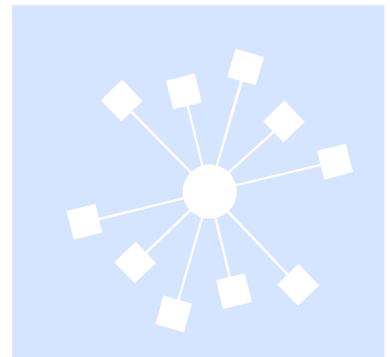
Control System Toolbox

For Configuring the Trend Recorder

These instructions do not purport to cover all details or variations in equipment, nor to provide every possible contingency to be met during installation, operation, and maintenance. If further information is desired or if particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to GE Industrial Systems, Salem, Virginia, USA.

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SAFETY SYMBOL LEGEND

Warning

Indicates a procedure or condition that, if not strictly observed, could result in personal injury or death.

Caution

Indicates a procedure or condition that, if not strictly observed, could result in damage to or destruction of equipment.

Attention

Indicates a procedure, condition, or statement that should be strictly followed in order to optimize these applications.

Note **Indicates an essential or important procedure or statement.**

Caution

The example and setup screens in this manual do not reflect the actual application configurations. Be sure to follow the correct setup procedures for your application.

Warning

To prevent personal injury or equipment damage caused by equipment malfunction, only adequately trained personnel should modify any programmable machine.

Contents

Chapter 5 Viewing Trends   23

Glossary of Terms   31

Chapter 1 Overview

Introduction

This document can apply to various controllers or drives, therefore the contents of the dialog boxes can vary according to your product.

This chapter describes the Trend Recorder, which monitors and graphs signal values from controllers or drives and graphs data collection analysis (.dca) files. Data can also be saved and exported for other applications, such as spreadsheets.

Data Collection

The Trend Recorder uses three methods to collect data: **real-time**, **block-collected**, and **reading .dca files**.

Real-time

Real-time data is collected by the toolbox. Real-time mode is for low to medium data collection rates. Signals can be trended from controllers and drives. When you are real-time trending data from a controller, both internal signals in the device and any external signal on a drive local area network (DLAN+) that the device is attached to can be trended. All the signals are sampled at the same time by a task running in the device. The sample set is then transmitted over the network to the toolbox. You can set the sampling rate when you are configuring the trend. The minimum interval between samples is 32 ms.

Real-time trending of internal data from a controller requires that the controller file be loaded in the toolbox while the trend is being set up. DLAN+ signals can be added to the trend without having the device file open in the toolbox; however, the toolbox must have access to the System Database (SDB). Once the trend is set up, data can be collected and displayed from a controller without the controller being loaded in toolbox.

It is not necessary to have the device file loaded while replaying previously collected data.

Only internal signals can be trended from an AcDcEx. Signals are sampled one at a time, sequentially. The sample interval between signals is an average 22 ms. The interval between samples of the same signal is the number of signals multiplied by the interval between samples. When real-time trending signals from a drive, you must have the device file open in the toolbox while the trend is set up and also when data is collected.

Signal Sampling for
Real-time Drive Trending

Value

|22 ms|

| 3 * 22 ms |

Time Axis
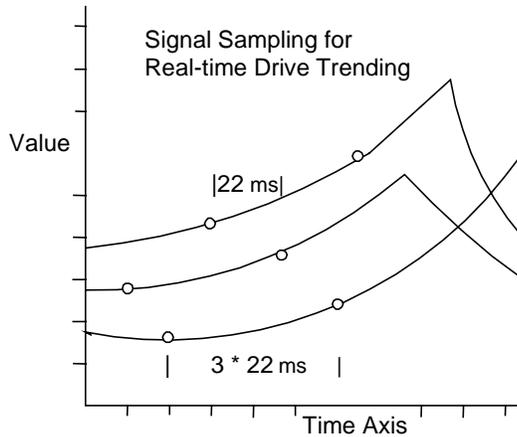
When trending from an Innovation Series™ drive, signal values are collected in a group of four at a time, at an average rate of 20 ms per group. The sampling strategy is similar to the AcDcEx drive; however, instead of getting only one signal value at a time, the Trend Recorder reads up to four signals simultaneously. This greatly improves the effective sampling rate over that of the AcDcEx drive.

Data is collected from the AcDcEx drive one signal value at a time. The average sample interval between signals is about 50 ms.

Block Collection

Refer to the section, Block Collected Trends.

Block collection is available in controllers and in the Innovation Series drive using the *Capture Buffer* block and in other drives using the *Circular List* block. The data is uploaded to the toolbox when the collection is completed. Block-collected mode is for high speed trending. The only limit on collection rate is the execution rate of the collector block.

It is not necessary to have the configuration file loaded while replaying previously uploaded data.

Block-collected trending requires that the configuration file, which contains the collector block, be loaded in the toolbox while the trend is set up and also when data is uploaded from the block.

.dca Files

The **.dca file** is a common data storage format used by many applications. It is primarily used to store data collected by the **Data Historian** product.

The Trend Recorder can read these files in two ways:

- Individually, where you specify the name(s) of the .dca files to load into the Trend Recorder.

- As part of a **Data Historian Collected Trend**, where you specify signals from a particular Data Historian device and/or **Data Historian collection**. The Trend Recorder determines the name(s) and location(s) of the necessary .dca files.

Chapter 2 Trend Recorder Window

Introduction

This chapter provides instructions for using the toolbox to create a Trend Recorder. It also describes toolbar and menu commands, as well as option settings.

For assistance, contact:

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Phone + 1 540 387 7595, Fax + 1 540 387 8606
(replace + with the international access code)

Creating a Trend Recorder

Or click [ ] *New*

➤ **To create a Trend Recorder**

◆   From the **File** menu, choose **New**. The **New** dialog box displays.

Click the **Utilities** tab. Then click **Trend Recorder** to highlight it, and click **OK**.

New	✕
Controllers | Drives & Exciters | System Configuration | Utilities | Other	OK
Batch Build File	Cancel
Trend Recorder	
Graphics Window	Help
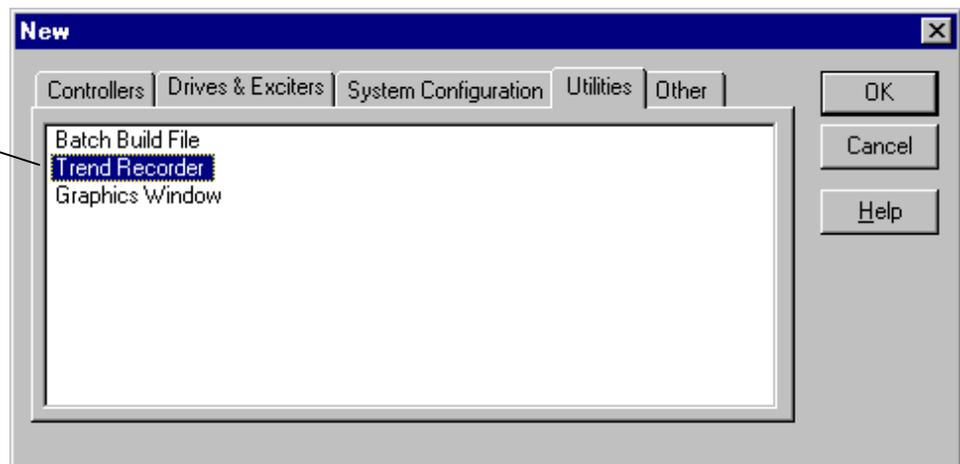
Trend Recorder Window

To set options for recording trends, refer to the section, Trend Recorder Settings.

When the **Trend Recorder Window** is invoked, it displays as a separate window in the toolbox. The window is divided into two views, which can be altered with the adjustable split bar (see screen below). The **Top Graph View** of the Trend Recorder Window displays the actual graph(s) and the **lower Signal View** displays the signals that are monitored in the graph and their current values.

Tip ✋ *Signals are selected in the lower Signal View when they are configured, edited, and removed. Adjust the size of the Signal view by dragging the split bar, shown in the screen below.*
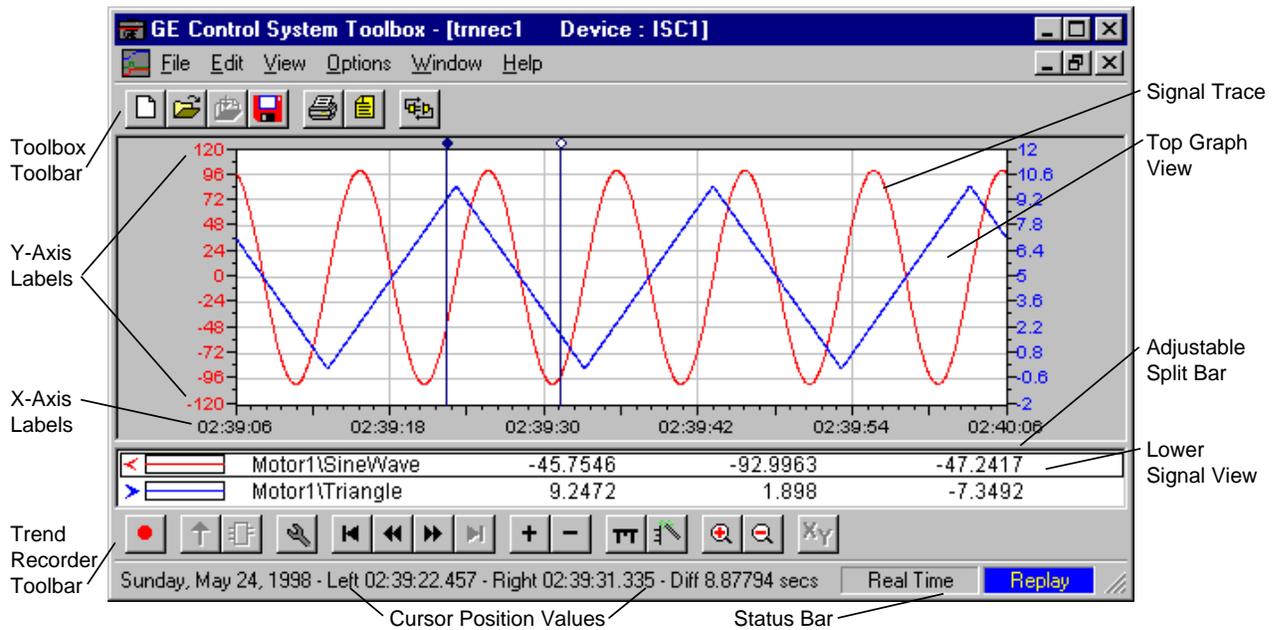
Tip ✋ *To view both the toolbox and the Trend Recorder window, choose **Tile Horizontal** or **Tile Vertical** from the Window menu. Then, to invoke and work in the Trend Recorder window, click anywhere in the Trend Recorder window or click anywhere in the toolbox window.*

Modes of Operation

The Trend Recorder has several modes of operation. The modes are indicated in the Status bar at the bottom of the Trend Recorder Window. These modes are:

Status bar displays Wait or Record.

Record mode: captures data and displays it as a graph, which can then be saved to disk. You can set Record to capture data continuously or only around a trigger event.

Status bar displays Replay.

Replay mode: allows you to review data collected in Record mode or uploaded from a device-based block-collected trend. You can scan back and forth between multiple recorded events to examine data in detail.

Status bar displays Upload.

Upload mode: captures data collected by a Capture Buffer block in a controller or in an Innovation Series drive or by a Circular List block in other drives. You can set Upload to run as a one-time event or leave the Trend Recorder in this mode. When left in the Upload mode, the toolbox monitors the blocks and automatically uploads data when a collection takes place.
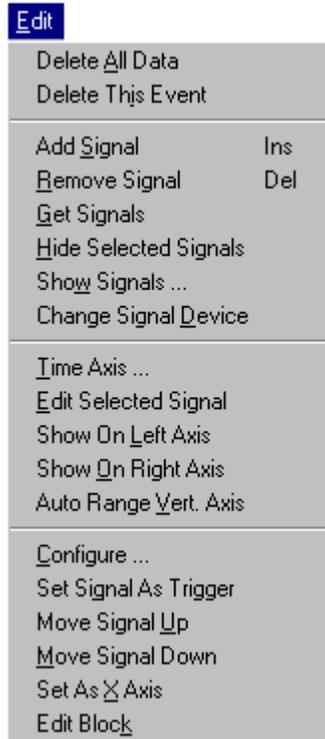
Toolbar

The Trend Recorder toolbar contains the following menu commands:

Click. . .	To
●	Record displays and graphs of the current values of the selected signals. Data is also captured and can be replayed or saved to disk.
↑	Upload data collected by the data collector block in a controller or a drive device. If automatic upload is selected, the Trend Recorder remains in upload mode until selected again.
▣	Edit the data collector block.
⚙	Configure the Trend Recorder.
◄	Move through events and display previously recorded data.
◄◄	Move the current event back by one-third of the currently displayed width of the time axis.
►►	Move the current event ahead by one-third of the currently displayed width of the time axis.
►|	Move through events and display the next recorded data.
+	Add signal(s) to be trended.
−	Remove chosen signal(s) from the trend.
ᴛᴛ	Configure the time (horizontal) axis parameters.
▤	Automatically range the vertical axis based on the data currently displayed in the graph.
🔍+	Zoom in and display the selected area of the graph between the replay cursors.
🔍−	Zoom out and display the area of the graph to a maximum of three times the current screen.
XY	Set the trend into X-Y plotting mode.

Edit Menu

The Edit menu allows you to change the configuration of the Trend Recorder as follows:

Edit

Delete All Data
Delete This Event

Add Signal   Ins
Remove Signal   Del
Get Signals
Hide Selected Signals
Show Signals ...
Change Signal Device

Time Axis ...
Edit Selected Signal
Show On Left Axis
Show On Right Axis
Auto Range Vert. Axis

Configure ...
Set Signal As Trigger
Move Signal Up
Move Signal Down
Set As X Axis
Edit Block

Delete All Data removes all data collected by the Trend Recorder.

Delete This Event removes the recorded event that is currently displayed.

Add Signal adds a signal to the Trend Recorder.

Remove Signal removes the signal selected in the lower Signal View.

Get Signals retrieves configuration information from the SDB for DLAN+ signals in real-time trends.

Hide Selected Signals conceals signals that are selected in the lower Signal View.

Show Signals selects which signals are displayed and hidden.

Change Signal Device changes the drive that a drive signal is trended from.

Time Axis changes the range of the time axis.

Edit Selected Signal changes the range, color, line width, and style for a signal.

Show on Left/Right Axis of the trace displays the range of the selected signal.

Auto Range Vert. Axis causes the graph to set the range of all signals based on the values of the signals that are currently displayed on the graph.

Configure invokes the Trend Recorder Configuration dialog box to set up the trend.

Set Signal As Trigger specifies the selected signal as the trigger for real-time triggered mode trends.

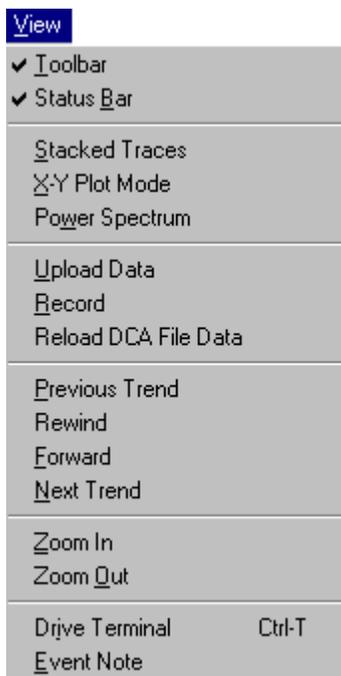**Move Signal Up** moves the signal up one position in the Signal View.

Move Signal Down moves the signal down one position in the Signal View.

Set As X Axis marks the chosen signals to be the X-axis for X-Y plots.

Edit Block invokes a detached block diagram view in a block-collected trend.

View Menu

The View menu allows you to view areas of the Trend Recorder as follows:

```
View
✔ Toolbar
✔ Status Bar

  Stacked Traces
  X-Y Plot Mode
  Power Spectrum

  Upload Data
  Record
  Reload DCA File Data

  Previous Trend
  Rewind
  Forward
  Next Trend

  Zoom In
  Zoom Out

  Drive Terminal      Ctrl-T
  Event Note
```

Toolbar controls whether the Trend Recorder toolbar displays.

Status Bar controls whether the Trend Recorder status bar displays.

Stacked Traces controls whether the Trend Recorder displays each signal trace in its own window (stacked mode) or in one signal graph view.

X-Y Plot Mode controls whether the X-axis of the Trend Recorder is based on the value of one of the signals that has been collected (X-Y plot mode) or based on time (normal mode).

Power Spectrum shows a spectral analysis of the trended data using a Fast Fourier Transform.

Upload Data causes the data collected by the collector block of a block-collected trend to be uploaded to the Trend Recorder.

Record starts and stops the Trend Recorder collecting data for a real-time trend.

Reload DCA File Data causes data to be re-read from a .dca file.

Previous Trend displays previously recorded data.

Rewind moves the current event back through the currently displayed trend by one-third of the currently displayed width of the time axis.

Forward moves the current event ahead by one-third of the currently displayed width of the time axis.

Next Trend is used to move through events and display the next recorded data.

Zoom In displays the area of the graph between replay cursors.

Zoom Out displays area of the graph to a maximum of three times current screen.

Drive Terminal invokes the drive terminal window.

Event Note invokes the note editor. A note can be added to each trend event (recording). Notes are displayed at the bottom of the page on printouts of trends.

Trend Recorder Settings

This document can apply to various controllers or drives, therefore the contents of the dialog boxes can vary according to your product.

➢ **To choose specific settings for a trend**

◆ From the **Options** menu, choose **Settings**, and click the **Trend Recorder** tab.

Click **Horizontal Grid Lines** to display horizontal grid lines when in Replay mode. Click **Vertical Grid Lines** to display vertical grid lines when in Replay mode.

Click **Right Vertical Axis** to display vertical axis on the right-hand side of the Trend Recorder.

Click here to automatically configure the Trend Recorder with predefined signals. (This feature currently only works with Innovation Series drives and when performing MarkVI I/O board calibrations.)

Click here to zoom in and out of the Trend Recorder, using the mouse to drag-and-drop a rectangle on the screen. Click here for a Yes/No confirmation prompt to display before the zoom takes place.
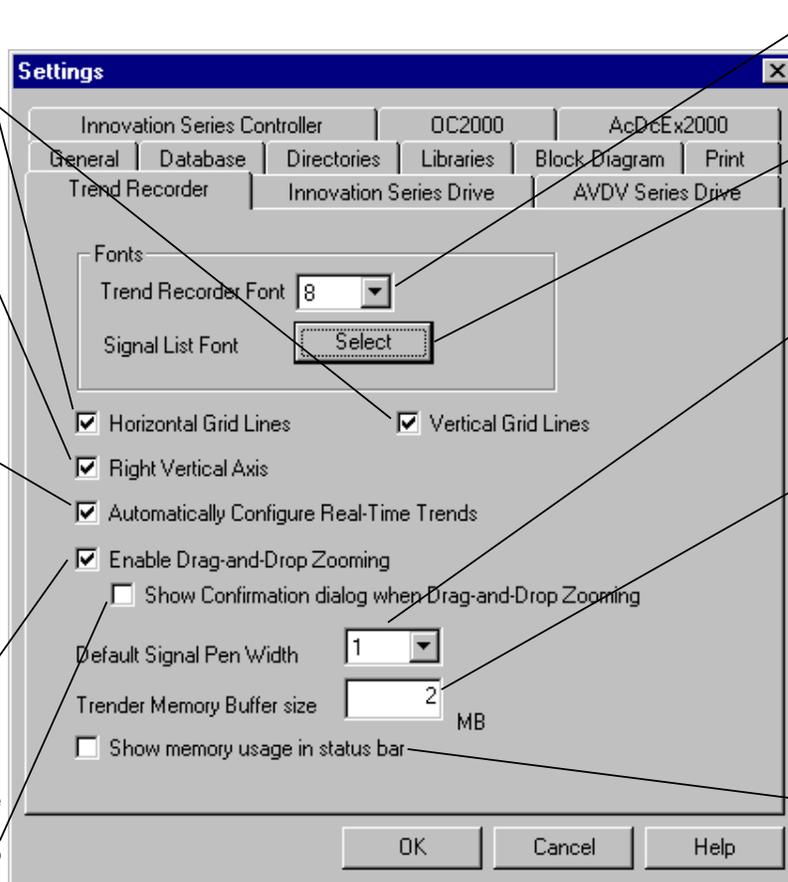
Select the font size to be used in the upper window of the Trend Recorder.

Set the font and size to be used in the lower window of the Trend Recorder.

Select the default pen width (measured in pixels) used to draw the signal traces.

This sets the amount of memory the toolbox reserves for storing traces. The default value of 2 MB allows 4 signals to be captured at 32 ms intervals for about 14 minutes before the oldest data is deleted. Click **Show memory usage in status bar** to show the amount of reserved memory that was used.

Settings

Innovation Series Controller		OC2000		AcDcEx2000
General	Database	Directories	Libraries	Block Diagram	Print
Trend Recorder		Innovation Series Drive		AVDV Series Drive

Fonts

Trend Recorder Font [8 ▼]

Signal List Font [Select]

☑ Horizontal Grid Lines   ☑ Vertical Grid Lines

☑ Right Vertical Axis

☑ Automatically Configure Real-Time Trends

☑ Enable Drag-and-Drop Zooming

☐ Show Confirmation dialog when Drag-and-Drop Zooming

Default Signal Pen Width [1 ▼]

Trender Memory Buffer size [2] MB

☐ Show memory usage in status bar

[OK]   [Cancel]   [Help]

Note While waiting for a trigger condition, the Trend Recorder displays and graphs the values of the signals. However, the values are not saved, and once they scroll off the left-hand side of the graph screen, they cannot be viewed.

Chapter 3 Types of Trends

Introduction

To set options for recording trends, refer to the section, Trend Recorder Settings.

This section provides instructions for using the toolbox to configure a Trend Recorder. There are four types of trend configurations:

- Real time
- Block collected
- Data Historian collected
- .dca files

Real-time Trends

Setting up a real-time trend includes:

- Selecting the signals to be trended
- Setting the scaling for both time and vertical axes
- Setting the record mode and sampling rate

Configuring the Trend

> ➢ **To set up the real-time trend**

> ◆ From the **Edit** menu, choose **Configure**. The **Trend Recorder Configuration** dialog box displays.

Real Time Trend Configuration

Select the **Real Time** tab to specify a live trend from the drive or controller

Save Mode allows you to specify whether to save just the setup for the trend or save the setup and all data that is collected. **Setup Only** saves all the signals, their scaling, the sample interval, axis ranges, and other setup data.

Continuous mode collects data until you stop recording. If the trace buffers fill up, the oldest one-eighth of the data in the buffer is deleted.

Triggered mode captures data based on a specific event. In this mode, the Trend Recorder watches the value of a designated trigger Boolean signal. You must specify whether to trigger based on this signal being True or on a value transition. You can also enter a time interval to collect data: **Pre-Trigger** (before the trigger) or **Post-Trigger** (after the trigger).

Choose a signal to use as the trigger. Or choose the trigger signal from the lower Signal View of the Trend Recorder window. Then, from the Edit menu, choose **Set Trigger Signal**. An asterisk displays beside the signal name, indicating that it is being used as the trigger. This option is only available when you are trending in a **Triggered** mode.

Sample Interval allows you to specify the sampling interval when you are real-time trending from a controller. Drives sample at the fastest rate possible.

Note If the Trend Recorder is left running in triggered record mode for an extended period, multiple events can be captured.

Continuous/Triggered Recording

The default size of this buffer is 2MB, which corresponds to approximately 16 minutes of data when sampling 4 signals at the fastest sampling rate (32 ms between samples).

Real-time trends can be recorded **continuously** or in a **triggered** mode through the Real-time Trending Record Mode in the **Trend Recorder Settings** dialog box, shown in the section, *Configuring the Trend*.

Continuous recording collects data until the trace buffer is full. The trace buffer is an internal buffer used to store data while recording and displaying traces. The size of the buffer is set using the **Trend Recorder Settings** dialog box. When the trace buffer is filled, the Trend Recorder will continue recording, deleting the oldest values as it adds new ones to the buffer.

Triggered recording collects data based on an external event. In this mode, the Trend Recorder watches a designated trigger signal. When the value of this signal satisfies the specified trigger condition, data is collected. The trigger signal must be a Boolean signal, and the Trend Recorder can be configured to trigger on the signal being True or on a change of value. Data is collected for a specified time interval before and after the trigger condition occurs. Once the data is collected, the Trend Recorder resumes watching the trigger signal for the next event. Each time data is collected, it is saved as a separate event within the trend file.

Tip ✄ *Refer to Chapter 5 for further information on events.*

➢ **To set the size of the Trend Recorder Buffer**

Increasing the value of this field also increases the amount of memory needed to run the toolbox.

1. From the **Options** menu, choose **Settings**.

2. Choose the **Trend Recorder** tab.

3. Change the value in the **Trender Memory Buffer size** text box. (Refer to the section, *Trend Recorder Settings.*)
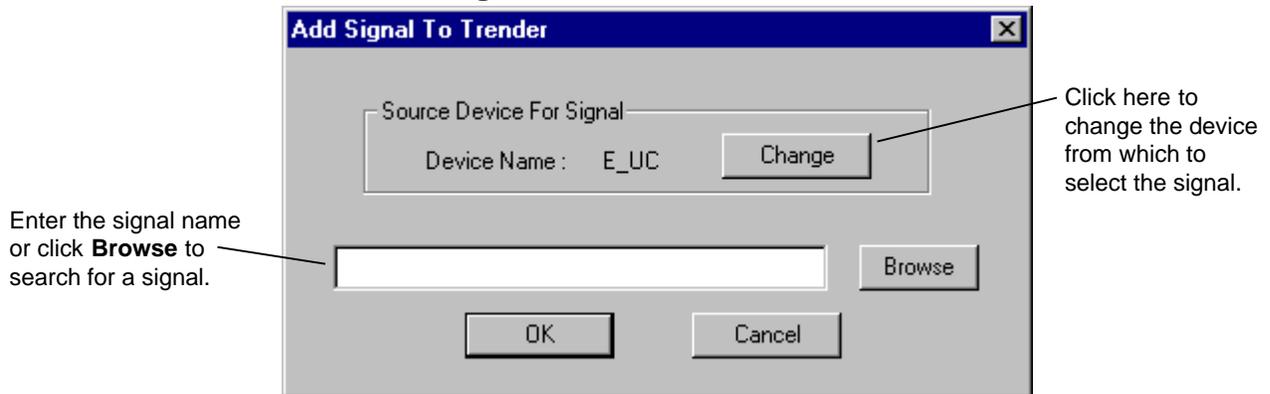
Adding Signals Using Menu

➤ **To add a signal**

Or click [+] *Add Signal*

◆ From the **Edit** menu, choose **Add Signal**. The **Add Signal To Trender** dialog box displays for you to enter the name of the signal.
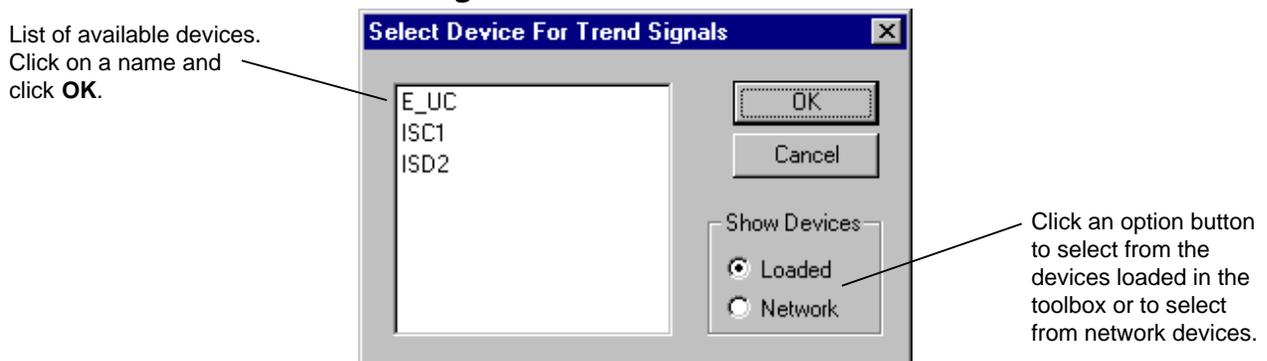
Note The first time this function is invoked, the **Select Device For Trend Signals** dialog box displays (shown in the section, *Change Device*). Choose the device from which to trend the signal.

Add Signal

Enter the signal name or click **Browse** to search for a signal.

Click here to change the device from which to select the signal.

Tip ✍ *When trending signals from an Innovation Series controller, if a signal is selected using the Signal Selector, it can be qualified using appropriate qualifiers as follows: The character (~), called a **tilde**, can be placed before Boolean signal to invert their sense. The character (#) can be placed before signals that are connected to I/O points to use the Signal Health bit and not the signal itself.*

Change Device

List of available devices. Click on a name and click **OK**.

Click an option button to select from the devices loaded in the toolbox or to select from network devices.

Adding Signals Using Drag-and-Drop

➢ To add a signal

The drag-and-drop feature allows you to trend automatically named signals from Innovation Series controllers and drives.

1. From the **Block Area/Summary View** (or **Detached Summary View**), click on a pin or a signal name in a block diagram.

2. *Drag* the signal (using the mouse) to the top view of the Trend Window and *drop* (release the mouse button). The **Trend Recorder Channel Configuration** dialog box displays.

When a signal is added to the Trend Recorder from a controller, the toolbox checks to see if the signal is an internal signal or an external DLAN+ signal. If it is an internal signal, token (address) information should exist in the device for the signal. This information is used to trend the signal.

If the signal is an external (DLAN+) signal, the toolbox attempts to find the signal in the SDB. If it finds the signal, it determines if the signal is available on the DLAN+ that the device is attached to. Then, the signal can be trended.

Note When a signal cannot be added or trending cannot be performed, an appropriate error message displays. Follow the instructions from the message box to correct the situation.

Once the signal is added to the trend, the range (upper and lower limits of Y-axis) and other properties related to the signal can be set in several ways (see the next section, *Editing Properties*).

Editing Properties

➢ To set the signal range and other properties

Click on the signal in the lower Signal View with the right mouse and choose Properties.

1. From the **lower Signal View**, click on the desired signal.

2. From the **Edit** menu, choose **Edit Selected Signal**. Or, double-click on the desired signal from the lower Signal View. The **Trend Recorder Channel Configuration** dialog box displays.

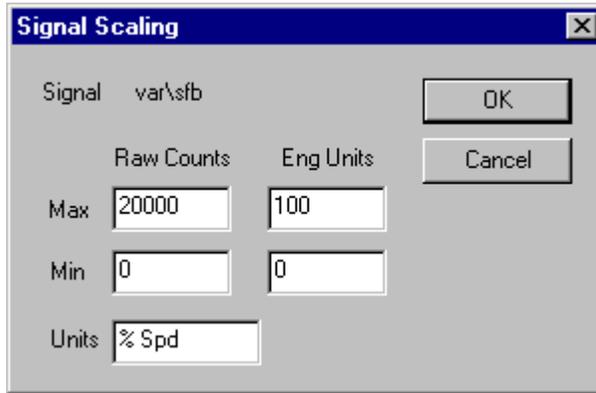### Channel Configuration Dialog Box

Sets the upper and lower limits of the Y-axis labels for the signal(s).

Allows you to change the color, line style, and line thickness of the pen used to outline the trace for the signal. A *trace* is a visible indication of the path of a signal.

Click to display the **Signal Scaling** dialog box to provide scaling for either an internal signal in a drive or an external DLAN+ signal in a controller. (See the next dialog box, *Signal Scaling*.)

Note If the line *width* is greater than one, only *solid style* is available.

Signal Scaling

If the signals being trended are internal signals (AcDcEx), the values defined allow signals to use engineering units instead of raw (count) values. If they are external signals (controller), these fields are grayed out and the scaling is defined in the database, and the dialog serves a display-only purpose.

Editing Signals

➢ **To remove a signal from the real-time trend**

1. From the **lower Signal View** of the Trend Recorder Window, click on the signal(s) to be removed. More than one signal can be removed at the same time by selecting multiple signals in the list.

2. From the **Edit** menu, choose **Remove Signal**.

➢ **To select which signal's range is displayed on axis**

1. From the **lower Signal View** of the **Trend Recorder Window**, choose the signal(s) you want to display on the axis.

2. From the **Edit** menu, choose either **Show on Left Axis** or **Show on Right Axis**. A check mark displays beside the selected signal.

– Or –

◆ Click on the labels for either the left or right axis. This will cycle through all the signals that are displayed on the graph.

The position of a signal in the signal list can be changed relative to other signals.

➢ **To change the position of a signal in the signal list**

1. From the **lower Signal View**, choose the signal(s) to be moved.

2. From the **Edit** menu, choose either **Move Signal Up** or **Move Signal Down**.

Signals in a list can also be hidden. If a signal is hidden, the data for that signal is still collected, but the signal is not displayed. For example, use this feature if a large number of signals are collected and only part of the data needs to be displayed.

➢ **To hide signals in the trend**

1. From the **lower Signal View** of the **Trend Recorder Window**, click the signal(s) you want to hide.

2. From the **Edit** menu, choose **Hide Signals**. (To redisplay hidden signals, choose **Show Signals**.)

Or click **–** *Remove Signal*

Click on the desired signal in the lower Signal View with the right mouse button. Choose either Left Axis or Right Axis (a check mark displays beside the selected signal).

Or use the right mouse button and click on the desired signal in the lower Signal View. From the pop-up menu, choose Move Up or Move Down.

Block Collected Trends

The Trend Recorder can upload and display data collected by blocks in the controller or drive. The Innovation Series controller and drive use the **Capture** block and the AcDcEx drive uses **Circular List** blocks (CLST1, CLST2, or CLST3) to collect data. The Capture and Circular List blocks must first be configured to capture data. Once the blocks are configured, the Trend Recorder is set up to access data from these blocks.

Configuring the Trend

> **To set up the block-collected trend**

1. From the **Edit** menu, choose **Configure**. The **Trend Recorder Configuration** dialog box displays.

2. From the **Trend Type** option buttons, choose **Block Collected**. If you have more than one controller or drive open in the toolbox, you will be prompted to select one.

The dialog box changes to the Block Collected Trend Configuration.

Block Collected Trend Configuration

Select the **Block Collected** tab to specify a trend based on uploaded data from the drive or controller.

Save Mode allows you to specify whether to save just the setup for the trend or save the setup and all data that is collected. **Setup Only** saves all the signals, their scaling, the sample interval, axis ranges, and other setup data.

A Capture Buffer is specified by the name of the signal that is attached to the status output pin of the block (and is only used if the Trend Recorder is attached to a controller). Click the **Browse** button to choose which block to upload data from.

If the Trend Recorder is attached to a drive, the Capture Buffer text box and Browse button are disabled.

Enables automatic upload of data from the block. In this mode, the toolbox watches the status of the block collector and initiates an upload every time the block finishes collecting.

Note There can be more than one Capture Buffer block in a controller. There can only be one Circular List block in an AcDcEx device and only one Capture Buffer block in an Innovation Series drive.

The toolbox automatically configures the Trend Recorder to use the signals on the collector block (Capture Buffer or Circular List) configuration in the current device. Signals cannot be added or removed from a block-collected trend; the configuration of the block must be changed. All other operations on signals defined for real-time trending can be performed.

➢ **To modify the block configuration**

Or click 🔲 *Edit Block*

1. From the **Edit** menu, choose **Edit Block**.

2. Modify the block as desired.

Tip ✥ *(Refer to Chapter 4 of the relevant device manual for editing blocks.)*

Uploading Data

➢ **To view data from the collector block**

Or click ⬆ *Upload*

◆ From the **View** menu, choose **Upload Data**.

If the trend is configured to automatically upload collected data, the toolbox monitors the status signal of the collector block and initiates an upload every time the block finishes a collection. While in this mode, the **Automatic Collector Block Upload** dialog displays:

Upload Data

Click **Stop** to stop automatic upload. The last event uploaded displays on the graph.

Automatic Collector Block Upload

Uploaded 2 events.

Stop
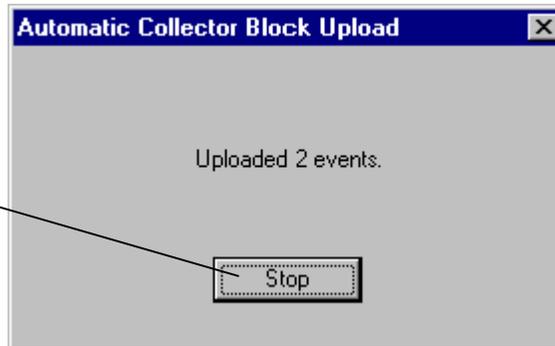
Note If the trend is configured for manual upload of captured data, a one-time upload will be initiated when the **Upload** button is selected. When the upload is complete, the data displays on the graph.

Data Historian Trends

The Trend Recorder can upload and display data collected by the Data Historian. The Data Historian is a service on a Windows NT platform. It can collect data continuously or upload Capture Buffers from a controller. The Data Historian configuration groups signals into collections. There are two types of collections: r**eal-time continuous** or **Capture Buffer uploaded**. Collected data for each collection is stored in .dca format files.

Configuring the Trend

➢ **To set up a Data Historian trend**

1. From the **Edit** menu, choose **Configure**. The **Trend Recorder Configuration** dialog box displays.

2. From the **Trend Type** option buttons, choose **Data Historian**. The Data Historian Trend Configuration dialog box displays.

Data Historian Trend Configuration

Select the **Data Historian** tab to specify a trend based on data collected by the Data Historian.

Save Mode allows you to specify whether to save just the setup for the trend or save the setup and all data that is collected. **Setup Only** saves all the signals, their scaling, the sample interval, axis ranges, and other setup data.

Enter the Microsoft Networking name for the PC that is the host for the Data Historian service.

Select the mode of the X-Y plot. For a detailed description of X-Y plots, refer to the section, *X-Y Plots*, in Chapter 5, *Viewing Trends*.
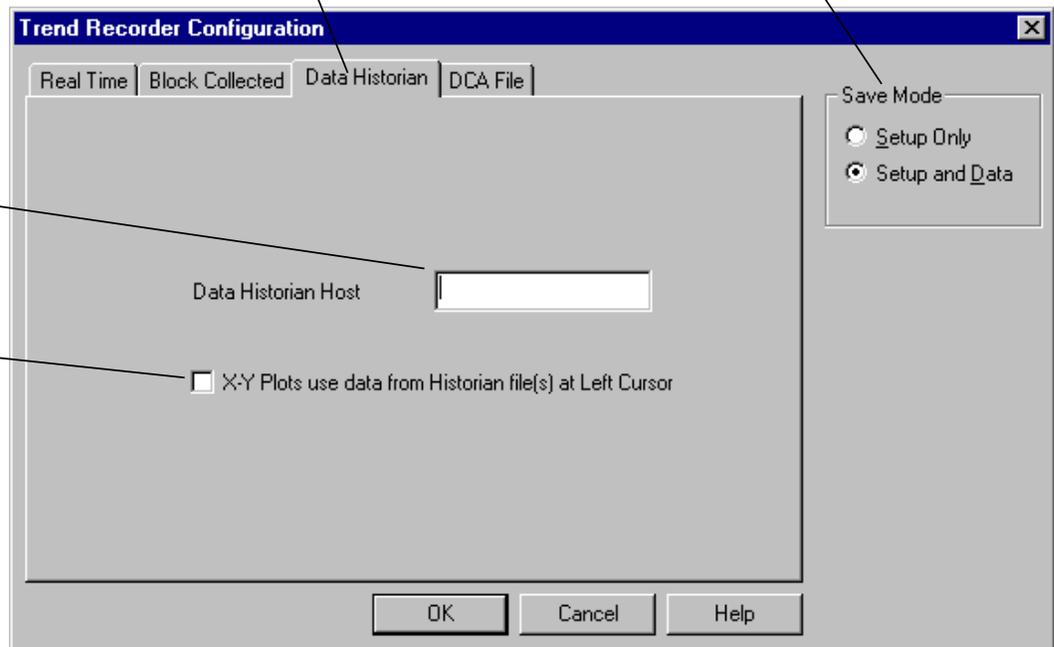
Click **OK**, and add signals to the Data Historian collection. (Refer to the section, *Adding Signals*.)

Adding Signals

> ➢ **To add signals to the Data Historian trend**

Or click [+] *Add Signal*

◆ From the **Edit** menu, choose **Add Signal**. The **Data Historian Signal Selection** dialog box displays the following two choices for choosing signals.

Pick from Signal List displays signals using the normal **Signal Selector** dialog box.

Pick from Collection List displays a list of signals from a specified collection. First, choose a collection. Then, choose a signal.

Data Historian Signal Selection

Select how you wish to choose signals to trend from the Data Historian

⦿ Pick from Signal List

○ Pick from Collection List

[OK]   [Cancel]

Choosing Signals From a Collection

Select Data Historian Signals

Select signals from collection UC23_NT

Choose a signal from the collection. Multiple signals can be chosen from this list.

Motor1\SineWave
Motor1\Triangle

[OK]   [Cancel]
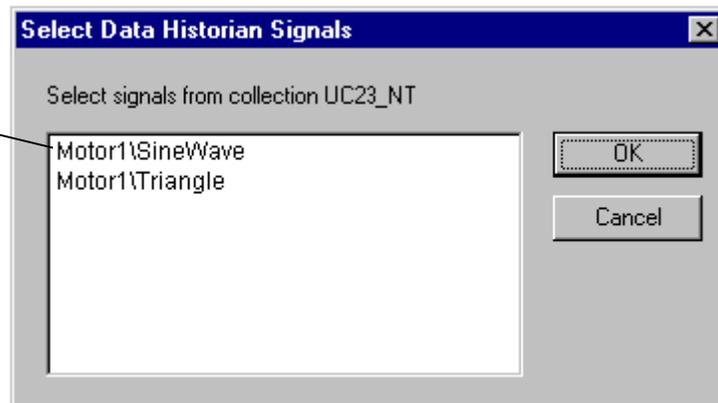
If signals are added to the trend from more than one device, the lower Signal View displays the name of the device before the name of the signal as follows:

uc1::m\ary
ISC1::mod1\sigout
E_UC::E_PLC\E_PL1

After all the signals are added, the trend recorder reads data from the Data Historian host and graphs the data (refer to the section, *Recording Trends,* in Chapter 4*).* Signal settings can be edited the same as for real-time trends.

.dca File Trends

The Trend Recorder can read data from data collection analysis (.dca) files. These files provide a standard format for storing data. The files can be written by many different software applications.

Configuring the Trend

> **To set up a .dca file trend**

1. From the **Edit** menu, choose **Configure**. The **Trend Recorder Configuration** dialog box displays.

2. From the **Trend Type** option buttons, choose **DCA Files**. The .dca File-Based Trend Configuration dialog box displays.

.dca File Trend Configuration

Select the **DCA File** tab to specify a trend based on data stored in DCA files.

Save Mode allows you to specify whether to save just the setup for the trend or save the setup and all data that is collected. **Setup Only** saves all the signals, their scaling, the sample interval, axis ranges, and other setup data.
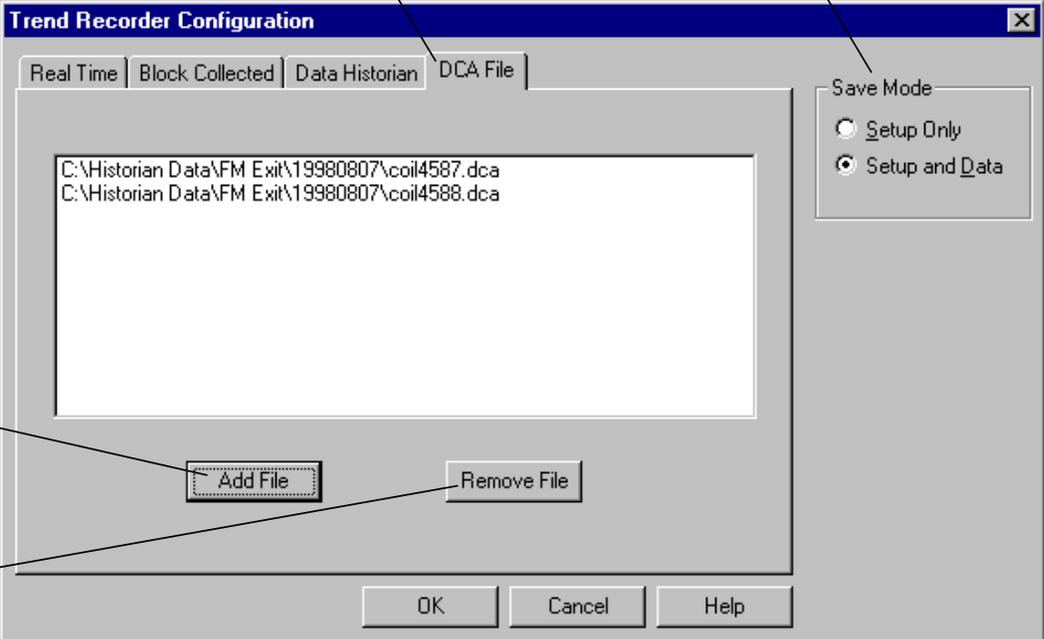
Click here to add a .dca file to the trend. Type the name of the file in the **DCA File** dialog text box, or use the drop-down list to choose a file.

Click here to remove files from the trend.

Trend Recorder Configuration

Real Time | Block Collected | Data Historian | DCA File

C:\Historian Data\FM Exit\19980807\coil4587.dca
C:\Historian Data\FM Exit\19980807\coil4588.dca

Save Mode
○ Setup Only
● Setup and Data

Add File   Remove File

OK   Cancel   Help

To view the trends, refer to Chapter 5, Viewing Trends.

Click **OK**. The file list is read and a trend is generated from the data contained in the files. (See the section, *Recording Trends*, in Chapter 4.)

Notes

Chapter 4 Using the Trend Recorder

Introduction

The following sections describe how to record, save, export, and print a trend. Once recorded, the displayed trend can be viewed on the screen just as it would be printed, or you can choose to print a hard copy.

Recording Trends

After you have added the signals to the trend, you must record the data to view the trend on the graph.

➢ **To record the trend**

Or click ![icon] *Record*

◆ From the **View** Menu, choose **Record**.

Or click ![icon] *Auto Range Vertical Axis*

When you want to stop recording, choose **Record** again from the View menu, or click the **Record** button again.

If the data cannot be viewed within the range you selected, you can either modify the range using the **Channel Configuration** dialog box (refer to the section, *Editing Properties*), or by choosing **Auto Range Vert. Axis** from the Edit menu.

Saving Trends

Trends can be saved to files for later replay and analysis. The files have the extension **.trn**. If the trend is attached to a device when saved, the trend defaults to the *Trends* sub-directory, under the directory of the device being trended. If the trend is not attached to a device, such as a Data Historian collected or .dca file trend, the trend defaults to the current working directory.

If you want to save just the setup that was recorded, this option must be chosen in the **Trend Recorder Configuration** dialog box under **Save Mode**. (See the section, *Configuring the Trend*.) The default for the Save Mode is **Setup and Data**. If you save the setup and data, each data event is saved to files of the same name with extensions starting at .000 and increasing.

➢ **To save the trend**

1. From the **Edit** menu, choose **Configure**.

2. From the **Trend Recorder Configuration** dialog box, choose the desired **Save Mode** and click **OK**.

3. From the **File** menu, choose **Save** or **Save As**.

➢ **To open a previously saved trend**

◆ From the **File** menu, choose **Open**. Choose the device directory and then the *Trends* sub-directory. Use the filename with the **.trn** extension.

Exporting Trends to .csv Files

Trends can be exported to a comma separated variable (.csv) file. Then, this text file can be imported by spreadsheets, such as Microsoft Excel or other applications.

➢ **To export a trend**

The default options are standard .csv format and should only be changed if you have special format requirements.

1. Open the trend you want to export in the **Trend Recorder**.

2. From the **File** menu, choose **Export Trend Data**. The **Trender Export Data Options** dialog box displays.

3. Choose a new format for the output file, if needed. (Refer to the next section, *Trender Export Data Options.*)

4. Enter a filename for the .csv file.

Trender Export Data Options

Check to make the first line of the file contain the name of each signal in the trend.

Check to make the first column of the exported file contain the date and time for each sample set of exported data.

Check to make the first column of exported data a sample sequence number.

Check to export just the data between the two replay cursors in the current trend event.

Change the delimiting character to something other than the default, which is a comma.

Set the text that will be written to the file when there is no value for a particular signal in a given sample set. The default is a blank space.

Trender Export Data Options

☑ Column Headers   Delimiting Character: [,]

☑ Time Stamps   No Data Text [   ]

☐ Sequence Numbers

☐ Between Cursors

[OK]   [Cancel]

Printing Trends

The currently displayed trend can be printed or print previewed.

➢ **To print a trend**

◆ From the **File** menu, choose **Print** (to produce a hard copy).

– **Or** –

◆ From the **File** menu, choose **Print Preview** (to view the trend on the screen as it would be printed).

Chapter 5 Viewing Trends

Introduction

An event is a set of data recorded without interruption.

When the Trend Recorder is not recording or uploading data, it is in replay mode. In replay mode there can be multiple events stored in the trend.

- For **real-time continuous** recording, there is an event each time the *Record* mode is chosen.

- For **real-time triggered** recording, there is an event each time the trigger condition is satisfied.

- For **block-collected** recording, there is an event for every upload that occurs.

- In **Data Historian** and **.dca file** trends, all data is maintained in a single continuous event (only one event).
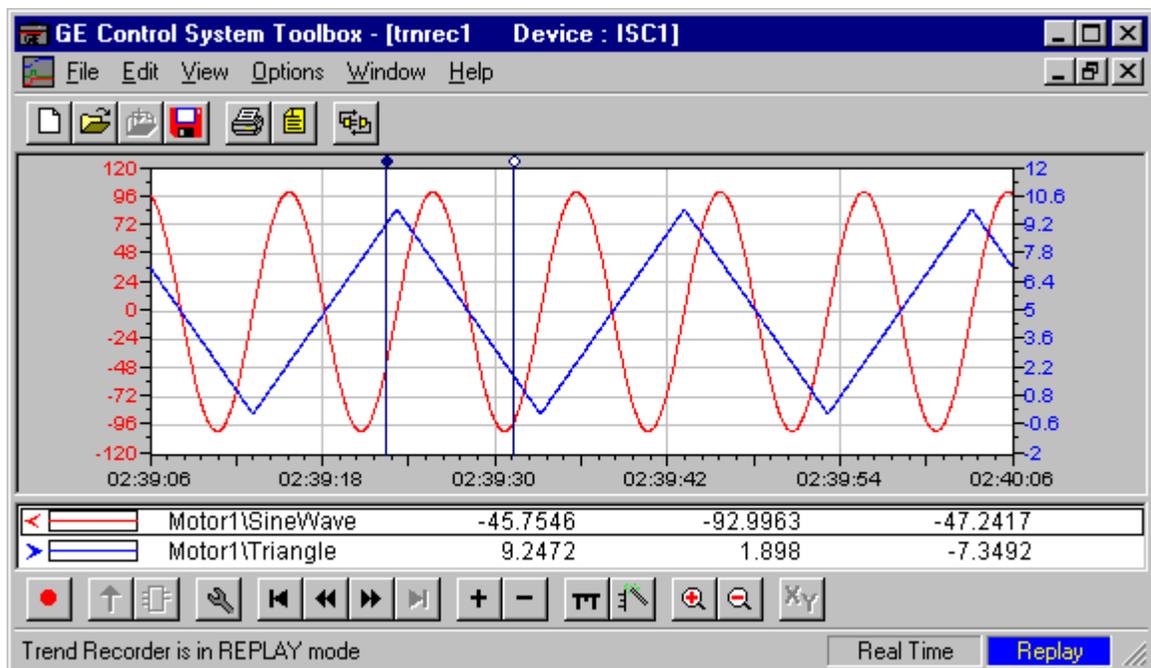
Moving Between Events

➢ To access other events

◆   From the toolbar, click [H◄] to view the next event.

– Or –

◆   From the toolbar, click [►H] to view the previously displayed event.

Note When you move between events, the Status bar shows which event is currently displayed.

➢ To move backward or forward within an event

◆   From the toolbar, click [◄◄] or [►►]. These buttons move back or forward within the current event by one-third of the currently displayed width of the time axis.

Changing The Time Axis

The range of the time axis can be changed by using the **Trender Time Axis** dialog box, **or** see the section, *Zoom In/Zoom Out*.

➢ To edit the time axis

◆   From the **Edit** menu, choose **Time Axis**. The **Trender Time Axis** dialog box displays. This dialog box varies depending on the type of trend.
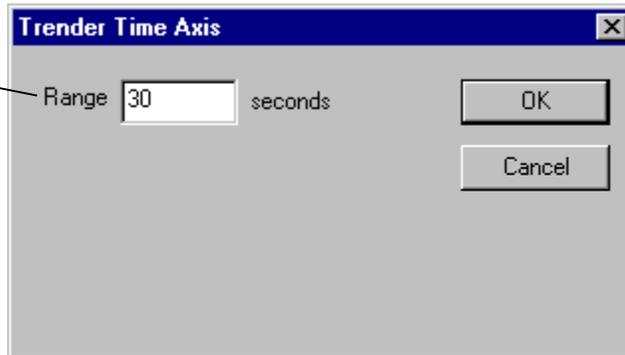
Real-time and **block-collected** trends require a single range in seconds.

Data Historian and **.dca file** trends allow you to set Start and End dates and times. (Refer to the section, *Data Historian/.dca Time Axis.*)
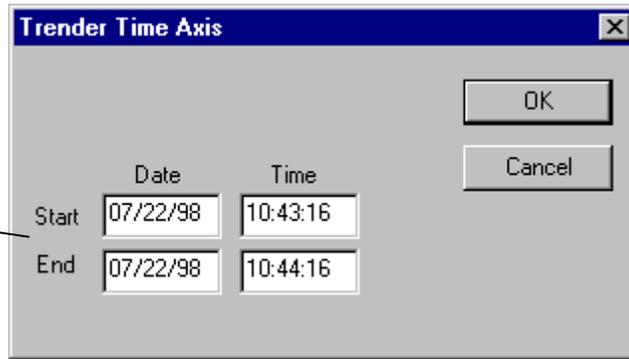
Trender Time Axis

Real-Time/Block-Collected Trends

Real-time and block-collected trends require a single range in seconds for the time axis.
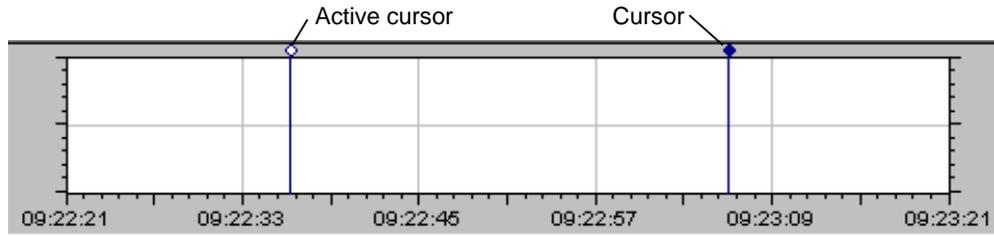
Data Historian/.dca File-based Trends

Data Historian and .dca file-based trends allow you to set **Start** and **End** dates and times for the time axis.

Using the Replay Cursors

Replay mode has two moveable cursors: a left cursor and a right cursor. The active cursor displays white and can be moved using the mouse or arrow keys on the keyboard.

➢ To move a cursor using the mouse

1. Place the mouse pointer at the top of the cursor and click. The cursor turns white to indicate it is active.

2. With the mouse pointer at the top of the cursor, press and hold the left mouse button and drag the cursor right or left to the desired position.

➢ To move a cursor using the arrow keys

1. The active cursor is white. Press the Tab key to toggle the active state of the cursors, and select the desired cursor.

2. Press and hold the right or left arrow key to move the cursor to the desired position.

To move the cursor faster, press and hold the Shift key as you press the arrow key.

If the cursor is placed exactly on one sample, the value will have an asterisk beside it.

As the cursor is moved, its values are displayed on the Status bar as follows:

- Left value is the value of the left cursor

- Middle value is the value of the right cursor

- Right value displays the difference between the two cursors

Note The Status bar also indicates the time of each of the cursors and the difference between the times.

Zoom In/ Zoom Out

When the Trend Recorder is in Replay mode, you can zoom in and zoom out of the trend.

> **To zoom in on the trend**

Or click [🔍] Zoom In

◆ From the **View** menu, choose **Zoom In**. The view of the trend zooms in to the area between the cursors. The cursors are repositioned to be at the left and right edges of the displayed area. The range of the vertical axis does not change.

– **Or** –

Place the mouse pointer at the top left corner of the area to you want to zoom in. Click and hold the left mouse button, then drag the pointer to the bottom right corner of the area.

> **To zoom out of the trend**

Or click [🔍] Zoom Out

◆ From the **View** menu, choose **Zoom Out**. The view of the trend zooms out to three times the width and height currently being displayed. Zoom Out stops when the width and height reach their original values.

– **Or** –

Place the mouse pointer at the bottom right corner of the area to you want to zoom out. Click and hold the left mouse button, then drag the pointer to the top left corner of the area.
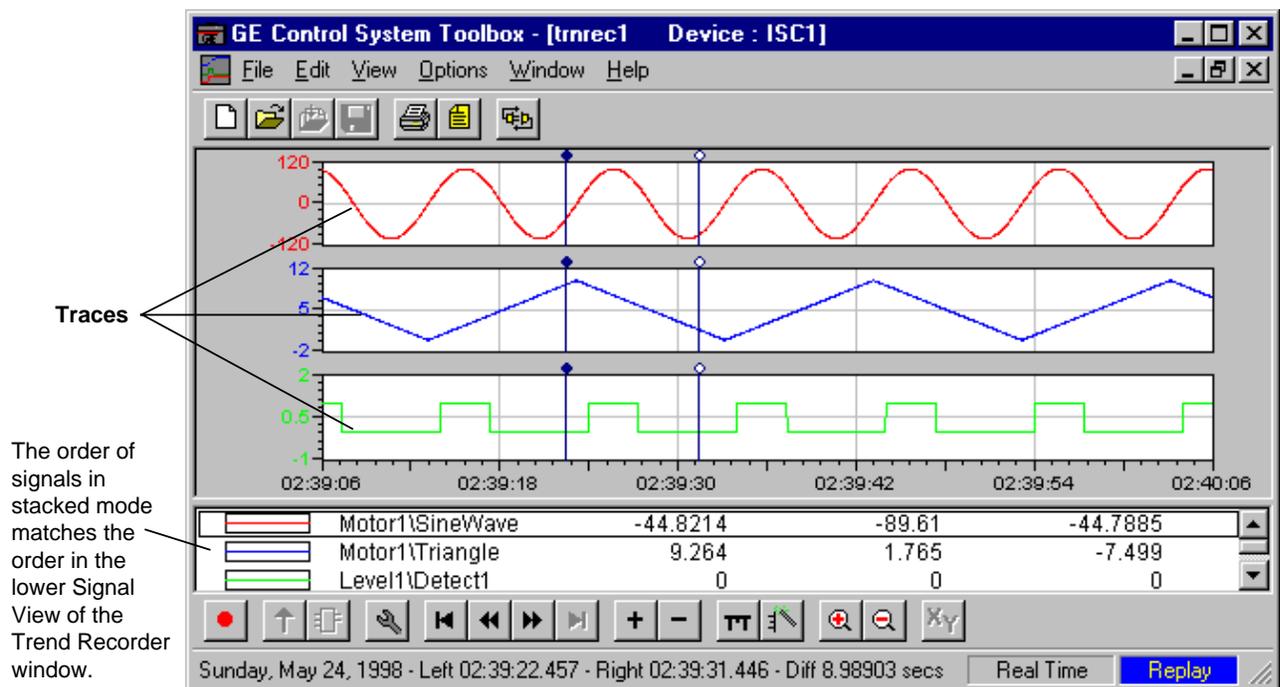
Stacked Signal Traces

A trace is a visible path of a signal.

In the default view for displaying graphs, all traces are on one common graph (shown below). To view each trace separately, place the Trend Recorder in *stacked view* as follows:

Traces

The order of signals in stacked mode matches the order in the lower Signal View of the Trend Recorder window.

➢ **To view Stacked Traces**

◆ From the **View** menu, choose **Stacked Traces**. A check mark (✓) displays beside the command when in stacked mode.

The order of signals in stacked mode matches the order in the lower Signal View of the Trend Recorder window.

If there are too many traces in one graph to display every signal in stacked view, the Trend Recorder automatically returns to normal view. To adjust the number of signal traces in a view:

Click 🔲 *to maximize screen.*

• Maximize the size of the screen.

• *Or*, remove signal(s) from the list in the lower Signal View. (From the **Edit** menu, choose **Remove Signal**.)

• *Or*, choose a smaller screen font size. (From the **Options** menu, choose **Settings**, then choose the tab **Trending**.)

➢ **To change the position of a signal in a stacked trace**

1. From the **lower Signal View**, click on the signal(s) to move.

2. From the **Edit** menu, choose either **Move Signal Up** or **Move Signal Down**.

– Or –

1. Click on the desired signal with the right mouse button.

2. From the pop-up menu, choose **Move Up** or **Move Down**.

Auto-Ranging the Displayed Data

The auto-range function examines the range of values for each signal in the time range currently displayed on the Trend Recorder. The range of each signal is then adjusted to display the graph using as much of the display area as possible.

Or click 📐 *Auto Range Vertical Axis*

➢ **To auto-range the displayed data**

◆ From the **Edit** menu, choose **Auto Range Vert. Axis**.

X-Y Plots

The Trend Recorder can convert plots of data that have been recorded in real time and re-plot the data where one (or more) of the variables in the trended set is designated as the X-axis. X-Y plots are normally created using the data between the replay cursors.

There are two modes of X-Y plots: *Between Cursors*, which is the normal mode, and *At Left Cursor*.

Between Cursor mode plots the values that are between the two cursors against the designated X-axis. This mode of X-Y plots is available for all types of trends.

At Left Cursor mode is available only for Data Historian collected trends. In this mode, the X-Y plot is generated using the entire data set in the individual .dca data file(s) that contain the sample time currently at the left cursor. This would typically be used to do an X-Y plot of all the data for an individual unit of a batch manufacturing operation, where data for each unit in the batch is collected in its own .dca file.

The value increases or decreases, but not both.

The signal used as the X-axis must have a monotonically changing value over the time span that data is to be plotted.

➢ **To create an X-Y Plot using a single X-axis signal**

1. Obtain a plot of data using any of the methods of collecting data.

2. Choose one of the signals to be the X-axis. Click on the signal in the **lower Signal View** of the Trend Recorder.

3. From the **Edit** menu, choose **Set As X Axis**.

4. Position the replay cursors to the start and end times of the data to plot in X-Y mode.

Or click ![XY] *X-Y Plot Mode*

5. From the **View** menu, choose **X-Y Plot Mode**.

6. Repeat step 5 to return to time-based mode.

➢ **To generate an X-Y Plot using multiple X-axis signals**

Plots using multiple signals for the X-axis can be used when there is a Data Historian collected trend and that trend contains data from multiple collections. One signal from each collection can be specified as an X-axis. All the other signals from that collection are plotted against the values of that signal.

1. Obtain a plot of data using any of the methods of collecting data.

2. Choose the signals to use for the X-axis. Click on multiple signals (Shift/click and Ctrl/click) in the lower Signal View of the Trend Recorder.

3. Position the replay cursors to the start and end times of the data to plot in X-Y mode.

Or click ![XY] *X-Y Plot Mode*

4. From the **View** menu, choose **X-Y Plot Mode**.

5. Repeat step 4 to return to time-based mode.

➢ **To generate an X-Y plot using all the data from .dca files**

An X-Y plot for all the data can also be obtained in an individual event file. This function works only with Data Historian collected trends and is most commonly used with Capture Buffer collections.

1. From the **Edit** menu, choose **Configure**.

2. From the **X-Y Plot Mode** options, choose **At Left Cursor**.

3. Obtain a plot of data in time-based mode using any of the methods of collecting data.

4. Choose the signals to use for the X-axis. Click on multiple signals (Shift/click and Ctrl/click) in the lower Signal View of the Trend Recorder.

5. Position the left cursor somewhere in the middle of the data event that you wish to plot in X-Y mode.

Or click ![XY] *X-Y Plot Mode*

6. From the **View** menu, choose **X-Y Plot Mode**.

7. Repeat step 6 to return to time-based mode.

Power Spectrum

The Trend Recorder can perform a spectral analysis on plots of real-time data and display the power spectrum of the recorded data. The Trend Recorder uses a Fast Fourier Transform (FFT) to convert the data from the time domain to the frequency domain. Power spectrum plots may be obtained from any trend but are most reliable with data obtained using a block-collected trend. Power spectra of data collected using real-time trending, especially of data coming across networks, should be regarded as unreliable.

➢ **To create a Power Spectrum plot**

1. Obtain a plot of data using any of the types of collecting data.

   Best results will be obtained when data is collected using block-collected trends with the capture block configured to collect a number of samples that is a power of 2 (512, 1024, 2048, etc.). The more samples collected, the better the resolution of the power spectrum.

2. From the **View** menu, choose **Power Spectrum**.

The **FFT Options** dialog box displays.

FFT Options

Select the window function to use with the data. (Refer to the note below.)

Select how many additional powers of 2 the data is padded with 0 values.
The Fast Fourier Transform algorithm requires a data set where the number of samples is a power of 2. Increasing the padding beyond the nearest power of 2 increases the apparent resolution of the power spectrum.
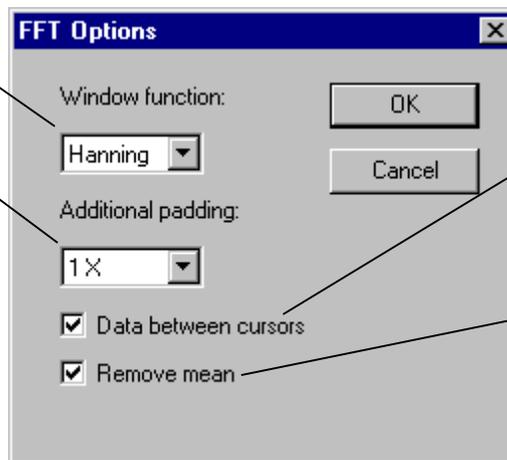
Check for the power spectra analysis to be performed on the data between the two cursors, instead of on the entire set of data contained in the current event being trended.

Check to remove any DC component of the power spectrum that could distort the appearance of the spectrum near 0 Hz.

FFT Options

Window function:

Hanning

Additional padding:

1X

☑ Data between cursors

☑ Remove mean

OK

Cancel

Note A variety of windowing functions (such as Hanning, Hamming, Bartlet, Welch, and others) are available to minimize phenomena associated with the discrete time-window nature of the collected data. Refer to other signal processing theory textbooks for explanations of the theory of operation of Fast Fourier Transforms, such as *Introduction to Communication Systems*, Ferrel G. Stremler; *Electrical Noise*, W. R. Bennett; *Circuits and Systems: A Modern Approach*, A. Papoulis.

Notes

Glossary of Terms

AcDcEx

Refers to ac drives (AC2000), dc drives (DC2000), and exciters (EX2000) devices, which are all referenced in the combined device type name. These three devices can use the same application control boards and devices in the toolbox.

automatically named signals

Signals that are created as a result of inserting some item of blockware other than a Signal Definition. One or more regions of such signals is of the form }00123.

bit

Binary Digit. The smallest unit of memory. It can be used to store only one piece of information that has two states, such as One/Zero, On/Off, Good/Bad, or Yes/No. Data that requires more than two states, such as numerical values of 000 to 999, requires multiple bits (see Word).

block

A unit of information that is processed or transferred. These elemental units exist in the runtime. The toolbox receives a description of the blocks from the block libraries.

blockware

Software that is composed of blocks. (See block.)

board

Printed wiring board.

Boolean

Digital statement that expresses a condition that is either True or False. In the toolbox, it is a data type for logical signals.

configure

To select specific options, either by setting the location of hardware jumpers or loading software parameters into memory.

device

A configurable element of a process control system.

DLAN+

GE Industrial Control Systems' LAN protocol, using an ARCNET controller chip with modified ARCNET drivers. A communications link between exciters, drives, and controllers, featuring a maximum of 255 drops with transmissions at 2.5MBps.

event

A property of Status_S signals that causes a task to execute when the value of the signal changes.

font

One complete collection of letters, punctuation marks, numbers, and special characters with a consistent and identifiable typeface, weight, posture, and size.

function

The highest level of the blockware hierarchy and the entity that corresponds to a single tree file.

health

A term that defines whether a signal is functioning as expected.

I/O

Input/output. Interfaces that allow the flow of data into and out of a device.

insert

Adding an item either below or next to another item in a configuration, as it is viewed in the Outline View of the toolbox.

logical

Statement of a true sense, such as a Boolean.

pin

Block, macro, or module parameters that creates a signal used to make interconnections.

real time

Immediate response. It refers to process control and embedded systems, and fast transaction processing systems that must respond instantly to changing conditions.

sample set

The set of values taken when signals are being trended together with the Trend Recorder.

sampling rate

The period that values are collected to put in a sample set.

service

Functionality derived from a particular software program. For example, the Data Historian service transmits and provides conversion of data in the SDB.

signal

The basic unit for variable information. Signals are the place holders for memory locations in the toolbox's different platforms.

Status_S

GE proprietary communications protocol that provides a way of commanding and presenting the necessary control, configuration, and feedback data for a device. The protocol over DLAN+ is Status_S. It can send directed, group, or broadcast.

task

Part of a Module that contains Blocks and Macros. Its scheduling is a function of its Modules base scheduling rate.

toolbox

A Windows-based software package used to configure controllers and OC2000 and drive devices.

trend

A time-based plot to show the history of values.

Trend Recorder

A subsystem of the toolbox that monitors and graphs signal values from a controller or drive device.

Windows NT

Windows New Technology. Advanced 32-bit operating system from Microsoft for 386s and above. It runs NT-specific applications, as well as those written for DOS, Windows 3.x (16- and 32-bit), OS/2 character mode (non-graphical), and POSIX. NT does not use DOS; it is a self-contained operating system.

Problem Report

General Electric Company

Name	Telephone Number
Company Name	Fax Number
Address	Job Site
	GE Requisition Number

Name of Product:

Description of PC Hardware:

Brand	Processor Type	Processor Speed (MHz)
	O 486 O Pentium O Other	

Description of PC Software

Version (see <u>H</u>elp, About Toolbox)	Windows NT Version	Amount of Memory

Problem Description (Describe problem thoroughly. Include sequence leading up to problem. If the program experienced a runtime error, attach a printout of the error.log file contained in the tools directory).

Detach, fold, and mail − or fax this side only.

**Place
stamp
here**

_____

_____

_____

_____

GE Motors & Industrial Systems

Product Service, Room 191
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA

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General Rating

	Excellent	Good	Fair	Poor	Additional Comments
Contents	○	○	○	○	_____
Organization	○	○	○	○	_____
Technical Accuracy	○	○	○	○	_____
Clarity	○	○	○	○	_____
Completeness	○	○	○	○	_____
Drawings / Figures	○	○	○	○	_____
Tables	○	○	○	○	_____
Referencing	○	○	○	○	_____
Readability	○	○	○	○	_____

Specific Suggestions *(Corrections, information that could be expanded on, and such.)*

Page No.   **Comments**

_____   _____

_____   _____

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_____   _____

Other Comments *(What you like, what could be added, how to improve, and such.)* _____

_____

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Overall grade *(Compared to publications from other manufacturers of similar products, how do you rate this publication?)*

○ Superior   ○ Comparable   ○ Inferior   ○ Do not know   Comment _____

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