LESSON 5

DATA COLLECTION AND HISTORIC DISPLAYS

This chapter describes how to set up data loggers for your application to collect data, and how to configure the historic display objects to display the collected data.

12.1. Data Logger

A data logger can collect and store the values of a data block. You can specify what data block you want to log, determine the frequency of data sampling, choose the type of memory to save the logged data, and specify how to save the logged data to files.

You can create up to 16 data loggers for your application. The maximum size of the data block that can be sampled by a data logger is 128 words.

You can use the function button to request the panel to clear logged data, or save/load logged data (.ldf/.txt file).
To know how to define a function button, please see Section 5.4.1 Basic Operations of function buttons.

To create a data logger, you may do one of the following:

1) In the Project Manager tool window, right-click the Data Loggers node of the concerned panel application and select Add Data Logger.
2) In the menu bar, click Panel to bring up the Panel sub-menu. Click Data Logger in the Panel sub-menu to bring up the Data Logger pop-up menu. Select Add in the pop-up menu.

12.1.1. Settings

You can set up a data logger with the Data Logger dialog box. There are two ways to open the dialog box of a data logger:

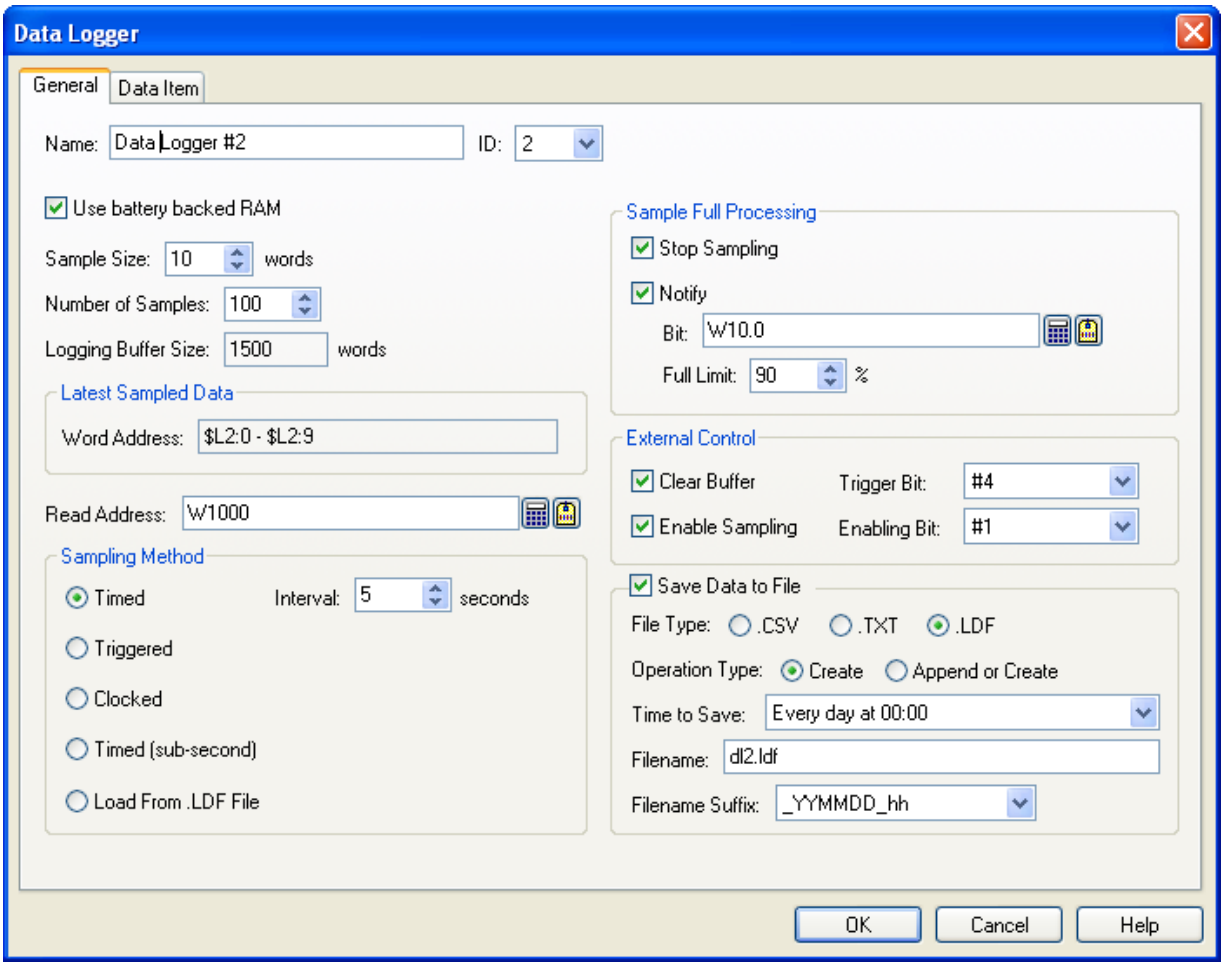
1) In the Project Manager window, right-click the node of the desired data logger and select Properties.
2) In the menu bar, click Panel to bring up the Panel sub-menu. Click Data Logger in the Panel sub-menu to bring up the Data Logger pop-up menu. Select Properties in the pop-up menu to bring up the data logger list of the current panel application. Select the data logger in the list.

The Data Logger dialog box contains the following two pages:

- **General**
  Described in Section 12.1.2.
- **Data Item**
  Described in Section 12.1.3.

12.1.2. General Settings

Use the General page to define the general settings for a data logger. The following is an example of the General page.



The table below describes each property in the General page.

Property		Description
Name		The data logger's name. The maximum length of the name is 48 characters.
ID		The data logger's ID number. Select a number between 1 and 16. The number is unique among all data loggers of the panel application.
Use battery backed RAM		Check this option so the logging buffer of the data logger will be located in the battery backed RAM. The logged data will not be lost after power down if the battery backed RAM is used as the logging buffer. If this option is not selected, the logging buffer will be located in an ordinary RAM, and the data logger will clear the logging buffer whenever the target panel is powered up.
Sample Size		The size of the data to be sampled. The unit is word.
Number of Samples		Specifies the maximum number of samples that the logging buffer of the data logger can hold.
Logging Buffer Size		The size of the logging buffer. The unit is word. The formula to calculate the size is: Logging Buffer Size = Number of Samples * (Sample Size + 5)
Latest Sampled Data	Word Address	You can use the addresses shown here to refer to the latest sampled data of the data logger for configuring screen objects and writing macros.
Read Address		Specifies the variable representing the data block to be sampled. Click to enter an address for this field. Click to select a tag for this field. The size of the data block is specified in the Sample Size field.

Continued

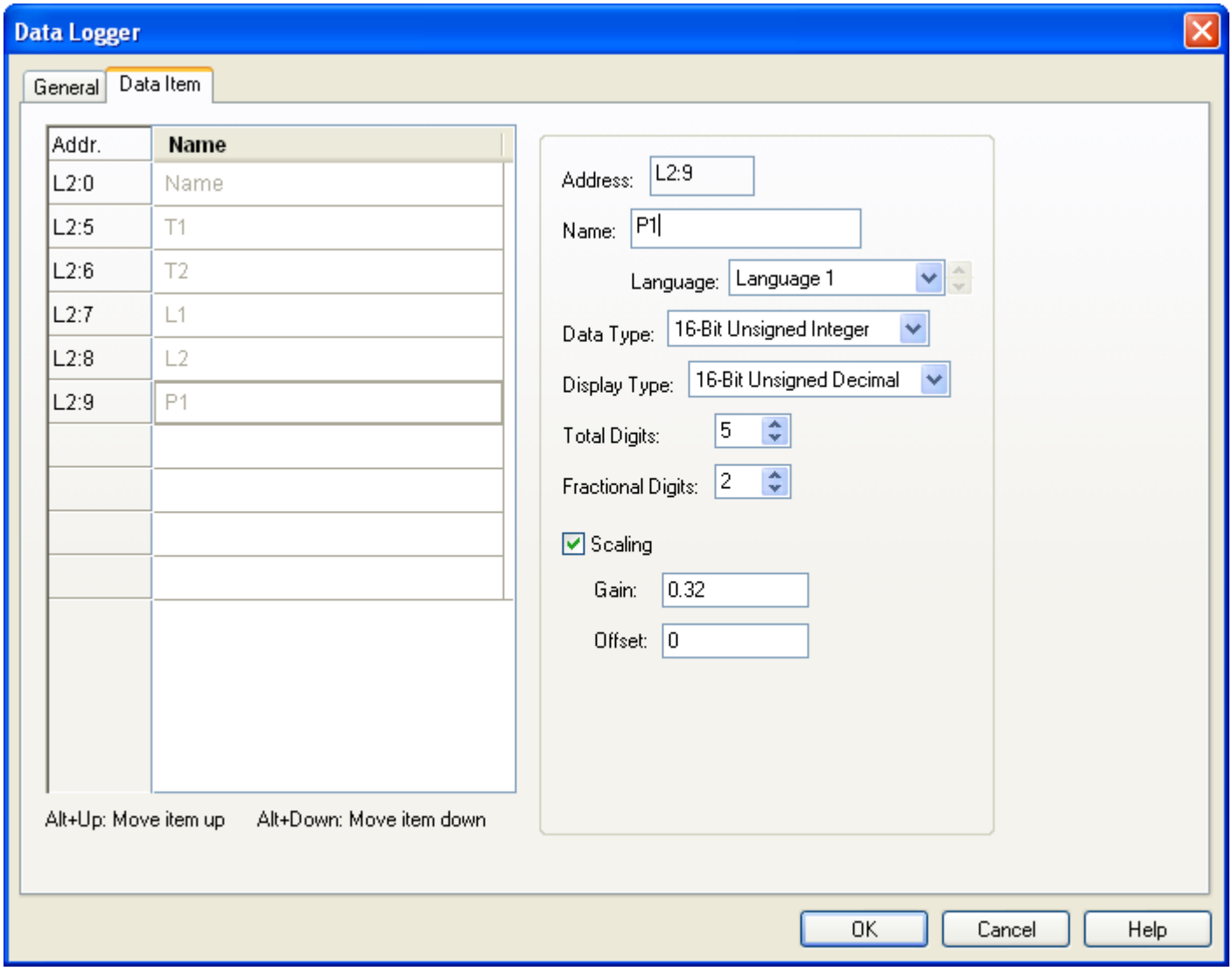
<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td rowspan="5">Sampling Method</td><td>Timed</td><td>The data logger samples data periodically at a rate specified in the Interval field. You can specify an interval between 1 and 65535 seconds for the Interval field. For example, if you want the data logger to sample data every 5 seconds, specify 5 for the Interval field.</td></tr>
<tr><td>Triggered</td><td>The data logger samples data once whenever the trigger bit specified in the Trigger Bit field changes from Off to On.</td></tr>
<tr><td>Clocked</td><td>The data logger samples data at fixed moments specified in the At Each field. There are six sets of fixed moments available for the At Each field.
<table>
<tr><th>At Each</th><th>Fixed Moments</th></tr>
<tr><td>1x</td><td>Every minute at 0 second</td></tr>
<tr><td>5x</td><td>The following moments of every hour: 00:00, 05:00, 10:00, 15:00, 20:00, 25:00, 30:00, 35:00, 40:00, 45:00, 50:00, 55;00</td></tr>
<tr><td>10x</td><td>The following moments of every hour: 00:00, 10:00, 20:00, 30:00, 40:00, 50:00</td></tr>
<tr><td>15x</td><td>The following moments of every hour: 00:00, 15:00, 30:00, 45:00</td></tr>
<tr><td>30x</td><td>The following moments of every hour: 00:00, 30:00</td></tr>
<tr><td>60x</td><td>Every hour on the hour</td></tr>
</table></td></tr>
<tr><td>Timed (sub-second)</td><td>The data logger samples data periodically at a rate specified in the Interval field. You can select an interval between 0.1 and 0.9 seconds for the Interval field. For example, if you want the data logger to sample data every 0.5 seconds, select 0.5 for the Interval field.
The sub-second sampling requires high data acquisition performance. As there are many factors that can affect performance, it is not guaranteed that the specified sampling rate can be attained.</td></tr>
<tr><td>Load from .LDF File</td><td>The data logger does not sample data. It receives the data loaded from an LDF file.</td></tr>
<tr><td rowspan="4">Sample Full Processing</td><td>Stop Sampling</td><td>Check the option if you want the data logger to stop sampling data when the logging buffer is full.</td></tr>
<tr><td>Notify</td><td>Check the option if you want the data logger to set the bit specified in the Bit field to On when the number of collected samples exceeds the limit specified in the Full Limit field.</td></tr>
<tr><td>Bit</td><td>Available when the Notify field is checked. Specifies the bit for the sample full notification. Click to enter an address for this field. Click to select a tag for this field.</td></tr>
<tr><td>Full Limit</td><td>Available when the Notify field is checked. Select a percentage as the full limit. When the ratio of collected samples to maximum samples specified in the Number of Samples field exceeds the percentage, the data logger sets the bit specified in the Bit field to On.</td></tr>
<tr><td rowspan="4">External Control</td><td>Clear Buffer</td><td>Check this option so the data logger can be controlled to clear its logging buffer with the trigger bit specified in the Trigger Bit field.</td></tr>
<tr><td>Trigger Bit</td><td>Available when the Clear Buffer option is checked. Select a trigger bit that will control the data logger to clear its logging buffer. The data logger clears its logging buffer when the trigger bit changes from Off to On.</td></tr>
<tr><td>Enable Sampling</td><td>Check this option so the data logger can be enabled and disabled by the enabling bit specified in the Enabling Bit field.</td></tr>
<tr><td>Enabling Bit</td><td>Available when the Enable Sampling option is checked. Select an enabling bit that will enable and disable the data logger. The data logger is enabled when the enabling bit is On.</td></tr>
</table>

Continued

<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td rowspan="5">Save Data to File</td><td>Save Data to File</td><td>Check this option so the data logger will periodically write the newly collected data to a specified file. Each time the data logger performs this operation, it writes only the data that have not saved to a file before.</td></tr>
<tr><td>File Type</td><td>The type of file to save the logged data.
<table>
<tr><th>File Type</th><th>Description</th></tr>
<tr><td>.CSV/.TXT</td><td>The logged data are saved in CSV or text format. You can use any text editor to view the logged data. Most importantly you can use Microsoft Excel to import the logged data from such files directly.</td></tr>
<tr><td>.LDF</td><td>The logged data are saved in a binary format and can only be used by a data logger that has exactly the same data definition. This file type allows you to view and operate historic data loaded from files.</td></tr>
</table></td></tr>
<tr><td>Operation Type</td><td>Specifies how to open a file to save the logged data.
<table>
<tr><th>Operation Type</th><th>Description</th></tr>
<tr><td>Create</td><td>Creates a new file with the specified filename to save the logged data.</td></tr>
<tr><td>Append or Create</td><td>If the specified file exists, appends the logged data to that file; otherwise creates a new file with the specified filename to save the logged data.</td></tr>
</table></td></tr>
<tr><td>Time to Save</td><td>Specifies the period to save the logged data. There are nine periods available:
<table>
<tr><th>Available Period</th></tr>
<tr><td>Every hour on the hour</td></tr>
<tr><td>Every 8 hours (00:00, 08:00, 16:00)</td></tr>
<tr><td>Every 12 hours (00:00, 12:00)</td></tr>
<tr><td>Every day at 00:00</td></tr>
<tr><td>Every day at 08:00</td></tr>
<tr><td>Every day at 12:00</td></tr>
<tr><td>Every Sunday at 00:00</td></tr>
<tr><td>Every Monday at 00:00</td></tr>
<tr><td>Every month's first day at 00:00</td></tr>
</table></td></tr>
<tr><td>Filename</td><td>The filename or the prefix of the filename of the file to save the logged data. The extension name must be "txt" when the File Type is ".TXT". The extension name must be "ldf" when the File Type is ".LDF".</td></tr>
<tr><td>Filename Suffix</td><td>Available when the Operation Type is Create. This property guarantees that the created file has a unique name and no existing file will be overwritten. There are four kinds of filename suffixes available as shown in the following table.
<table>
<tr><th>Filename Suffix</th><th>Description</th><th>Example</th></tr>
<tr><td>_YYMMDD_hhmmss</td><td>YY: year (00-99)
MM: month (01-12)
DD: day (01-31)
hh: hour (00-23)
mm: minute (00-59)
ss: second (00-59)</td><td>Log_090423_102358
(Assume that the specified Filename is "Log", the current date is April 23, 2009, and the current time is 10:23:58.)</td></tr>
<tr><td>_YYMMDD_hhmm</td><td>See above</td><td>Log_090423_1023</td></tr>
<tr><td>_YYMMDD_hh</td><td>See above</td><td>Log_090423_10</td></tr>
<tr><td>_YYMMDD</td><td>See above</td><td>Log_090423</td></tr>
</table></td></tr>
</table>

12.1.3. Data Item Settings

Use the Data Item page to define the data items of the sampled data for a data logger. The following is an example of the Data Item page.



The Data Item page contains two parts. The left part is the data item list that shows the address and name of each data item in rows. The right part shows the properties of the selected data item. To select a data item, click the row of that data item in the data item list.

The following table describes each property of the data item.

Property	Description
Address	You can use the address shown here to refer to the latest sampled value of the data item.
Name	Specifies the name of the data item for the language specified in the Language field.
Language	Select a language so you can view and edit the name of the data item for that language.
Data Type	The data type of the data item. The supported data types include: 16-Bit Unsigned Integer, 32-Bit Unsigned Integer, 16-Bit Signed Integer, 32-Bit Signed Integer, 16-Bit BCD, 32-Bit BCD, 32-Bit Floating Point, ASCII String, and Unicode String.

Continued

<table>
<tr><th>Property</th><th>Description</th></tr>
<tr><td>Display Type</td><td>The display type for the value of the data item. The following table shows the available display types for each data type.
<table>
<tr><th>Data Type</th><th>Available Display Types</th></tr>
<tr><td>16-Bit Unsigned Integer</td><td>16-Bit Unsigned Decimal, 16-Bit Hexadecimal, 16-Bit Octal</td></tr>
<tr><td>32-Bit Unsigned Integer</td><td>32-Bit Unsigned Decimal, 32-Bit Hexadecimal, 32-Bit Octal</td></tr>
<tr><td>16-Bit Signed Integer</td><td>16-Bit Signed Decimal</td></tr>
<tr><td>32-Bit Signed Integer</td><td>32-Bit Signed Decimal</td></tr>
<tr><td>16-Bit BCD</td><td>16-Bit Unsigned Decimal</td></tr>
<tr><td>32-Bit BCD</td><td>32-Bit Unsigned Decimal</td></tr>
<tr><td>32-Bit Floating Point</td><td>32-Bit Floating Point</td></tr>
<tr><td>ASCII String</td><td>ASCII String</td></tr>
<tr><td>Unicode String</td><td>Unicode String</td></tr>
</table></td></tr>
<tr><td>Total Digits</td><td>Specifies the number of digits to be displayed for the value of the data item.</td></tr>
<tr><td>Fractional Digits</td><td>Specifies how to display the fractional part of the value of the data item. When the Display Type is 32-bit Floating Point, this property specifies the number of fractional digits to be displayed. When the Display Type is not 32-bit Floating Point, this property specifies not only the number of fractional digits to be displayed, but also the number of least significant digits to be displayed as the fractional part. With this feature, an integer can be shown as a fixed point number.
Example:
<table>
<tr><th>Display Type</th><th>Total Digits</th><th>Fractional Digits</th><th>Sampled Value</th><th>Displayed Value</th></tr>
<tr><td>32-bit Floating Point</td><td>4</td><td>2</td><td>12.34</td><td>12.34</td></tr>
<tr><td>32-bit Floating Point</td><td>4</td><td>2</td><td>123.4</td><td>23.40</td></tr>
<tr><td>16-bit Signed Decimal</td><td>5</td><td>2</td><td>12345</td><td>123.45</td></tr>
<tr><td>16-bit Signed Decimal</td><td>5</td><td>2</td><td>-5</td><td>-0.05</td></tr>
</table></td></tr>
<tr><td>Scaling</td><td>Check this option if you want the value of the data item to be displayed in a scaled manner. The following is the scaling formula:
DisplayedValue = SampledValue * Gain + Offset
Note: The Gain and Offset are 32-bit floating point numbers. They have at most 6 significant digits. Rounding and truncation errors may occur.</td></tr>
<tr><td>Gain</td><td>Available when the Scaling option is checked. Specifies the Gain used in the scaling formula.</td></tr>
<tr><td>Offset</td><td>Available when the Scaling option is checked. Specifies the Offset used in the scaling formula.</td></tr>
</table>

12.1.4. Using LDF File to Save Logged Data

The LDF files allow you to save logged data in files and view the data later. Hence, the size of the battery backed RAM or the buffer sizes of the data loggers will not limit the size of the historical data you want to collect.

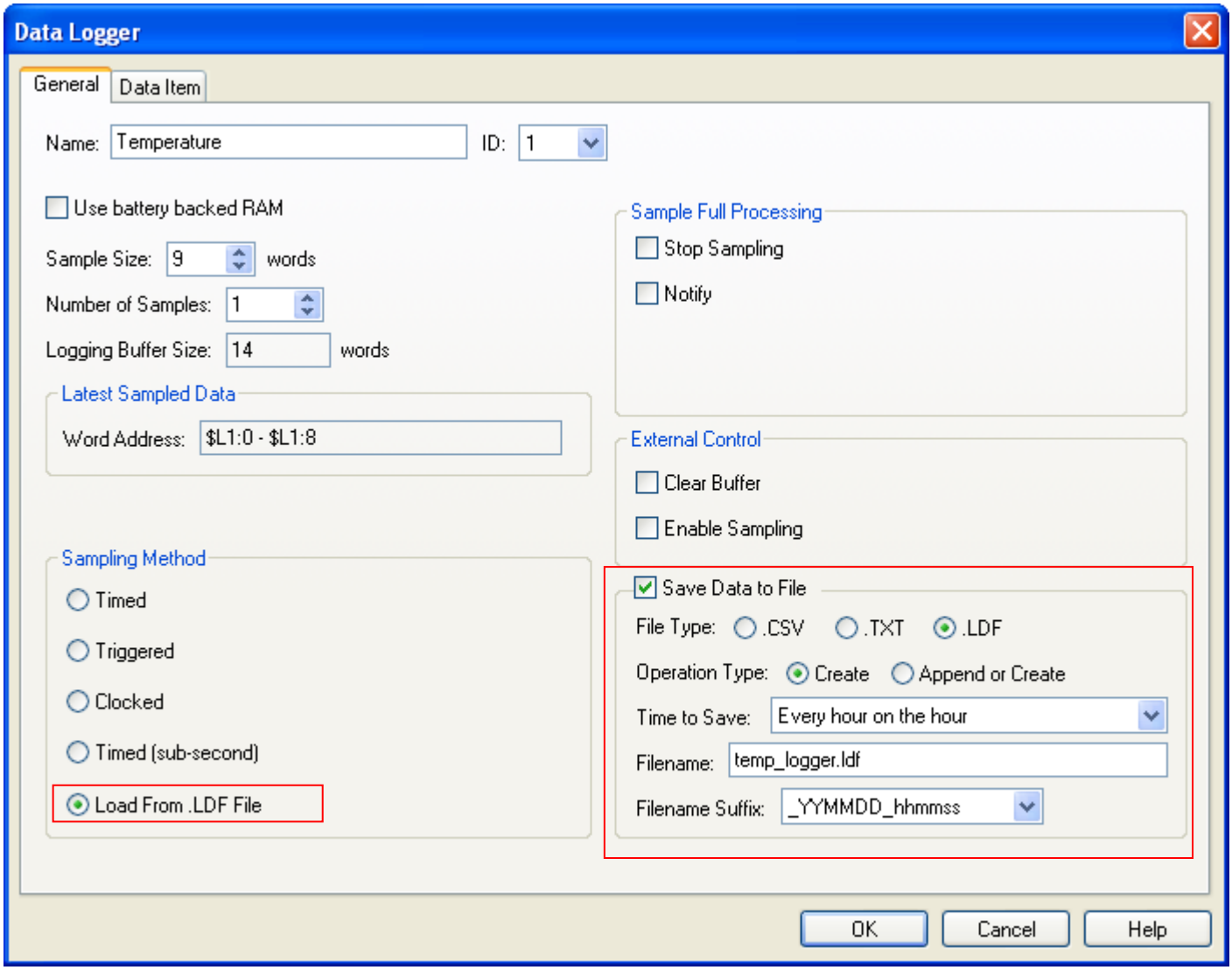
There are three ways to write the logged data of a data logger to an LDF file:

1) You can use a function button to perform “Copy Logged Data To .LDF File”. The button writes all the logged data of the specified data logged to an LDF file.
2) You can use the Command Block to request this operation.
3) You can configure a data logger to write its collected data to an LDF file automatically with preset time intervals.

To view the logged data of an LDF file, you need to load the data of that LDF file into a data logger first. A data logger is able to receive the data from an LDF file only when:

1) The definitions of the data items of the LDF file and the data logger are identical, and
2) The number of samples of the LDF file is not greater than the number of samples of the data logger.

The viewing objects for an LDF file should be configured for the data logger that is able to receive the data from that LDF file.



12.2. Displaying Logged Data Values Using Historic Data Tables

12.2.1. Basic Operations

Use the following steps to create a historic data table:

1) Click the Historic Data Table icon in the Object toolbar, or select Historic Data Table in the Object sub-menu.
2) Move the cursor to the screen on which you want to create the object.
3) Click the desired position on the screen to place the new object.

You can use a historic data table to list the values of the data collected by a data logger.

Date	Time	T1	T2	T3	P1	P2	P3	V1	V2	V3
05/03/09	08:51:39	344.9	379.4	69.0	215.8	163.2	152.7	126.4	115.8	100.0
05/03/09	08:51:34	931.3	1000.3	931.3	236.9	221.1	200.0	184.2	163.2	173.7
05/03/09	08:51:29	931.3	1000.3	1414.2	336.9	310.5	284.2	284.2	289.5	305.3
05/03/09	08:51:24	1655.6	1931.6	1517.7	352.6	336.9	315.8	321.1	321.1	315.8
05/03/09	08:51:19	1414.2	1655.6	1241.7	321.1	247.4	242.1	231.6	231.6	242.1
05/03/09	08:51:14	1241.7	1241.7	1034.8	268.4	247.4	221.1	200.0	194.8	179.0
05/03/09	08:51:09	896.8	931.3	896.8	247.4	215.8	200.0	179.0	168.5	179.0
05/03/09	08:51:04	655.3	724.3	758.8	210.6	210.6	179.0	184.2	173.7	173.7

The above is an example of the historic data table. The first row is the title row. It displays the title of each column. The other rows display one data record per row. You can create scroll button groups or scroll bars to scroll the contents. The titles of data columns are the names of data items defined in the Data Item page of the Data Logger dialog box.

12.2.2. Operation Options

The following operation option can be added to a historic data table. Select and set the option in the Historic Data Table dialog box.

Options	Description
Visibility Control	You can show and hide a historic data table by a specified bit or the current user level. Select and set this option in the Visibility page.

12.2.3. Settings

You can set up a historic data table with the Historic Data Table dialog box. There are three ways to open the dialog box of an object:

1) Double-click the object.
2) Right-click the object to bring up the Object pop-up menu. Select Properties in the pop-up menu.
3) In the Object List window, double-click the row that shows the information of the object.

You can complete all the settings of a historic data table in the Historic Data Table dialog box. This dialog box contains the following three pages.

- **General**

Described in Section 12.2.4.

- **Data Item**

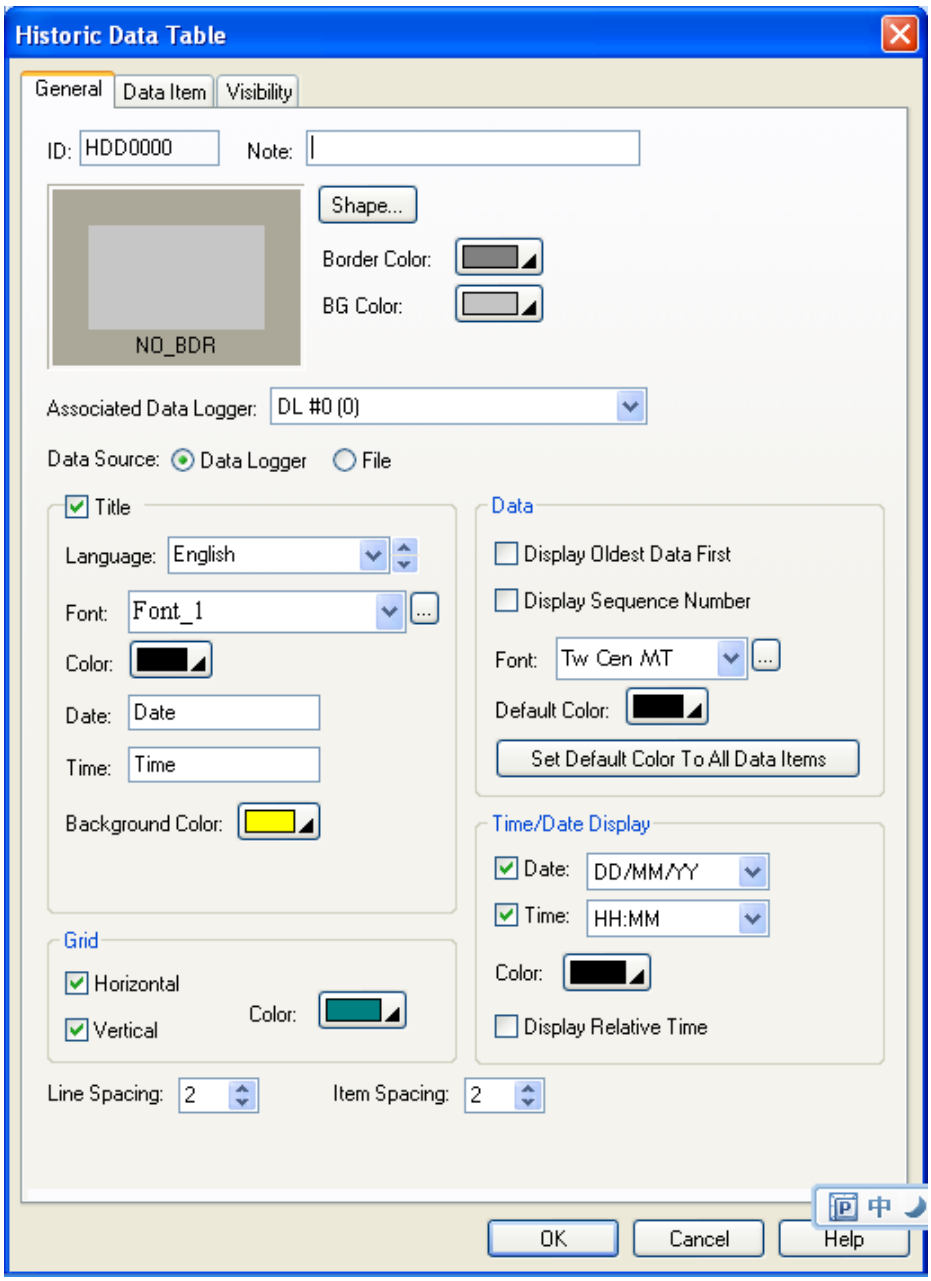
Described in Section 12.2.5.

- **Visibility**

Described in Section 4.4.6.

12.2.4. General Settings

This section describes how to define the general settings for a historic data table. The following is an example of the General page.



The following table describes each property in the General page.

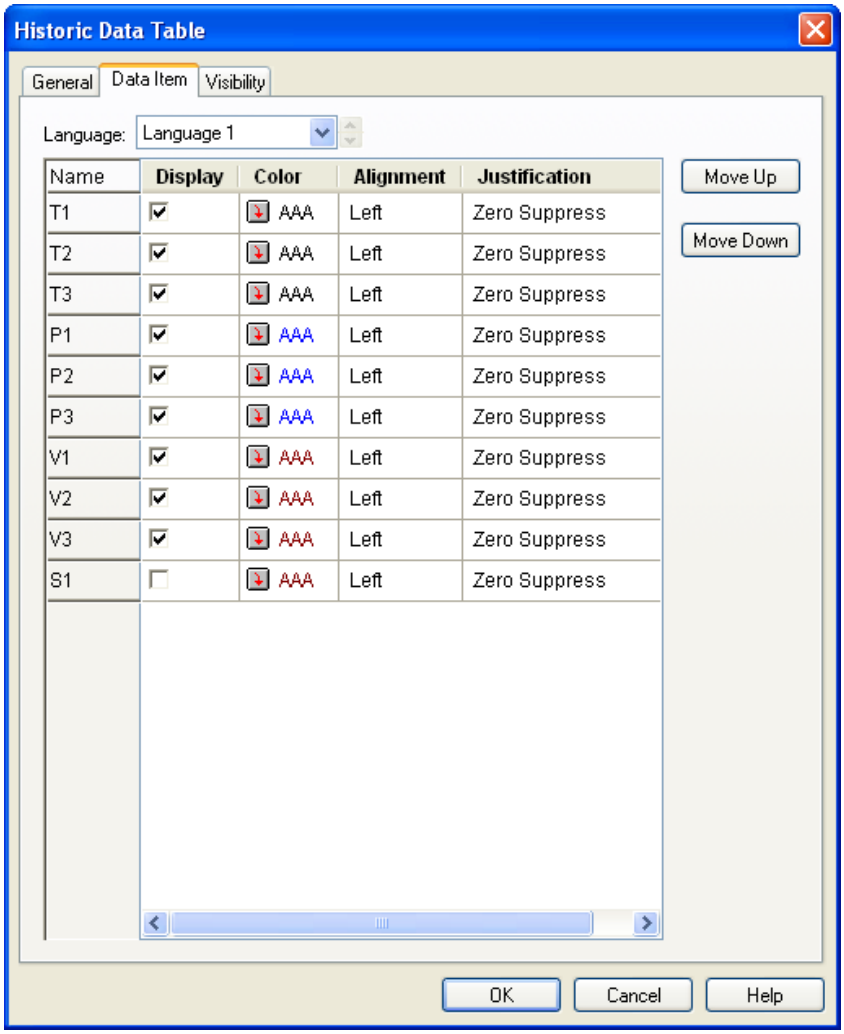
Property	Description
ID	The object's identifier. It is generated when the object is created and is unchangeable. The identifier is unique within the screen where the object is located. The format of the IDs for the historic data tables is HDDnnnn.
Note	You can type a note for the object.
Shape settings	For details about the following properties, Section 4.3.4 Setting up the Shape of an Object. Shape..., Border Color, BG Color
Associated Data Logger	Select the data logger whose collected data is to be displayed by the object.

Continued

Property		Description
Data Source		Select data logger or file as the source of the collected data. This new feature allows you to display historic data that are stored in files. There are two data sources you can select for Historic Trend Graphs, Historic Data Tables, and Single Record Line Charts. When "Data Logger" is selected as the data source for such objects, that object displays the sampled data stored in the logging buffer of the associated data logger. When "File" is selected as the data source for such objects, that object displays the sampled data stored in the specified file buffer. One HMI can have up to 16 file buffers and each file buffer is identified by a unique number between 0 and 15. You can create a function button to load the sampled data stored in a file. 1) Select "Load Logged Data From File" as the operation of that function button. 2) Select the file extension type. Both CSV and TXT are supported. 3) Specify the associated data logger. 4) Specify the file buffer to save the loaded data. 5) Specify the size of the file buffer. The size is the maximum number of samples that the file buffer can hold.
File Buffer ID		Specify the File Buffer ID if the data source is a file. To specify a file buffer ID for a file, you can use the Load Logged Data From File operation of the function button. Please see Section 5.4 Performing Built-in Function Using Function Buttons for details.
Title	Title	Select this option if you want the object to display a title row.
	Language	Select a language so you can view and edit the settings of the title row for that language.
	Font	Select a font for the title text.
	Color	Select a color for the title text.
	Date	Specifies the title for the Date column.
	Time	Specifies the title for the Time column.
	Background Color	Select a color for the background of the title row.
Grid	Vertical	Check this option if you want the object to have vertical grids.
	Horizontal	Check this option if you want the object to have horizontal grids.
	Color	Select a color for the grids.
Data	Display oldest Data First	Check this option if you want the object to display the oldest data first.
	Display Sequence Number	Check this option if you want the object to display sequence number on the first column.
	Font	Select a font for displaying data.
	Default Color	Select a color as the default color for displaying data.
	Set Default Color to All Data Items	Click this button to set the colors of all the data items to the Default Color.
Time/Date Display	Date	Check this option if you want the object to display the Date column. You need to select a format for displaying the date.
	Time	Check this option if you want the object to display the Time column. You need to select a format for displaying the time.
	Color	Select a color to displaying Time/Date.
	Display Relative Time	Check this option if you want the object to display a relative measure of time.
Line Spacing		Specifies the extra space in pixels for two adjacent rows in the table.
Item Spacing		Specifies the extra space for every column in the table.

12.2.5. Data Item Settings

This section describes how to define the display format for the sampled values of each data item. The following is an example of the Data Item page.



The following table describes each property in the Data Item page.

Property		Description
Language		Select a language so you can view and edit the settings for that language.
Row #n of the property table	Name	The name of data item #n. The data item names are defined in the Data Item page of the Data Logger dialog box.
	Display	Check this option if you want the object to display data item #n.
	Color	Select a color for displaying data item #n.
	Alignment	The alignment for displaying data item #n. There are three types of alignment: Left, Center, and Right.
	Justification	The justification for displaying data item #n. There are three types of justification:

Option	Description
Zero Suppress	The leading digits will not display when they are 0.
Leading Zeros	All digits will display.
Leading Spaces	The leading digits will display as blank characters when they are 0.

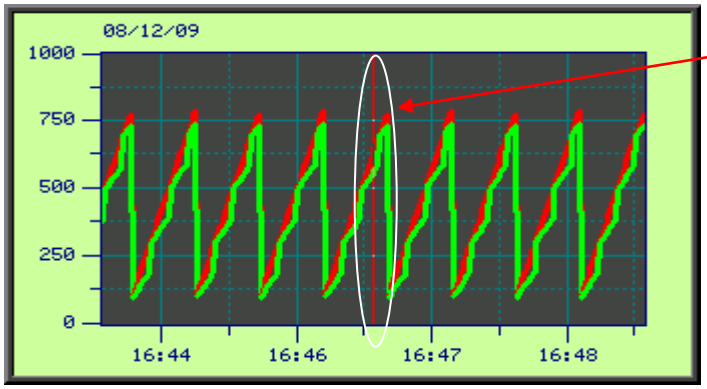
12.3. Displaying Logged Data Trend Using Historic Trend Graph

12.3.1. Basic Operations

Follow the steps below to create a historic trend graph:

1) Click the Historic Trend Graph icon in the Object toolbar, or select Historic Trend Graph in the Object sub-menu.
2) Move the cursor to the screen on which you want to create the object.
3) Click the desired position on the screen to place the new object.

You can use a Historic Trend Graph to display the values of the data collected by a data logger as a trend graph.



A historic trend graph can display up to 16 curves. The above is an example of the historic trend graph with two curves. A historic trend graph can provide a cursor for you to estimate the value in the desired time

12.3.2. Operation Options

The following operation option can be added to a historic trend graph. Select and set the option in the Historic Trend Graph dialog box.

Options	Description
Visibility Control	You can show and hide a historic trend graph by a specified bit or the current user level. Select and set this option in the Visibility page.

12.3.3. Settings

You can set up a historic trend graph with the Historic Trend Graph dialog box. There are three ways to open the dialog box of an object:

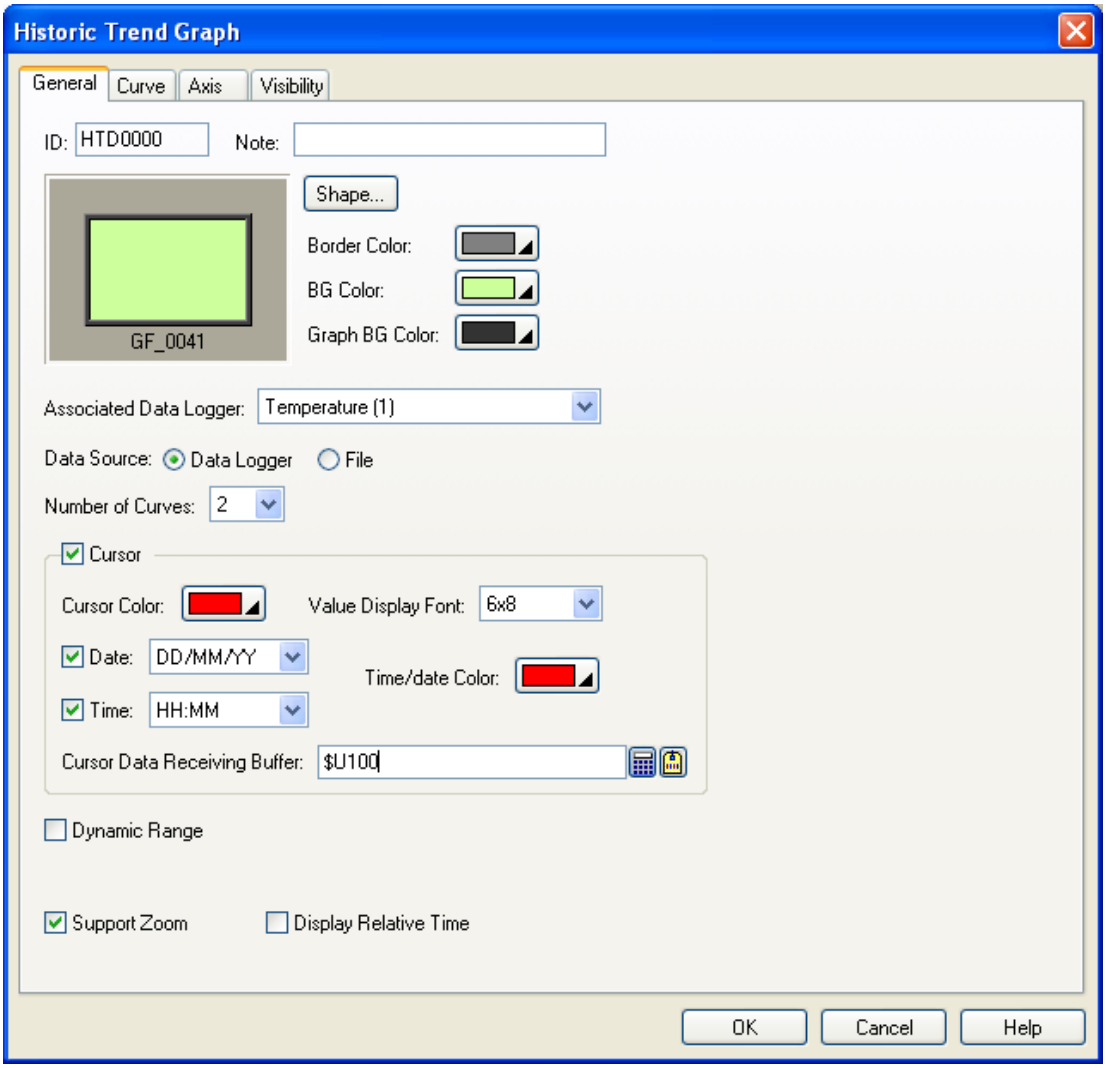
1) Double-click the object.
2) Right-click the object to bring up the Object pop-up menu. Select Properties in the pop-up menu.
3) In the Object List window, double-click the row that shows the information of the object.

The Historic Trend Graph dialog box contains the following four pages:

- **General**
  Described in Section 12.3.4.
- **Curve**
  Described in Section 12.3.5.
- **Axis**
  Described in Section 12.3.6.
- **Visibility**
  Described in Section 4.4.6.

12.3.4. General Settings

This section describes how to define the general settings for a historic trend graph. The following is an example of the General page of the Historic Trend Graph property sheet.



The following table describes each property in the General page.

Property	Description
ID	The object's identifier. It is generated when the object is created and is unchangeable. The identifier is unique within the screen where the object is located. The format of the IDs for the historic trend graph is HTDnnnn.
Note	You can type a note for the object.
Shape settings	For details about the following properties, see Section 4.3.4 Setting up the Shape of an Object. Shape..., Border Color, BG Color.
Graph BG color	Select a color for the background of the graph.
Associated Data Logger	Specifies the associated data logger.
Data Source	Select data logger or file as the source of the collected data.
File Buffer ID	Specify the File Buffer ID if the data source is a file. To specify a file buffer ID for a file, you can use Load Logged Data From File operation of the function button. Please see Section 5.4 Performing Built-in Function Using Function Buttons for details.

Continued

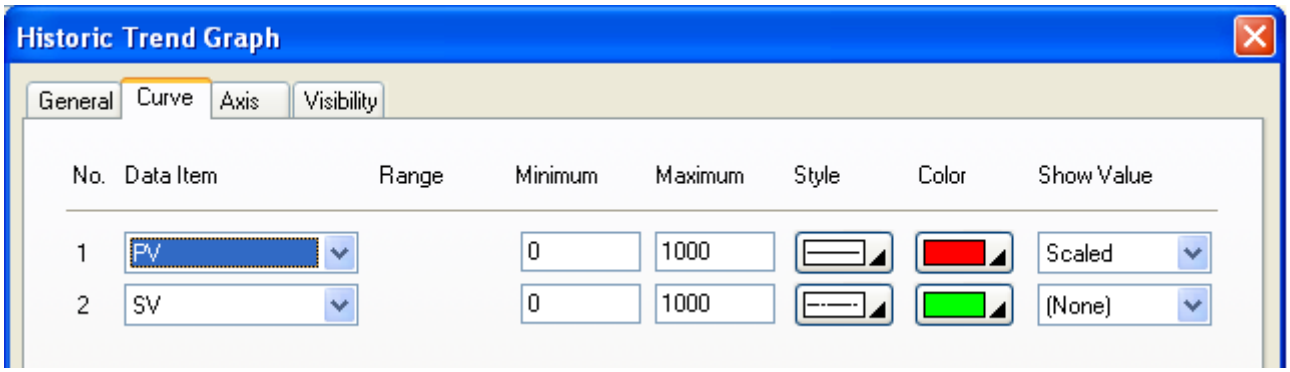
<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td colspan="2">Number of Curves</td><td>Specifies the number of curves.</td></tr>
<tr><td rowspan="6">Cursor</td><td><Check box></td><td>Check this option so the historic trend graph will display a cursor. You can touch and drag the cursor to the data point(s) that you want to select.</td></tr>
<tr><td>Cursor Color</td><td>Select a color for the cursor.</td></tr>
<tr><td>Value Display Font</td><td>Select a font for displaying the values of the selected data point(s).</td></tr>
<tr><td>Date</td><td>Check this option to display the date at the top left of the historic trend graph object. You need to select a format for displaying the date.
There are 12 formats available: dd/mm/yy, mm/dd/yy, yy/mm/dd, dd.mm.yy, mm.dd.yy, yy.mm.dd, dd-mm-yy, mm-dd-yy, yy-mm-dd, dd-MMM-yy, MMM-dd-yy, and yy-MMM-dd.
Note: dd: 01-31 (day); mm: 01-12 (month); yy: 00-99 (year); MMM: JAN-DEC (month)</td></tr>
<tr><td>Time</td><td>Check this option if you want the object to display the Time at the top left corner. You need to select a format for displaying the time.</td></tr>
<tr><td>Time/Date Color</td><td>Select a color to display the Time/Date.</td></tr>
<tr><td>Cursor Data Receiving Buffer</td><td>Specifies the variable to receive the data selected by the cursor to be read and displayed.
Click to enter an address for this field. Click to select a tag for this field.</td></tr>
<tr><td rowspan="2">Dynamic Range</td><td>Dynamic Range</td><td>When this option is selected, the following three ranges can be specified at runtime:
• The minimum and the maximum for the Y values of each curve
• The maximum time duration for the X axis
• The minimum and maximum of the marks for the Y axis
The data that specifies the above three ranges should be set and arranged correctly in a memory block called the dynamic range parameter block. You need to specify the dynamic range parameter block in the Dynamic Range Parameter Block field.</td></tr>
<tr><td>Dynamic Range Parameter Block</td><td>Specifies the variable that stores the dynamic range parameter block for the historic trend graph when Dynamic Range is selected.
Click to enter an address for this field. Click to select a tag for this field.
The following table shows the data arrangement of the parameter block.
<table>
<tr><th>Word</th><th>Description</th></tr>
<tr><td>0,1</td><td>The maximum time duration for the time axis (X axis)</td></tr>
<tr><td>2,3</td><td>The number of major division for the time axis (X axis); 32-bit integer number. The minimum value is 1.</td></tr>
<tr><td>4,5</td><td>The number of sub-division for the time axis (X axis); 32-bit integer number. The minimum value is 1.</td></tr>
<tr><td>6,7</td><td>The minimum of the mark for the Y axis</td></tr>
<tr><td>8,9</td><td>The maximum of the mark for the Y axis</td></tr>
<tr><td>10,11</td><td>The minimum of Y values for curve #1</td></tr>
<tr><td>12,13</td><td>The maximum of Y values for curve #1</td></tr>
<tr><td>14,15</td><td>The minimum of Y values for curve #2</td></tr>
<tr><td>16,17</td><td>The maximum of Y values for curve #2</td></tr>
<tr><td>…</td><td>…</td></tr>
<tr><td>70,71</td><td>The minimum of Y values for curve #16</td></tr>
<tr><td>72,73</td><td>The maximum of Y values for curve #16</td></tr>
</table></td></tr>
</table>

Continued

Property	Description
Support Zoom	Check this option so the zoom option will be supported at runtime. You may use the function button to zoom in or zoom out of the historic trend graph at the runtime. This field is available only when the Dynamic Range field is not checked.
Display Relative Time	Check this option if you want the object to display a relative measure of time.

12.3.5. Curve Settings

This section describes how to define the pens of the historic trend graph. The following is an example of the Pen page.



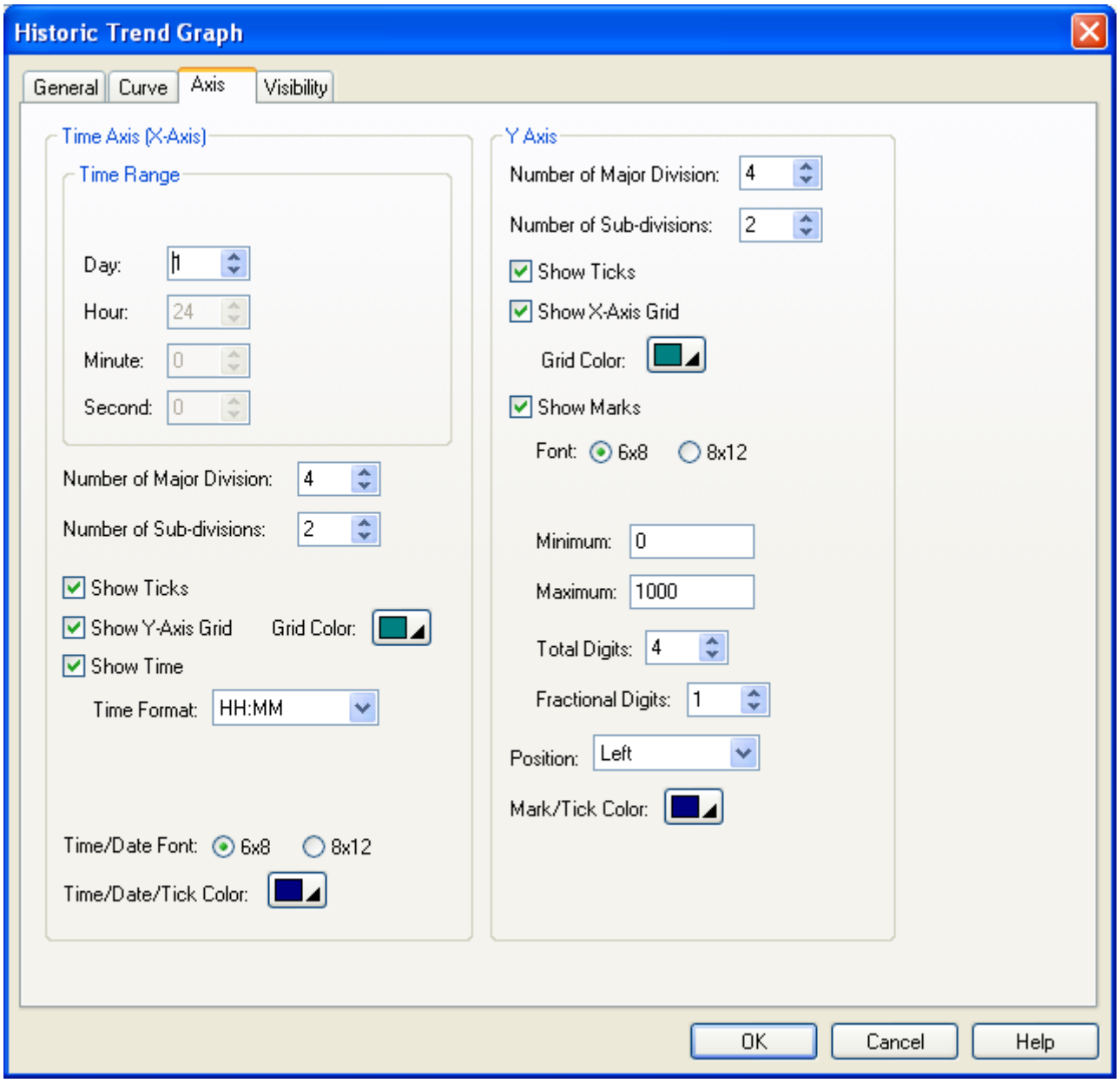
The following table describes each property on the Curve page.

Property	Description
Data Item	Select a data item in the associated data logger for the curve.
Range	Check this option so the minimum and the maximum for the Y values of the associated curve will be specified at runtime. This option is available only when the Dynamic Range option on the General page is checked.
Minimum	The Y minimum of the data value of the associated curve. This property is available when the Dynamic Range option is not selected.
Maximum	The Y maximum of the data value of the associated curve. This property is available when the Dynamic Range option is not selected.
Style	Select a style for the trend curve.
Color	Select a color for the trend curve.
Show Value	Select one of the following methods for displaying the selected data point value.

Show Value	Description
(None)	Does not display the data point value.
Original	Displays the data point value without modification.
Scaled	Displays the corresponding Y axis value of the data point.

12.3.6. Axis Settings

This section describes how to define the Time axis (X axis) and the Y axis for the historic trend graph.



The following table describes each property in the Axis page.

Property		Description
Time Axis (X Axis) – Time Range	Dynamic Range	Check this option if you want the maximum time duration to be controlled by the dynamic range parameter block of the associated object at runtime. This option is available only when the Dynamic Range option on the General page is checked.
	Unit	Select a unit for the dynamic range. The field is only available when Dynamic Range is checked.
	Day/Hour/Minute/Second	If Dynamic Range is not checked on both the general page and the axis page, you need to specify the maximum time duration.

Continued

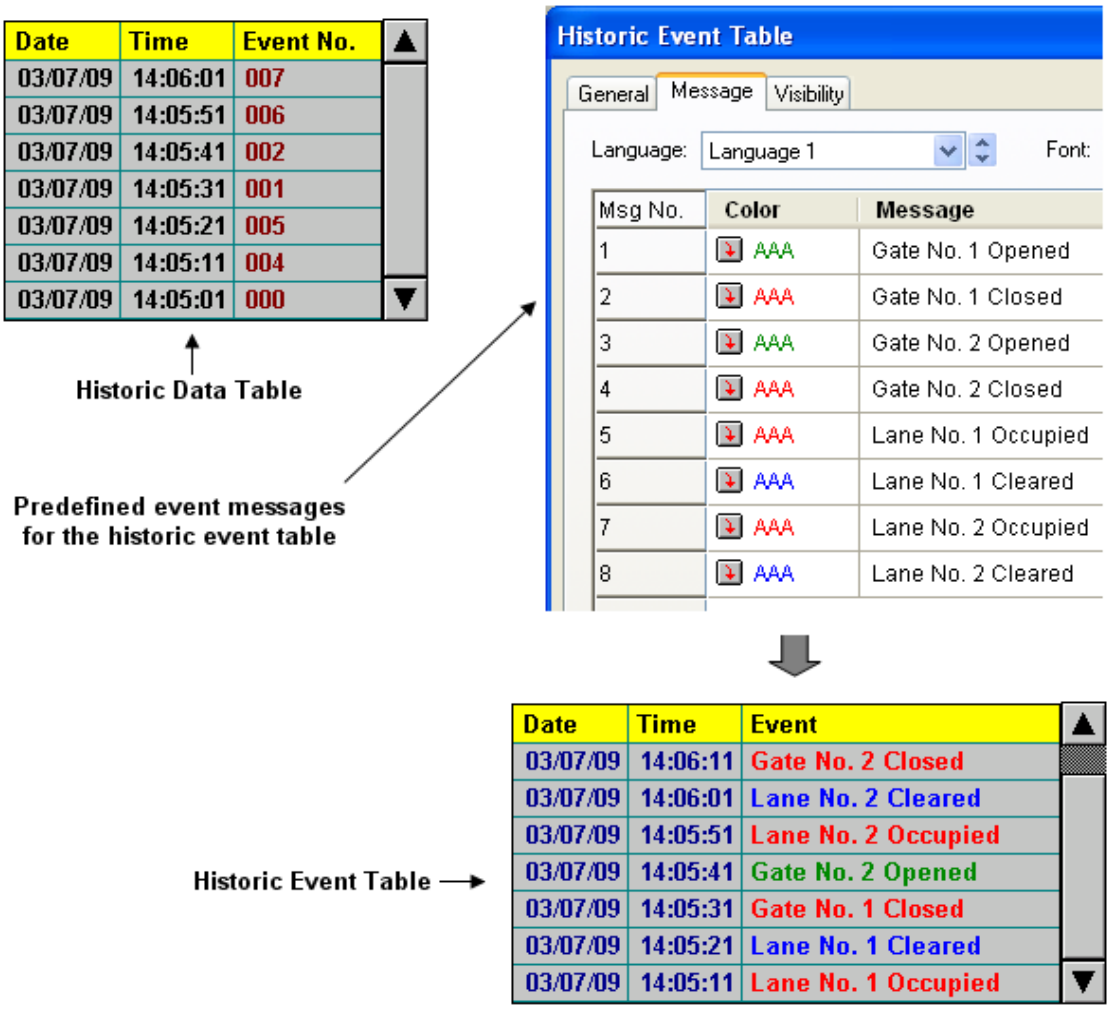
<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td rowspan="10">Time Axis (X Axis)</td><td>Number of Major Divisions</td><td>The number of major divisions for the X axis. The minimum you can specify is one.</td></tr>
<tr><td>Number of Sub-divisions</td><td>The number of divisions between two adjacent major ticks. The minimum you can specify is one.</td></tr>
<tr><td>Show Ticks</td><td>Check this option if you want the X axis to have ticks.</td></tr>
<tr><td>Show Y-axis Grid</td><td>Select this option if you want the X axis to have vertical grids.</td></tr>
<tr><td>Grid Color</td><td>Select a color for the vertical grids.</td></tr>
<tr><td>Show Time</td><td>Check this option if you want to display the time. You need to select a format for displaying the time.</td></tr>
<tr><td>Time Format</td><td>The format of how the time is displayed. There are two formats available.
<table>
<tr><th>Format</th><th>Description</th></tr>
<tr><td>HH:MM</td><td>HH: 00-23 (hour); MM: 00-59 (minute)</td></tr>
<tr><td>HH:MM:SS</td><td>HH: 00-23 (hour); MM: 00-59 (minute); SS: 00-59 (second)</td></tr>
</table></td></tr>
<tr><td>Time/Date Font</td><td>Font of the time/date.</td></tr>
<tr><td>Time/Date/Tick Color</td><td>Select a color for the X axis and its ticks.</td></tr>
<tr><td rowspan="5">Y Axis</td><td>Number of Major Divisions</td><td>The number of major divisions for the Y axis. The minimum you can specify is one.</td></tr>
<tr><td>Number of Sub-divisions</td><td>The number of divisions between two adjacent major ticks. The minimum you can specify is one.</td></tr>
<tr><td>Show Ticks</td><td>Check this option if you want the Y axis to have ticks.</td></tr>
<tr><td>Show X-axis Grid</td><td>Select this option if you want the Y axis to have horizontal grids.</td></tr>
<tr><td>Grid Color</td><td>Select a color for the horizontal grids.</td></tr>
<tr><td rowspan="8">Y Axis Mark</td><td>Show Marks</td><td>Check this option if you want the major ticks to have marks.</td></tr>
<tr><td>Font</td><td>The font of the marks.</td></tr>
<tr><td>Dynamic Range</td><td>Check this option if you want the minimum and maximum of the marks to be controlled by the dynamic range parameter block of the associated object at runtime.</td></tr>
<tr><td>Minimum</td><td>The minimum of the marks. You can specify a 32-bit signed integer.</td></tr>
<tr><td>Maximum</td><td>The maximum of the marks. You can specify a 32-bit signed integer.</td></tr>
<tr><td>Total Digits</td><td>The total digits to be displayed for the marks.</td></tr>
<tr><td>Fractional Digits</td><td>The number of fractional digits for the marks. For example, when the Maximum is 5000, the Total Digits is 4, and the Fractional Digits is 2, the mark for the Maximum will be 50.00.</td></tr>
<tr><td>Position</td><td>Select a position to locate the scale. The scale can be displayed on the left, the right or both sides.</td></tr>
<tr><td>Mark/Tick Color</td><td>Select a color for the marks and ticks.</td></tr>
</table>

12.4. Displaying History of Predefined Events Using Historic Event Tables

12.4.1. Basic Operations

Follow the steps below to create a historic event table:
1) Click Historic Event Table icon in the Object toolbar, or select Historic Event Table in the Object sub-menu.
2) Move the cursor to the screen on which you want to create the object.
3) Click at the desired position on the screen to place the new object.

You can number the predefined events of your application, use a word in the controller or the target panel to store the number of the current event at runtime, and have a data logger in the target panel to collect the value of that word. This is a way to record the events of your application. You can use the historic event table to display the event history. Each message defined for the historic event table is associated with an event by the message/event number.



In the above example, the historic data table and the historic event table display the same historic data in different ways.

12.4.2. Operation Options

The following operation option can be added to a historic event table. Select and set the option in the Historic Event Table dialog box.

Options	Description
Visibility Control	You can show and hide a historic event table by a specified bit or the current user level. Select and set this option in the Visibility page.

12.4.3. Settings

You can set up a historic event table with the Historic Event Table dialog box. There are three ways to open the dialog box of an object:

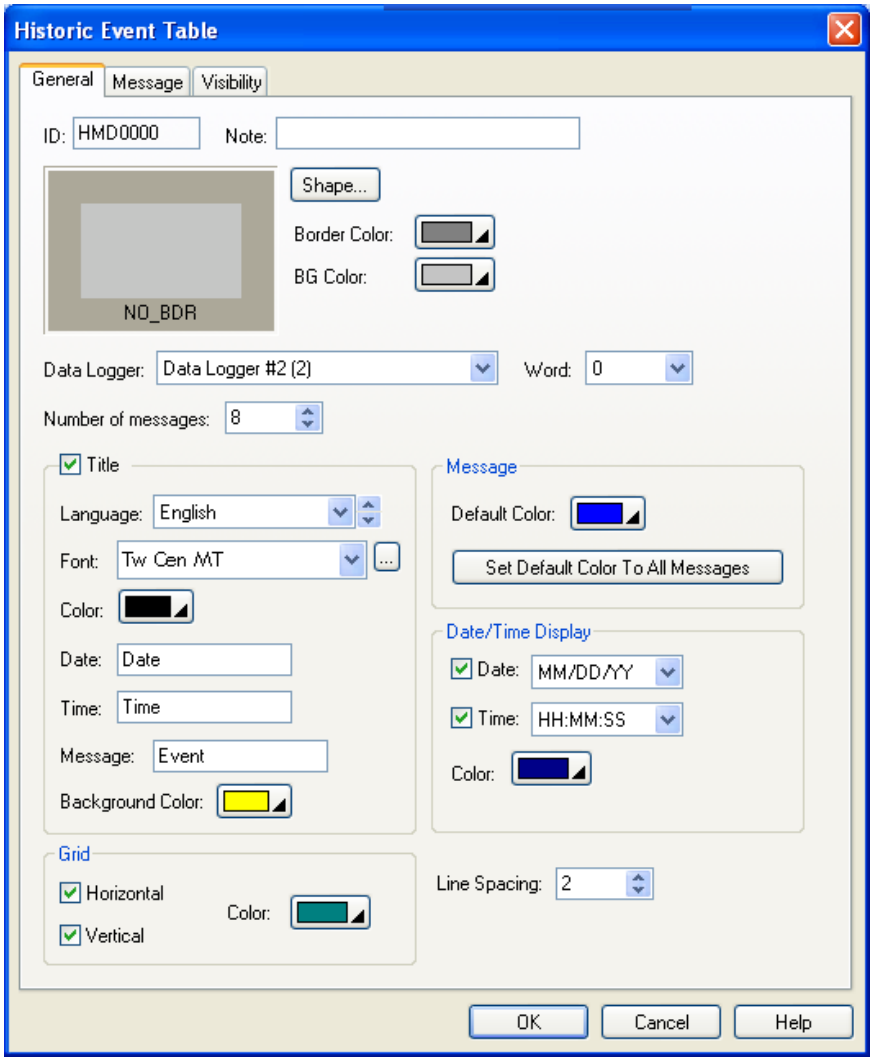
1) Double-click the object.
2) Right-click the object to bring up the Object pop-up menu. Select Properties in the pop-up menu.
3) In the Object List window, double-click the row that displays the information of the object.

You can complete all the settings of a historic event table in the Historic Event Table dialog box. This dialog box contains the following three pages.

- **General**
  Described in Section 12.4.4.
- **Message**
  Described in Section 12.4.5.
- **Visibility**
  Described in Section 4.4.6.

12.4.4. General Settings

This section describes how to define the general settings for a historic event table. The following is an example of the General page.



The following table describes each property in the General page.

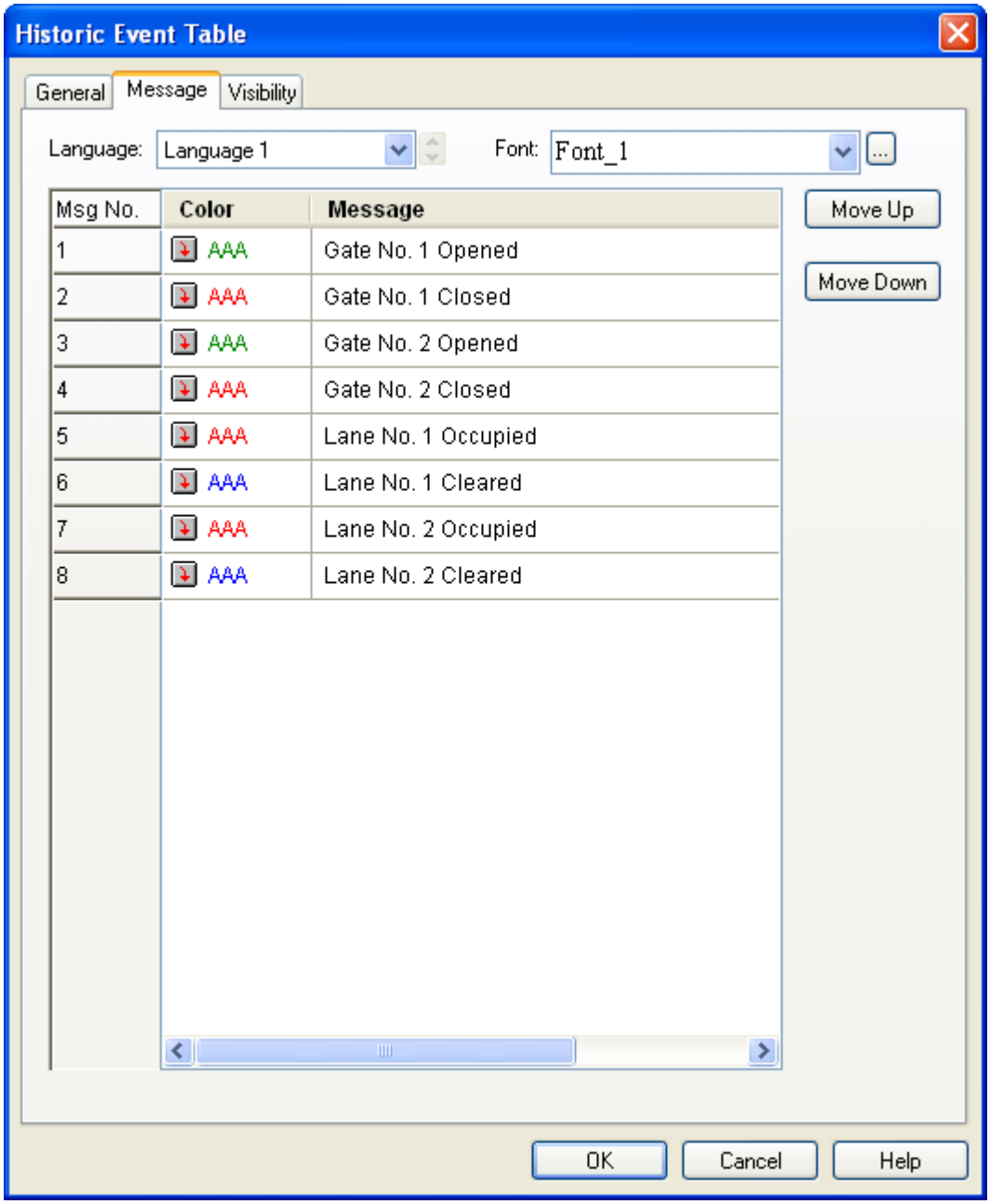
Property	Description
ID	The object's identifier. It is generated when the object is created and is unchangeable. The identifier is unique within the screen where the object is located. The format of the IDs for the historic event tables is HMDnnnn.
Note	You can type a note for the object.
Shape settings	For details about the following properties, see Section 4.3.4 Setting up the Shape of an Object. Shape..., Border Color, BG Color
Data Logger	Specifies the associated data logger. The object will take a specified word in each of the data records collected by the data logger as the event number, and display a corresponding message for that number.
Word	Specifies the number of the word in each of the data records that stores the event number.
Number of messages	Specifies the number of event messages.

Continued

Property		Description
Title	Title	Select this option if you want to have a title row.
	Language	Select a language so you can view and edit the settings of the title row for that language.
	Font	Select a font for the title text.
	Color	Select a color for the text.
	Date	Specifies the title of the Date column.
	Time	Specifies the title of the Time column.
	Message	Specifies the title of the Message column.
	Background Color	Select a color for the background of the title row.
Grid	Vertical	Check this option if you want the object to display vertical grids.
	Horizontal	Check this option if you want the object to display horizontal grids.
	Color	Select a color for the grids.
Message	Font	Select a font for displaying messages.
	Default Color	Select a color as the default message color.
	Set Default Color To All Messages	Click this button to set the colors of all the messages to the Default Color.
Date/Time Display	Date	Check this option if you want the object to display the Date column. You need to select a format for displaying the date.
	Time	Check this option if you want the object to display the Time column. You need to select a format for displaying the time.
Line Spacing		Specifies the extra space in pixels for two adjacent rows in the table.

12.4.5. Message Settings

This section describes how to define the messages of the historic event table. The following is an example of the Message page.



The following table describes each property in the Message page.

Property		Description
Language		Select a language so you can view and edit the settings for that language.
Font		Select a font for displaying the messages.
No. 1-N	Color	Select a color for displaying the message of the associated event.
	Message	Define the text message for the associated event.

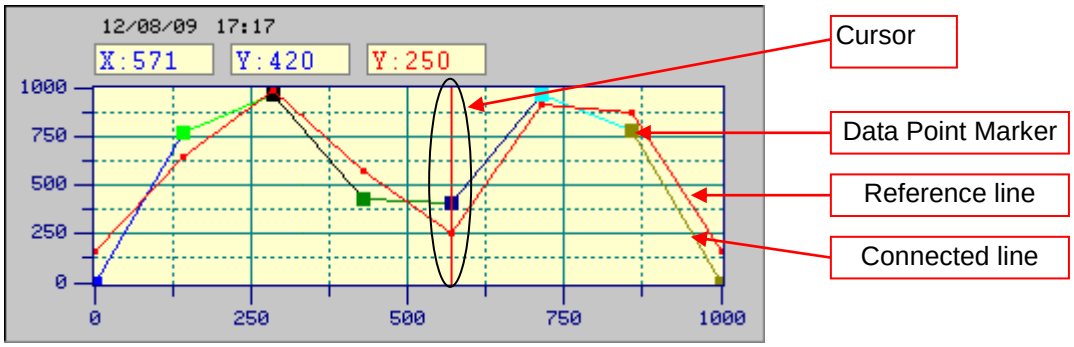
12.5. Displaying Time Slice Data Profile Using Single Record Line Charts

12.5.1. Basic Operations

Use the following steps to create a single record line chart:

1) Click the Single Record Line Chart icon in the Object toolbar, or select Single Record Line Chart in the Object sub-menu.
2) Move the cursor to the screen on which you want to create the object.
3) Click at the desired position on the screen to place the new object.

You can use a single record line chart to display the values of the data collected by a data logger as a line chart.



A single record line chart can display up to 255 data points. The above is an example of the single record line chart with 8 data points. A single record line chart can provide a cursor to display the value of the desired point.

12.5.2. Operation Options

The following operation option can be added to a historic trend graph. Select and set the option in the Historic Trend Graph dialog box.

Options	Description
Visibility Control	You can show and hide a historic trend graph by a specified bit or the current user level. Select and set this option in the Visibility page.

12.5.3. Settings

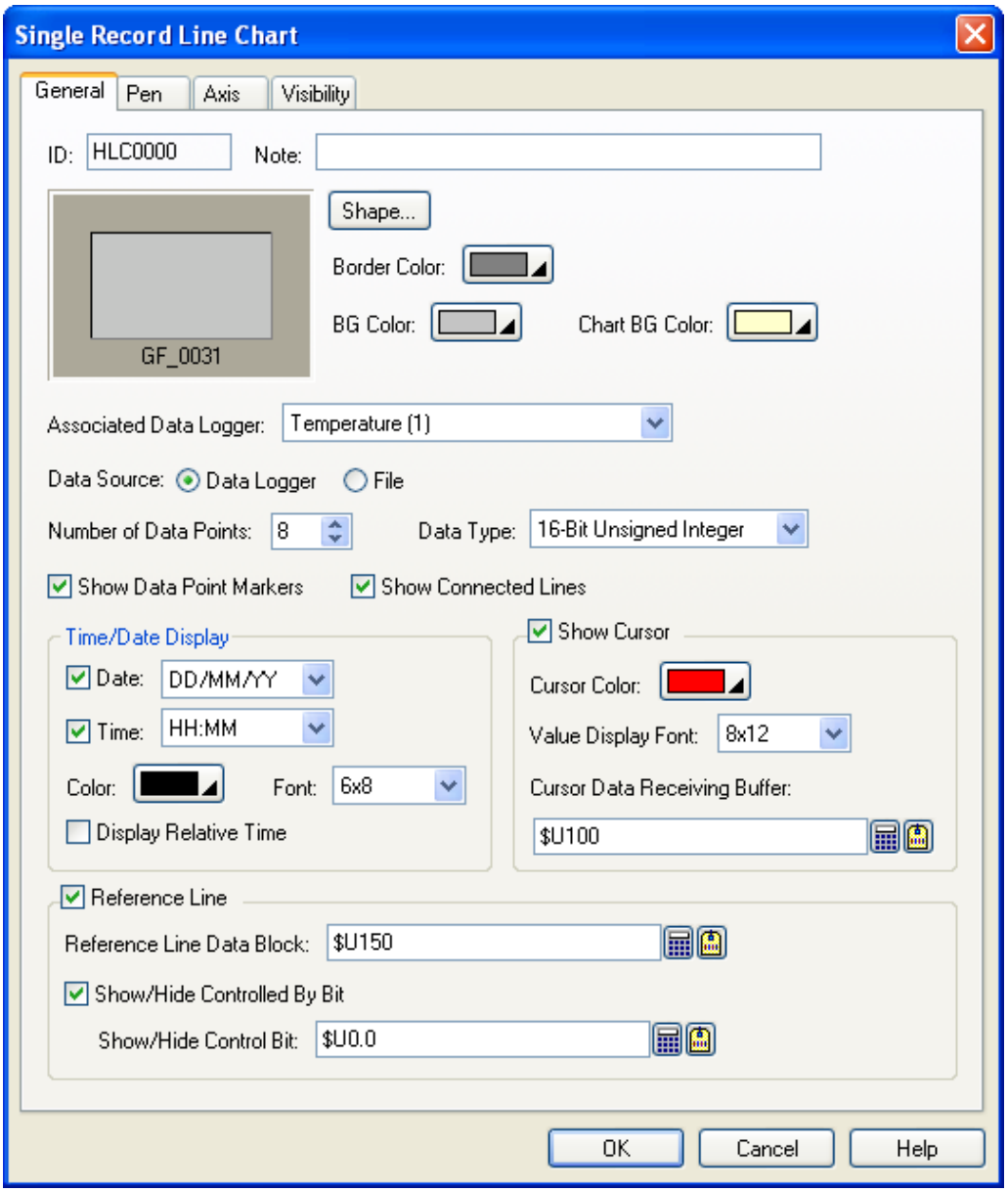
You can set up a single record line chart with the Single Record Line Chart dialog box. There are three ways to open the dialog box of an object:

1) Double-click the object.
2) Right-click the object to bring up the Object pop-up menu. Select Properties in the pop-up menu.
3) In the Object List window, double-click the row that displays the information of the object.

The Single Record Line Chart dialog box contains the following four pages:

- **General**
  Described in Section 12.5.4.
- **Pen**
  Described in Section 12.5.5.
- **Axis**
  Described in Section 12.5.6.
- **Visibility**
  Described in Section 4.3.6.

12.5.4. General Settings



The following table describes each property in the General page.

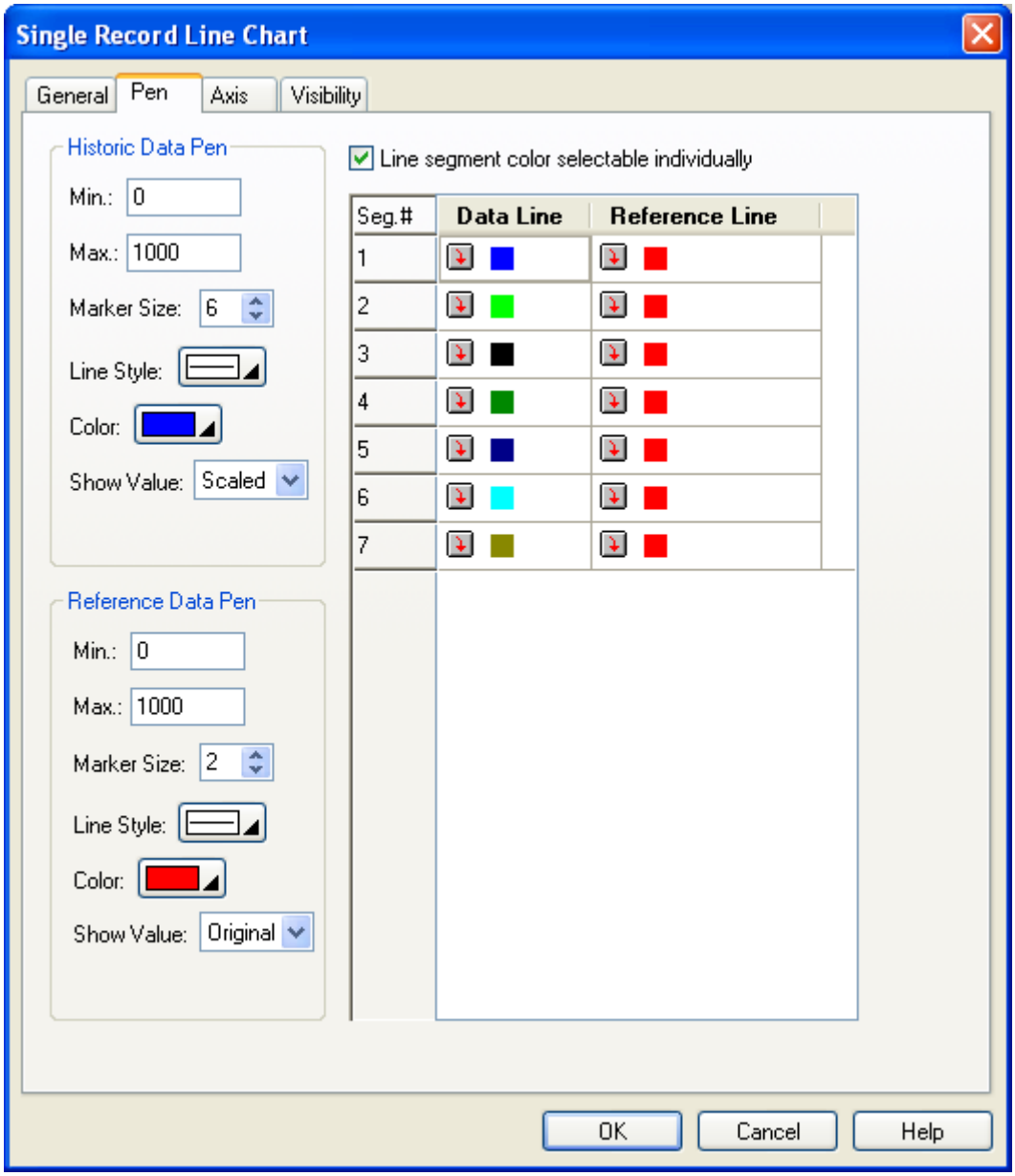
Property	Description
ID	The object's identifier. It is generated when the object is created and is unchangeable. The identifier is unique within the screen where the object is located. The format of the IDs for the Single Record Line Charts is HLCnnnn.
Note	You can type a note for the object.
Shape settings	For details about the following properties, see Section 4.3.4 Setting up the Shape of an Object. Shape..., Border Color, BG Color
Associated Data Logger	Specifies the associated data logger.
Data Source	Select a data logger or file as the source of the collected data.
File Buffer ID	Specify the File Buffer ID if the data source is a file. To specify a file buffer ID for a file, you can use the Load Logged Data From File operation of the function button. Please see Section 5.4 Performing Built-in Function Using Function Buttons.for details.

Continued

Property		Description
Number of Data Points		Specifies the number of data points.
Data Type		The data type of the data logger. The supported data types include: 16-Bit Unsigned Integer, 32-Bit Unsigned Integer, 16-Bit Signed Integer, 32-Bit Signed Integer, 16-Bit BCD, 32-Bit BCD, 32-Bit Floating Point, 16-Bit Signed BCD (LMB), 32-Bit Signed BCD (LMB), 16-Bit Signed BCD (LMD), and 32-Bit Signed BCD (LMD).
Show Data Point Markers		Check this option so the single record line chart will display all the data point markers.
Show Connected Lines		Check this option so the single record line chart will display the connected lines.
Time/Date Display	Date	Check this option if you want the object to display the Date column. You need to select a format for displaying the date.
	Time	Check this option if you want the object to display the Time column. You need to select a format for displaying the time.
	Color	Select a color for the text.
	Font	Select a font for the title text.
	Display Relative Time	Check this option if you want the object to display a relative measure of time.
Show Cursor	<Check Box>	Check this option so the single record line chart will display a cursor. You can touch and drag the cursor to the data point(s) that you want to select.
	Cursor Color	Select a color for the cursor.
	Value Display Font	Select a font for displaying the values of the selected data point(s).
	Cursor Data Receiving Buffer	Specifies the variable to receive the data selected by the cursor to be read and displayed. Click  to enter an address for this field. Click  to select a tag for this field.
Reference Line	<Check Box>	Check this option so the single record line chart will display a reference line.
	Reference Line Data Block	Specifies the variable as the data to be read from and displayed as a reference for comparison. Click  to enter the word address. Click  to enter the word tag.
	Show/Hide Controlled By Bit	Check this option if you want to show or hide the reference line controlled by the specified bit.
	Show/Hide Control Bit	Specifies the bit that controls the reference line to be shown or hidden. Click  to enter the bit address. Click  to enter the bit tag.

12.5.5. Pen Settings

This section describes how to define the pens for the line charts. The following is an example of the Pen page.



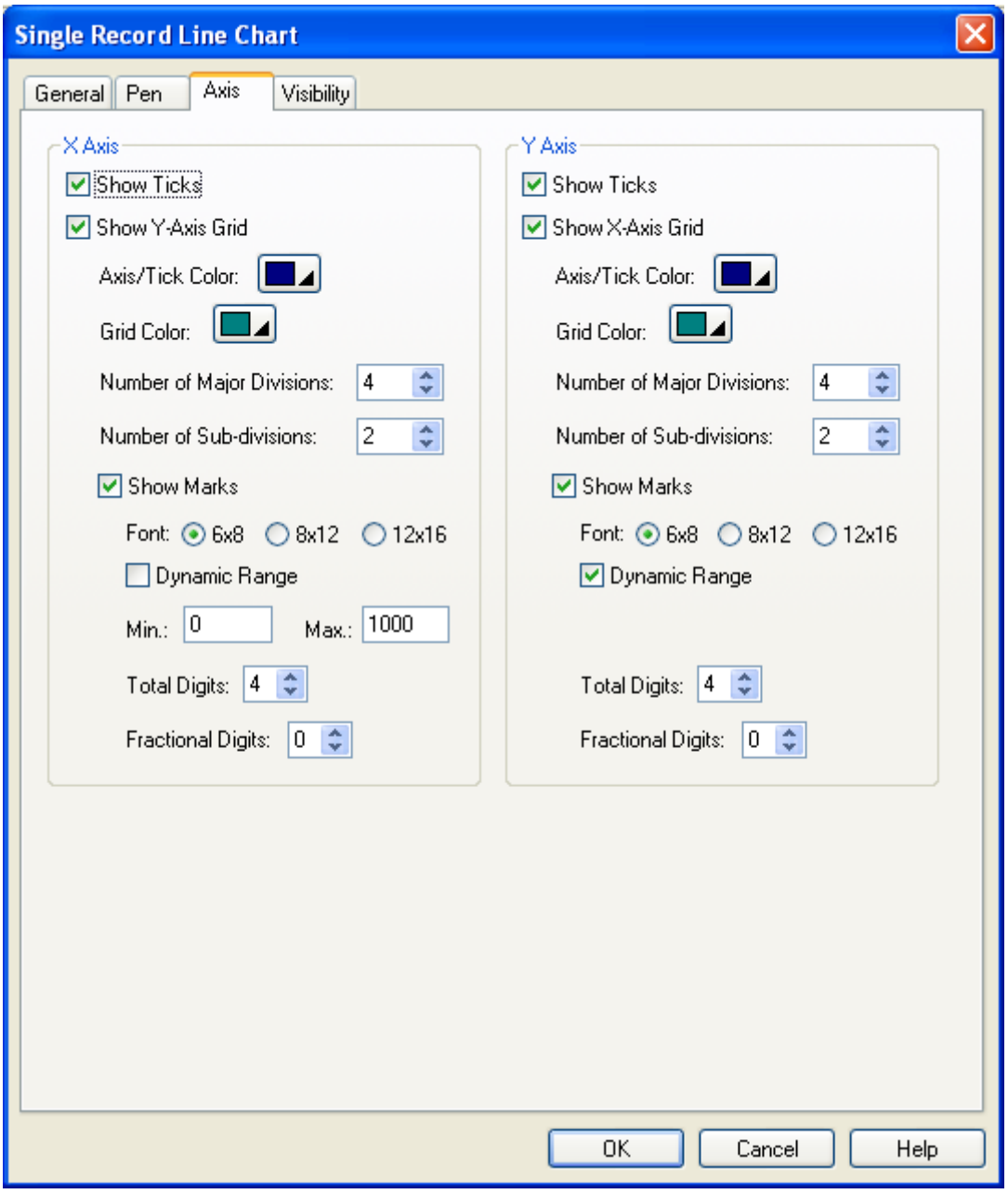
The following table describes each property in the Pen page.

<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td rowspan="6">Historic Data Pen</td><td>Min.</td><td>The minimum of the associated data set. This property is available when the Dynamic Range option is not selected.</td></tr>
<tr><td>Max.</td><td>The maximum of the associated data set. This property is available when the Dynamic Range option is not selected.</td></tr>
<tr><td>Mark Size</td><td>Select a size for the data point mark. The selection is valid when the Show Mark option in the General page is selected.</td></tr>
<tr><td>Line Style</td><td>Select a style for the connecting lines. The selection is valid when the Show Line option in the General page is selected.</td></tr>
<tr><td>Color</td><td>Select a color for the connecting lines.</td></tr>
<tr><td>Show Value</td><td>Select one of the following methods for displaying the selected data point value.
<table>
<tr><th>Show Value</th><th>Description</th></tr>
<tr><td>(None)</td><td>Does not display the data point value.</td></tr>
<tr><td>Original</td><td>Displays the data point value without modification.</td></tr>
<tr><td>Scaled</td><td>Displays the corresponding Y axis value of the data point.</td></tr>
</table>
The selection is valid when the Show Cursor option in the General page is selected.</td></tr>
<tr><td rowspan="6">Reference Data Pen</td><td>Min.</td><td>The minimum of the associated data set. This property is available when the Dynamic Range option is not selected.</td></tr>
<tr><td>Max.</td><td>The maximum of the associated data set. This property is available when the Dynamic Range option is not selected.</td></tr>
<tr><td>Mark Size</td><td>Select a size for the data point mark. The selection is valid when the Show Mark option in the General page is selected.</td></tr>
<tr><td>Line Style</td><td>Select a style for the connecting lines. The selection is valid when the Show Line option in the General page is selected.</td></tr>
<tr><td>Color</td><td>Select a color for the connecting lines.</td></tr>
<tr><td>Show Value</td><td>Select one of the following methods for displaying the selected data point value.
<table>
<tr><th>Show Value</th><th>Description</th></tr>
<tr><td>(None)</td><td>Does not display the data point value.</td></tr>
<tr><td>Original</td><td>Displays the data point value without modification.</td></tr>
<tr><td>Scaled</td><td>Displays the corresponding Y axis value of the data point.</td></tr>
</table>
The selection is valid when the Show Cursor option in the General page is selected.</td></tr>
<tr><td colspan="2">Line segment color selectable individually</td><td>Check this option to set the line segment color individually in the list window. The list window has three columns. The first column is the line segment number. The second column is the color setting for the data line. The third column is the color setting for the reference line.</td></tr>
</table>

12.5.6. Axis Settings

This section describes how to define the X axis and the Y axis for single record line charts.

The following is an example of the Axis page.



The following table describes each property in the Axis page.

Property		Description
X Axis	Show Ticks	Check this option if you want the X axis to have ticks.
	Show Y-axis Grid	Select this option if you want the X axis to have vertical grids.
	Axis/Tick Color	Select a color for the X axis and its ticks.
	Grid Color	Select a color for the vertical grids.
	Number of Major Divisions	The number of major divisions for the X axis. The minimum you can specify is one.
	Number of Sub-divisions	The number of divisions between two adjacent major ticks. The minimum you can specify is one.
Mark	Show Marks	Check this option if you want the major ticks to have marks.
	Font	The font of the marks.
	Dynamic Range	Check this option if you want the minimum and maximum of the marks to be controlled by the dynamic range parameter block of the associated object at runtime.
	Min.	The minimum of the marks. It is a 32-bit integer.
	Max.	The maximum of the marks. It is a 32-bit integer.
	Total Digits	The total digits to be displayed for the marks.
	Fractional Digits	The number of fractional digits for the marks. For example, when the Maximum is 5000, the Total Digits is 4, and the Fractional Digits is 2, the mark for the Maximum will be 50.00.
Y Axis	Show Ticks	Check this option if you want the Y axis to have ticks.
	Show X-axis Grid	Select this option if you want the Y axis to have horizontal grids.
	Axis/Tick Color	Select a color for the X axis and its ticks.
	Grid Color	Select a color for the horizontal grids.
	Number of Major Divisions	The number of major divisions for the Y axis. The minimum you can specify is one.
	Number of Sub-divisions	The number of divisions between two adjacent major ticks. The minimum you can specify is one.
Mark	Show Marks	Check this option if you want the major ticks to have marks.
	Font	The font of the marks.
	Dynamic Range	Check this option if you want the minimum and maximum of the marks to be controlled by the dynamic range parameter block of the associated object at runtime.
	Min.	The minimum of the marks. You can specify a 32-bit signed integer.
	Max.	The maximum of the marks. You can specify a 32-bit signed integer.
	Total Digits	The total digits to be displayed for the marks.
	Fractional Digits	The number of fractional digits for the marks. For example, when the Maximum is 5000, the Total Digits is 4, and the Fractional Digits is 2, the mark for the Maximum will be 50.00.