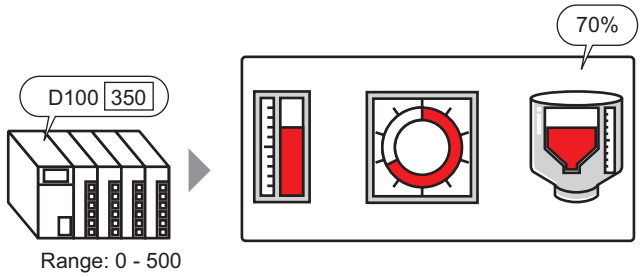
18 Graph Display

This chapter explains basic features of the GP-Pro EX "Graph Display" feature and the basic operation for placing graphs.
Please start by reading "18.1 Settings Menu" (page 18-2) and turn to the page with the relevant explanation.

18.1 Settings Menu

Displaying the Current Value in a Bar/Circle/Tank Graph

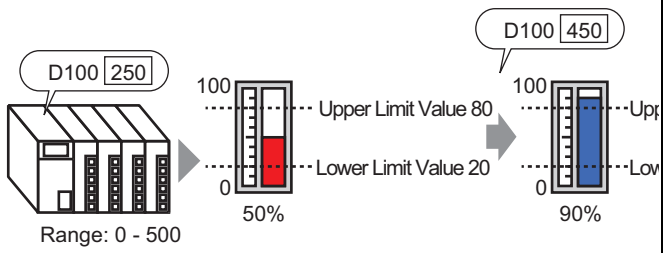
Specified data stored in a device/PLC can be displayed as a Graph.



☞ Setup Procedure (page 18-7)
☞ Introduction (page 18-6)

Displaying Alarms in a Bar/Circle/Tank Graph

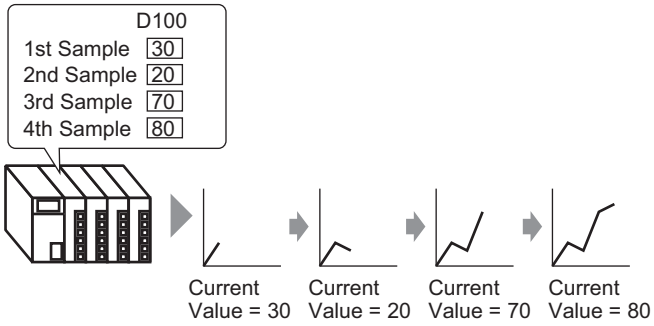
The displayed color will change when the value exceeds a set range.



☞ Setup Procedure (page 18-10)
☞ Introduction (page 18-9)

Using Trend Graphs

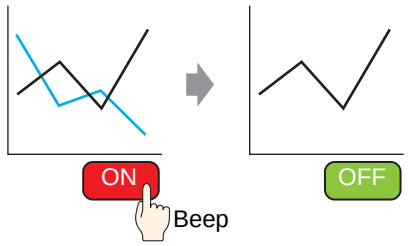
Displays changes in data on a Line Chart.



☞ Setup Procedure (page 18-14)
☞ Introduction (page 18-13)

Show/Hide Graph Lines

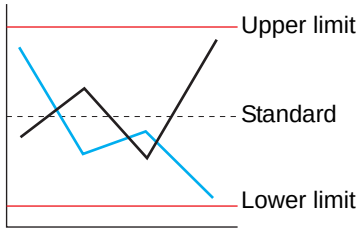
You can show/hide the graph for each channel.



☞ Setup Procedure (page 18-18)
☞ Introduction (page 18-17)

Display a Standard Line in a Graph

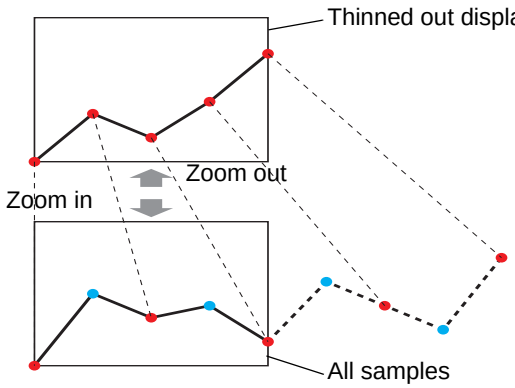
You can set three auxiliary lines: Upper Limit, Lower Limit, and Standard.



☞ Setup Procedure (page 18-22)
☞ Introduction (page 18-21)

Zoom Graph Scale In or Out

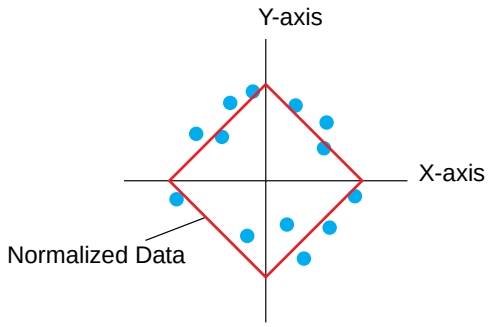
The line chart can be zoomed out in a longer range for normal use, or zoomed in within shorter range if you want to view it in detail.



☞ Setup Procedure (page 18-25)
☞ Introduction (page 18-24)

Place Normalized Data on a Graph for Comparison with Actual Data

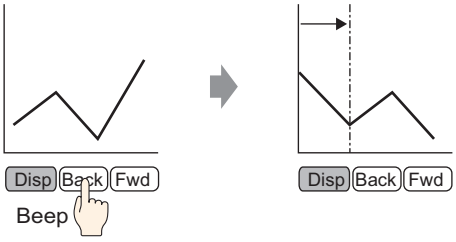
Values of two Word devices are collected and points and lines are displayed in a graph as x-axis/y-axis coordinates.
Normalized data and x-axis/y-axis data can also be displayed.



☞ Setup Procedure (page 18-29)
☞ Introduction (page 18-28)

Using a Trend Graph to View Historical Data

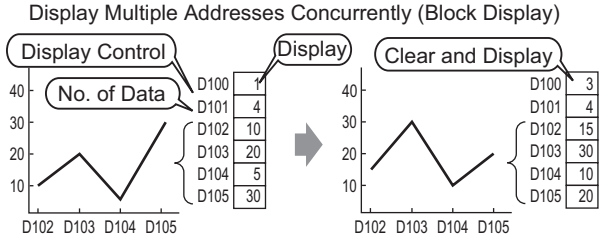
You can display a Line Chart's past data.



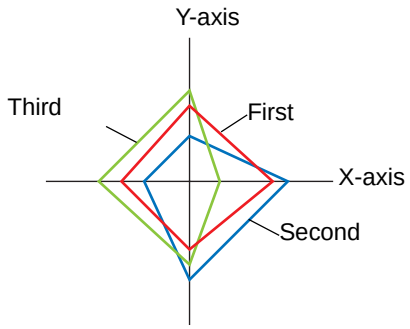
☞ Setup Procedure (page 18-33)
☞ Introduction (page 18-32)

Displaying Multiple Addresses Concurrently (Block Display)

Display the values of multiple consecutive Word Addresses on a single Line Chart.



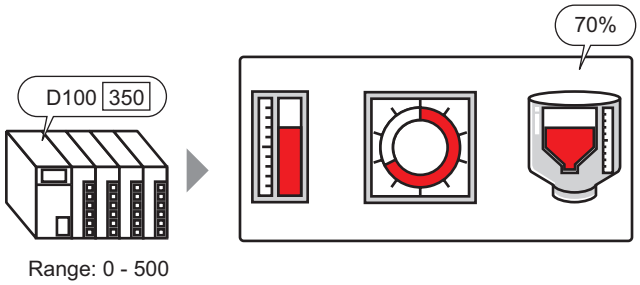
☞ Setup Procedure (page 18-44)
☞ Introduction (page 18-43)

Compare Historical and Current Data Values in a Graph	
Multiple data consisting of a pair of two Word devices' values are collected at once and points and lines are displayed in a graph.  	☞ Setup Procedure (page 18-49) ☞ Introduction (page 18-48)

18.2 Displaying the Current Value in a Bar/Circle/Tank Graph

18.2.1 Introduction

The current value is converted as defined in the range values and displayed on the Graph.



18.2.2 Setup Procedure

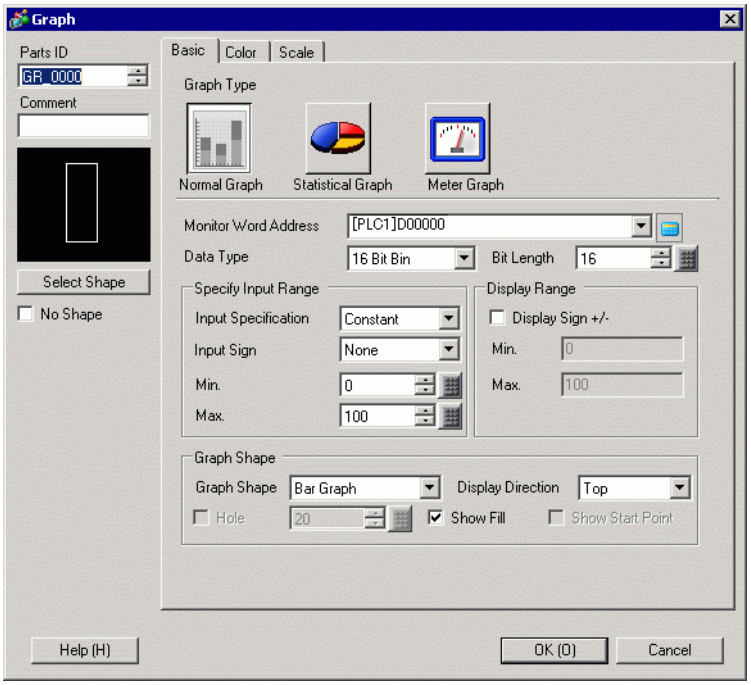
NOTE

- Please refer to the Settings Guide for details.
  ☞"18.12.1 Graph Part Settings Guide" (page 18-51)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Displays word address (D100) data on a Bar Graph.

1 From the [Parts (P)] menu, select [Graph (G)] or click . Place the Graph on the screen.

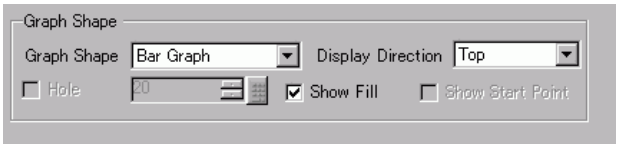
2 Double-click the new Graph. The following dialog box appears.



3 In [Monitor Word Address], set the address (D100) you want to display. Then set the [Data Type] and [Bit Length].

4 In the [Input Specification] drop-down list, select [Constant]. In the [Min] and [Max] fields, set the range of data stored in that address. If you are storing negative values, set the [Input Sign] to [2's Complement] or [MSB Sign].

5 In the [Graph Shape] drop-down list, select [Bar Graph].

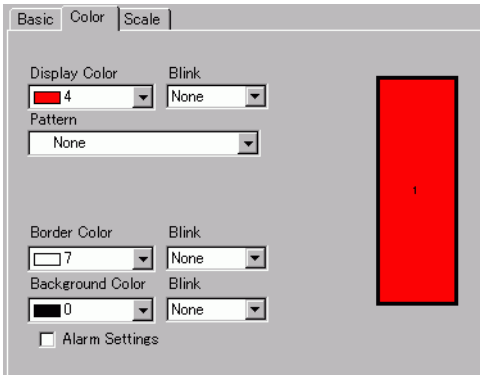


NOTE

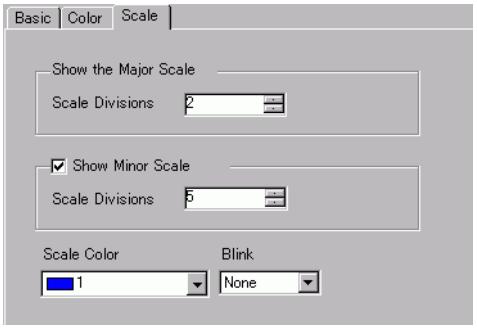
- You can also select [Circle Graph], [Semicircle Graph], and [Tank Graph].

6 In [Select Shape], select the Graph shape.

7 On the [Color] tab, set the [Display Color].
Set the Graph's other colors (pattern color, border color) if necessary.



8 On the [Scale] tab, set the scale's display settings, designate the scale colors, and click [OK].



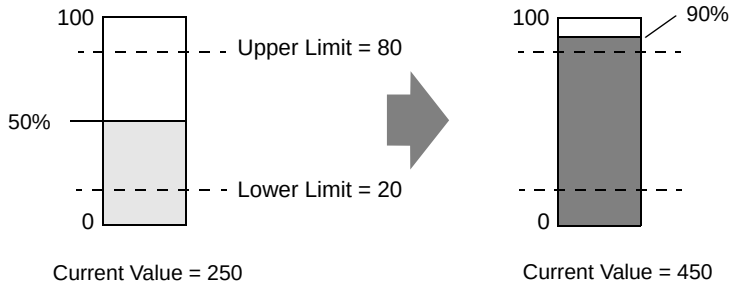
NOTE

- For graph parts with a scale, Scale Label for the scale can be automatically placed using a text part.
Right-click the graph part with a scale and click [Scale Label Placement] from the displayed menu. The [Text] dialog box appears. Set up each item and click [OK].

18.3 Displaying Alarms in a Bar/Circle/Tank Graph

18.3.1 Introduction

When the data range is 0-500:



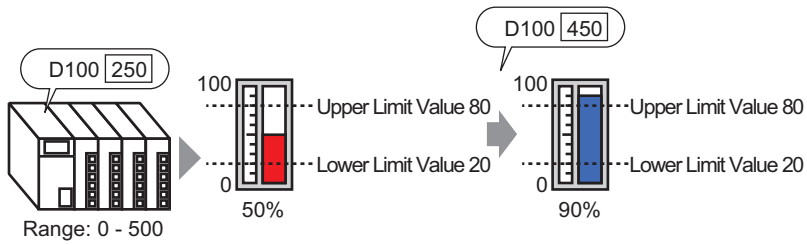
You can set the normal and abnormal values. When an abnormal value occurs, the Graph color changes.This is useful for users to quickly see abnormal values.

18.3.2 Setup Procedure

NOTE

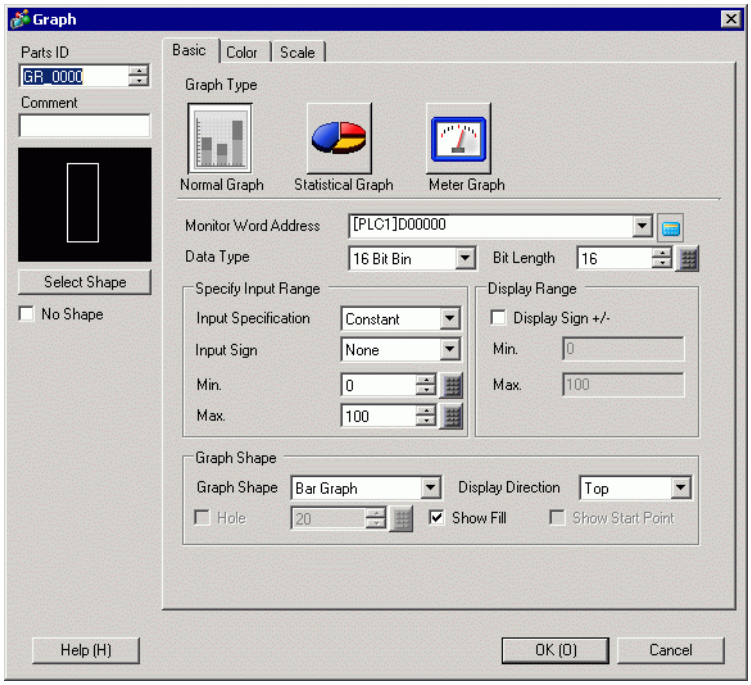
- Please refer to the Settings Guide for details.
  ☞"18.12.1 Graph Part Settings Guide" (page 18-51)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Set the Graph color so that it changes when the word address (D100) data goes below 20% or above 80% of the Input Range.



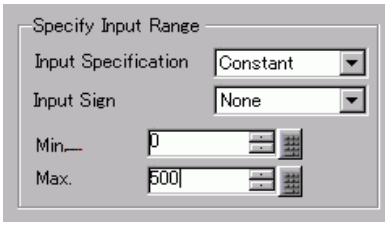
1 From the [Parts (P)] menu, select [Graph (G)] or click . Place the Graph on the screen.

2 Double-click the new Graph. The following dialog box appears.

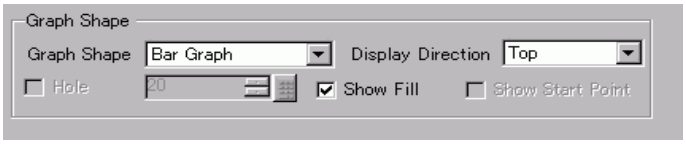


3 In [Monitor Word Address], set the address (D100) you want to display. Then set the [Data Type] and [Bit Length].

4 In the [Input Specification] drop-down list, select [Constant]. In the [Min] and [Max] fields, set the range of data stored in that address.



5 In the [Graph Shape] drop-down list, select [Bar Graph].

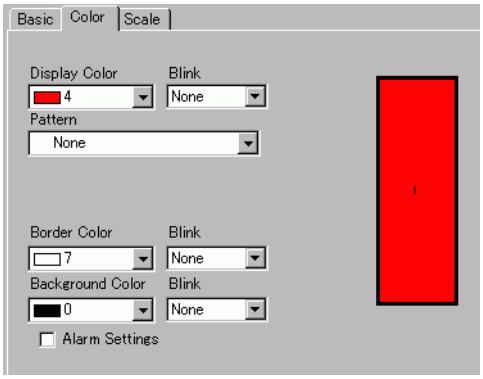


NOTE

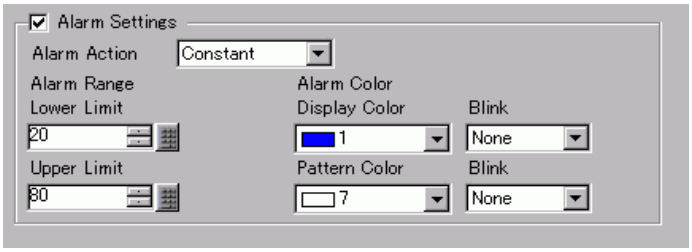
- You can also select [Circle Graph], [Semicircle Graph], and [Tank Graph].

6 In [Select Shape], select the Graph shape.

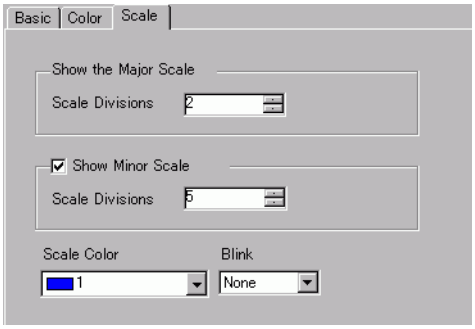
7 On the [Color] tab, set the [Display Color].
Set the Graph's other colors (pattern color, border color) if necessary.



8 Select the [Alarm] check box, and specify the alarm range (percentage). (For example, Lower Limit 20, Upper Limit 80).
In [Display Color], set the Alarm Display color.



9 On the [Scale] tab, set to show the scales and the color and blink. Click [OK].



NOTE

- For graph parts with a scale, Scale Label for the scale can be automatically placed using a text part.
  Right-click the graph part with a scale and click [Scale Label Placement] from the displayed menu. The [Text] dialog box appears. Set up each item and click [OK].

18.4 Using Trend Graphs

18.4.1 Introduction

You can collect and display data in regular or random intervals in a Line Chart.
You can use this to identify significant changes in data or to view the relationship between different data.
Up to 20 lines can be displayed on a single Line Chart.

IMPORTANT

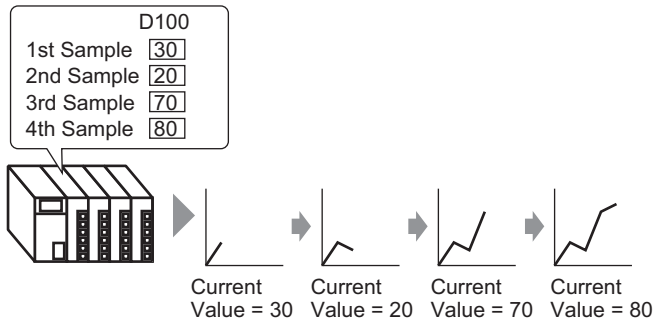
- Use the Sampling function to get data. To display a historical trend graph, you first need to set connection device/PLC data to be collected in the GP using the Sampling.
  ☞"24.3 Sampling Data at Constant Intervals" (page 24-5)
  ☞"24.4 Sampling Data at Specific Periods" (page 24-10)

18.4.2 Setup Procedure

NOTE

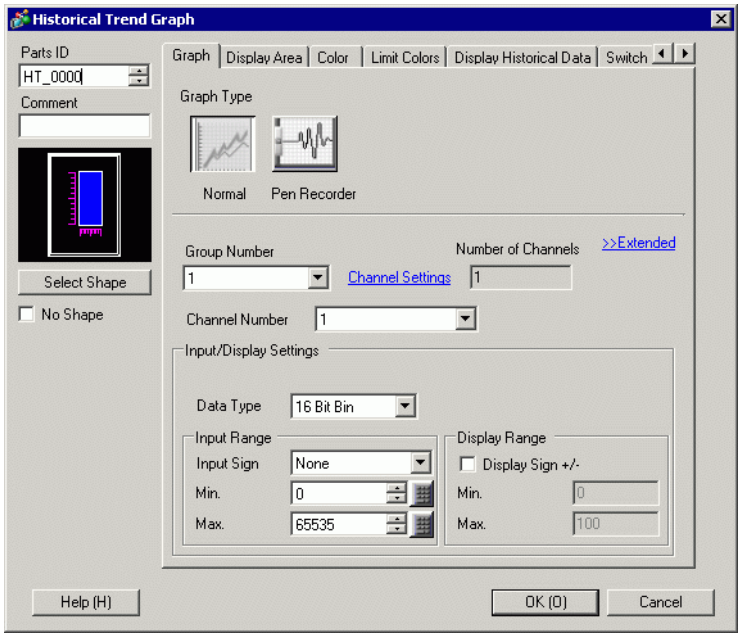
- Please refer to the Settings Guide for details.
  ☞"18.12.2 Historical Trend Graph Settings Guide" (page 18-67)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Each time a Word Address (D100) data point is sampled, that data point displays on a Line Chart.



1 From the [Parts (P)] menu, select [Historical Trend Graph (H)] or click . Place the Graph on the screen.

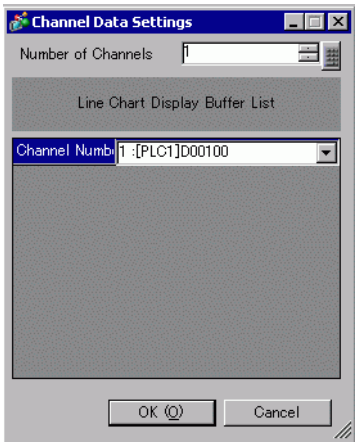
2 Double-click the new Graph. The following dialog box appears.



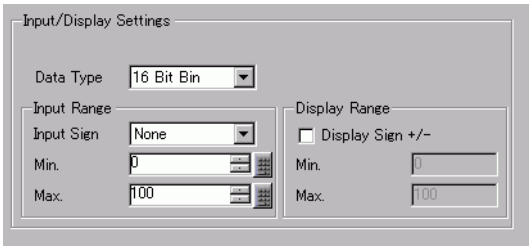
3 In [Select Shape], select the Graph shape.

4 In [Group Number], select the number of the sampling group you want to display.

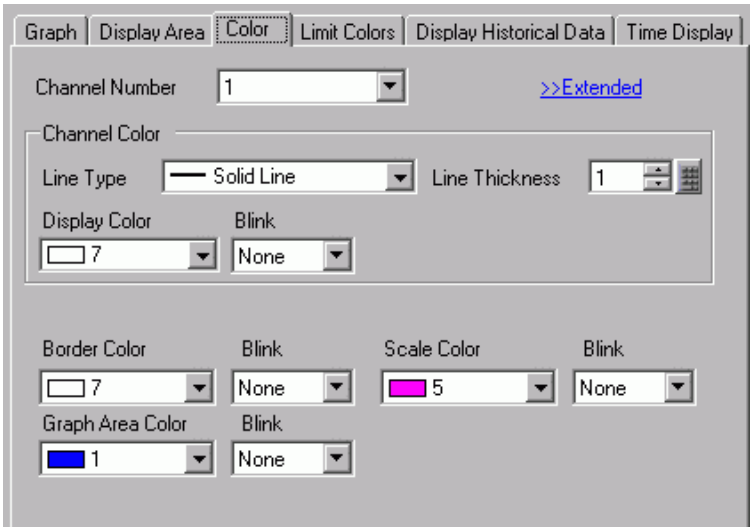
5 Click [Channel Settings]. The following dialog box appears.
In [Number of Channels], set the number of sets of data lines to display on the graph (1). In [Channel Number 1], select the graph display address (for example, D100).



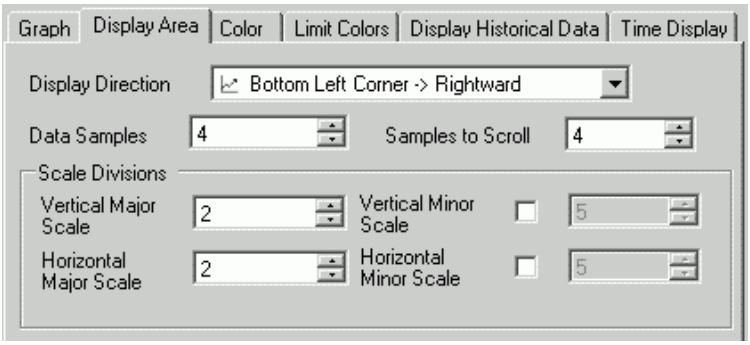
6 Set the data type and input range for the graph data.



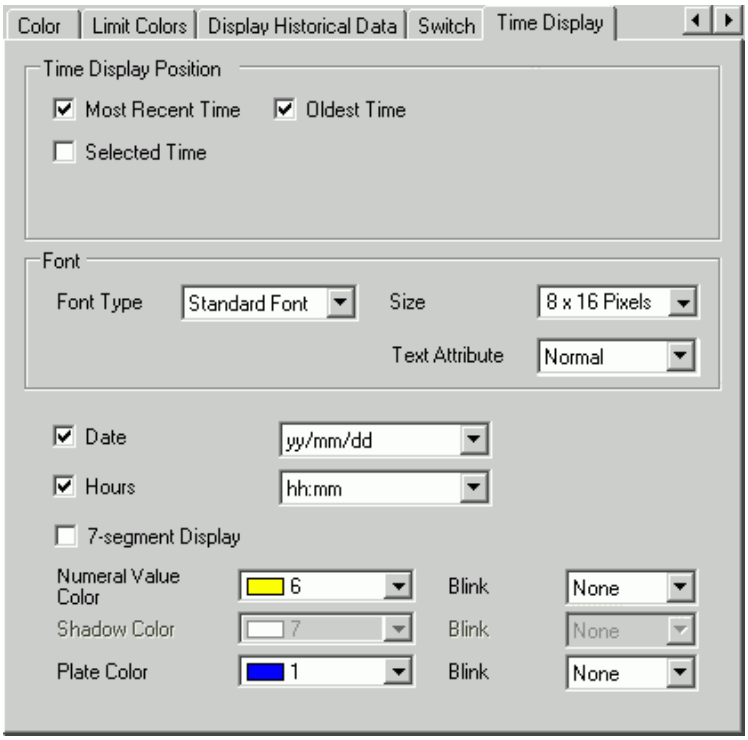
7 On the [Color] tab, set the color and type of the line to be displayed and the color of the Graph Display Area.



8 In the [Display Area] tab, set the graph Display Direction and the number of Data Samples as "4". Set the same value for the Samples to Scroll as the Data Samples. If required, set up a scale.



9 In the [Time Display] tab, select the [Most Recent Time] and [Oldest Time] check boxes, and set the format for the displayed date and time.



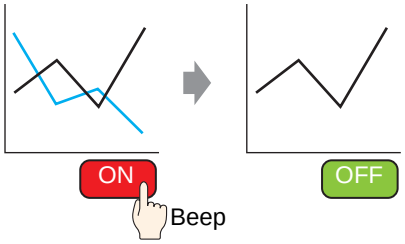
10 As needed, set the font size and color, and click [OK].

NOTE

- [Oldest Time] is placed in the lower left axis of the Historical Trend Graph, and [Most Recent Time] in the lower right axis.

18.5 Show/Hide Graph Lines

18.5.1 Introduction



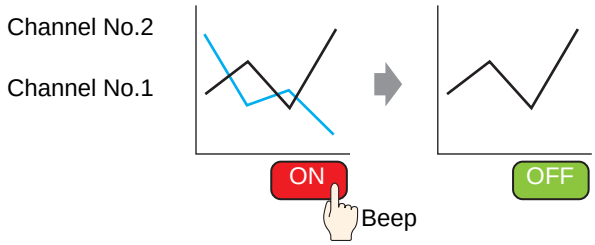
You can show/hide the line chart for each channel.
You do not need to display many channels on one graph all at once for checking. This is useful when you want to isolate or compare specific lines on a multiple line graph.

18.5.2 Setup Procedure

NOTE

- Please refer to the Settings Guide for details.
  ☞"18.12.2 Historical Trend Graph Settings Guide" (page 18-67)
- For details of the part placement method and the address, shape, color, and label setting method, refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Show/hide the Channel No.2 graph by touching the switch.

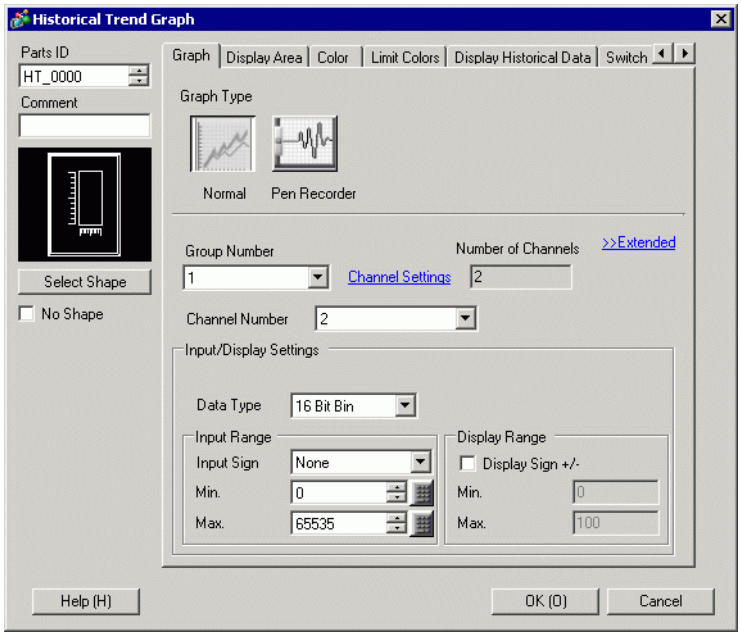


1 From the [Parts (P)] menu, select [Historical Trend Graph (H)] or click  . Place the Graph on the screen.

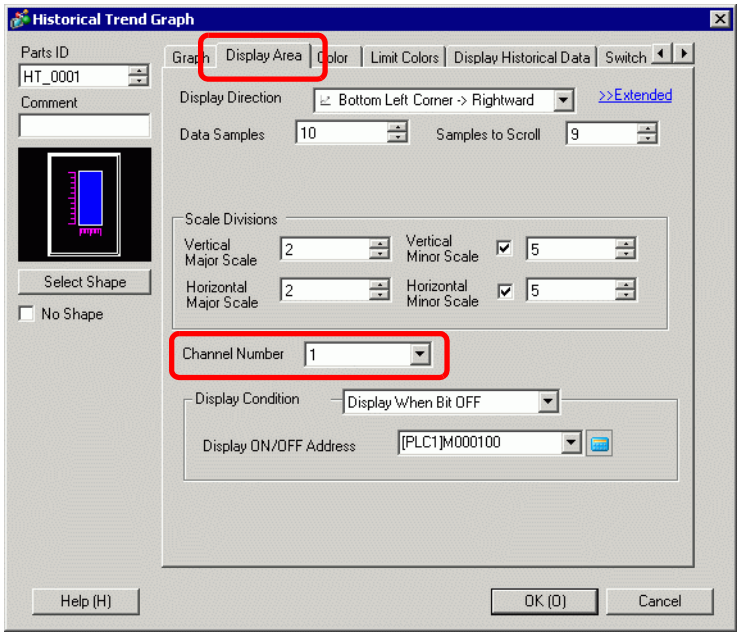
2 Double-click the new Graph. The settings dialog box appears.

- Set the sampling group and address, then adjust settings such as line color, number of display data, etc.
- In [Number of Channels] from [Channel Settings], set the number of sets of data lines to display on the graph (2). Apply the same settings on the graph to be displayed using [Channel No.2].

☞"18.4.2 Setup Procedure" (page 18-14)



3 Configure the Channel No. for the graph you want to show/hide. Click the [Display Area] tab and select "2" from [Channel No].



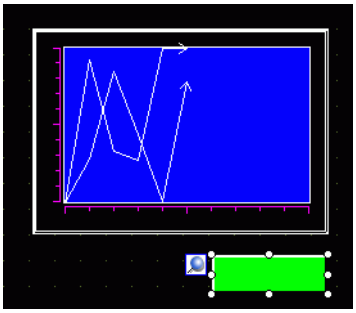
NOTE

- Changing [Channel No] will change the setting items on the other tabs for the selected [Channel No].

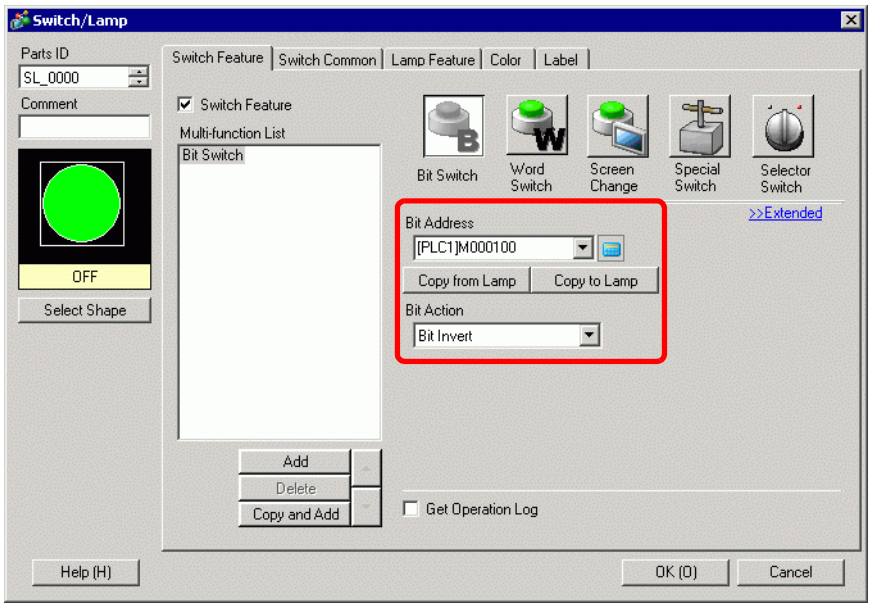
4 From [Display Condition], choose [Display When Bit OFF].

5 In [Display ON/OFF Address], select the address (for example, M100) for changing the show/hide status of the graph, and click [OK].

6 Place a switch to change the show/hide status of the Channel No. 2 graph.
On the [Parts (P)] menu, point to [Switch Lamp (C)] and click [Bit Switch (B)], or click  to place the switch on the screen.



7 Double-click the switch. The following dialog box appears. In the [Bit Address] list, select the (M100) address for changing the show/hide status of the graph and select [Bit Invert] in the [Bit Action] list.



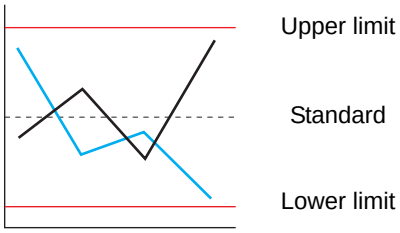
8 As needed, set the color and display text on the [Color] tab and [Label] tab, and click [OK].

NOTE

- Depending on the shape, you may not be able to change the color.
- When you select a switch and press the [F2] key, you can directly edit the Label text. When [Text Table] is selected, you can change the Text Table to be displayed.

18.6 Display a Standard Line in a Graph

18.6.1 Introduction



You can set three auxiliary lines: Upper Limit, Lower Limit, and Standard.
You can easily determine whether an error occurred or not.

NOTE

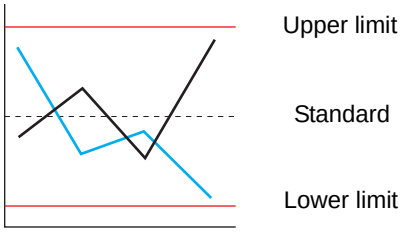
- To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].

18.6.2 Setup Procedure

NOTE

- Please refer to the Settings Guide for details.
  ☞"18.12.2 Historical Trend Graph Settings Guide" (page 18-67)
- For details of the part placement method and the address, shape, color, and label setting method, refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

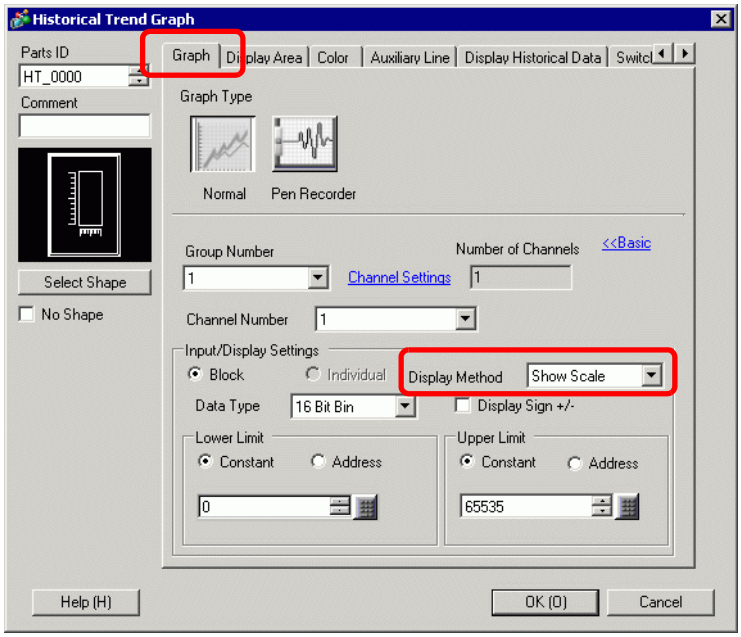
Set three auxiliary lines: Upper Limit, Lower Limit, and Standard.



1 From the [Parts (P)] menu, select [Historical Trend Graph (H)] or click  . Place the Graph on the screen.

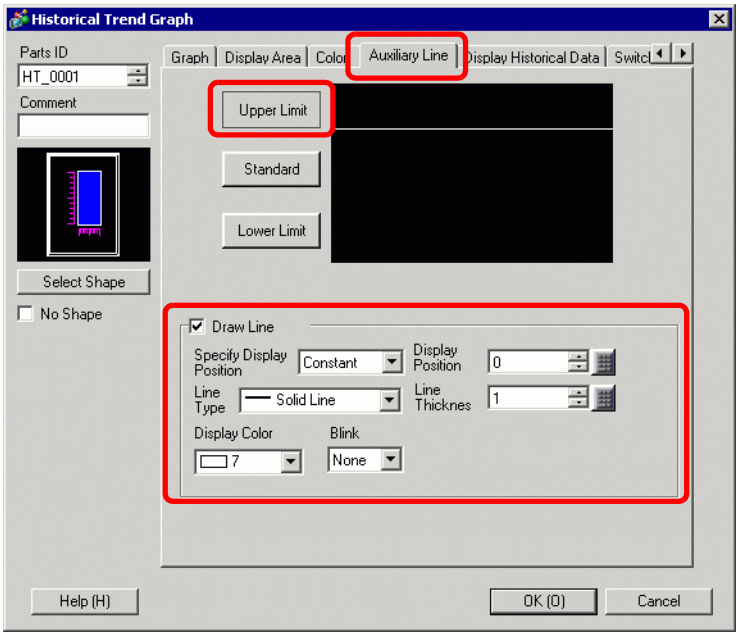
2 Double-click the new Graph. The settings dialog box appears.
Set the sampling group and address, then adjust settings such as line color, number of display data, etc.
☞"18.4.2 Setup Procedure" (page 18-14)

3 In the [Graph] tab, click [Extended] and select [Show Scale] for [Display Method] in the [Input/Display Settings].



4 The [Auxiliary Line] tab appears. Click the [Auxiliary Line] tab.

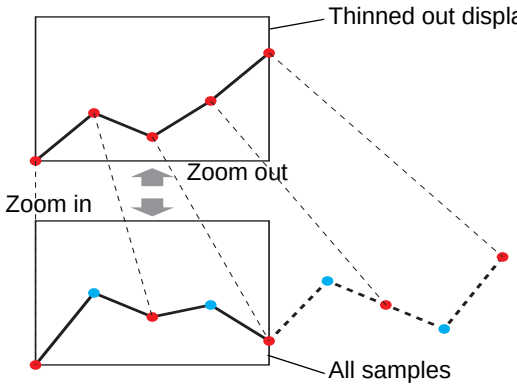
5 The auxiliary line setting is selected for [Upper Limit]. Set the upper limit auxiliary line. Select [Draw Line] and set the display position, type, display color, and other properties for the line.



6 Click [Lower Limit] and [Standard], set the details for each auxiliary line in a similar manner, and then click [OK].

18.7 Zoom Graph Scale In or Out

18.7.1 Introduction



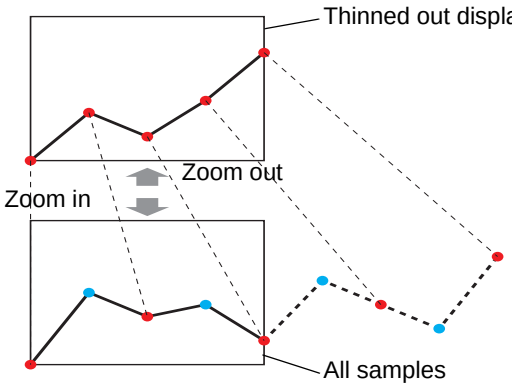
The the line chart can be displayed in a longer range for normal use and can be zoomed in only when you want to view it in detail as a line chart within a shorter range.

18.7.2 Setup Procedure

NOTE

- Please refer to the Settings Guide for details.
  ☞"18.12.2 Historical Trend Graph Settings Guide" (page 18-67)
- For details of the part placement method and the address, shape, color, and label setting method, refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

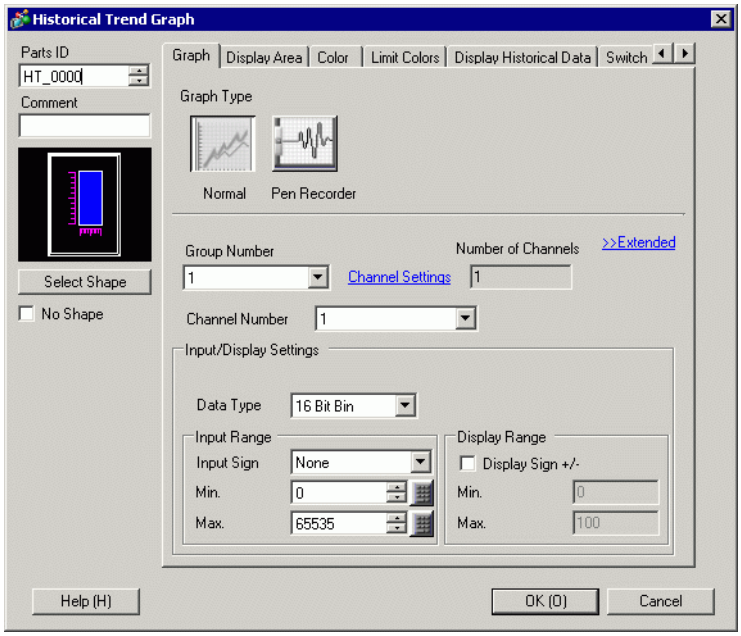
Set the line chart to zoomed out to long range for normal use, or zoom in to short range to view in detail. Also set a switch for changing zoom in/zoom out.



1 From the [Parts (P)] menu, select [Historical Trend Graph (H)] or click  . Place the Graph on the screen.

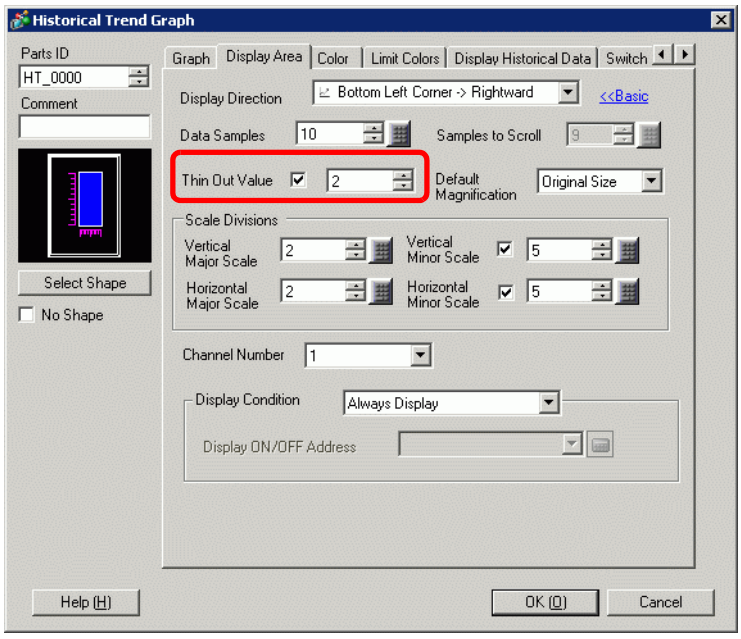
2 Double-click the new Graph. The settings dialog box appears.
Set the sampling group and address, then adjust settings such as line color, number of display data, and so on.

☞"18.4.2 Setup Procedure" (page 18-14)



3 Click the [Display Area] tab, and click [Extended].

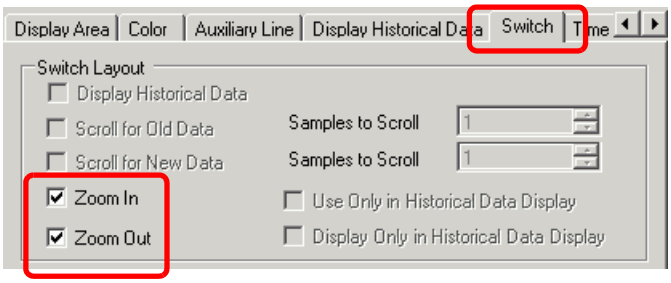
4 Select the [Thin Out Value] check box and set the level of Thin Out.



5 Select the magnification ratio usually applied for the graph from [Default Magnification].

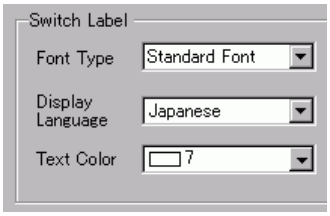
6 Click the [Switch] tab.

7 Set a switch for zooming the line chart in/out. Select [Zoom In] and [Zoom Out].

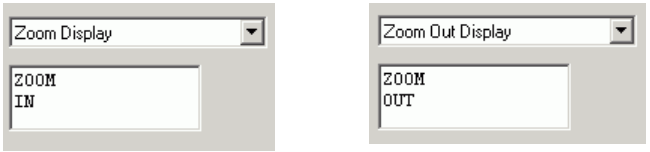


8 In [Select Shape], select the Switch shape.

9 In [Switch Label], select the Switch Label [Font Type] and [Display Language]. Set the [Text Color].



10 In [Switch Label], choose a switch and enter text in [Label].

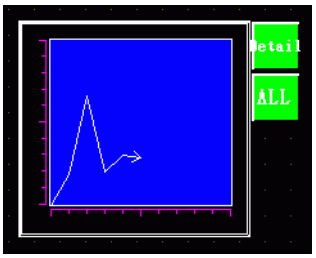


11 In [Switch Color], select the color of the switch.

NOTE

- When you use the [Historical Trend Graph Switch] from [Special Switch] in the switch lamp part without setting the switch layout on the Historical Trend Graph, you can set the shape and color for an individual switch.
- Depending on the shape, you may not be able to change the color.

12 Click [OK].

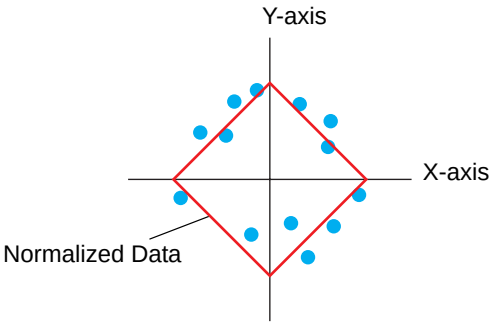


NOTE

- When you select a switch and press the [F2] key, you can directly edit the Label text.

18.8 Place Normalized Data on a Graph for Comparison with Actual Data

18.8.1 Introduction



Values of two Word devices are collected and points and lines are displayed in a graph as x-axis/y-axis coordinates.
You can display normalized data and compare it with actual data.

IMPORTANT

- Use the Sampling function to get data. To display a historical trend graph, you first need to set connection device/PLC data to be collected in the GP using the Sampling.
  ☞"24.3 Sampling Data at Constant Intervals" (page 24-5)
  ☞"24.4 Sampling Data at Specific Periods" (page 24-10)

NOTE

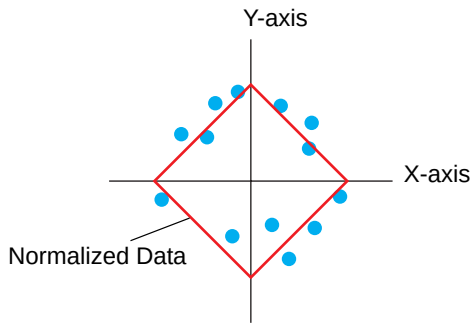
- Normalized data can be set in XY Historical Scatter Graph.
  XY Historical Scatter Graph shows the values of collected sampling data in x-axis/y-axis coordinates.

18.8.2 Setup Procedure

NOTE

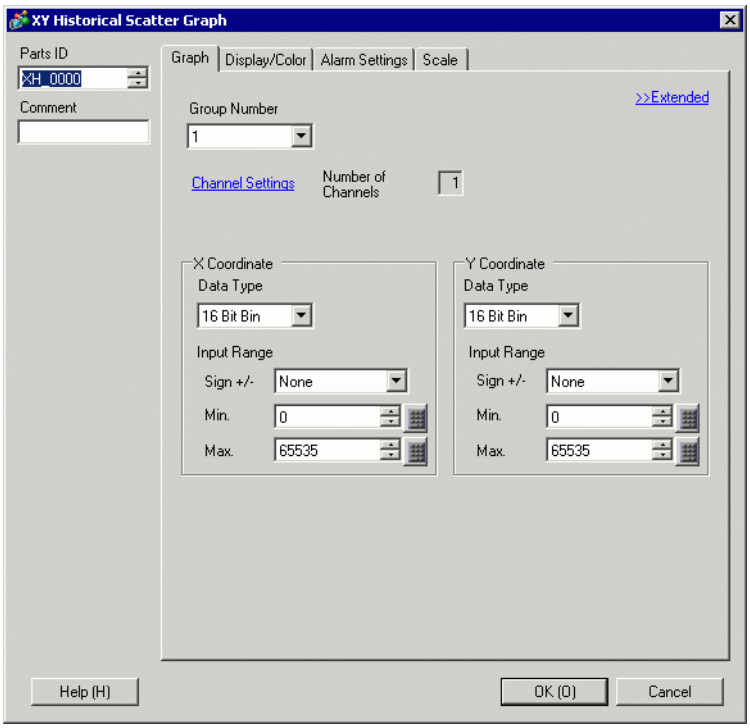
- Please refer to the Settings Guide for details.
  ☞"18.12.4 XY Historical Scatter Graph Settings Guide" (page 18-111)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Values of two Word devices (D100/D101) are collected and points and lines are displayed in a graph as x-axis/y-axis coordinates.
You can display normalized data and compare it with actual data.



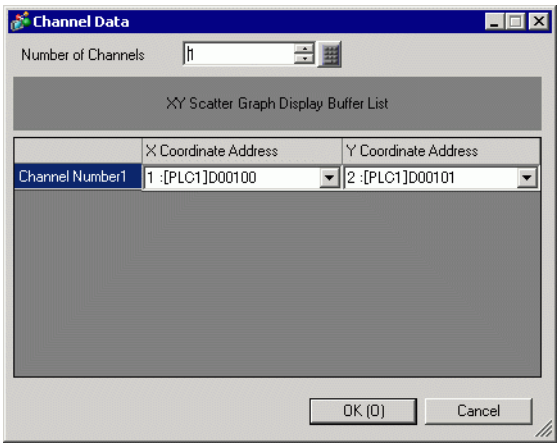
1 On the [Parts (P)] menu, point to [XY Scatter Graph (Y)] and select [XY Historical Scatter Graph (X)], or click  to place it on the screen.

2 Double-click the new Graph. The following dialog box appears.

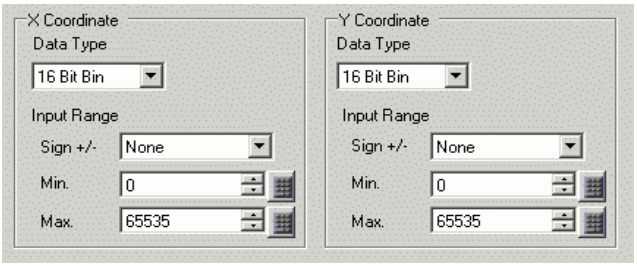


3 In [Group Number], select the number of the sampling group you want to display.

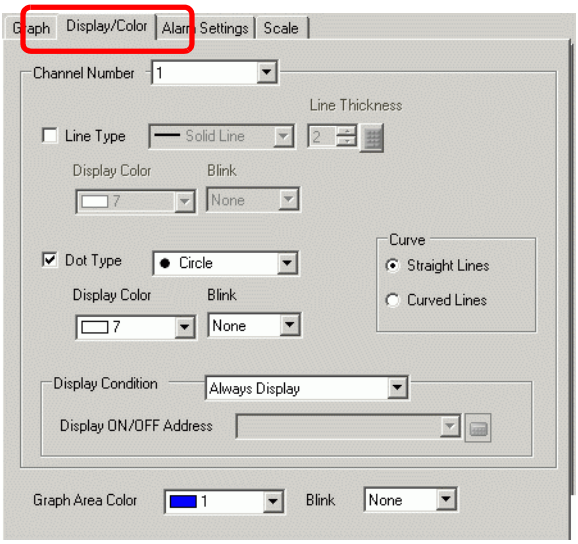
4 Click [Channel Settings]. The following dialog box appears.
In [Number of Channels], set the number of sets of data lines to display on the graph (1). In [Channel Number 1], select [X Coordinate Address] (for example, D100) and [Y Coordinate Address] (for example, D101).



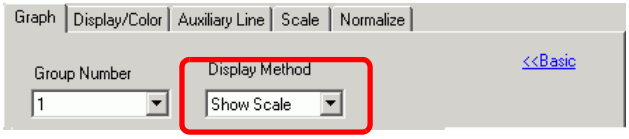
5 Set the data type and input range for the graph data.



6 On the [Display/Color] tab, set the type and color of the line/point of the graph to be displayed and the color of the Graph Display Area. When you display the graph with only points, check [Dot Type] and clear the [Line Type] check box.

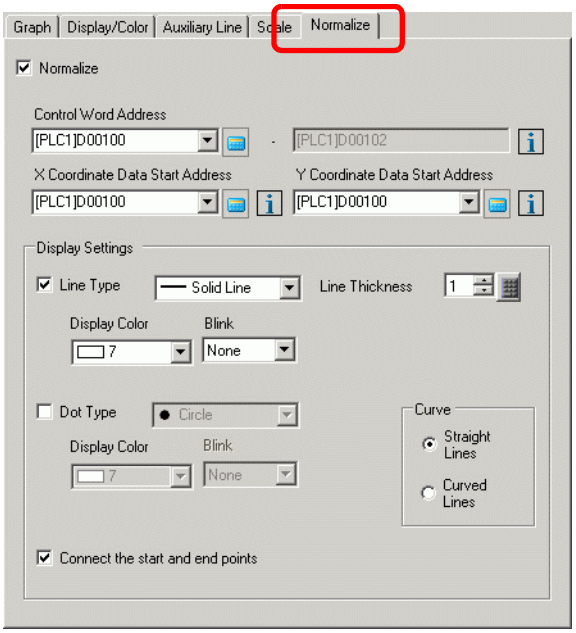


7 Click [Extended] in the [Graph] tab, and select [Show Scale] for [Display Method]. The [Auxiliary Line] tab and [Normalize] tab are displayed.

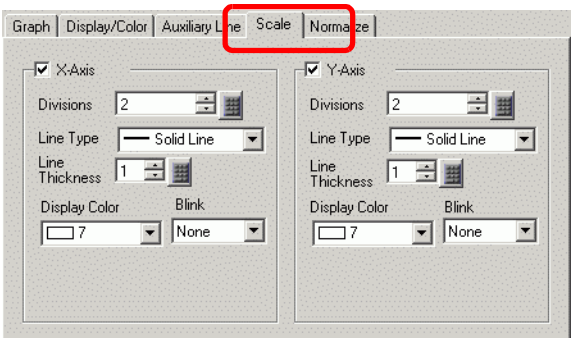


8 Set normalization in the [Normalize] tab. Select the [Normalize] check box.

Set the addresses for [Control Word Address], [X Coordinate Data Start Address] and [Y Coordinate Data Start Address]. In [Display Settings], set the type, color, etc., of the lines and points for the normalized data.



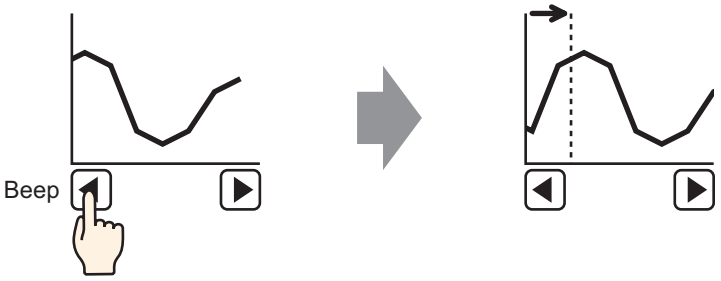
9 Configure x-axis and y-axis in the [Grid] tab.
Check [X-Axis] and [Y-Axis], and set the number of divisions, type, display color and blink.



10 Set the auxiliary line in the [Auxiliary Line] tab as necessary and click [OK].

18.9 Using a Trend Graph to View Historical Data

18.9.1 Introduction



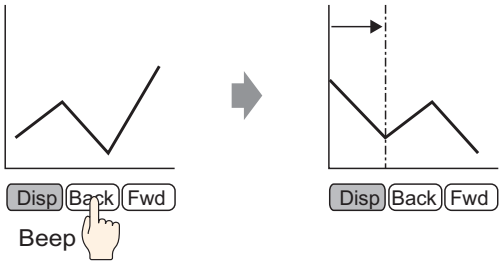
You can display a Line Chart's past data.
You can view historic data that has been cleared from the Line Chart. This function is useful for evaluating changes in data over time.

18.9.2 Setup Procedure

NOTE

- Please refer to the Settings Guide for details.
  ☞"18.12.2 Historical Trend Graph Settings Guide" (page 18-67)
- For details of the part placement method and the address, shape, color, and label setting method, refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

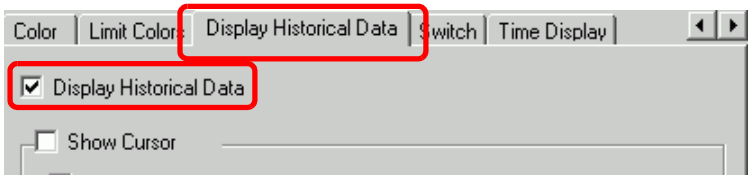
Use these settings when you want to check a Word Address (D100) historic data.



1 From the [Parts (P)] menu, select [Historical Trend Graph (H)] or click  . Place the Graph on the screen.

2 Double-click the new Graph. The settings dialog box appears.
Set the sampling group and address (D100), then adjust the settings needed for display such as the line color, number of display data, etc.
☞"18.4.2 Setup Procedure" (page 18-14)

3 Click the [Display Historical Data] tab and select the [Display Historical Data] check box.



NOTE

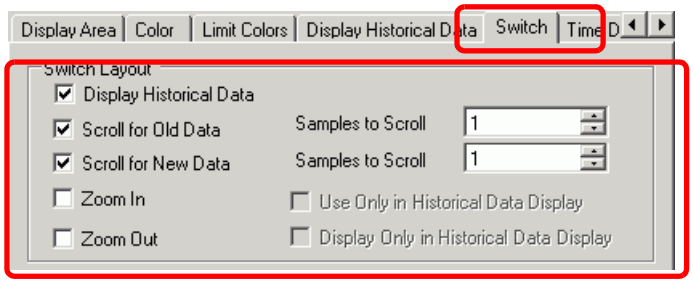
- Only one Historical Trend Graph part with a Display Historical Data function can be placed per screen.

4 Select the [Show Cursor] check box.

NOTE

- For sampling groups without [Use Memory Card as Backup Area] selected in Sampling Settings, selecting the [Show Cursor] check box does not display the cursor on the screen.

5 Set the switches which will display historical data.
Select the [Switch] tab to set the number of rows to scroll up or down per touch.

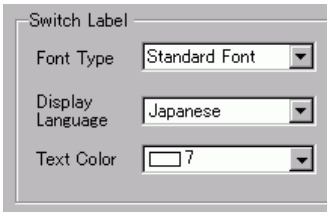


NOTE

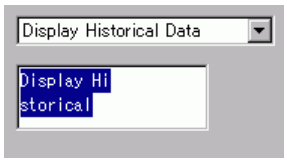
- When you use the [Historical Trend Graph Switch] from [Special Switch] in the switch lamp part without setting the switch layout on the Historical Trend Graph, you can set the shape and color for an individual switch.
- For sampling groups without [Use Memory Card as Backup Area] selected in Sampling Settings, [Zoom Display] and [Zoom Out Display] switches do not work when they are selected.

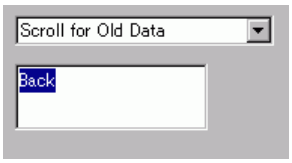
6 In [Select Shape], select the Switch shape.

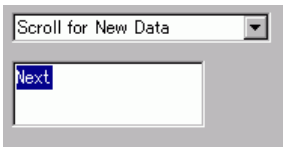
7 In [Switch Label], select the Switch Label [Font Type] and [Display Language]. Set the [Text Color].



8 In [Switch Label], choose a switch and enter text in [Label]. Type a label for each switch.



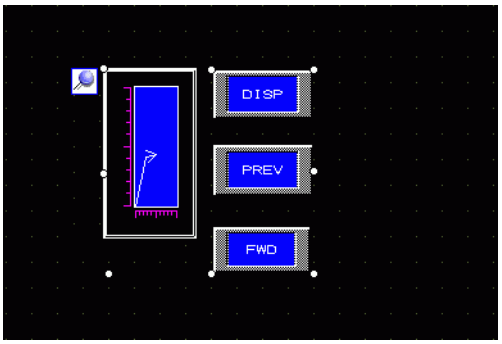




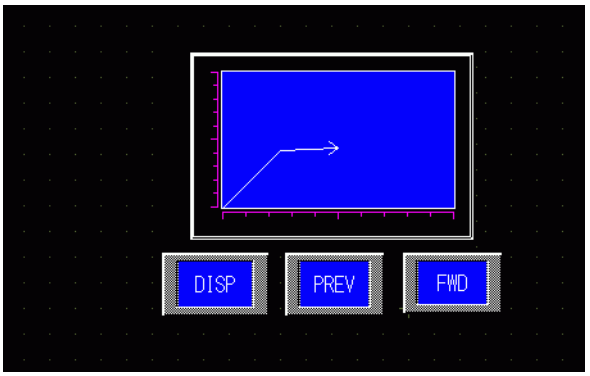
9 In [Switch Color], select the color of the switch.

NOTE

- The switches are placed on the top right of the Historical Trend Graph.

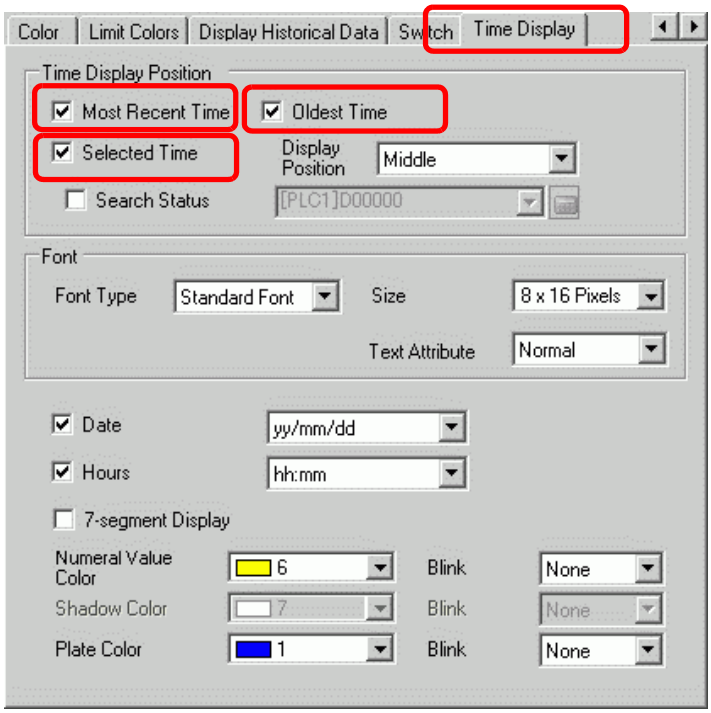


- Each switch on the graph can be individually selected and moved anywhere within the screen.



- Depending on the shape, you may not be able to change the color.

10 In the [Time Display] tab, select the [Most Recent Time], [Oldest Time], or [Selected Time] check box. Set the display format and color, and click [OK].



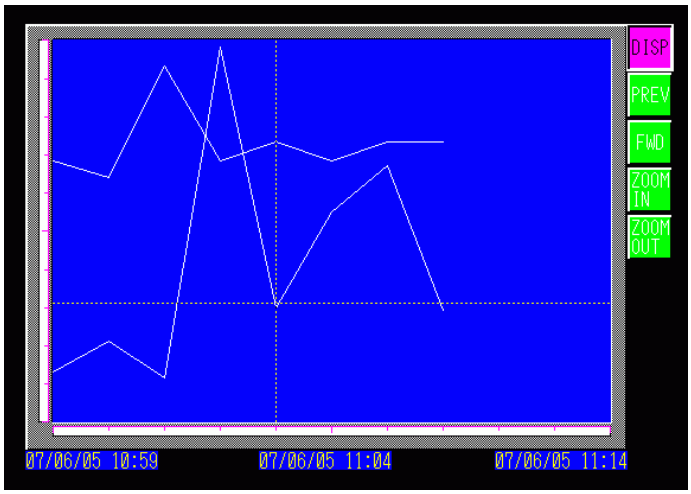
NOTE

- When you select a switch and press the [F2] key, you can directly edit the Label text.

18.9.3 Operating Procedure

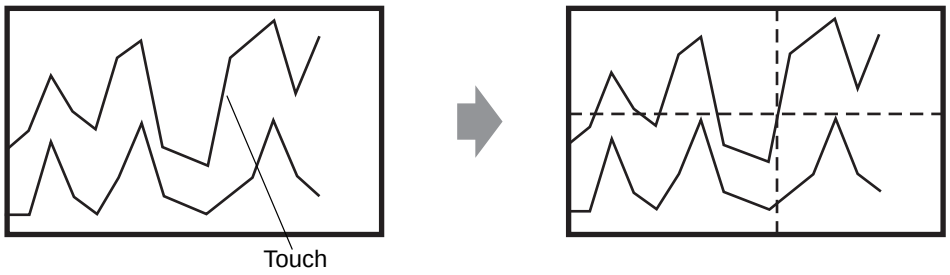
Touch the "Display Historical Data" switch ([DISP]) to switch to Display Historical Data Mode.
Touch Scroll for Old Data Switch, and you can scroll back to previous data on the display. To exit Display Historical Data Mode, touch the "Display Historical Data" switch again, or switch the screen.

When [Use Memory Card as Backup Area] is selected in the [Mode] tab in the Sample settings, you can use Show Cursor, Zoom in and Zoom out, and the search functions described below.



■ Cursor Operation

1 Touch the "Display Historical Data" switch to change to the Display Historical Data Mode.



NOTE

- To display historical data, in the [Sampling Settings] workspace, click the [Mode] tab, and select the [Backup in Internal Memory] check box. When [Use Memory Card as Backup Area] is selected, old data is saved in external memory when internal memory becomes full.

☞"24.8.1 Common (Sampling) Settings Guide ■ Mode" (page 24-41)

- If [Show Cursor] is not ON, the cursor will not appear.

☞"18.12.2 Historical Trend Graph Settings Guide ◆ Display Historical Data" (page 18-81)

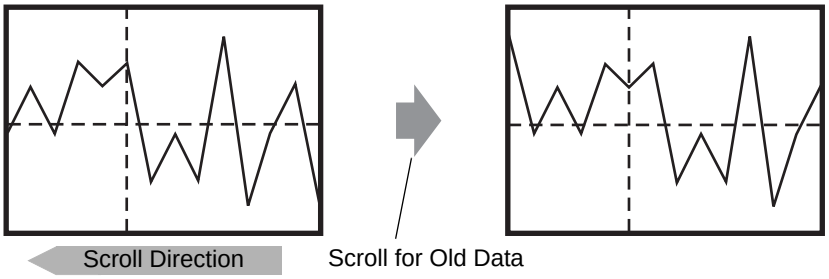
- If Display Historical Data Mode is not selected, the cursor will not appear when you touch the Graph Display Area.
- If there is no data in Backup SRAM, search for a file with the same sampling settings as the backup data file (Bin format) in the CF card or USB storage. The cursor appears if a file is found. If multiple files (Bin format) of backup data are found, only the graph for 1 file displays.
- Graph data for the point touched (date, time and graph value) is stored in the [Cursor Information Storage Address] for the number of channels set. Stored data can be displayed on [Date Display].

☞"14.2 Displaying/Inputting Numeric Data" (page 14-5)

2 Touch the [Scroll for Old Data] switch to scroll the graph.

When scrolling, the graph moves while the cursor position remains fixed.

Display Direction: Bottom Left Corner -> Toward right

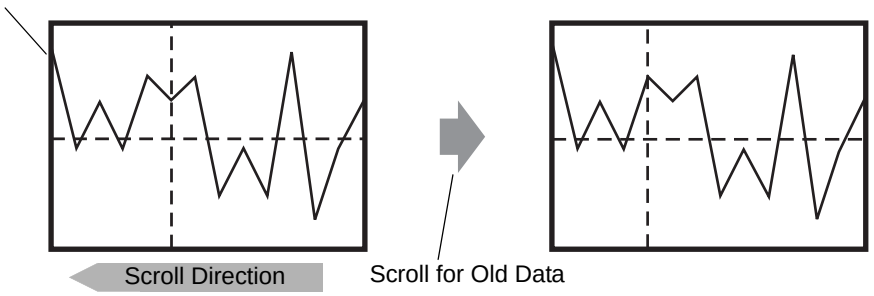


NOTE

- When the oldest data (on the left axis here) displays while scrolling, the graph becomes fixed while the cursor moves.

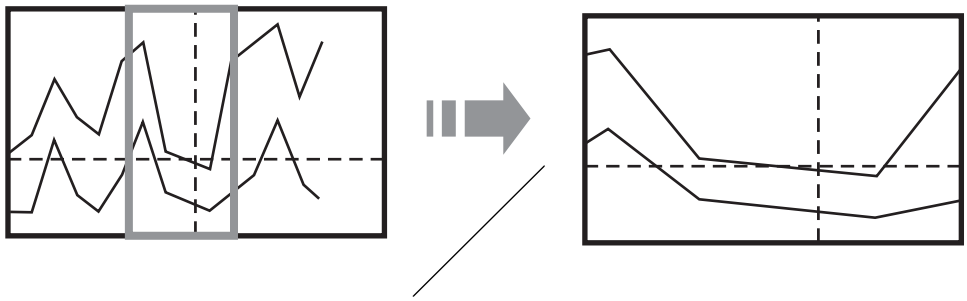
Oldest Data

Display Direction: Bottom Left Corner -> Toward right



If you keep scrolling after the cursor has moved to the end, the cursor is shown only in the X-axis direction (landscape).

■ Zoom In/Zoom Out Display



Touch the Zoom In switch after the cursor appears.

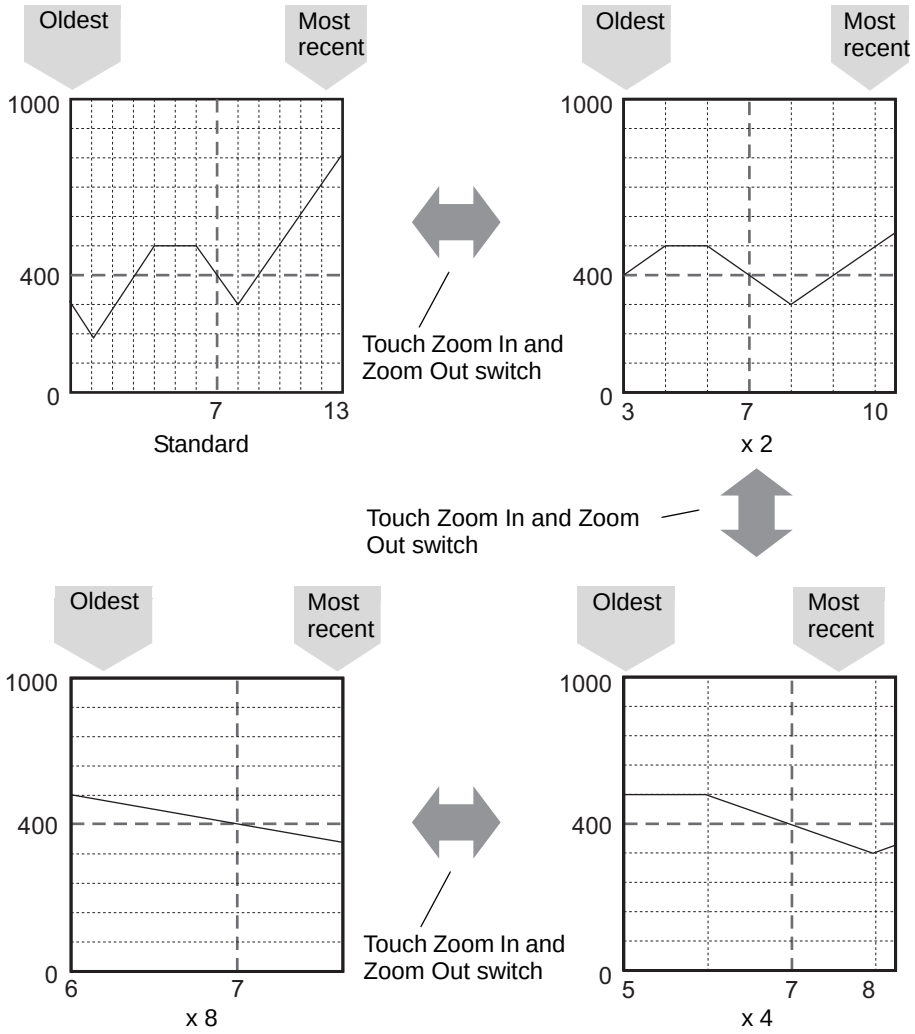
1 Touch the "Display Historical Data" switch to change to the Display Historical Data Mode.
2 Touch the [Zoom In]/[Zoom Out] switch.

NOTE

- The [Zoom In]/[Zoom Out] switch can be placed individually by creating a Special Switch.
- Zoom In and Zoom Out cannot be used if [Show Cursor] is not ON.

☞"18.12.2 Historical Trend Graph Settings Guide ◆ Display Historical Data" (page 18-81)

Zoom Display zooms in 2, 4, or 8 times in the X-axis direction (landscape) every time you touch the switch. It cannot be zoomed in more than 8 times. Zoom Out Display zooms out the image to 1/2 its current size in the X-axis direction (landscape).



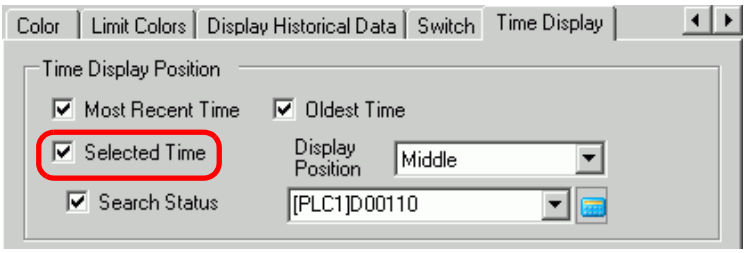
NOTE

- Once displayed in Original Size, the graph cannot be zoomed out any further.
- The oldest data is always displayed at the start of the graph, but the most recent data may not be at the end, depending on the magnification ratio.
- Time Display is available when zoomed in or out; depending on the magnification, the graph's endpoint may not appear on the sampling display. In this case, the date and time of the newest sampled data displays.
- Regardless of whether there is data older than the data displayed in the graph, the point touched becomes the center point for Zoom Display.
- When there are only two sets of data displayed in the graph, further data cannot be displayed.
- When you want to Zoom In/Zoom Out in the Y-axis direction (portrait), enable the [Show Scale] setting in [Display Direction].

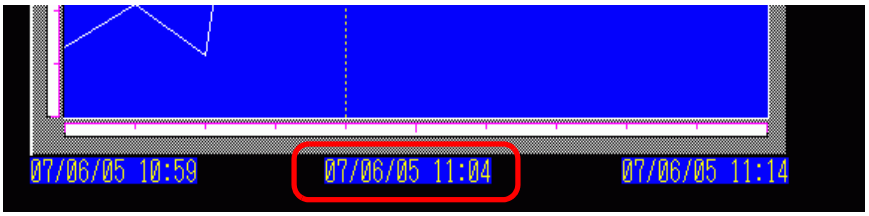
☞ "18.12.2 Historical Trend Graph Settings Guide ◆ Graph/Extended" (page 18-71)

■ Time Display and Searching Historical Data

Selecting the [Selected Time] check box in Historical Trend Graph Parts displays the (Date and Time Display) option, which displays the date and time wherever the cursor is placed on the graph.
In [Search Status], set the Status Address for search, and search for the historical data that you want to check.



1 Touch the Date and Time Display located in the center of the graph screen to display the date and time input dialog box.



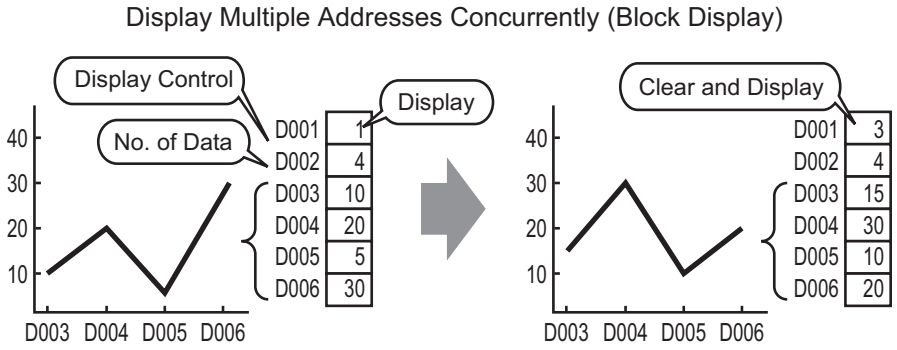
2 Input the date and time of the graph data that you want to display, and touch [ENT] to start the search.

The graph displays on the screen if there is applicable data.
If there is no applicable data, the action is as follows.

- If there is no data with a specified time
  The cursor points to the first data from before the specified time, and displays the time for that data.
- If there is no data earlier than the specified time
  The cursor points to the oldest data and the oldest time displays.
- If the specified time is newer than the data
  The cursor points to the most recent data, and the most recent time displays.

18.10 Displaying Multiple Addresses Concurrently (Block Display)

18.10.1 Introduction



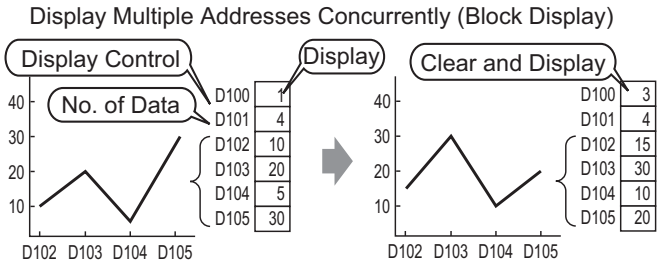
You can display multiple values from consecutive word addresses on a single Line Chart. You can compare the values and state of multiple data points.

18.10.2 Setup Procedure

NOTE

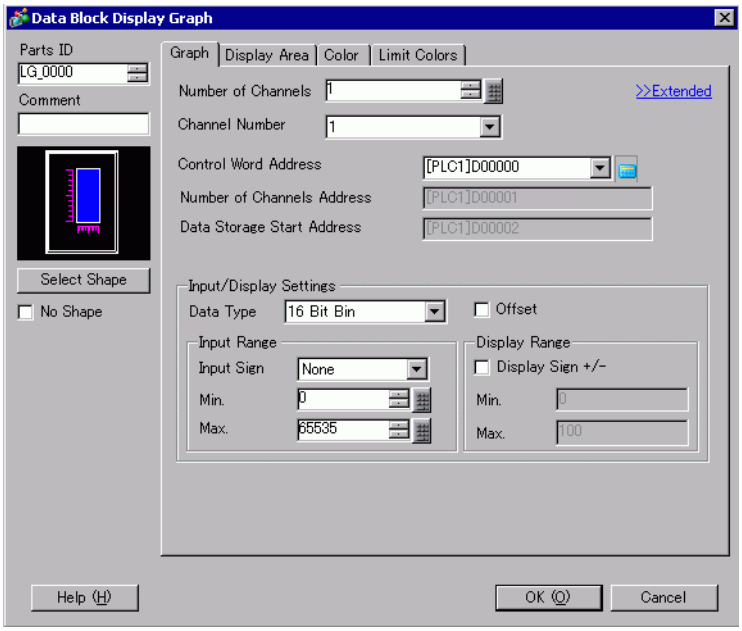
- Please refer to the Settings Guide for details.
  ☞"18.12.3 Data Block Display Graph Settings Guide" (page 18-94)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

When bit 0 of a word address (D100) is turned on, and a Graph is created, displaying the Line Chart of data from 4 consecutive words in block display.



1 From the [Parts (P)] menu, select [Data Block Display Graph (L)] or click . Place the Graph on the screen.

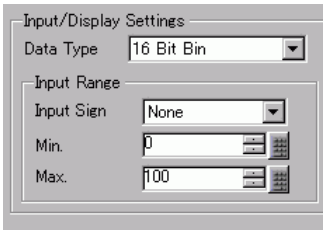
2 Double-click the placed Data Block Display Graph. The following dialog box appears.



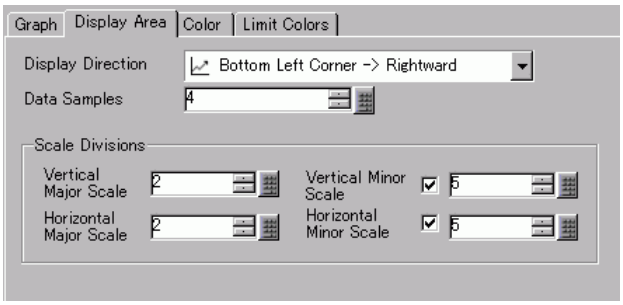
3 In [Select Shape], select the Graph shape.

4 In [Control Word Address], set the address (D100) to control the graph display.
The address (D101) used to store the number of sets of data displayed on the graph "4" displays in [Number of Channels Address].

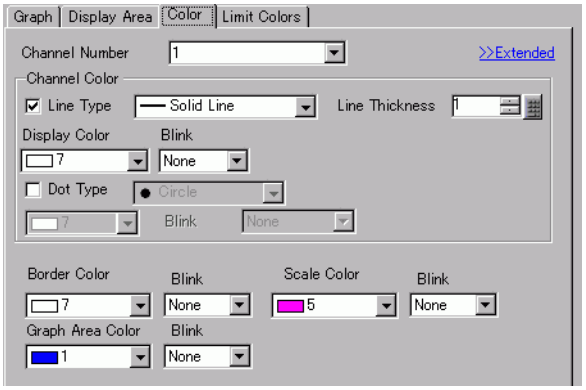
5 In the [Min] and [Max] fields, set the range of data stored in that address. If you are storing negative values, set the [Input Sign] to [2's Complement] or [MSB Sign].



6 On the [Display Area] tab, set [Display Direction]. Set the [Data Samples] to 4.



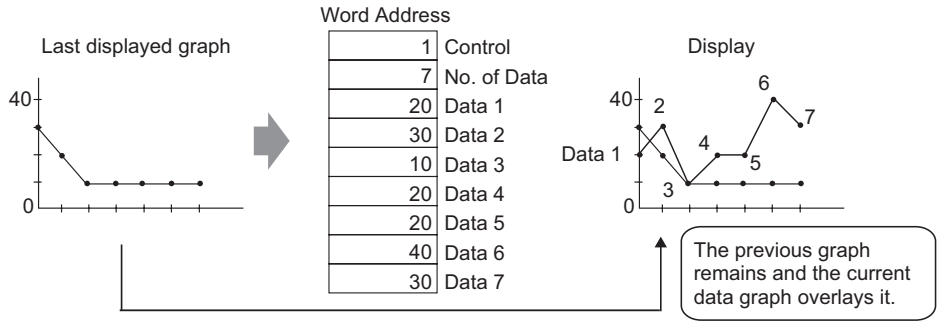
7 On the [Color] tab, set the color and type of the line to be displayed, and the color of the Graph Display Area. Next click [OK].



18.10.3 Displaying/Clearing a Data Block Display Graph

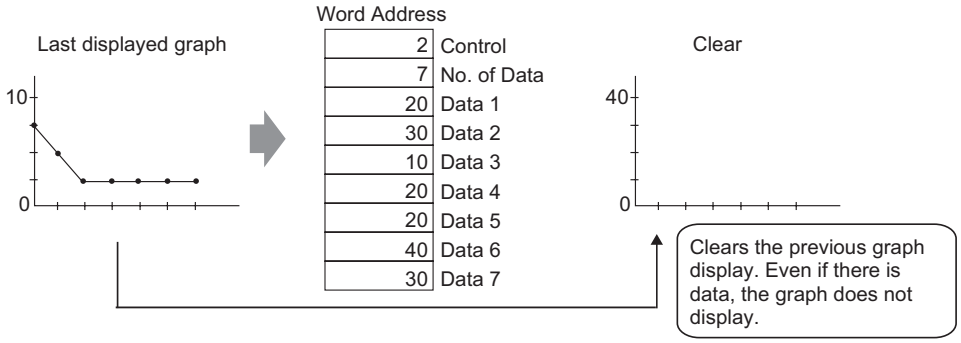
◆ Display

Stores the graph display's data count in the [Number of Channels Address], and after storing the defined number of data to the [Data Storage Start Address] onward, turns ON bit 0 of the [Control Word Address]. (For example, write 1 to the [Control Word Address])



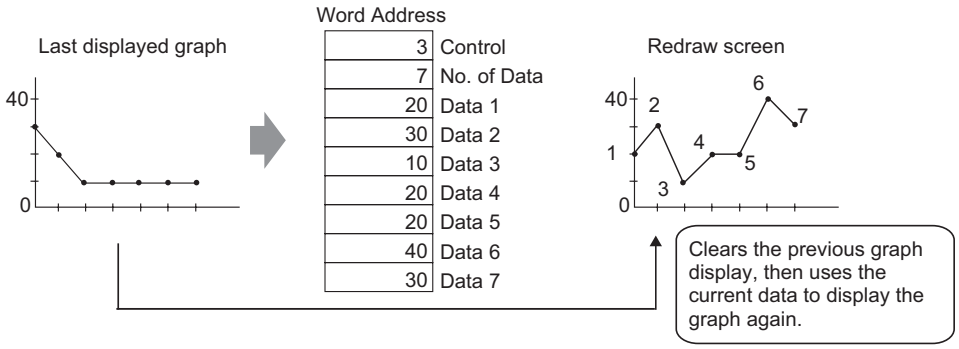
◆ Clear

Turn ON bit 1 in the [Control Word Address]. (For example, write "2" in the [Control Word Address]). The displayed graph will be deleted.



◆ Clear and Display

Turn on bit 0 and bit 1 in the [Control Word Address]. (For example, write "3" in the [Control Word Address]). After the displayed graph is deleted, the graph is redisplayed based on the current stored data.

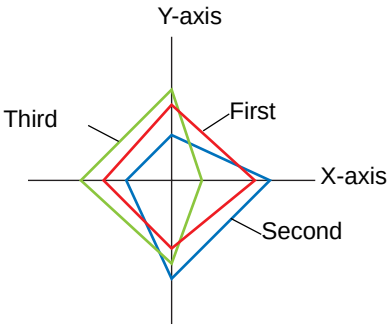


IMPORTANT

- To display the graph, delay the Control Address' display bit (bit 0) by a time longer than the communication cycle time or 50ms (whichever is larger), after storing the data count and data values.
- Control address data is set to zero after the graph displays. To display the graph again, restore the data to the control address with a time longer than the communication cycle time or 50ms (whichever is longer).
- The communication cycle time is stored in GP internal device special relay (LS2037).

18.11 Compare Historical and Current Data Values in a Graph

18.11.1 Introduction



Multiple data consisting of a pair of two Word devices' values are collected at once and points and lines are displayed in a graph.
When updating the graph, you can leave the points that were previously displayed. Therefore, you can see the historical change of the data.

NOTE

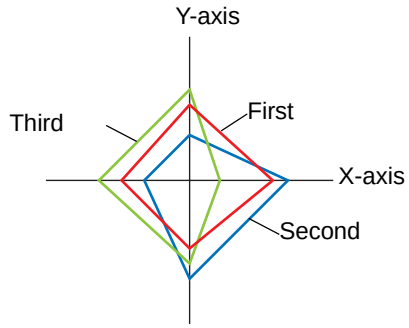
- Historical change can be set in XY Block Display Scatter Graph.
  In XY Block Display Scatter Graph, start addresses for X and Y are specified and linked to the values stored in predetermined number of sequential addresses.

18.11.2 Setup Procedure

NOTE

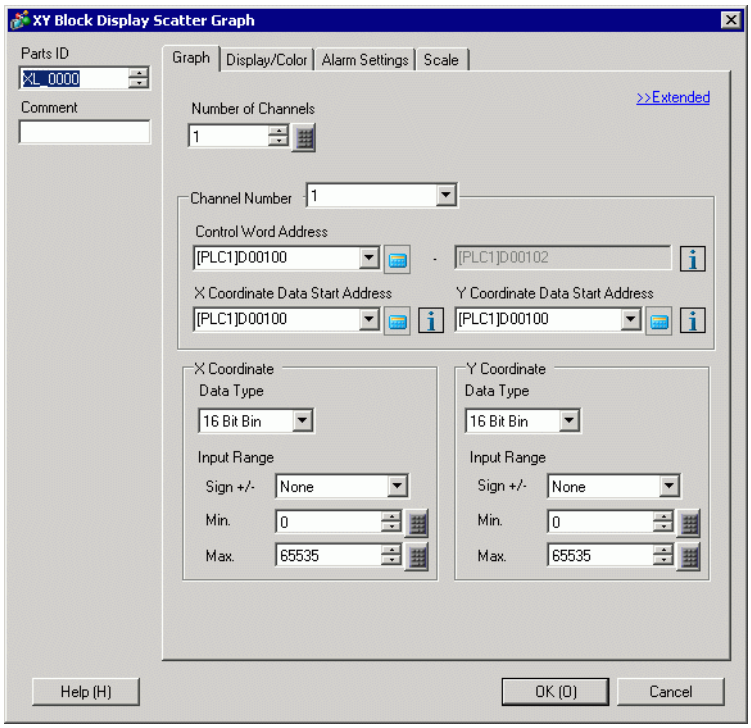
- Please refer to the Settings Guide for details.
  ☞"18.12.5 XY Block Display Scatter Graph Settings Guide" (page 18-125)
- For details about placing parts or setting addresses, shapes, or colors, please refer to the "Part Editing Procedure".
  ☞"8.6.1 Editing Parts" (page 8-44)

Multiple data consisting of a pair of two Word devices' values are collected at once and points and lines are displayed in a graph.
When updating the graph, you can leave the points that were previously displayed.



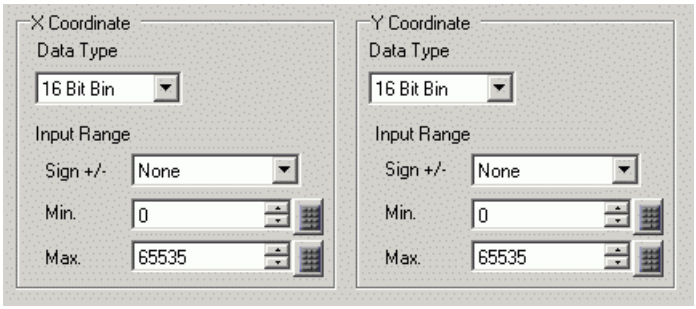
1 From the [Parts (P)] menu, select [XY Scatter Graph (X)] - [XY Block Display Scatter Graph (Y)] or click . Place the Graph on the screen.

2 Double-click the placed XY Block Display Scatter Graph. The following dialog box appears.

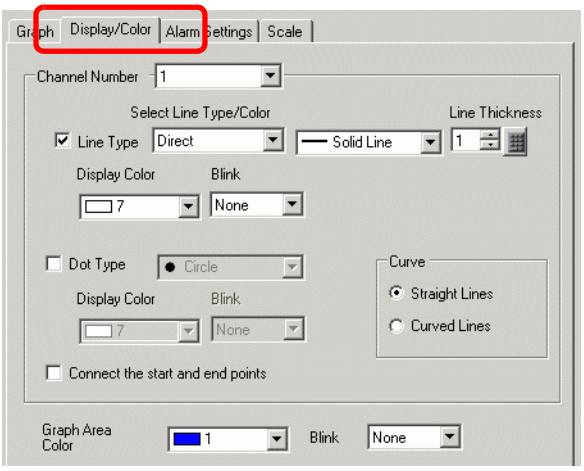


3 Set an address for controlling the graph display to [Control Word Address] (for example, D100), and set addresses to [X Coordinate Data Start Address] (for example, D200) and [Y Coordinate Data Start Address] (for example, D300).

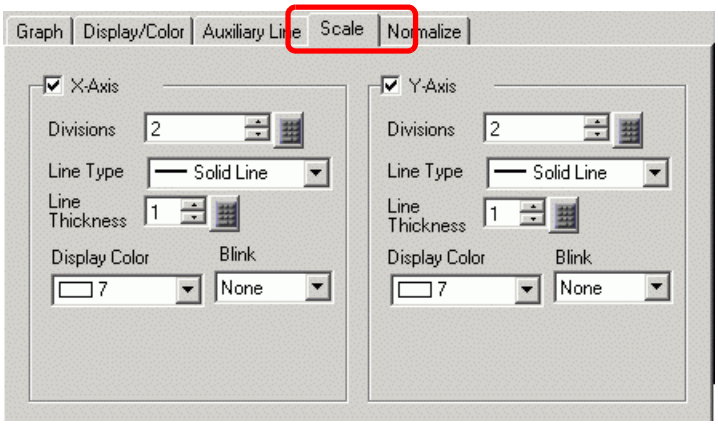
4 Set the data type and input range for the graph data.



5 On the [Display/Color] tab, set the type and color of the line/point of the graph to be displayed and the color of the Graph Display Area.



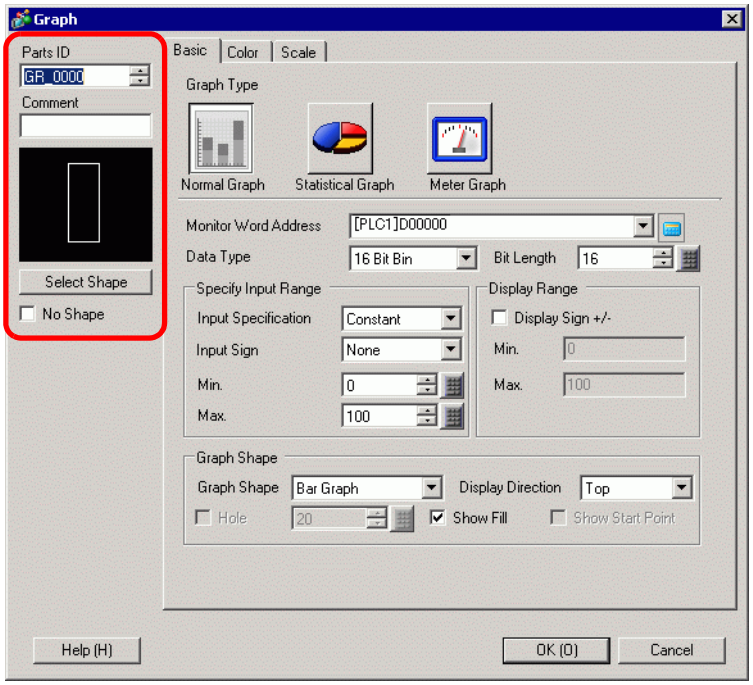
6 Configure x-axis and y-axis in the [Grid] tab.
Check [X-Axis] and [Y-Axis], and set the number of divisions, type, display color and blink.



7 Set the alarm in the [Alarm Settings] tab as necessary an click [OK].

18.12 Settings Guide

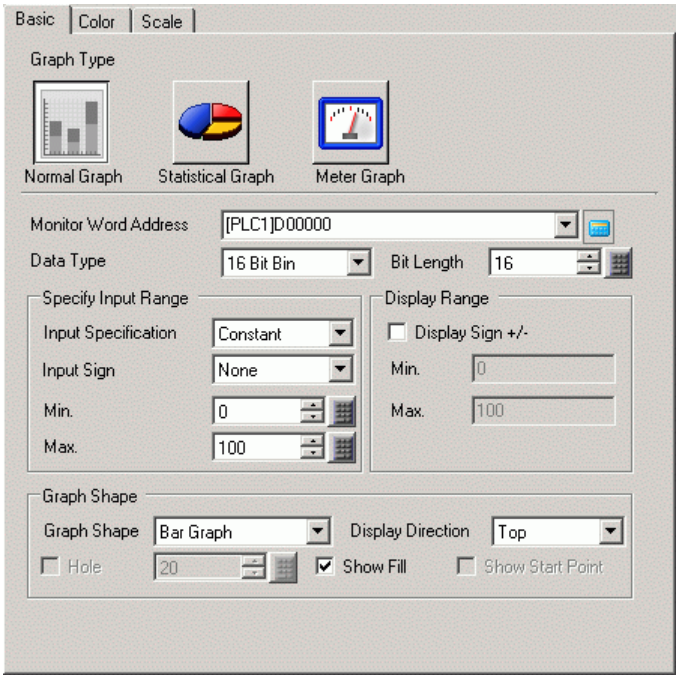
18.12.1 Graph Part Settings Guide

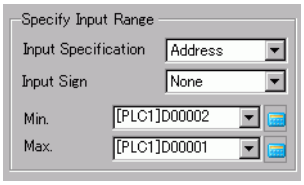


Setting	Description
Parts ID	Parts are automatically assigned an ID number. Graph ID: GR_**** (4 digits) The letter portion is fixed. You can change the number portion within the range of 0000-9999.
Comment	The comment for each Part can be up to 20 characters.
Part Shape	Displays the shape that you chose for the part with [Select Shape].
Select Shape	Open the Select Shape dialog box to choose the Part shape.
No Shape	Select whether the part will be transparent with no shape. This can only be set when the [Graph Type] set to [Normal Graph] or [Statistical Graph].
Graph Type	Select the Graph type. • Normal Graph Displays a specified address' current value in the graph. ☞"18.12.1 Graph Part Settings Guide ■ Normal Graph" (page 18-52) • Statistical Graph Statistics are taken from data stored in multiple consecutive addresses starting from a set address and displayed on the graph. ☞"18.12.1 Graph Part Settings Guide ■ Statistical Graph" (page 18-61) • Meter Graph Displays a specified address' current value with a moving needle. ☞"18.12.1 Graph Part Settings Guide ■ Meter Graph" (page 18-63)

■ Normal Graph

◆ Basic

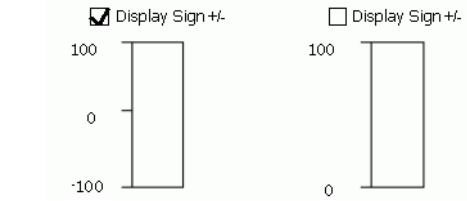


Setting		Description
Monitor Word Address		The data stored in this Word Address displays in the graph.
Data Type		Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float].
Bit Length		If [Data Type] is [16 Bit Bin], set the data's enabled bit length from 1 to 16.
Specify Input Range	Input Specification	Choose how the input range's max and min values is specified. • Constant Specify a set constant as the Min/Max. • Address Specify the address where the Min/Max values are stored. 

Continued

<table>
<tr><th colspan="2">Setting</th><th>Description</th></tr>
<tr><td rowspan="2">Specify Input Range</td><td>Input Sign</td><td>Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin].
• None
Only positive numeric data will be handled.
• 2's Complement
Negative numbers are handled with 2's complement.
• MSB Sign
Negative numbers are handled with MSB sign.</td></tr>
<tr><td>Min/Max</td><td>Select the input range for graph display data.If [Input Specification] is [Constant], set a min value/max value.If [Address] is set, specify the Word Address where the min value/max value are stored.
Each [Data Type] and [Input Sign] has a different size range.

<table>
<tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr>
<tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr>
<tr><td>2's Complement</td><td>–32768 to 32767</td></tr>
<tr><td>MSB Sign</td><td>–32767 to 32767</td></tr>
<tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr>
<tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr>
<tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr>
<tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr>
<tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr>
<tr><td>32 Bit Float</td><td>–</td><td>–9.9e16 to 9.9e16</td></tr>
</table>

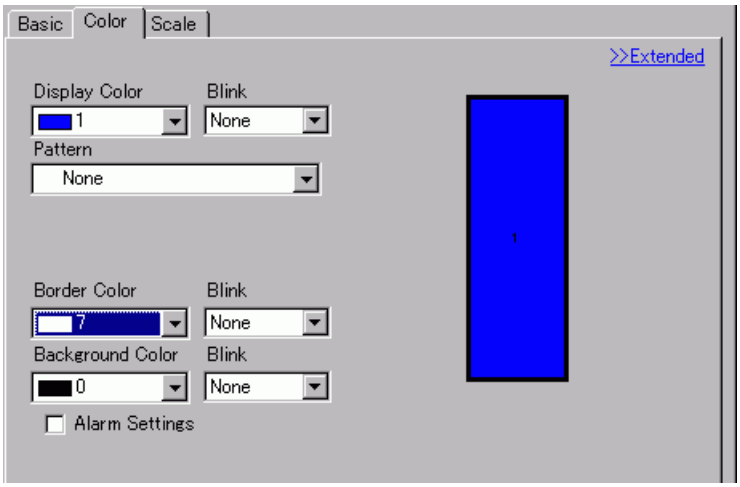
NOTE
• Word address data is convert to correspond to the input range, and displays on the graph as a value between 1 and 1,000.</td></tr>
<tr><td rowspan="2">Display Range</td><td>Display Sign +/–</td><td>Set to display negative numbers. This can be set when the [Data Type] is [Bin] or [Float].
For example, for a Bar Graph
 

Negative numbers displayed Negative numbers not displayed</td></tr>
<tr><td>Min/Max</td><td>Shows the display range's Min and Max. If [Display Sign +/–] is set, the Min displays as "–100". If it is not set, the Min displays as "0". The Max is fixed as "100".</td></tr>
</table>

Continued

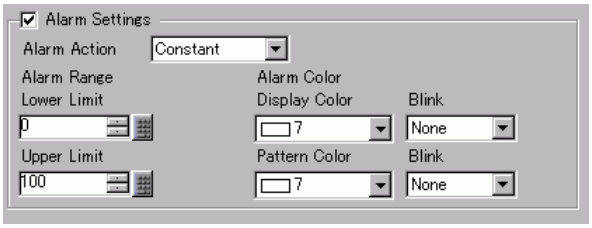
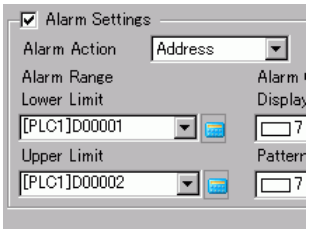
Setting		Description
Graph Shape	Graph Shape	Choose the graph shape from [Bar Graph], [Circle Graph], [Semicircle Graph], and [Tank Graph].
	Display Direction	Set a direction for the graph display. If the [Graph Shape] is [Bar Graph] or [Tank Graph], choose from [Top], [Bottom], [Left], or [Right]. For [Circle Graph] and [Semicircle Graph], the starting point is fixed at the top and rotates clockwise.
	Hole	When the [Graph Shape] is [Circle Graph] or [Semicircle Graph], set the radius of the inner circle. **NOTE** • If you set the radius of the inner circle to less than 20 dots, the graph may not be properly displayed.
	Show Fill	Set whether to display a fill in the graph. If you do not want to display a fill, the graph is set to a Meter Graph.
	Show Start Point	If the [Graph Shape] is [Circle Graph] or [Semicircle Graph] and [Show Fill] is not set, select whether to display the start point.

◆ Color/Basic



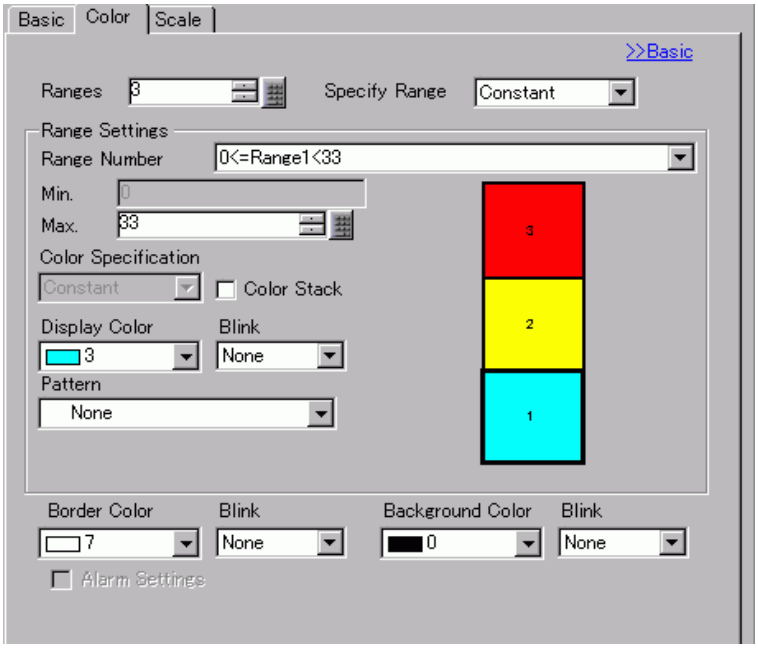
Setting	Description
Display Color	Select the display color for the graph. If [Show Fill] is not selected and a Meter Graph is used, the color set becomes the needle color.
Pattern	Select the graph pattern.
Pattern Color	Select the pattern color.
Border Color	Select a color for the graph border. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Background Color	Select the background color for the graph. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Blink	Select the blink and blink speed. You can choose different blink settings for the [Display Color], [Pattern Color], [Border Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Graph Display Sample	Displays a sample of how the graph appears with the [Display Color].

Continued

Setting		Description
Alarm		Set the graph's color changes when the value goes outside of the set range.  **NOTE** • This cannot be set when the detail settings' [Ranges] is 2 or more. • This cannot be set when detail settings' [Color Specification] is set to [Address].
	Alarm Action	Choose how the alarm range's upper and lower limit value are specified. • Constant Specify a set constant as the Min/Max value. • Address Specify the address where the Upper/Lower Limit values are stored. 
	Upper Limit/ Lower Limit	Set the upper and lower limits for the Alarm Range from 0 to 100 (if [Display Sign +/−] is selected, the range is from −100 to 100). If [Alarm Action] is [Constant], enter an upper/lower limit value. If [Address] is set, specify the Word Address where the upper/lower limit value is stored.
	Display Color	Select the graph display color for when the alarm displays.
	Pattern Color	Select the pattern color for when the alarm displays.
	Blink	Select the blink and blink speed. You can choose different blink settings for the alarm display's [Display Color] and [Pattern Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

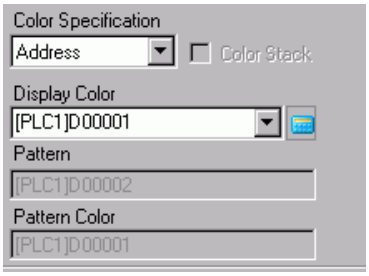
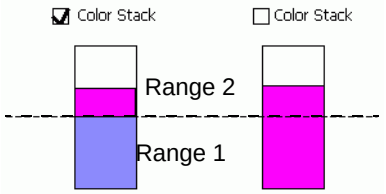
◆ Color/Extended

You can set the data range and have the Graph's color change according to that range.



Setting		Description
Ranges		Set the number of ranges the graph display is divided into, from 1 to 16.
Specify Range		If [Ranges] is more than "2", select the method to specify the minimum and maximum for each range. If [Ranges] is "1", fixed to [Constant]. • Constant Specify a set constant as the Min/Max. • Address Specify the address where the Min/Max values are stored.
Range Settings	Range Number	Select the set range for Min. and Max and color within the range specified in [Ranges]. You can select by clicking the range you want to specify on the graph display sample. Display as "(Min.) <= Range No. <= (Max.)".
	Min/Max	Set the Min. and Max. value range for the [Range Number], as a percentage of 0 to 100 (if [Display Sign +/–] is selected, the range is from -100 to 100). If [Specify Range] is [Constant], set a min value and max value. If [Address] is set, specify the Word Address where the min/max values will be stored. Default sets the Min. and Max. values to equalize each range.

Continued

Setting		Description
Range Settings	Color Specification	Select the designation method of the display color and pattern for the range selected with [Range Number]. If the [Ranges] is 2 or greater or [Color Stack] is set, this will be fixed as [Direct]. • Constant Individually designate the display color and pattern. • Address Set the address which will store the color code and pattern code.  ☞" ◆ Changing the Graph Color from a Device/PLC" (page 18-59)
	Color Stack	Specify whether each range is color-coded when displayed. This can only be set if the [Ranges] is "2" or more. Ranges = 2  Both Range 1 and Range 2 are displayed with Range 2's color. Range 1 and Range 2 are displayed with the Range 2 color.

◆ Changing the Graph Color from a Device/PLC

In the address set in [Display Color], the bottom 8 bits store the color code, and the top 8 bits store the pattern color code.
In the next address after [Display Color], the lower 8 bits store the pattern code.

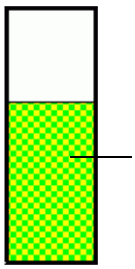
	15	8 7	0
Specified Display Color Address	Pattern Color	Display Color	
+1	(0 Fixed)	Pattern	

- Color Code
  The color code is the number displayed on the color palette.
  ☞"8.5.1 Setting Colors ■ Specifying Colors" (page 8-38)

- Pattern Code

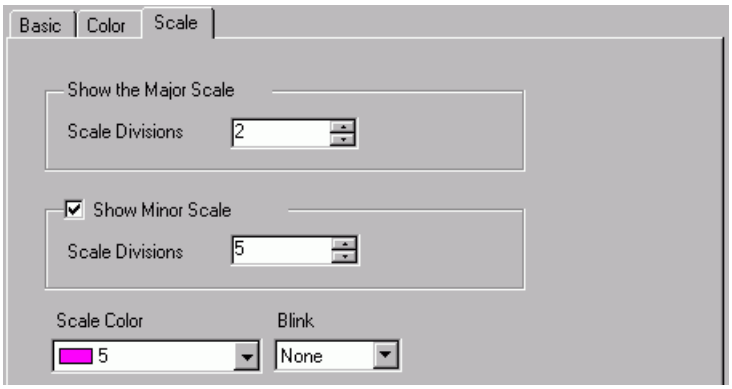
Stored Value	0	1	2	3	4	5	6	7	8
Pattern									

For example, Display Color: D100



Display Color: D100 Bit 0 to Bit 7 stores the color code "6"
Pattern: D101 Bit 0 to Bit 7 stores the color code "8"
Pattern Color: D100 Bit 8 to Bit 16 stores the color code "2"

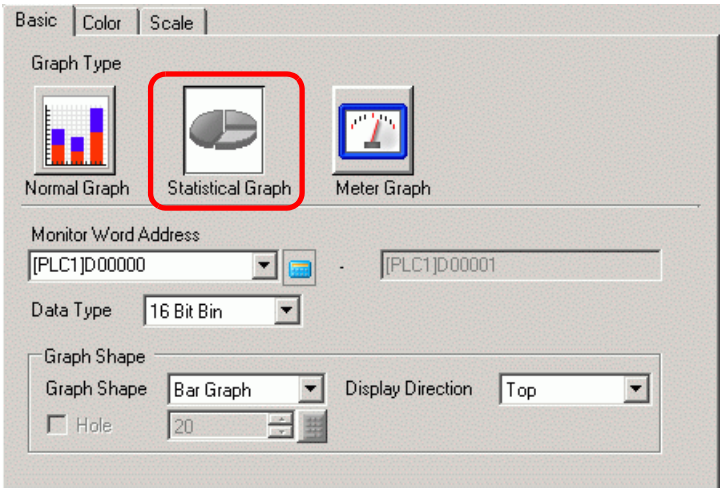
◆ Scale



Setting		Description
Show the Major Scale		Shows the Major Scale.
	Scale Divisions	Set the number of scale divisions to be displayed from 1 to 100.
Show Minor Scale		Specify whether to display a small scale to further divides the large scale.
	Scale Divisions	Set the number of scale divisions to be displayed from 2 to 100.
Scale Color		Select the display color for the scales.
Blink		Select whether the [Scale Color] blinks and the blink speed. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

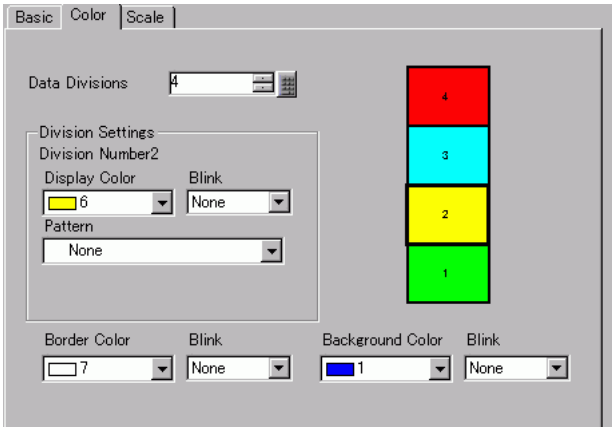
■ Statistical Graph

◆ Basic



Setting	Description
Monitor Word Address	Select the top Word Address from where the statistical data is taken. Addresses from this address to the portion specified in the [Color] tab's [Data Divisions] are automatically allotted and that address range displays.
Data Type	Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float]. **NOTE** • Different data formats can not be used within the same Statistical Graph.
Graph Shape	Choose the Graph shape from [Bar Graph] or [Circle Graph].
Display Direction	Set a direction for the graph display. If the [Graph Shape] is [Bar Graph], [Top], [Bottom], [Left], and [Right] are your choices. **NOTE** • For [Circle Graph], the starting point is fixed at the top and rotates clockwise. If you want to change the starting point, rotate the part.
Hole	When the [Graph Shape] is [Circle Graph], set the radius of the inner circle. **NOTE** • If you set the radius of the inner circle to less than 20 dots, the graph may not be properly displayed.

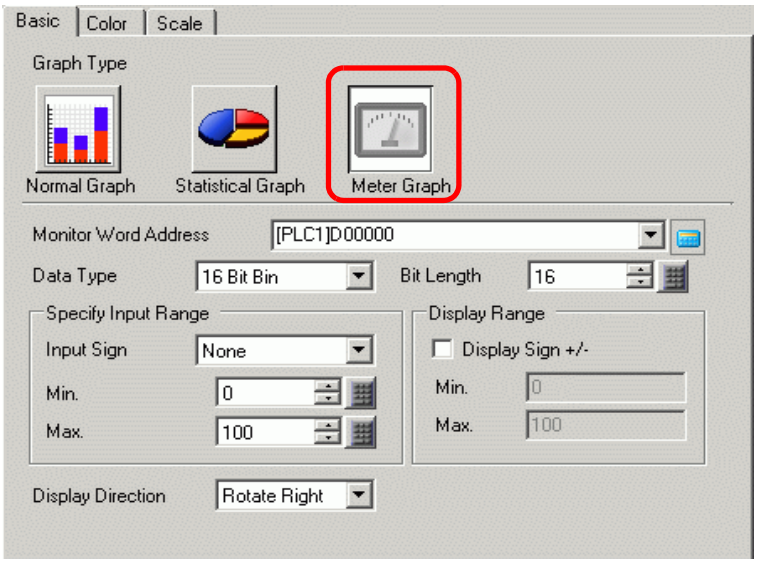
◆ Color



Setting		Description
Data Divisions		Set the number of data to be displayed on the graph, from 1 to 16. Statistics are taken from consecutive addresses starting from the address set in [Monitor Address] for the set number of sections.
Division Settings	Division Number	Displays the division number selected in the Graph Display Sample. The Division Number depends on the Display Direction, and is assigned automatically in order from the top address.
	Display Color	Set the color for each division. Click the graph number displayed to the right to set up the display color for each area in the graph.
	Pattern	Select from 9 types to define the pattern for each division.
	Pattern Color	Select a pattern color for each division.
Border Color		Select a color for the graph border. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Background Color		Select the background color for the graph. This color will be displayed when all data is 0. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Blink		Select the blink and blink speed. You can choose different blink settings for the [Display Color], [Pattern Color], [Border Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Graph Display Sample		Displays a sample of how the graph appears with the [Display Color].

■ Meter Graph

◆ Basic



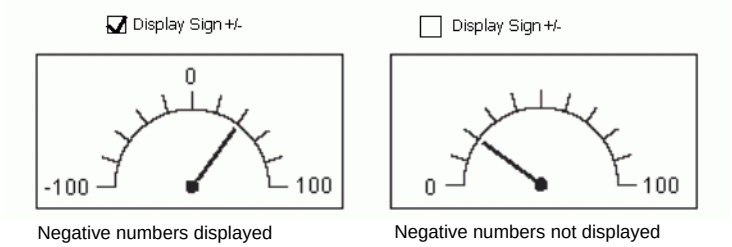
Setting		Description
Monitor Word Address		The data stored in this Word Address appears in the Meter Graph.
Data Type		Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float].
Bit Length		If [Data Type] is [16 Bit Bin], set the data's enabled bit length from 1 to 16.
Specify Input Range	Input Sign	Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin]. • None Only positive numeric data will be handled. • 2's Complement Negative numbers are handled with 2's complement. • MSB Sign Negative numbers are handled with MSB sign.

Continued

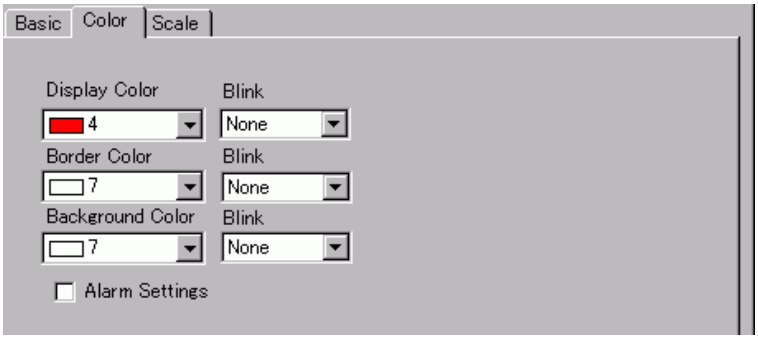
<table>
<tr><th colspan="2">Setting</th><th>Description</th></tr>
<tr><td>Specify Input Range</td><td>Min/Max</td><td>Select the input range for graph display data. Each [Data Type] and [Input Sign] has a different size range.

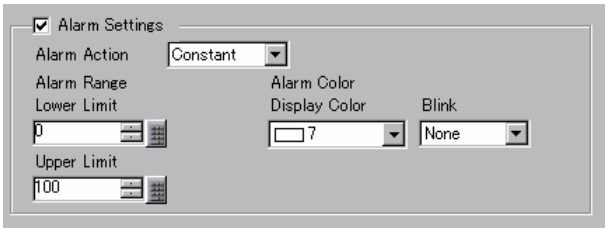
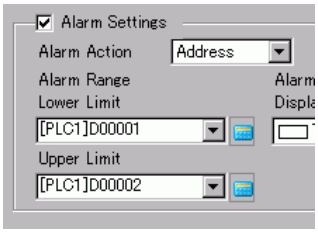
<table>
<tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr>
<tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr>
<tr><td>2's Complement</td><td>–32768 to 32767</td></tr>
<tr><td>MSB Sign</td><td>–32767 to 32767</td></tr>
<tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr>
<tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr>
<tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr>
<tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr>
<tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr>
<tr><td>32 Bit Float</td><td>–</td><td>–9.9e^{16} to 9.9e^{16}</td></tr>
</table>

NOTE
• Word address data is convert to correspond to the input range, and displays on the graph as a value between 1 and 1,000.</td></tr>
<tr><td rowspan="2">Display Range</td><td>Display Sign +/–</td><td>Set to display negative numbers. This can only be set when the [Data Type] is [16 Bit Bin], [32 Bit Bin], or [32 Bit Float].


</td></tr>
<tr><td>Min/Max</td><td>Shows the display range's Min and Max. If [Display Sign +/–] is set, the Min displays as "–100". If it is not set, the Min displays as "0". The Max is fixed as "100".</td></tr>
<tr><td colspan="2">Display Direction</td><td>Select the graph display direction from [Rotate Right] or [Rotate Left].</td></tr>
</table>

◆ Color



Setting		Description
Display Color		Select the color for the needle.
Border Color		Select a color for the graph border.
Background Color		Select the background color for the graph.
Blink		Select the blink and blink speed. [Display Color], [Border Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Alarm		Set whether the needle color changes when the value moves from one range to another range. 
Alarm Range	Alarm Action	Choose how the alarm range's upper and lower limit value are specified. • Constant Specify a set constant as the Min/Max value. • Address Specify the address where the Upper/Lower Limit values are stored. 

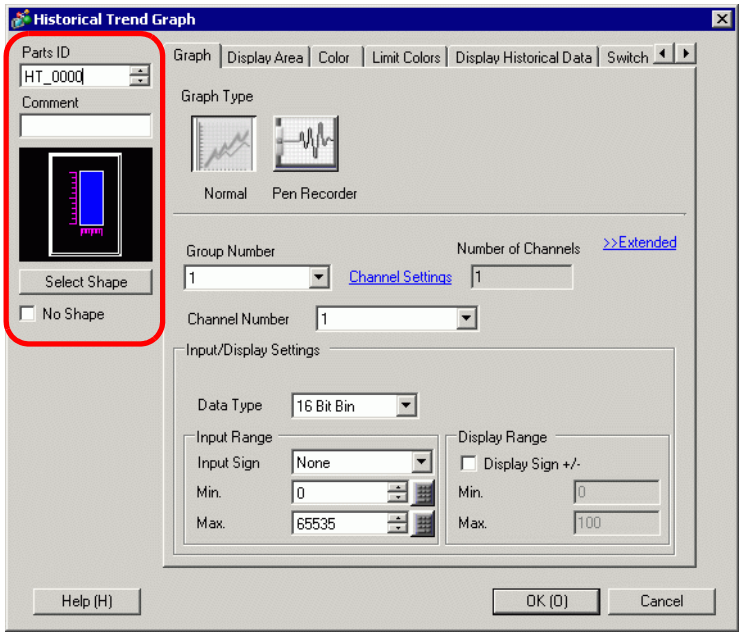
Continued

Setting		Description
Alarm Range	Upper Limit/ Lower Limit	Set the upper and lower limits for the Alarm Range from 0 to 100 (when [Display Sign +/−] is selected, from −100 to 100). If [Alarm Action] is [Constant], enter an upper/lower limit value. If [Address] is set, specify the Word Address where the upper/lower limit value is stored.
	Display Color	Select the needle color displaying the alarm.
	Blink	Select whether the [Display Color] blinks when the alarm appears and the blink speed. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

18.12.2 Historical Trend Graph Settings Guide

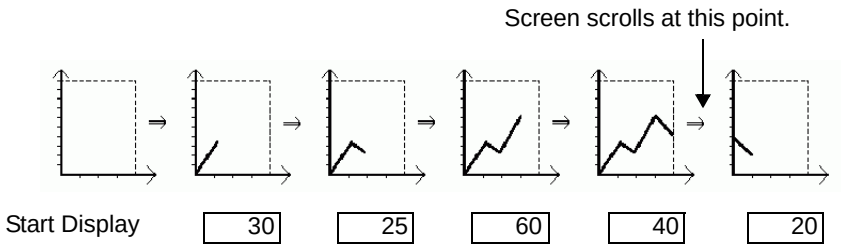
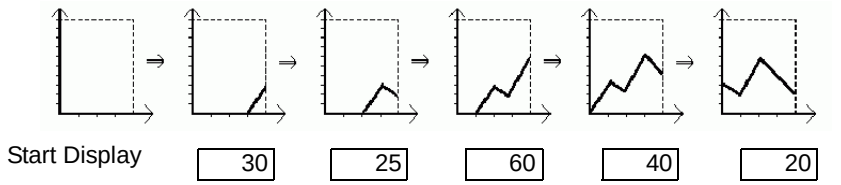
Sampled data taken at regular or random intervals can be displayed on a Line Chart.

☞ "24.8.1 Common (Sampling) Settings Guide" (page 24-37)



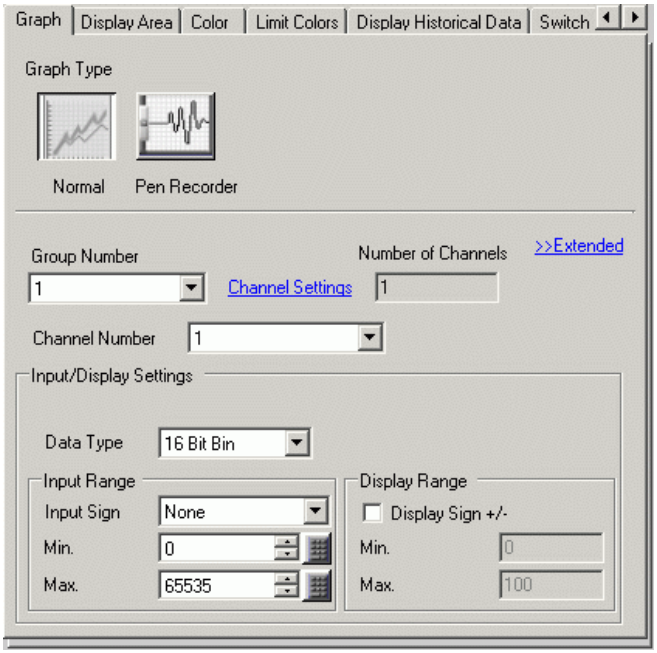
Setting	Description
Parts ID	Parts are automatically assigned an ID number. Historical Trend Graph ID: HT_**** (4 digits) The letter portion is fixed. You can change the number portion within the range of 0000-9999.
Comment	The comment for each Part can be up to 20 characters.
Part Shape	Displays the shape that you chose for the part with [Select Shape].
Select Shape	Open the Select Shape dialog box to choose the Part shape.
No Shape	Select whether the part will be transparent with no shape.

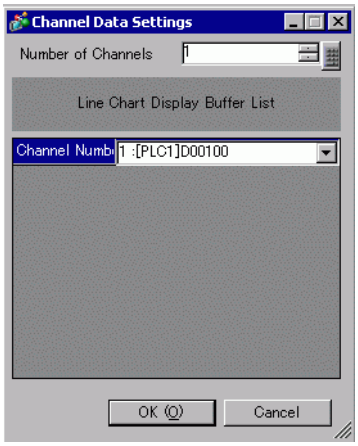
Continued

Setting	Description
Graph Type	Select the line shape from [Normal] or [Pen Recorder]. • Normal The specified word address data changes are displayed over time in a Line Chart. Data at the start time is "0". As each sampling period elapses, the latest data is added in the specified [Display Direction]. When the graph line reaches the limit of the Display Area, the graph is shifted in the display direction for the number of units set in [Samples to Scroll]. For example, Display Direction: Bottom Left Rotate Right, Data Samples: 4, Samples to Scroll: 4  • Pen Recorder The specified word address data changes are displayed over time in a Line Chart. Data at the start time is "0". The latest data always appears at the edge of the Display Area. Each time sampling occurs, the whole graph scrolls 1 spot in the set [Display Direction]. For example, Display Direction: Bottom Left Rotate Right, Data Samples: 4 

■ Normal/Pen Recorder

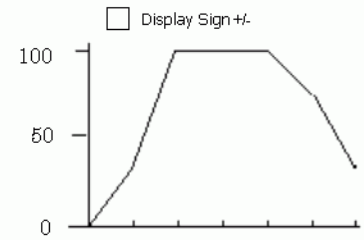
◆ Graph/Basic



Setting	Description
Group Number	The sampling group number from 1 to 64 of the graph to display.
Channel Settings	Open the [Channel Data Settings] dialog box appears. From among the specified sampling group, set the address and number of addresses (Number of Channels) of the trend graph you want to display. The Number of Channels can be from 0 to 20. 
Number of Channels	The set Number of Channels appears in the [Channel Data Settings] dialog box. The number of channels displays as lines on the Graph Display Area.
Channel	Select the Channel to process Input/Display.
Data Type	Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float].

Continued

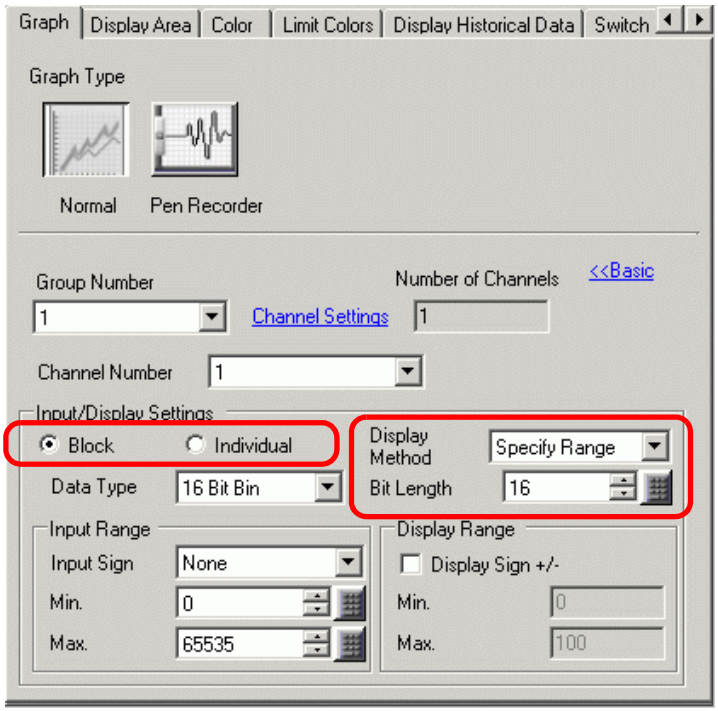
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Input Sign</td><td>Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin].
• None
Only positive numeric data will be handled.
• 2's Complement
Negative numbers are handled with 2's complement.
• MSB Sign
Negative numbers are handled with MSB sign.</td></tr>
<tr><td>Min. Value/Max. Value</td><td>Select the input range for Line Chart display data.
Each [Data Type] and [Input Sign] has a different size range.
<table>
<tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr>
<tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr>
<tr><td>2's Complement</td><td>–32768 to 32767</td></tr>
<tr><td>MSB Sign</td><td>–32767 to 32767</td></tr>
<tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr>
<tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr>
<tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr>
<tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr>
<tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr>
<tr><td>32 Bit Float</td><td>–</td><td>–9.9e^{16} to 9.9e^{16}</td></tr>
</table>
NOTE
• Data collected from the sampling function corresponds to the input range and displays on the graph as a value between 1 and 1,000.</td></tr>
<tr><td>Display Sign +/–</td><td>Set to display negative numbers. This can only be set when the [Data Type] is [Bin].
When the [Data Type] is [BCD], [Display Sign +/–] is not set. For [Float], [Display Sign +/–] is set.
 

Negative numbers displayed
 

Negative numbers not displayed</td></tr>
<tr><td>Min. Value/Max. Value</td><td>Shows the Min and Max for data displayed on the Trend Graph. If [Display Sign +/–] is set, the Min is "–100". If it is not set, the Min is "0". The Max is "100".</td></tr>
</table>

◆ Graph/Extended

You can set Input/Display for each channel.

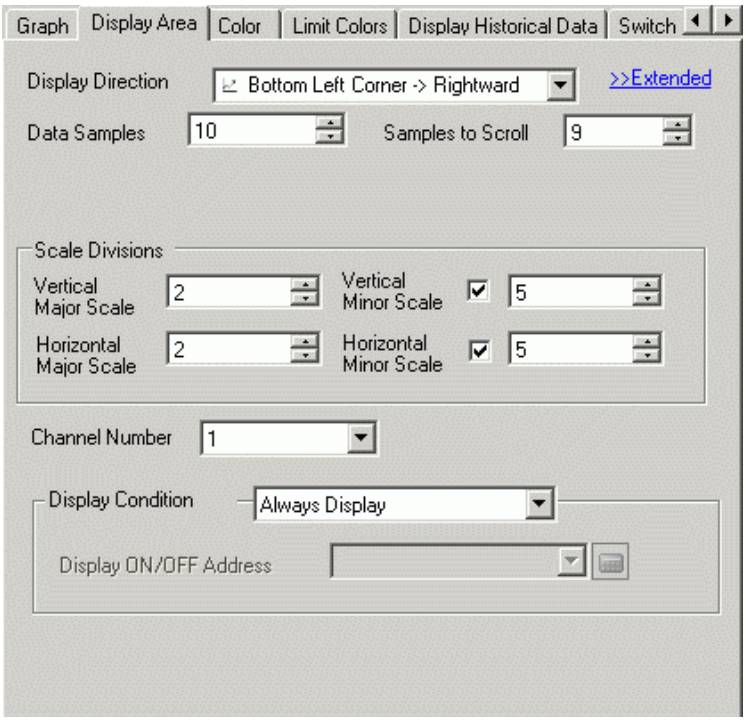


Setting	Description
Display Method	Select the setting method for the graph display range from [Specify Range] and [Show Scale]. **NOTE** • When [Show Scale] is selected, the [Fill Below Line] option in the [Color] tab's [Extended] settings cannot be selected. • When [Show Scale] is selected, the [Alarm Settings] tab is not displayed. • When [Specify Range] is selected, the [Auxiliary Line] tab is not displayed.
Block/Individual	Define the [Input/Display] for all the channels as a whole or separately.
Bit Length	If [Data Type] is [16 Bit Bin], set the data's enabled bit length from 1 to 16.

Continued

Setting	Description
Constant/Address	Select whether the Lower Limit/Upper limit is set with a numeric value or address. • Constant The setting range differs, depending on the [Data Type] and [Sign +/–] settings. Min Max 16 Bit Bin Sign Check Disabled:0 to 655340 to 65535 32 Bit Bin Sign Check Enabled:-32768 to 32766-32767 to 32767 16 Bit Bin Sign Check Disabled:0 to 42949672941 to 4294967295 32 Bit Bin Sign Check Enabled:-2147483648 to 2147483646-2147483647 to 2147483647 • Address Set the Word Address. When the selected address value is changed, the value is read and updated.

◆ Display Area/Basic

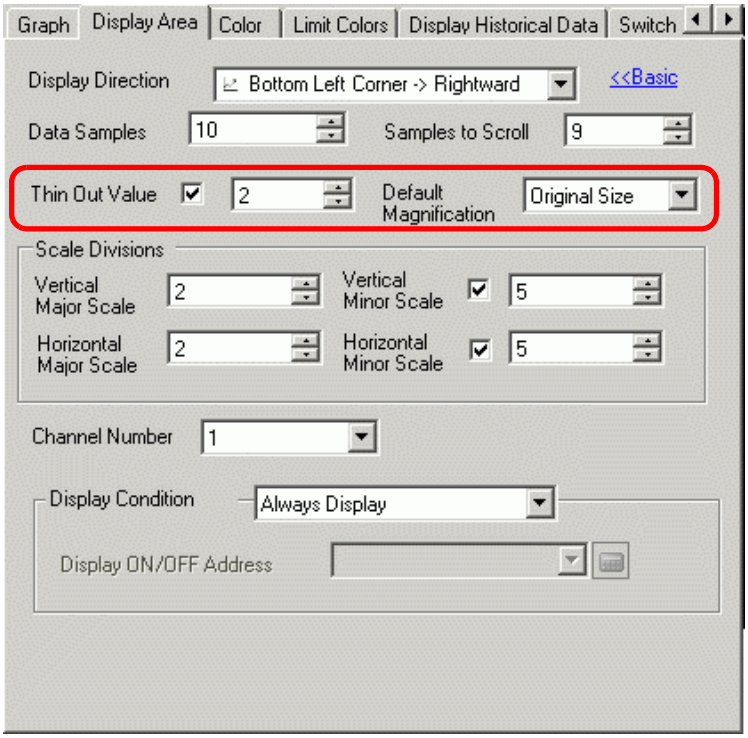


Setting	Description
Display Direction	Select the graph display direction. 
Data Samples	Set the number of sets of data samples to be displayed on a single line. The range depends on the set model's Display Number of Dots. Display Number of Dots / Data Samples 320 x 240 dots (QVGA) / 0 to 319 640 x 480 dots (VGA) / 0 to 639 800 x 600 dots (SVGA) / 0 to 799 1024 x 768 dots (XGA) / 0 to 799 **NOTE** • You can verify the Display Number of Dots with [System Settings] - [Display]. • When [Fill Below Line] is set, the maximum number of [Data Samples] is 97.
Samples to Scroll	Select the number of sets of data to remove when the graph fills the Display Area. This can only be set when the Graph Type is [Normal]. Set this within the range specified by [Data Samples].

Continued

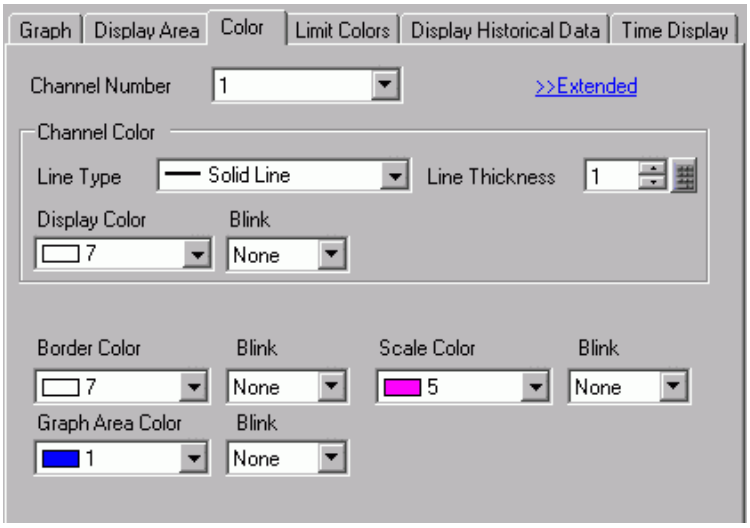
Setting	Description
Vertical Major Scale/ Minor Scale	Set whether to display the major and minor scale on the Line Chart's Y-axis. If so, choose the number of divisions. The number of divisions can be set from 1 to 638 for Major Scale, and from 2 to 638 for Minor Scale.
Horizontal Major Scale/Minor Scale	Set whether to display the major and minor scale on the Line Chart's X-axis. If so, choose the number of divisions. The number of divisions can be set from 1 to 638 for Major Scale, and from 2 to 638 for Minor Scale.
Channel Number	Select the Channel to configure the graph display condition.
Display Condition	Select the graph display condition. • Always Display Always displays the graph. • Display When Bit OFF Displays the graph when [Display ON/OFF Address] is OFF an hides the graph when [Display ON/OFF Address] is ON. • Display When Bit ON Displays the graph when [Display ON/OFF Address] is ON an hides the graph when [Display ON/OFF Address] is OFF.
Display ON/OFF Address	Set the bit address to turn ON/OFF the graph display.

◆ Display Area/Extended



Setting	Description
Thin Out Value	Set whether or not to use the Thin Out feature. When checked, set [Thin Out Value]. • Thin Out Value Set this value within the range of 2 to 100. Sampled data are displayed after being thinned out based on the Thin Out Value.
Default Magnification	Set the display magnification when the screen is changed. • Thin Out Mode This can be selected only when [Thin Out Value] is set. • Original Size • x 2 • x 4 • x 8

◆ Color/Basic

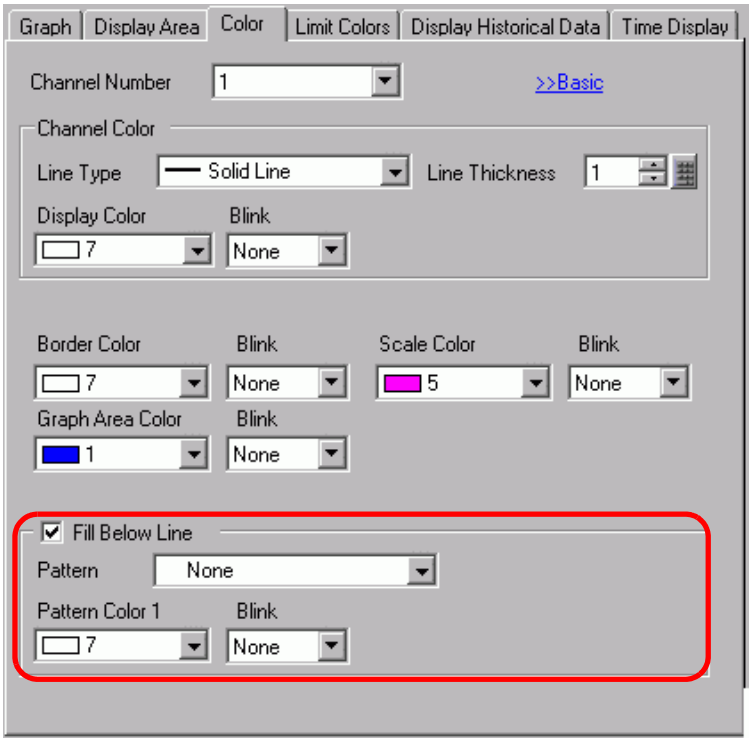


Setting	Description
Channel	Select the Channel to configure.
Line Type	Select the type of line from among 5 kinds: Solid Line, Dashed Line, Dash Line, Chain Line, and Two-Dot Chain Line. **NOTE** • When the data display spacing is less than 16 dots, line types other than the solid line may not display correctly.
Line Thickness	Set the line thickness from 1 to 2.
Display Color	Set the line color.
Background Color	Set the line's background color.
Border Color	Set the border color of the Historical Trend Graph. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Scale Color	Select the graph's scale color. **NOTE** • Some settings cannot be set depending on the part that you chose with [Select Shape].
Graph Area Color	Select a color for the Graph Display Area.

Continued

Setting	Description
Blink	Select the blink and blink speed. For the [Display Color], [Background Color], [Border Color], [Scale Color], and [Graph Area Color] can be set up with different blink settings. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

◆ Color/Extended

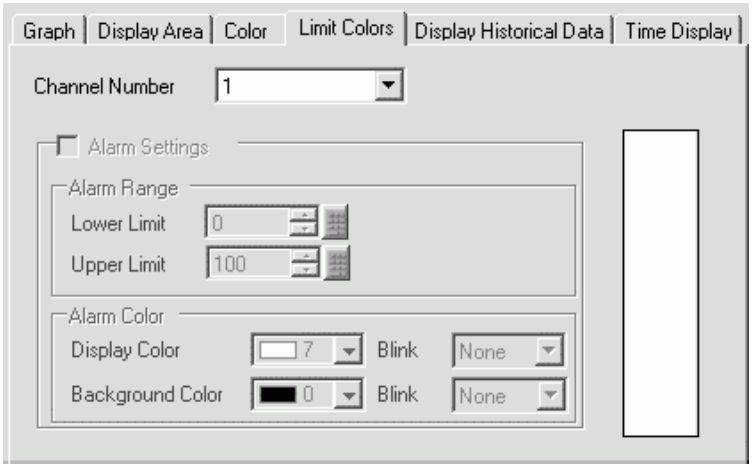


Setting	Description
Fill Below Line	Select whether to fill in the area under the Line Chart. This can only be set when [Number of Channels] is 1. **NOTE** • This can not be set when alarms are being used. • This cannot be set when [Display Settings] is [Show Scale].
Pattern	Select a pattern for filling the area below the graph line.
Pattern Color 1	Select the pattern color.
Pattern Color 2	Set the pattern's background color.

Continued

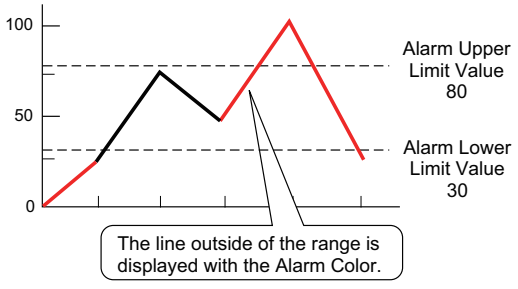
Setting	Description
Blink	Select the blink and blink speed. You can choose different blink settings for [Pattern Color 1] and [Pattern Color 2]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

◆ Alarm



NOTE

• When [Show Scale] is selected for [Display Method] in the [Graph] tab, the [Alarm Settings] tab is not displayed.

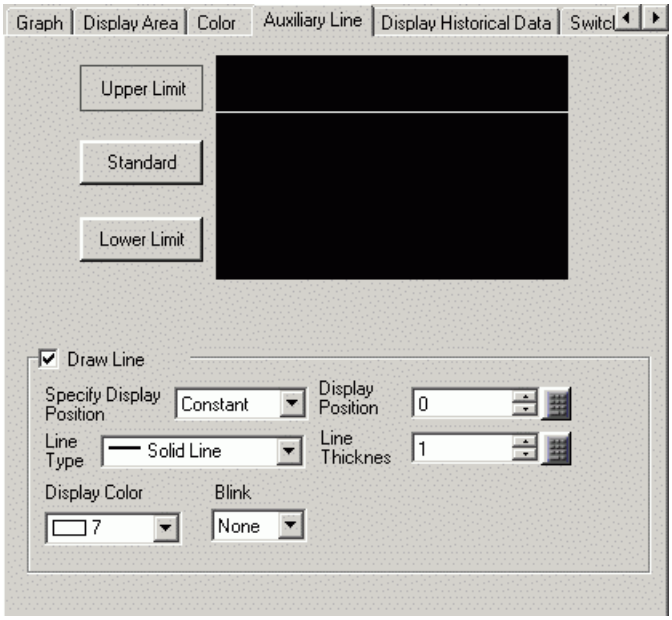
Setting	Description
Channel	Select the Channel to configure.
Alarm	If set, the displayed color changes when the value moves outside of a specified range.
Upper Limit/ Lower Limit	Set the Alarm Display range from 0 to 100 (if [Display Sign +/–] is selected, the range is from –100 to 100).
Display Color	Select the Alarm Display color. The Alarm Display color appears as follows. For example, Upper Limit = 80, Lower Limit = 30 Sampling Data 1st Sample 0 2nd Sample 25 3rd Sample 75 4th Sample 50 5th Sample 100 6th Sample 25 

Continued

Setting	Description
Background Color	Select the background color for displaying the alarm.
Blink	Select the blink and blink speed. The alarm color's [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Color Range Display Bar	Displays a sample of how the color in each range appears. Any alarm ranges specified in [Alarm] are also displayed.

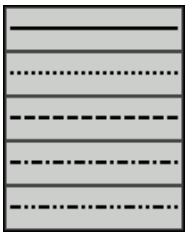
◆ Auxiliary Line

To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].



Setting	Description
Upper Limit/ Standard/Lower Limit	Select the auxiliary line to set. **NOTE** • Only a horizontal axis is set for the Standard Line.
Draw Line	Defines whether to draw the [Upper Limit], [Standard], and [Lower Limit] auxiliary lines in the selected positions.
Specify Display Position	Select the designation method of the auxiliary lines' display position from [Constant] or [Address]. • Constant Specify a set constant as the Display Position. • Address Specify the address where the Display Position is stored.

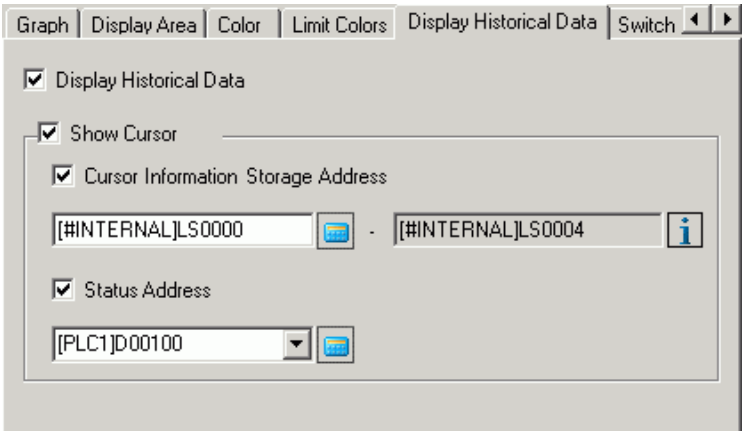
Continued

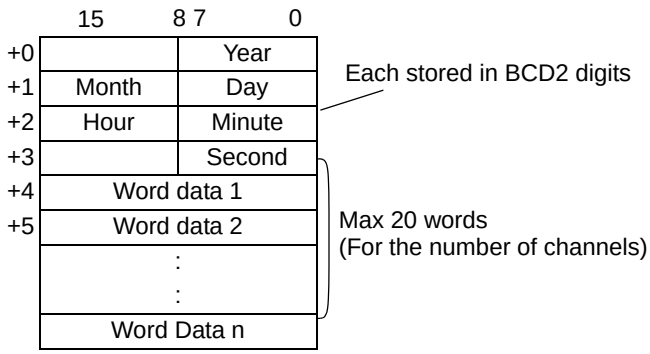
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Display Position</td><td>Set the auxiliary line's Display Position.
The setting range for each auxiliary line on the Y-axis is as follows.
<table>
<tr><th>Data Type</th><th>Display Sign +/–</th><th>Setting Range</th></tr>
<tr><td>16 Bit Bin</td><td>Cleared</td><td>0 to 65535</td></tr>
<tr><td>16 Bit Bin</td><td>Selected</td><td>–32768 to 32767</td></tr>
<tr><td>32 Bit Bin</td><td>Cleared</td><td>0 to 4294967295</td></tr>
<tr><td>32 Bit Bin</td><td>Selected</td><td>–2147483648 to 2147483647</td></tr>
</table></td></tr>
<tr><td>Line Type</td><td>Select the auxiliary line type:
 

NOTE
• If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.</td></tr>
<tr><td>Line Thickness</td><td>Set the auxiliary line thickness from 1 to 2.</td></tr>
<tr><td>Display Color</td><td>Set the auxiliary line color.</td></tr>
<tr><td>Background Color</td><td>If you selected a line type other than a solid line, set the auxiliary line's background color.</td></tr>
<tr><td>Blink</td><td>Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color].
NOTE
• There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings].
☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)</td></tr>
</table>

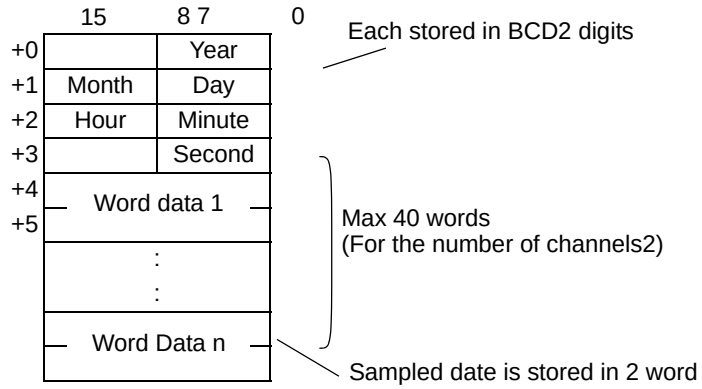
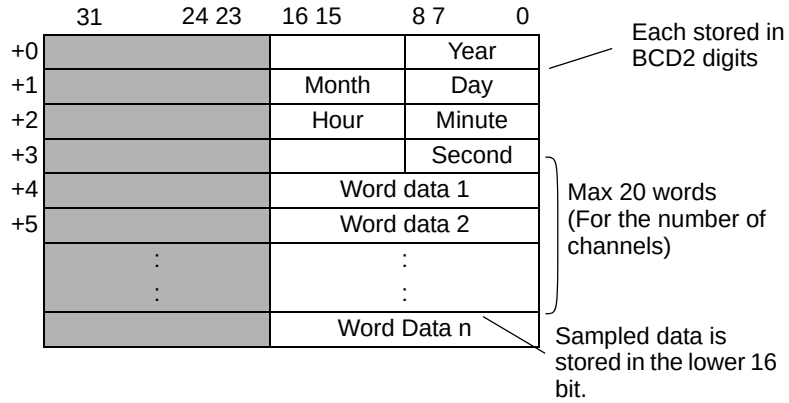
◆ Display Historical Data

Set to display the data older than the current data displayed ("historical data").

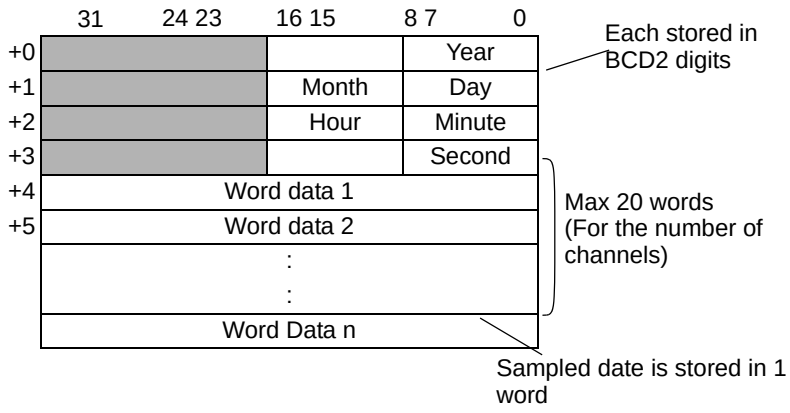


Setting	Description
Display Historical Data	Specify whether to display historical data. Select the check box to display the [Switch] tab. ☞"18.12.2 Historical Trend Graph Settings Guide ◆ Switch" (page 18-85)
Show Cursor	Specify whether to show the cursor on the screen. **NOTE** • If [Add Time Data] is not set for the sampling group specified in [Graph], a Warning displays during Error Check. The cursor is not shown if data is transmitted in this state. ☞"24.8.1 Common (Sampling) Settings Guide ■ Mode" (page 24-41)
Cursor Information Storage Address	Specify whether graph data in the cursor position is stored in the address.
	Data to be stored uses words for date and time (four words) and the number of channels of the graph from the set address. Address • Storage address 16 bit length <If the data length in Sampling Settings is 16 bit> 

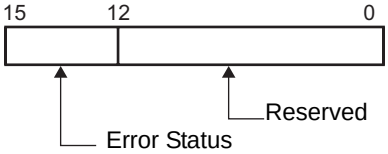
Continued

Setting		Description
Show Cursor	Cursor Information Storage Address	<If the data length in Sampling Settings is 32 bit>  • Storage address 32 bit length <If the data length in Sampling Settings is 16 bit> 

Continued

Setting		Description
Show Cursor	Cursor Information Storage Address	<If the data length in Sampling Settings is 32 bit>  Address display Displays the rearmost address to store graph data in the cursor position. Click the icon to display a composition of the address used. Cursor Information Storage Address +0 Time Data (Year) +1 Time Data (Month/Date) +2 Time Data (Hours: Minutes) +3 Time Data (Seconds) +4 Channel No.1 +5 Channel No.2 +m Channel No.n Storage address 16 bit length Cursor Information Storage Address +0 Time Data (Year) +1 Time Data (Month/Date) +2 Time Data (Hours: Minutes) +3 Time Data (Seconds) +4 Channel No.1 +6 Channel No.2 +m Channel No.n Storage address 32 bit length

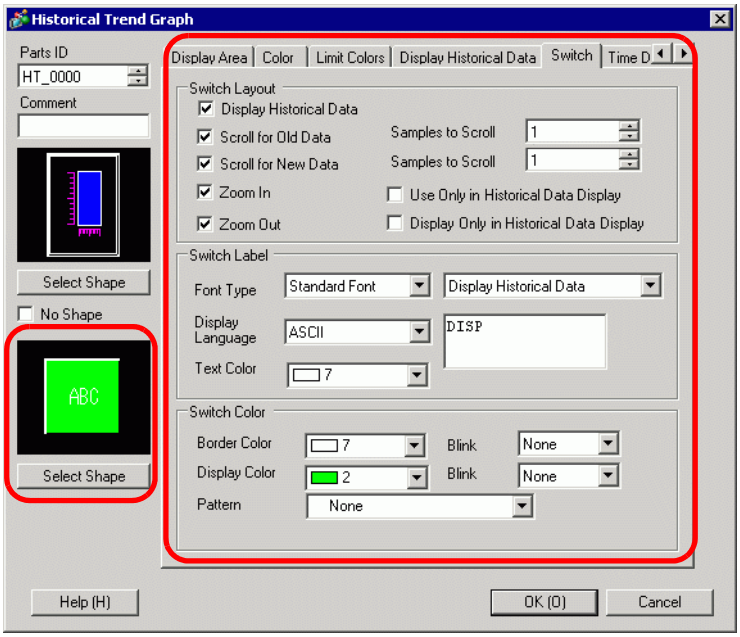
Continued

<table>
<tr><th colspan="2">Setting</th><th>Description</th></tr>
<tr><td>Show Cursor</td><td>Status Address</td><td>
Specify whether to store in the specified address the Historical Display Mode's operating condition or error information.


The error status indicates the following error codes.
(Error Code)
<table>
<tr><th>Bit 12 to 15</th><th>Description</th><th>Introduction</th></tr>
<tr><td>0000</td><td>Completed Successfully</td><td>Occurs when the process was completed successfully.</td></tr>
<tr><td>0001</td><td>Reserved</td><td>–</td></tr>
<tr><td>0010</td><td>Reserved</td><td>–</td></tr>
<tr><td>0011</td><td>Reserved</td><td>–</td></tr>
<tr><td>0100</td><td>CF Card/USB No storage</td><td>When a CF Card/USB storage is not inserted while saving Bin files or the CF Card hatch is open.</td></tr>
<tr><td>0101</td><td>Reserved</td><td>• Occurs when the CF Card/USB storage does not have sufficient free space for capturing or when it is removed during writing.
• Occurs when more than 11 bin files are created simultaneously when time is reset.</td></tr>
<tr><td>0110</td><td>Reserved</td><td>–</td></tr>
<tr><td>0111</td><td>CF Card/USB storage error</td><td>Occurs when the CF Card is unformatted, or due to another error</td></tr>
<tr><td>1000</td><td>Reserved</td><td>–</td></tr>
<tr><td>1001</td><td>Excess Number of Files</td><td>Occurs when the set number of files is exceeded</td></tr>
</table>
NOTE
• Selectable only when [Show Cursor] is [ON].
</td></tr>
</table>

◆ Switch

If a switch is created, you can set the color and label for the switch.



Setting			Description
Switch Layout	Historical Data Display		Set whether to place a switch on the screen to display historical data. When you press the switch displays in Display Historical Data mode, you can scroll back to previous data on the display. Pressing the switch again cancels the Display Historical Data mode, and the current values are displayed. Only one switch of this kind can be placed on a Graph using Display Historical Data.
	Scroll for Old Data		Set whether to place a switch to scroll backward from current to historical data. Multiple switches of this kind can be placed on a graph.
		Samples to Scroll	Set the number of samples to scroll. The setting range is from 1 to 65535.
	Scroll for New Data		Set whether to place a switch to scroll forward from historical data to the most current data. Multiple switches of this kind can be placed on a graph.
		Samples to Scroll	Set the number of samples to scroll. The setting range is from 1 to 65535.

Continued

Setting		Description
Switch Layout	Zoom Display/ Zoom Out Display/ Display only in Display Historical Data	Specify whether a switch for Zoom In/Zoom Out Display is placed. • Zoom Display Zoom in 2 times, 4 times, and 8 times every time the switch is pressed. • Zoom Out Display Zoom out the zoomed image to 1/2, 1/4, and 1/8. You cannot zoom out from the actual size. ☞"18.9.3 Operating Procedure ■ Zoom In/Zoom Out Display" (page 18-40) • Display only in Display Historical Data Specify whether to use the Zoom In/Zoom Out switch only in Display Historical Data or also use in Normal Mode. This setting is available only when [Display Historical Data] and [Show Cursor] are [ON] in the [Display Historical Data] tab. Performs Zoom In/ Zoom Out Display with the cursor position as a reference point when checked.
Switch Label	Font Type	Set the font type for the switch label from [Standard Font] or [Stroke Font].
	Display Language	Select the language that to display on the switch label. Choose from [ASCII], [Japanese], [Chinese (Traditional)], [Chinese (Simplified)], [Korean], [Cyrillic], or [Thai].
	Select Switch	Select the Switch whose label you want to set.
	Label	Enter the text that you want to display on the switch selected in [Select Switch].
	Text Color	Set a color for the label text.
	Blink	Select whether the [Text Color] blinks and the blink speed.
Switch Color	Border Color	Set the border color for the switch.
	Display Color	Set the color for the switch.
	Pattern	Set the pattern for the switch.
	Pattern Color	Set the pattern color for the switch.
	Blink	Select the blink and blink speed. You can set up blink settings for the [Border Color], [Display Color], and [Pattern Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Select Shape		Open the Select Shape dialog box to choose the switch shape.
Status Display		Displays the shape and status of the switch.

■ Display Historical Data

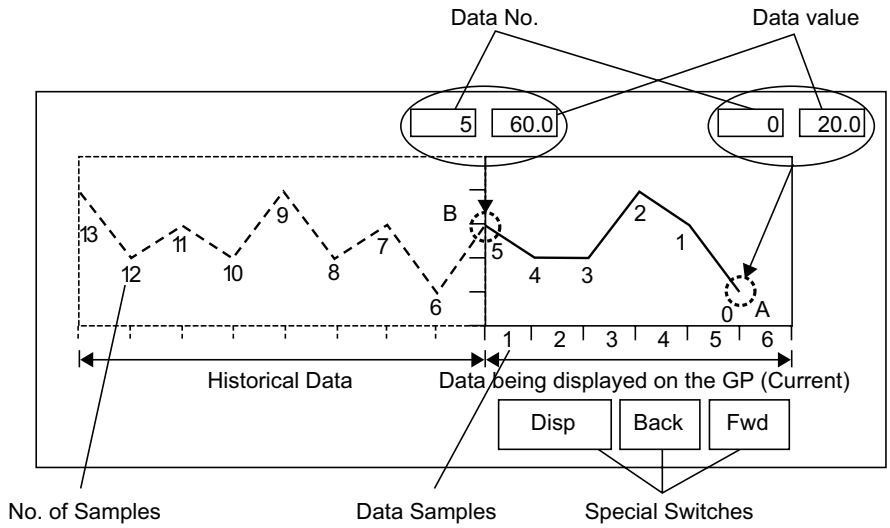
To execute an historical data display on the GP display, you need the historical data operation switch. You can specify the location of the switch on the historical trend graph or use the switch lamp parts [Special Switch].

When using a Historical Trend Graph featuring the Display Historical Data function, the excluded dotted-line portion displays on the GP screen. By touching the Display Historical Data Switch, past data stored in the GP can be viewed on the graph display.

For example, Number of Samples Taken: 14, Data Samples (shown): 6

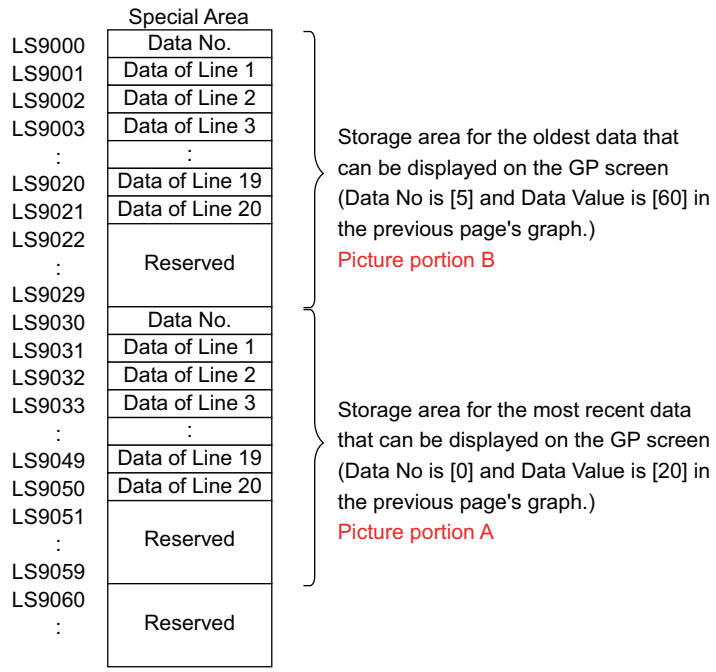
Displays sampled data stored in SRAM as historical data. First, in the [Sampling Settings] workspace's [Mode] tab, select the [Backup in Internal Memory] check box. When [Use Memory Card as Backup Area] is selected, previous data is saved in external memory if internal memory becomes full.

☞ "24.8.1 Common (Sampling) Settings Guide ■ Mode" (page 24-41)



◆ Data Numbers/Data Values

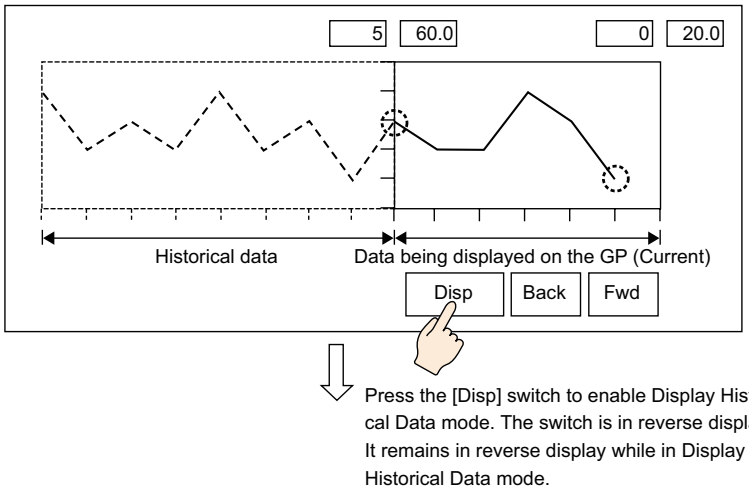
Data Numbers are assigned to data values, with the most recent data value specified as Data Number 0. The data values are stored by data number and are in reverse chronological order, starting with the most recent numbered as "0", followed by "1", "2", "3", etc.
When a Historical Trend Graph with the Display Historical Data function displays on the GP, the most recent data samples (picture portion A) and the historical data samples (picture portion B) are automatically stored in the Special Relay Area (LS9000 to) in the GP Internal Device. Data numbers are stored in the LS area as binary numbers in the range of 0 to 65,237. The data type is Bin.
To understand the data sampling in the drawing above, the data numbers and data values of portion A and B are displayed below.
The data samples and data values are stored even if a graph is not in Display Historical Data mode.



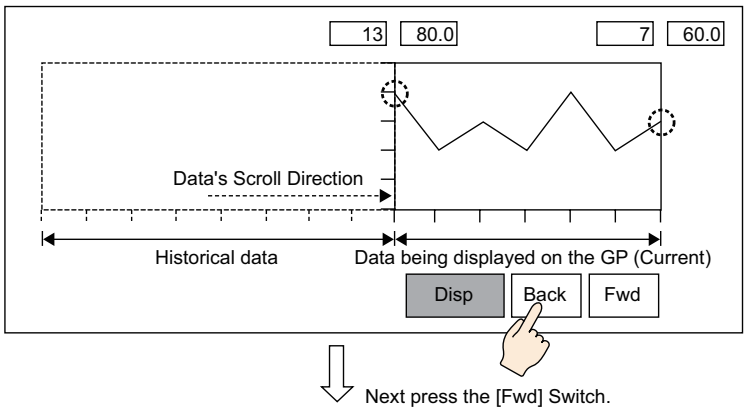
IMPORTANT

- When a screen change occurs, all data samples stored in the Special Area (LS9000+) of the GP internal device are cleared to 0.
- Each inputted data is converted to the display value and saved as a ratio of 1000. When using [Sign+/-], range is -1000 to 1000. (Display data is automatically calculated.)
- To display the data value "200" as "20.0" in a Data Display, set the [Decimal Places] to "1".

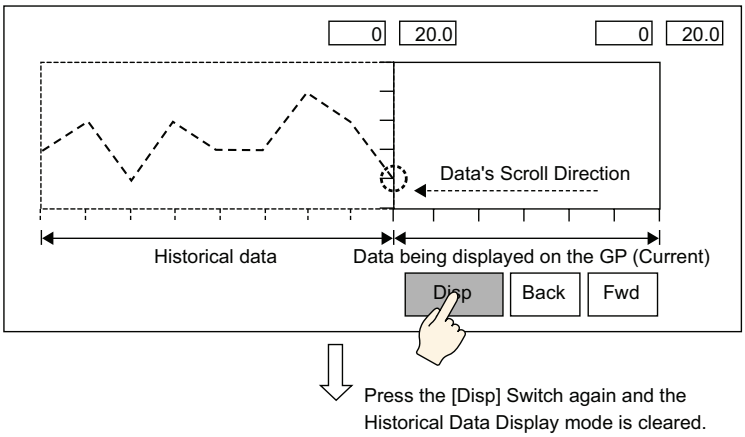
◆ Display Historical Data Examples



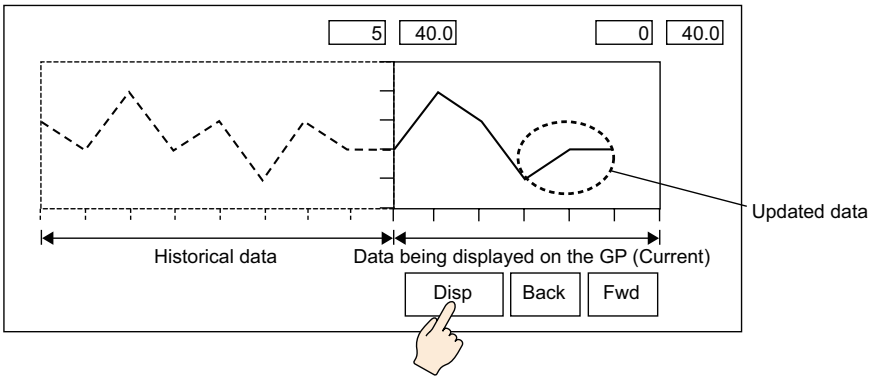
Touching the "Back" switch scrolls the data backward by the predetermined scroll number and displays previous data records.
Touching the "Back" switch while the historical data samples are being retrieved from backup SRAM causes the buzzer to sound three times. The data cannot be scrolled further until the data samples are retrieved.



Touching the "Fwd" switch scrolls the data forwards the recent data samples by the predetermined scroll number.
When you scroll to the most recent data samples after changing to Display Historical Data mode, the graph will appear blank. Touching the [FWD] switch again causes the buzzer to sound three times, indicating data cannot be scrolled further.

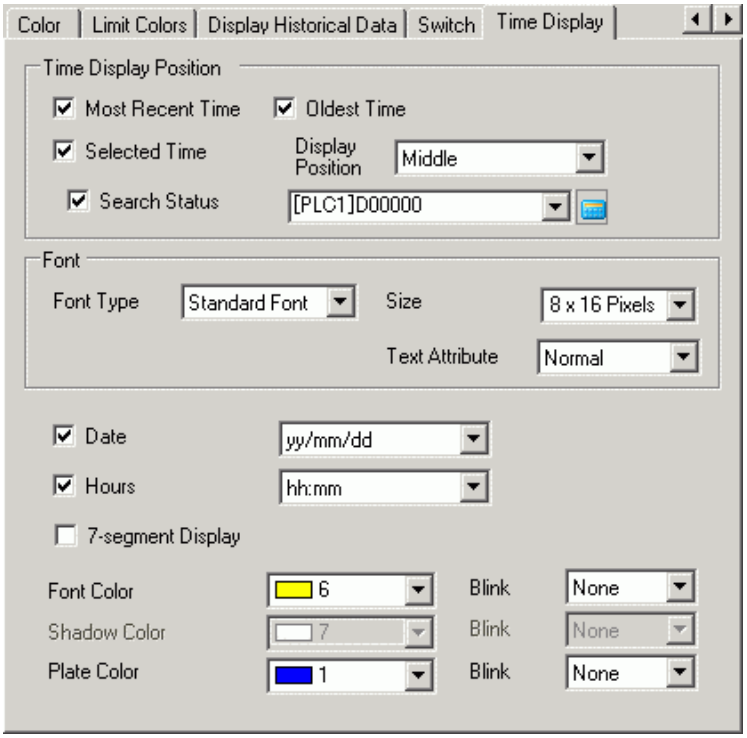


Data samples are still taken in Display Historical Mode.



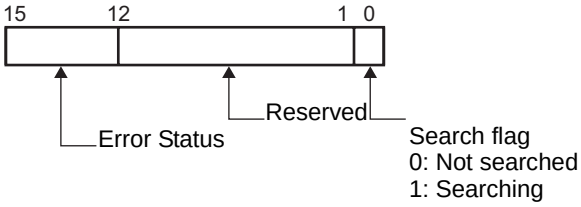
◆ Time Display

Add date and time display in graph data. Relevant data can be displayed in the cursor position by searching for the time that you want to display.



Setting		Description
Time Display Position	Most Recent Time	Set to display the most recent time. Data Display (Date and Time Display) is placed in the lower right corner on the graph screen.
	Oldest Time	Set to display oldest time. Data Display (Date and Time Display) is placed in the lower left corner on the graph screen.
	Selected Time	Set to display the time of the cursor position when the cursor is shown. This can be placed when [Show Cursor] is set in the [Display Historical Data] tab. Touch (Date and Time Display) to display sampled data searched from the graph's date and time input dialog box. ☞"18.9.3 Operating Procedure ■ Time Display and Searching Historical Data" (page 18-42)
	Display Position	Select a reference point from the Right Axis, the Middle or the Left Axis to display the Search Results for the Selected Time.

Continued

<table>
<tr><th colspan="2">Setting</th><th>Description</th></tr>
<tr><td rowspan="3">Time Display Position</td><td>Search Status</td><td>Specify whether or not to set an address for checking the search status of Selected Time.
• Status
In the Date and Time Input dialog box, input the date and time, and touch [ENT] to turn ON bit 0 in [Status] address.
 

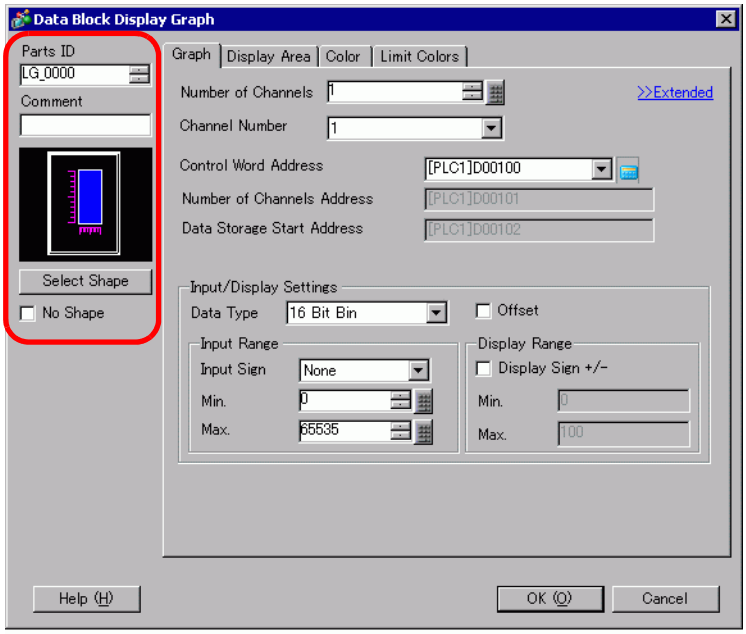
The error status indicates the following error codes.
(Error Code)
<table>
<tr><th>Bit 12 to 15</th><th>Description</th><th>Introduction</th></tr>
<tr><td>0000</td><td>Completed Successfully</td><td>Occurs when the process was completed successfully.</td></tr>
<tr><td>0001</td><td>Reserved</td><td>–</td></tr>
<tr><td>0010</td><td>Reserved</td><td>–</td></tr>
<tr><td>0011</td><td>Reserved</td><td>–</td></tr>
<tr><td>0100</td><td>CF Card/USB No storage</td><td>The CF Card/USB storage is not inserted when reading files or the CF Card hatch is open.</td></tr>
<tr><td>0101</td><td>Reserved</td><td>–</td></tr>
<tr><td>0110</td><td>Reserved</td><td>–</td></tr>
<tr><td>0111</td><td>CF Card/USB storage error</td><td>Occurs when the CF Card is unformatted, or due to another error</td></tr>
<tr><td>1000</td><td>Reserved</td><td>–</td></tr>
<tr><td>1001</td><td>Data lost</td><td>When BIN file is deleted.</td></tr>
</table></td></tr>
<tr><td rowspan="3">Font</td><td>Font Type</td><td>Select the font type for the date and time display from [Standard Font] or [Stroke Font].</td></tr>
<tr><td>Size</td><td>Select the font size for the date and time display.
Standard Font: (8 to 64) x (8 to 128).
Standard Font (Fixed Size): [6x10], [8x13], [13x23].
Stroke Font: 6 to 127.</td></tr>
<tr><td>Text Attributes</td><td>Select the text attributes.
Standard Font: Choose from [Standard], [Bold], [Shadow]
(When using a fixed font size [6 x 10], select either [Standard] or [Shadow].)
Stroke Font: Choose from [Standard], [Bold], [Outline]</td></tr>
</table>

Continued

Setting	Description
Date	Set to display the date. Select the display format from the following. • yy/mm/dd • dd/mm/yy • mm/dd/yy • 20yy/mm/dd • dd/mm/20yy • mm/dd/20yy • yy/mm/dd • 20yy/mm/dd
Time	Set to display the time. Select the display format from the following. • hh:mm • hh:mm:ss **NOTE** • When "yy/mm/dd" or "20yy/mm/dd" is selected for the date display, select from the following two types. hh:mm hh:mm:ss
7-segment Display	Set to display the date and time display in 7 segments. **NOTE** • This cannot be set when a fixed size for [Standard Font] or [Text Attribute] in [Stroke Font] has been set.
Numeral Value Color	Select the number's color.
Shadow Color	Set a color for the shadow. This can be set only when [Shadow] is set in [Standard Font] and [Text Attribute].
Plate Color	Select a background color for the date and time display.
Blink	Select the blink and blink speed.

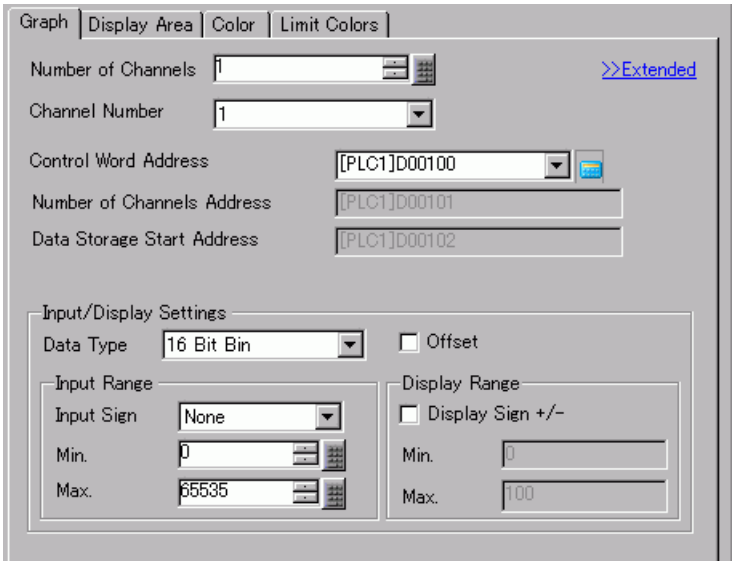
18.12.3 Data Block Display Graph Settings Guide

Displays the current values of multiple addresses on a single graph.



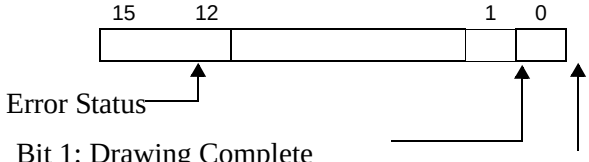
Setting	Description
Parts ID	Parts are automatically assigned an ID number. Data Block Display Graph ID: LG_**** (4 digits) The letter portion is fixed. You can change the number portion within the range of 0000-9999.
Comment	The comment for each Part can be up to 20 characters.
Part Shape	Displays the shape that you chose for the part with [Select Shape].
Select Shape	Open the Select Shape dialog box to choose the Part shape.
No Shape	Select whether the part will be transparent with no shape.

■ Graph/Basic



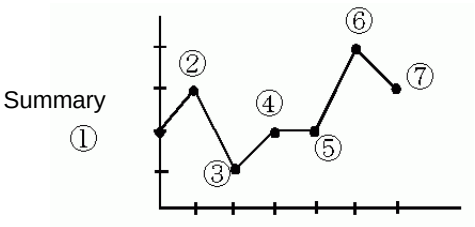
Setting	Description
Number of Channels	Select the number of channels to display on the graph. The setting range is from 1 to 20.
Channel	Choose the channel (data line) to configure. Change to the numbers of the channels set in [Number of Channels] and set input/display settings.
Control Word Address	Set the address that controls the displaying/clearing of the graph. This address' bit 0 and bit 1 control when the graph displays and cleared. • When bit 0 is ON ("1" is stored in the address), the graph will be displayed. **Control** 15 03 02 01 00 • When bit 1 is ON ("2" is stored in the address), the displayed graph will be cleared. **Control** 15 03 02 01 00 • When bit 0 and bit 1 are ON ("3" is stored in the address), the displayed graph will temporarily be cleared and then displayed again. **Control** 15 03 02 01 00 This can be set to either a device/PLC address or GP internal device address. ☞ "18.10.1 Introduction" (page 18-43)

Continued

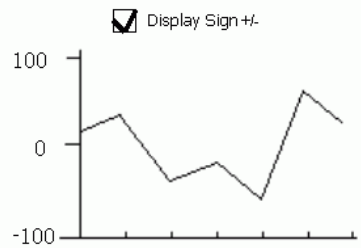
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Control Word Address</td><td>
• Status
Control bit 0 is ON when drawing or clearing the graph.
When the graph is displayed or cleared, bit 0 turns OFF and bit 1 turns ON.
When control is 0, Status bits 0 and 1 turn OFF.


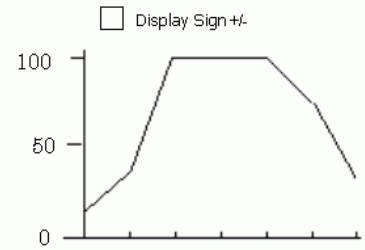
Bit 1: Drawing Complete
[0]:Not Displayed (Not Cleared)
[1]: Drawing complete (Clear complete)
Bit 0: Drawing Complete
[0]: Not Displayed (Not Cleared)
[1]: Outputting (Clearing)
The error status corresponds to the following error codes.
Error Code
<table>
<tr><th>Bits 12 to 15</th><th>Description</th><th>Details</th></tr>
<tr><td>0000</td><td>Successful</td><td>Occurs when the process was completed successfully.</td></tr>
<tr><td>0001</td><td>Number of coordinates is zero points</td><td>Set up when the Control+2 coordinate value is zero.</td></tr>
<tr><td>0010</td><td>Display range error</td><td>Set up when displaying a scale that uses addresses for the display range, the of the upper and lower limit values is zero, or the lower limit is greater than the upper limit. When using the auxiliary line, set up when the upper and lower limit widths are less than one.</td></tr>
<tr><td>0011</td><td>Communication error</td><td>Set when a communication (timeout) error occurs when getting coordinates.</td></tr>
<tr><td>0100</td><td>Reserved</td><td>–</td></tr>
<tr><td>:</td><td></td><td></td></tr>
<tr><td>1111</td><td>Reserved</td><td>–</td></tr>
</table>
When setting the error status, set Bit 0 (Drawing Process) and Bit 1 (Drawing Process Complete) to zero.
</td></tr>
</table>

Continued

Setting		Description
Number of Channels Address		Displays the address at [Control Word Address] + 1. This address stores the number of sets of data lines displayed on the graph. On the graph, this will become the number of sets of data samples. For example, number of data entries: 7 
Data Storage Start Address/Offset Value Storage Address		Displays the address at [Control Word Address] + +2. This address stores the start data displayed on the graph. When an [Offset] is set, this changes to the [Offset Value Storage Address].
Input/ Display	Data Type	Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float]. **NOTE** • If [Individual] is selected in the Detail Settings, individual channels settings can be modified. • If [Show Scale] is selected in the Detail Settings, only [16 Bit Bin] or [32 Bit Bin] can be set.
	Offset	Select whether to display an offset on the graph. ☞" ◆ Data Block Display Graph Structure" (page 18-99)
	Input Sign	Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin]. • None Only positive numeric data will be handled. • 2's Complement Negative numbers are handled with 2's complement. • MSB Sign Negative numbers are handled with MSB sign.

Continued

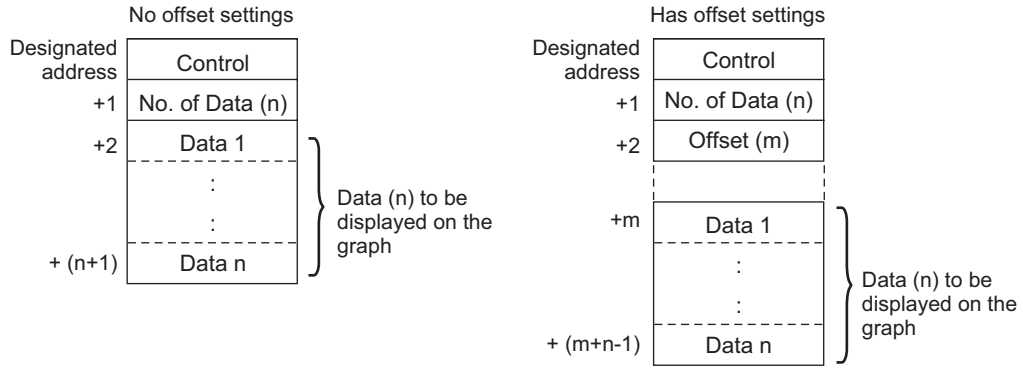
<table>
<tr><th colspan="2">Setting</th><th>Description</th></tr>
<tr><td rowspan="3">Input/ Display</td><td>Min/Max</td><td>Select the input range for graph display data.
Each [Data Type] and [Input Sign] has a different size range.
<table>
<tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr>
<tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr>
<tr><td>2's Complement</td><td>–32768 to 32767</td></tr>
<tr><td>MSB Sign</td><td>–32767 to 32767</td></tr>
<tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr>
<tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr>
<tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr>
<tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr>
<tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr>
<tr><td>32 Bit Float</td><td>–</td><td>–9.9e^{16} to 9.9e^{16}</td></tr>
</table>
NOTE
• Each word address' data corresponds to the input range and displays on the graph as a value between 1 and 1,000.</td></tr>
<tr><td>Display Sign +/–</td><td>Set to display negative numbers. This can only be set when the [Data Type] is [Bin]. When the [Data Type] is [BCD], [Display Sign +/–] is not set. For [Float], [Display Sign +/–] is set.
 

Negative numbers displayed
 

Negative numbers not displayed</td></tr>
<tr><td>Min/Max</td><td>Set the range's Min/Max to be displayed on the graph. If [Display Sign +/–] is set, the Min is "–100". If it is not set, the Min is "0". The Max is "100".</td></tr>
</table>

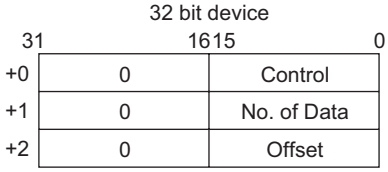
◆ Data Block Display Graph Structure

When using the Data Block Display feature, you need to reserve the areas for the number of addresses specified below, beginning from the specified Control Word Address. The Control Word Address can be set to either a device/PLC address or GP internal device address. Configure offset settings and you can set the graph display data in an address shifted down from the address storing the [Data Items].



NOTE

- [Control], [Data Items] and [Offset] are all fixed as 16 bit.
- For 32 bit devices, the lower 16 bits will be enabled. Please enter [0] for the upper 16 bits.



When you want to control the graph display from a device/PLC, the graph's display speed will differ depending on if you set the [Control Word Address] to a device address or use the GP Internal Read Area.

When setting a device/PLC address

When the "control" display bit (bit 0) turns ON, the GP needs more time to read data from the device/PLC and display it on the graph than it takes to process from the GP Internal Device. However, when the graph is not displayed, the time taken to display the whole screen is faster than the GP Internal Device.

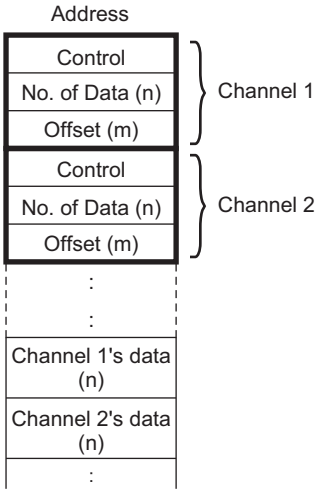
GP Internal Device Using the Read Area

The Read Area constantly reads data from the device/PLC to the GP, regardless of screen display status. After the "control" display bit (bit 0) turns ON, the time to display the graph is

shorter than when using a device/PLC address. However, when the Read Area size is large, the time to display the entire screen is slower than when using a device/PLC address.

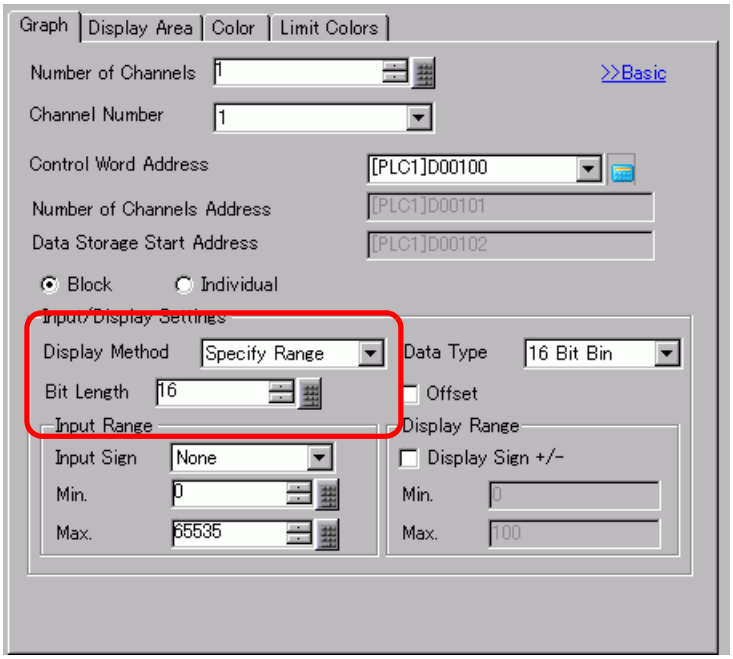
NOTE

- To use the GP Internal Device's Read Area, you need to set the [Read Area Size].
  From the [System Settings], click [Display Unit] then check the [System Area] tab. A maximum of 256 words are allowed.
- When setting a device/PLC address and displaying multiple data lines (channel) with Block Display, enable offset settings to improve the graph display speed. By setting all the data in continuous addresses as in the following, data can be easily read in one communication round.



■ Graph/Extended

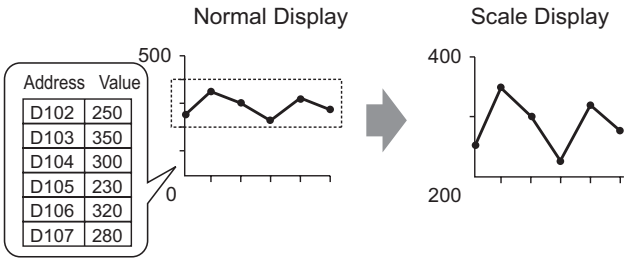
Configure input/display settings for each channel's Data Type, Input Sign, etc.

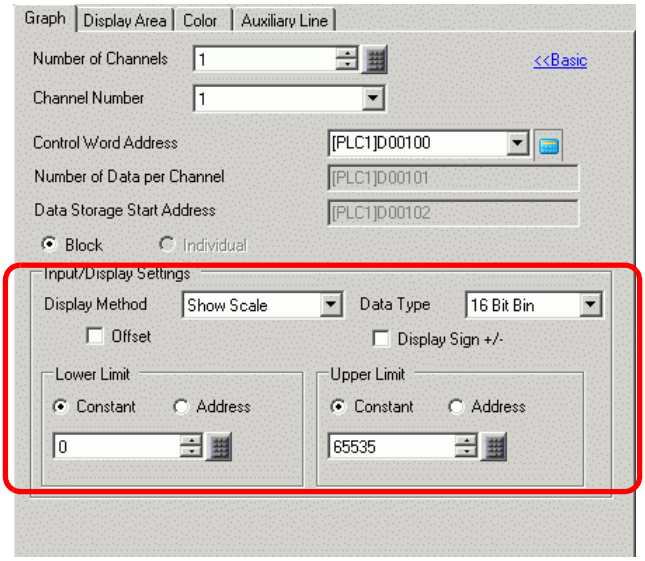


Setting	Description
Block/Individual	For the Data Type, Input Sign, etc., to change the input/display settings for all channels as a whole or separately. When the [Display Method] is selected as [Show Scale], this setting is fixed as [Block].
Display Method	Select the setting method for the graph display range from [Specify Range] and [Show Scale]. ☞" ◆ Show Scale" (page 18-102) **NOTE** • When [Show Scale] is selected, the [Fill Below Line] option in the [Color] tab's Extended settings cannot be selected. • When [Show Scale] is selected, the [Alarm Settings] tab is not displayed. • When [Specify Range] is selected, the [Auxiliary Line] tab is not displayed.
Bit Length	If [Data Type] is [16 Bit Bin], set the data's enabled bit length from 1 to 16.

◆ Show Scale

Displays only the specified range of the graph. When data is concentrated in a fixed range, this is useful for verifying details.





Setting	Description
Data Type	Choose the graph data type from [16 Bit Bin] or [32 Bit Bin].
Offset	Select whether to display an offset on the graph. ☞ " ◆ Data Block Display Graph Structure" (page 18-99)
Display Sign +/–	Set to display negative numbers.

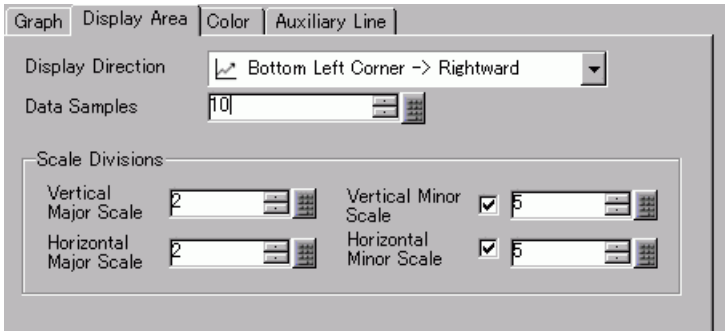
Continued

<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Upper Limit/ Lower Limit</td><td>Select the method for setting the scale's upper and lower value from [Constant] or [Address], and set the Upper and Lower Limit.
• Constant
Specify a set constant as the Min/Max value.
• Address
Specify the address where the Upper/Lower Limit values are stored.

<table>
<tr><th>Data Type</th><th>Display Sign +/–</th><th>Range</th></tr>
<tr><td rowspan="2">16 Bit Bin</td><td>Cleared</td><td>0 to 65535</td></tr>
<tr><td>Selected</td><td>–32768 to 32767</td></tr>
<tr><td rowspan="2">32 Bit Bin</td><td>Cleared</td><td>0 to 4294967295</td></tr>
<tr><td>Selected</td><td>–2147483648 to 2147483647</td></tr>
</table>

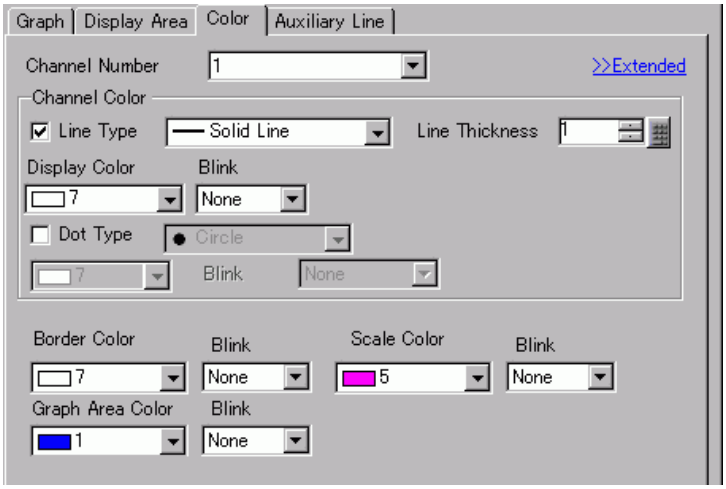
NOTE
• If [Display Sign +/–] is set, negative numbers are handled with the 2's complement system.
• If [Address] is selected in [Show Scale] setting, drawings are updated in real time when the address is changed.</td></tr>
</table>

■ Display Area



Setting	Description
Display Direction	Select the graph display direction. 
Data Samples	Set the number of sets of data samples that to display on a single line. The range depends on the set model's Display Number of Dots. Display Number of Dots / Data Samples 320 x 240 dots (QVGA) / 0 to 319 640 x 480 dots (VGA) / 0 to 639 800 x 600 dots (SVGA) / 0 to 799 1024 x 768 dots (XGA) / 0 to 799 **NOTE** • You can verify the Display Number of Dots with [System Settings] - [Display]. • When [Fill Below Line] is set, the maximum number of [Data Samples] is 97.
Vertical Major Scale/ Minor Scale	Set whether to display the major and minor scale on the Line Chart's Y-axis. If so, choose the number of divisions. The number of divisions can be set from 1 to 638 for Major Scale, and from 2 to 638 for Minor Scale.
Horizontal Major Scale/Minor Scale	Set whether to display the major and minor scale on the Line Chart's X-axis. If so, choose the number of divisions. The number of divisions can be set from 1 to 638 for Major Scale, and from 2 to 638 for Minor Scale.

■ Color/Basic

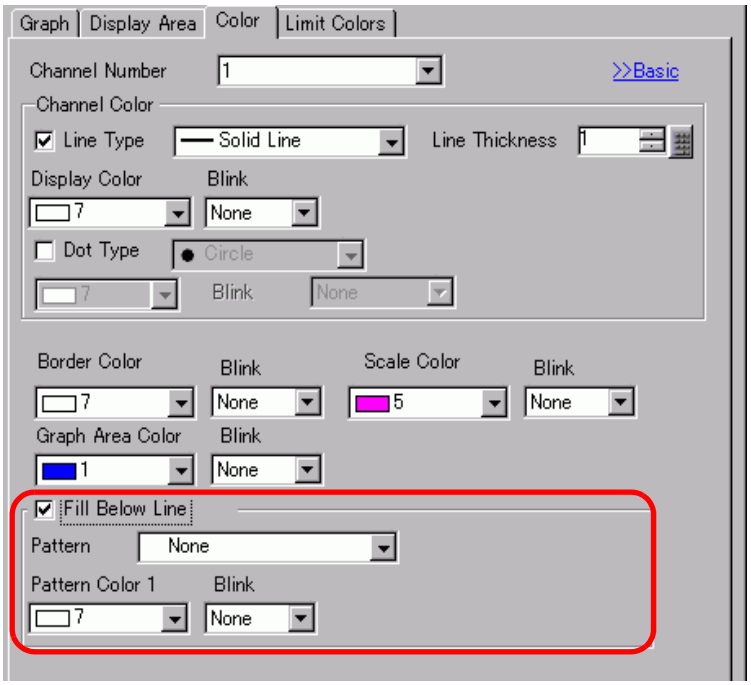


Setting			Description
Channel			Select the Channel to configure color settings. Channel Color
Channel Color	Line Type		Select to display the lines on the Graph. Choose a line type from among 5 kinds: Solid Line, Dashed Line, Dash Line, Chain Line, and Two-Dot Chain Line. **NOTE** • When the data display spacing is less than 16 dots, line types other than the solid line may not display correctly.
	Line Thickness		Set the line thickness from 1 to 2.
	Display Color		Select the data line color.
	Background Color		Select the data line background color.
	Dot Type		Select to display dots on the Graph. Choose a dot type from among the 7 patterns: filled circle, filled triangle, filled square, circle, triangle, square, and X. The dot size is fixed at 5 pixels. **IMPORTANT** • This cannot be used at the same time as the Detail Settings' [Fill Below Line] on the [Color] tab.
		Display Color	Set the dot color.
Border Color			Select the border color of the Data Block Display Graph.
Scale Color			Select the graph's scale color.
Graph Area Color			Select the color of the Graph Display Area.

Continued

Setting	Description
Blink	Select the blink and blink speed. You can choose different blink settings for the line's [Display Color] and [Background Color], the dots [Display Color], and the Graph's [Border Color], [Scale Color], and [Graph Area Color]. NOTE • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Color/Extended



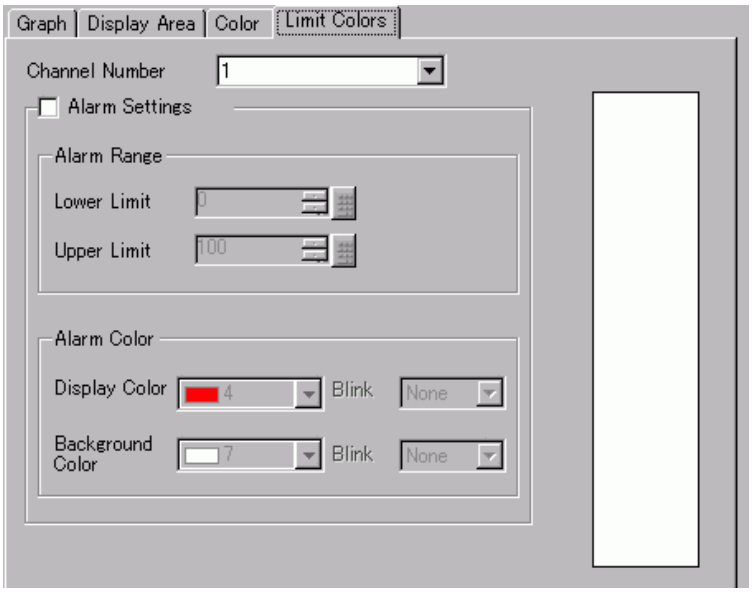
Setting	Description
Fill Below Line	Select to fill in the area under the Line Chart. This can only be set when [Number of Channels] is 1. **NOTE** • This can not be set when alarms are being used. • Cannot be used with [Show Scale].
Pattern	Select a pattern for filling the area below the graph line.
Pattern Color 1	Select the pattern color.
Pattern Color 2	Select the pattern background color.
Blink	Select the blink and blink speed. You can choose different blink settings for [Pattern Color 1] and [Pattern Color 2]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Alarm

Configure settings to change the line color when values move outside of a set range.

NOTE

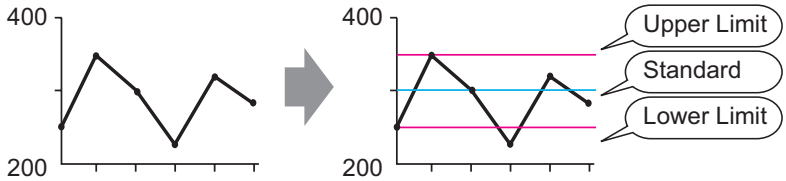
- When [Show Scale] is set, Alarm cannot be used.

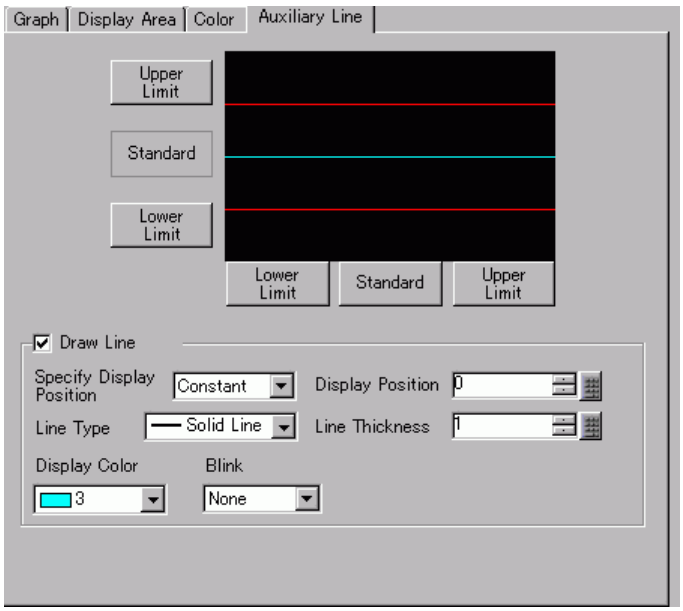


Setting	Description
Channel	Select the Channel to configure Alarm.
Alarm	Select to change the color when the value moves outside of a set range. **NOTE** • This cannot be set if the [Fill Below Line] option is set in the Detail Settings on the Color tab.
Upper Limit/ Lower Limit	Set the Alarm Display range from 0 to 100 (if [Display Sign +/−] is selected, the range is from −100 to 100).
Display Color	Select the data line color for the alarm.
Background Color	Select the data line background color for the alarm.
Blink	Select the blink and blink speed. The alarm color's [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Color Range Display Bar	Displays a sample for the alarm colors.

■ Auxiliary Line

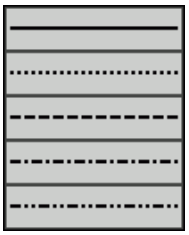
To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].
This option is located in [Detailed Settings] under the [Graph] tab. By using auxiliary lines to show the standard value or a range, you can quickly verify which data have moved away from the standard value.





Setting	Description
Upper Limit/ Standard/Lower Limit	Select the auxiliary line to set.
Draw Line	Defines whether to draw the [Upper Limit], [Standard], and [Lower Limit] auxiliary lines in the selected positions.
Specify Display Position	Select the designation method of the auxiliary lines' display position from [Constant] or [Address]. • Constant Specify a set constant as the Display Position. • Address Specify the address where the Display Position is stored.

Continued

<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Display Position</td><td>Set the auxiliary line's Display Position.
The setting range for each auxiliary line on the Y-axis is as follows.
<table><tr><th>Data Type</th><th>Display Sign +/–</th><th>Setting Range</th></tr><tr><td>16 Bit Bin</td><td>Cleared</td><td>0 to 65535</td></tr><tr><td>16 Bit Bin</td><td>Selected</td><td>–32768 to 32767</td></tr><tr><td>32 Bit Bin</td><td>Cleared</td><td>0 to 4294967295</td></tr><tr><td>32 Bit Bin</td><td>Selected</td><td>–2147483648 to 2147483647</td></tr></table>
Set each horizontal auxiliary line from 0 to 1,000 (out of 1000%). 500 is the middle position, 1000 is the largest position.</td></tr>
<tr><td>Line Type</td><td>Select the auxiliary line type:
 
Solid Line
Dashed Line
Dash Line
Chain Line
Two-Dot Chain Line

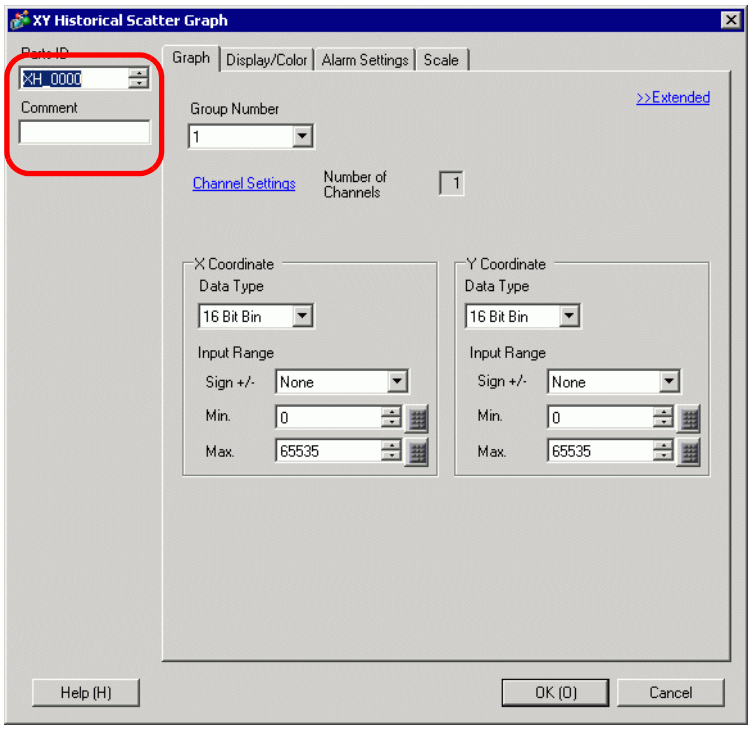
NOTE
• If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.</td></tr>
<tr><td>Line Thickness</td><td>Set the auxiliary line thickness from 1 to 2.</td></tr>
<tr><td>Display Color</td><td>Set the auxiliary line color.</td></tr>
<tr><td>Background Color</td><td>If you selected a line type other than a solid line, set the auxiliary line's background color.</td></tr>
<tr><td>Blink</td><td>Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color].

NOTE
• There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings].
☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)</td></tr>
</table>

18.12.4 XY Historical Scatter Graph Settings Guide

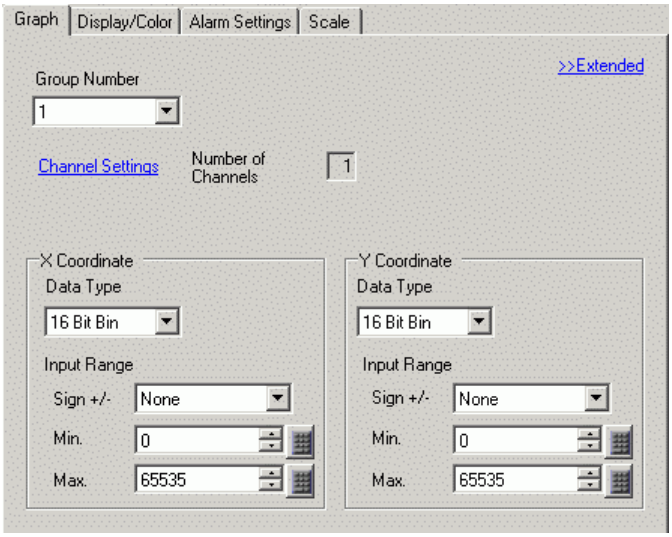
The values of two Word devices collected with the Sampling settings are displayed in x-axis/y-axis coordinates of a graph.

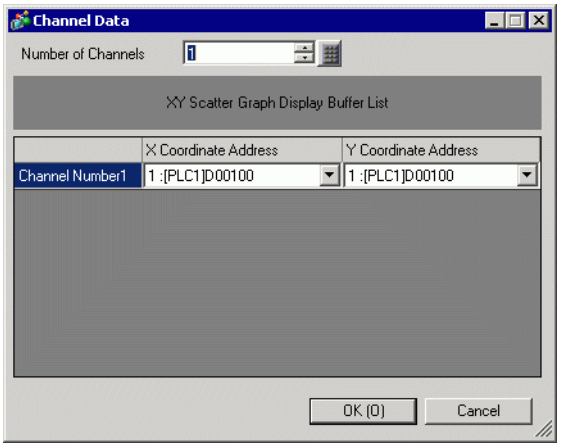
☞ "24.8.1 Common (Sampling) Settings Guide" (page 24-37)



Setting	Description
Parts ID	Parts are automatically assigned an ID number. XY Historical Scatter Graph ID: XH_**** (4 digits) The letter portion is fixed. You can change the number portion within the range of 0000-9999.
Comment	The comment for each Part can be up to 20 characters.

■ Graph/Basic



Setting	Description
Group Number	The sampling group number from 1 to 64 of the graph to display.
Channel Settings	Open the [Channel Data Settings] dialog box appears. From among the specified sampling group, set the address and number of addresses (Number of Channels) of the line you want to display as an xy graph. The Number of Channels can be from 1 to 10. 
Number of Channels	The set Number of Channels appears in the [Channel Data Settings] dialog box. The number of channels displays as lines on the Graph Display Area.
Channel	Select the Channel to configure.

Continued

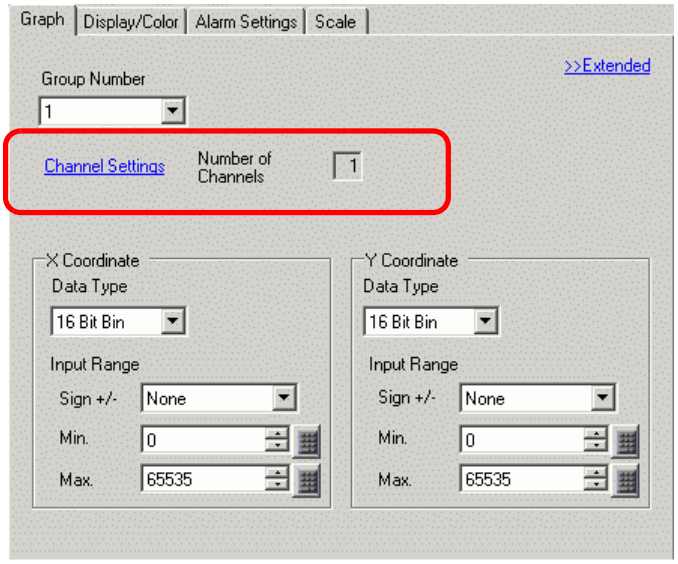
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>X Coordinates/Y Coordinates</td><td>Set [Data Type] and [Input Range] for X and Y coordinates.</td></tr>
<tr><td>Data Type</td><td>Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float].</td></tr>
<tr><td>Input Sign</td><td>Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin].
• None
Only positive numeric data will be handled.
• 2's Complement
Negative numbers are handled with 2's complement.
• MSB Sign
Negative numbers are handled with MSB sign.</td></tr>
<tr><td>Min. Value/Max. Value</td><td>Select the input range for XY graph display data.
Each [Data Type] and [Input Sign] has a different size range.

<table>
<tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr>
<tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr>
<tr><td>2's Complement</td><td>–32768 to 32767</td></tr>
<tr><td>MSB Sign</td><td>–32767 to 32767</td></tr>
<tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr>
<tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr>
<tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr>
<tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr>
<tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr>
<tr><td>32 Bit Float</td><td>–</td><td>$-9.9e^{16}$ to $9.9e^{16}$</td></tr>
</table>

NOTE
• Data collected from the sampling function corresponds to the input range and displays on the graph as a value between 1 and 1,000.</td></tr>
</table>

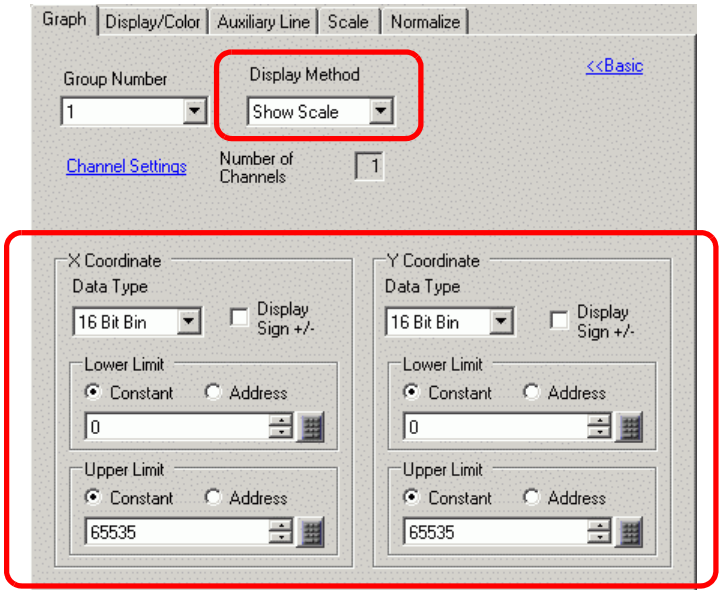
■ Graph/Extended

You can set Input/Display for each channel.



Setting	Description
Display Method	Select the setting method for the graph display range from [Specify Range] and [Show Scale]. ☞ " ◆ Show Scale" (page 18-115) **NOTE** • When [Show Scale] is selected, the [Alarm Settings] tab is not displayed. • When [Specify Range] is selected, the [Auxiliary Line] and [Normalize] tabs are not displayed.
Block/Individual	Define the [Data Type] and [Input Range] for all the channels as a whole or separately when you select [Specify Range] in [Display Method].

◆ Show Scale



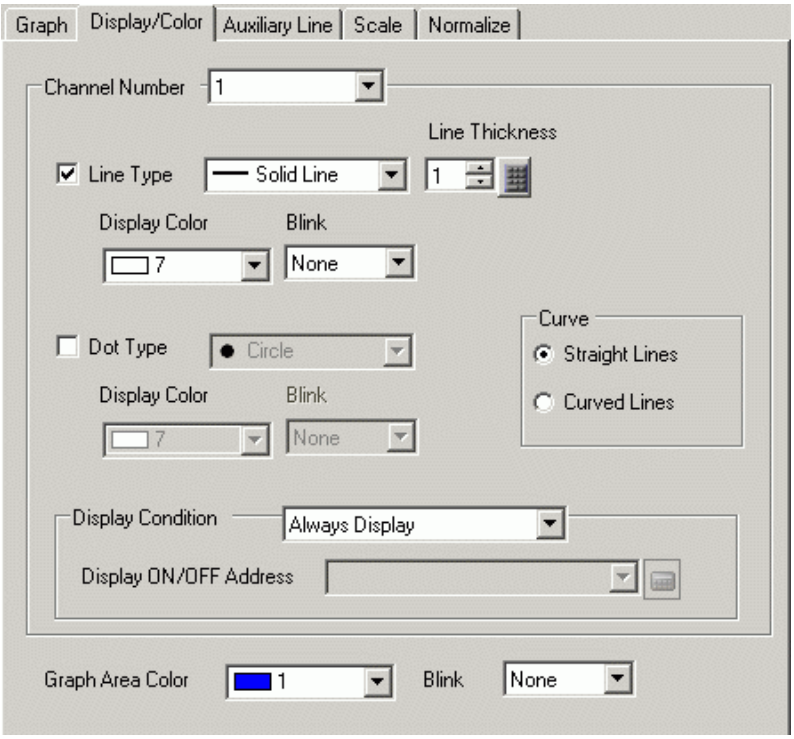
Setting	Description
X Coordinates/Y Coordinates	Set [Data Type] and [Upper Limit]/[Lower Limit] for X and Y coordinates.
Data Type	Choose the graph data type from [16 Bit Bin] or [32 Bit Bin].
Display Sign +/–	Set to display negative numbers.
Upper Limit/ Lower Limit	Select the method for setting the scale's upper and lower value from [Constant] or [Address], and set the Upper and Lower Limit. • Constant Specify a set constant as the Min/Max value. • Address Specify the address where the Upper/Lower Limit values are stored.

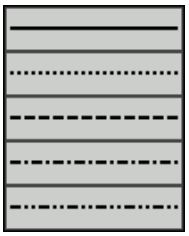
Data Type	Display Sign +/–	Range
16 Bit Bin	Cleared	0 to 65535
	Selected	–32768 to 32767
32 Bit Bin	Cleared	0 to 4294967295
	Selected	–2147483648 to 2147483647

NOTE

- If [Display Sign +/–] is set, negative numbers are handled with the 2's complement system.

■ Display/Color

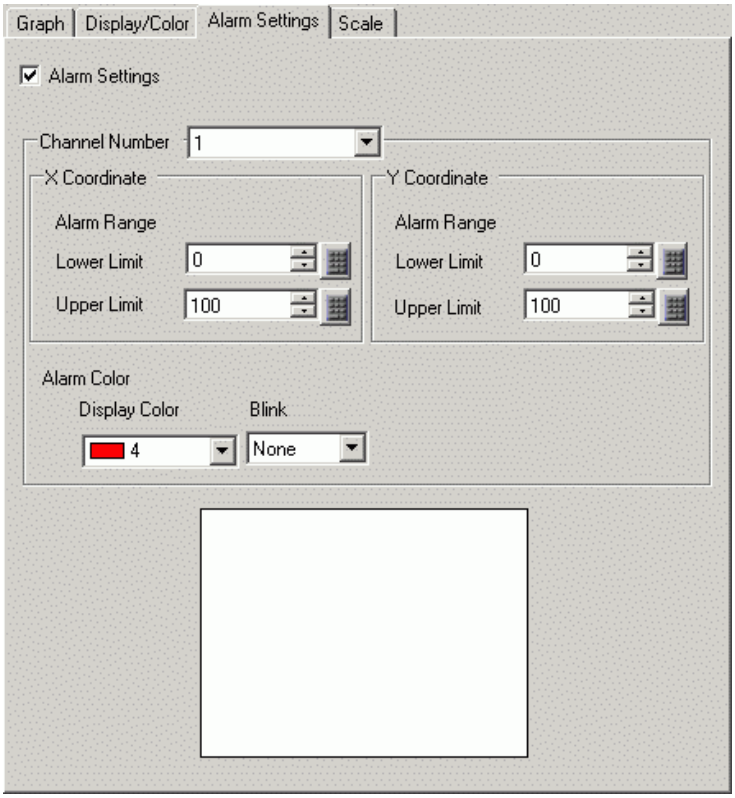


Setting	Description
Channel Number	Select the Channel to configure the graph display and color.
Line Type	Specify whether to draw a line on the graph. When checked, select a type of line from among 5 patterns:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display. • When comparing dot pattern with line pattern, the line pattern is drawn first.
Line Thickness	Set the line thickness from 1 to 2.
Display Color	Set the line color.
Background Color	If you selected a line type other than the solid line, set the line's background color.

Continued

Setting	Description
Pixel Size	Specify whether to show the points on the graph. When checked, select a dot type from among the 7 patterns: filled circle, filled triangle, filled square, circle, triangle, square, and X. The dot size is fixed at 5 pixels.
Display Color	Set the dot color.
Curve	Specify whether to curve the line within the display range when the data values exceeded the specified value of the display range. When [Curved Lines] is selected, the value over the display range is displayed as a preset upper level. When both X and Y values are over the display range, the intersecting point is displayed. When [Straight Lines] is selected, the value over the display range is not displayed. **NOTE** • When displaying a graph, if the 16-bit display range is exceeded, the graph will be curved regardless of the Curve setting.
Display Condition	Select the graph display condition. • Always Display Always displays the graph. • Display When Bit OFF Displays the graph when [Display ON/OFF Address] is OFF an hides the graph when [Display ON/OFF Address] is ON. • Display When Bit ON Displays the graph when [Display ON/OFF Address] is ON an hides the graph when [Display ON/OFF Address] is OFF.
Display ON/OFF Address	Set the bit address to turn ON/OFF the graph display.
Graph Area Color	Select a color for the Graph Display Area.
Blink	Select the blink and blink speed. You can choose different blink settings for [Display Color], [Background Color], and [Graph Area Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Alarm



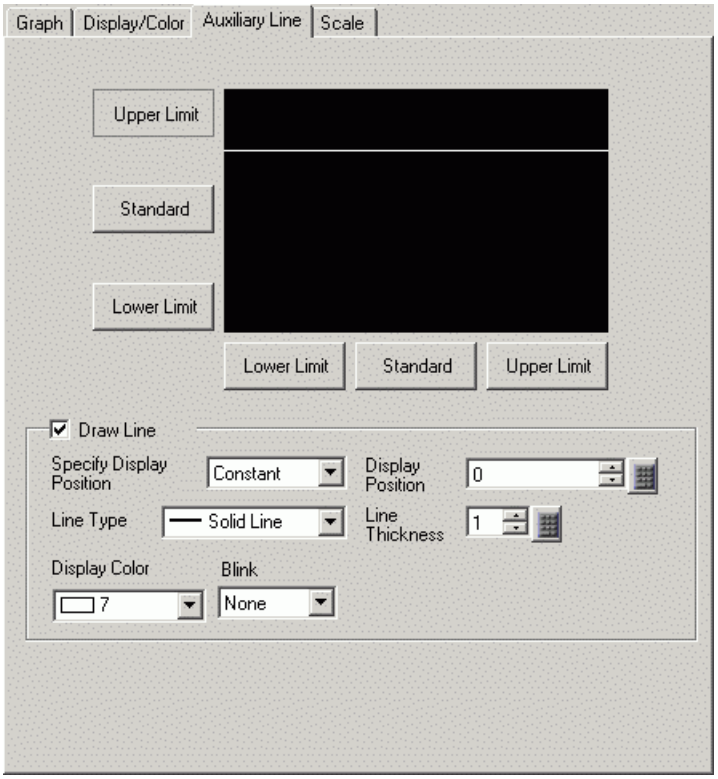
NOTE

- When [Show Scale] is selected for [Display Method] in the [Graph] tab, the [Alarm Settings] tab is not displayed.

Setting	Description
Alarm	If set, the displayed color changes when the value moves outside of a specified range.
Channel	Select the Channel to configure.
Upper Limit/ Lower Limit	Set the Alarm Display range for X and Y coordinates from 0 to 100.
Display Color	Select the Alarm Display color. The Alarm Display color appears as follows.
Background Color	Select the background color for displaying the alarm.
Blink	Select the blink and blink speed. The alarm color's [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Color Range Display Bar	Displays a sample for the alarm colors.

■ Auxiliary Line

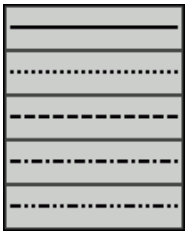
To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].



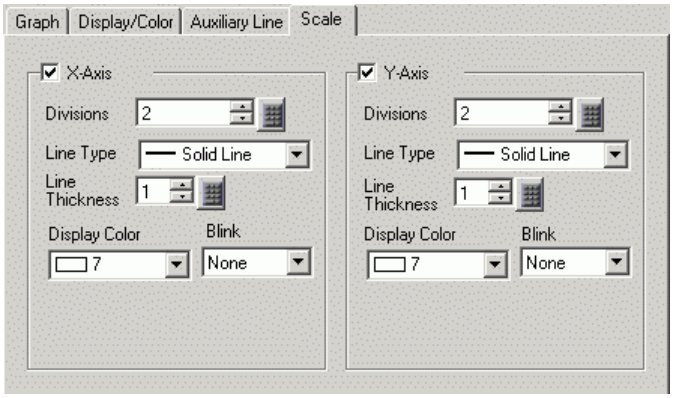
Setting	Description
Upper Limit/ Standard/Lower Limit	Select the auxiliary line to set.
Draw Line	Defines whether to draw the [Upper Limit], [Standard], and [Lower Limit] auxiliary lines in the selected positions.
Specify Display Position	Select the designation method of the auxiliary lines' display position from [Constant] or [Address]. • Constant Specify a set constant as the Display Position. • Address Specify the address where the Display Position is stored.
Display Position	Set the auxiliary line's Display Position. Each auxiliary line's setting range is as follows.

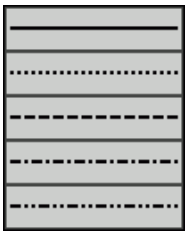
Data Type	Display Sign +/–	Setting Range
16 Bit Bin	Cleared	0 to 65535
16 Bit Bin	Selected	–32768 to 32767
32 Bit Bin	Cleared	0 to 4294967295
32 Bit Bin	Selected	–2147483648 to 2147483647

Continued

Setting	Description
Line Type	Select the auxiliary line type:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Line Thickness	Set the auxiliary line thickness from 1 to 2.
Display Color	Set the auxiliary line color.
Background Color	If you selected a line type other than a solid line, set the auxiliary line's background color.
Blink	Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

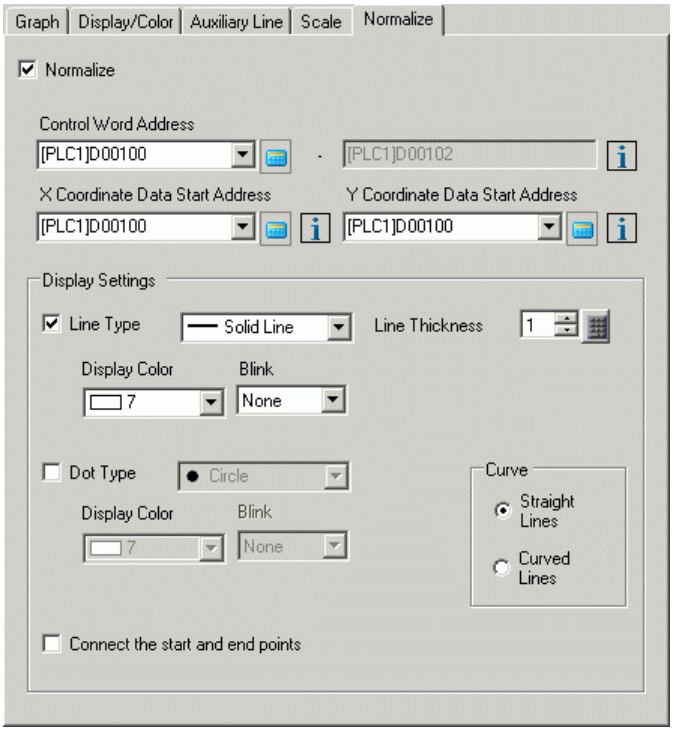
■ Scale



Setting	Description
X-axis/Y-axis	Set whether or not to display a scale for x-axis and y-axis.
Divisions	Set the number of scale divisions to be displayed from 2 to 100.
Line Type	Select a type of the line from among the five patterns:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Line Thickness	Set the line thickness from 1 to 2.
Display Color	Set the line color.
Background Color	If you selected a line type other than the solid line, set the line's background color.
Blink	Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Normalized Data

To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].

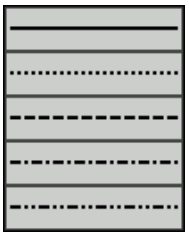


Setting	Description
Normalized Data	Set to normalize data.

Continued

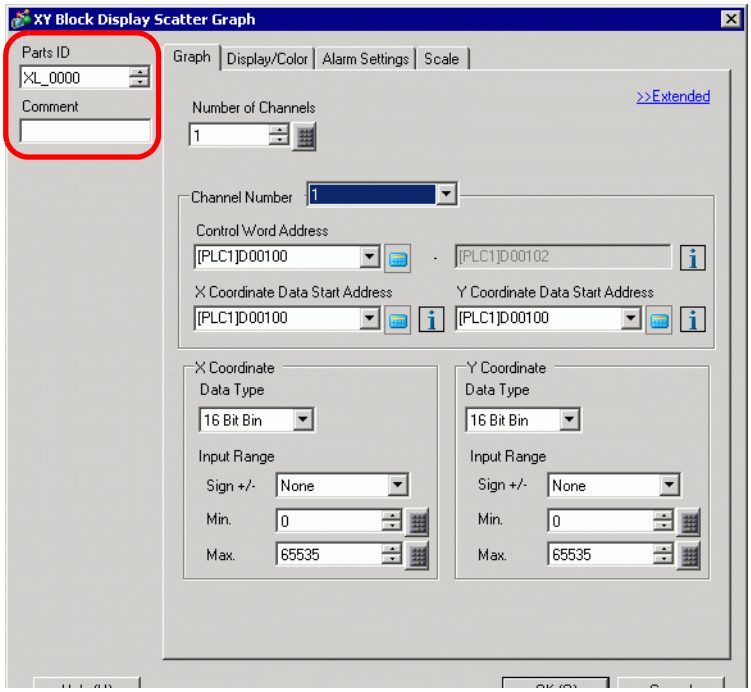
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Control Word Address</td><td>
Set the address that controls the displaying/clearing of the graph.
In addition, the following two addresses are used as a sequential address.
• Control Word Address +1: Status Address
• Control Word Address +2: Address for the Number of Coordinates (Displayed as the last address.)
Click the icon to display a composition of the address used.
Control Word Address
<table>
<tr><td>+0</td><td>Control</td></tr>
<tr><td>+1</td><td>Status</td></tr>
<tr><td>+2</td><td>Number of Coordinates (n)</td></tr>
</table>
• When bit 0 is ON ("1" is stored in the address), the graph will be displayed.
Control 15 03 02 01 00
• When bit 1 is ON ("2" is stored in the address), the displayed graph will be cleared.
Control 15 03 02 01 00
• When bit 0 and bit 1 are ON ("3" is stored in the address), the displayed graph will temporarily be cleared and then displayed again.
Control 15 03 02 01 00
This can be set to either a device/PLC address or GP internal device address.
☞ "18.10.1 Introduction" (page 18-43)
</td></tr>
<tr><td>X Coordinate Data Start Address</td><td>
Set the start address of the address area where X coordinate data is stored.
Click the icon to display a composition of the address used.
Y Coordinate Data Start Address
<table>
<tr><td>+0</td><td>X coordinate 1</td></tr>
<tr><td>+1</td><td>X coordinate 2</td></tr>
<tr><td>+2</td><td>X coordinate 3</td></tr>
<tr><td>:</td><td>:</td></tr>
</table>
When accessing a 16-bit device using 32-bit access, the composition of the address is as shown on the right.
Y Coordinate Data Start Address
<table>
<tr><td>+0</td><td>X coordinate 1</td></tr>
<tr><td>+2</td><td>X coordinate 2</td></tr>
<tr><td>+4</td><td>X coordinate 3</td></tr>
<tr><td>:</td><td>:</td></tr>
</table>
</td></tr>
</table>

Continued

Setting	Description
Y Coordinate Data Start Address	Set the start address of the address area where Y coordinate data is stored. Click the icon to display a composition of the address used. Y Coordinate Data Start Address +0 Y coordinate 1 +1 Y coordinate 2 +2 Y coordinate 3 : : When accessing a 16-bit device using 32-bit access, the composition of the address is as shown on the right. Y Coordinate Data Start Address +0 Y coordinate 1 +2 Y coordinate 2 +4 Y coordinate 3 : :
Line Type	Specify whether to draw a line on the graph. When checked, select a type of line from among 5 patterns:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Line Thickness	Set the line thickness from 1 to 2.
Display Color	Set the line color.
Background Color	If you selected a line type other than the solid line, set the line's background color.
Pixel Size	Specify whether to show the points on the graph. When checked, select a dot type from among the 7 patterns: filled circle, filled triangle, filled square, circle, triangle, square, and X. The dot size is fixed at 5 pixels.
Display Color	Set the dot color.
Curve	Specify whether to curve the line within the display range when the data values exceeded the specified value of the display range.
Connect the start and end points	Specify whether to connect the start and end points of the graph to create a closed line.
Blink	Select the blink and blink speed. You can choose different blink settings for [Display Color], [Background Color], and [Graph Area Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

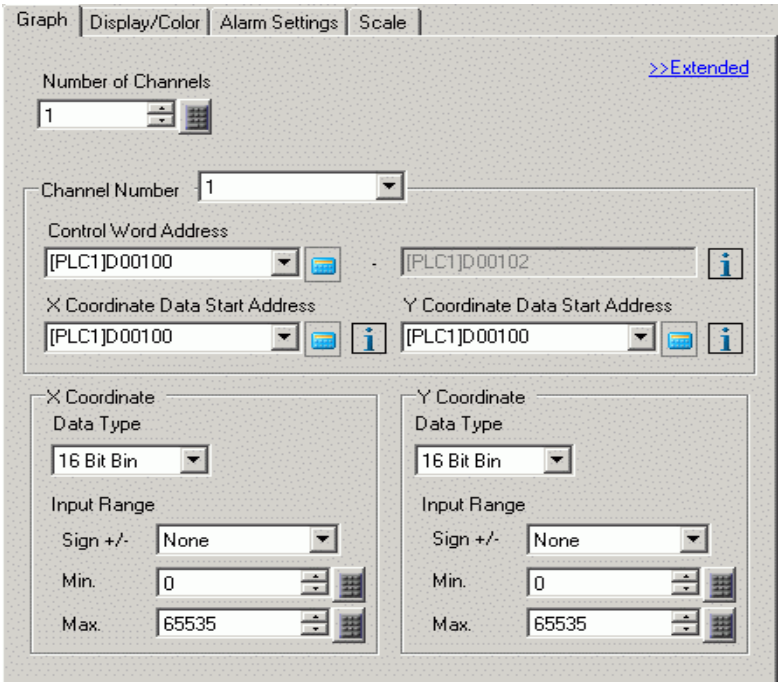
18.12.5 XY Block Display Scatter Graph Settings Guide

Multiple data consisting of a pair of two Word devices' values are collected at once and displayed as a graph in x-axis/y-axis coordinates.



Setting	Description
Parts ID	Parts are automatically assigned an ID number. XY Block Display Scatter Graph ID: XL_**** (4 digits) The letter portion is fixed. You can change the number portion within the range of 0000-9999.
Comment	The comment for each Part can be up to 20 characters.

■ Graph/Basic



Setting	Description
Number of Channels	Select the number of graph display data. The setting range is from 1 to 10.
Channel	Select the channel to configure. Change to the numbers of the channels set in [Number of Channels] and set input/display settings.

Continued

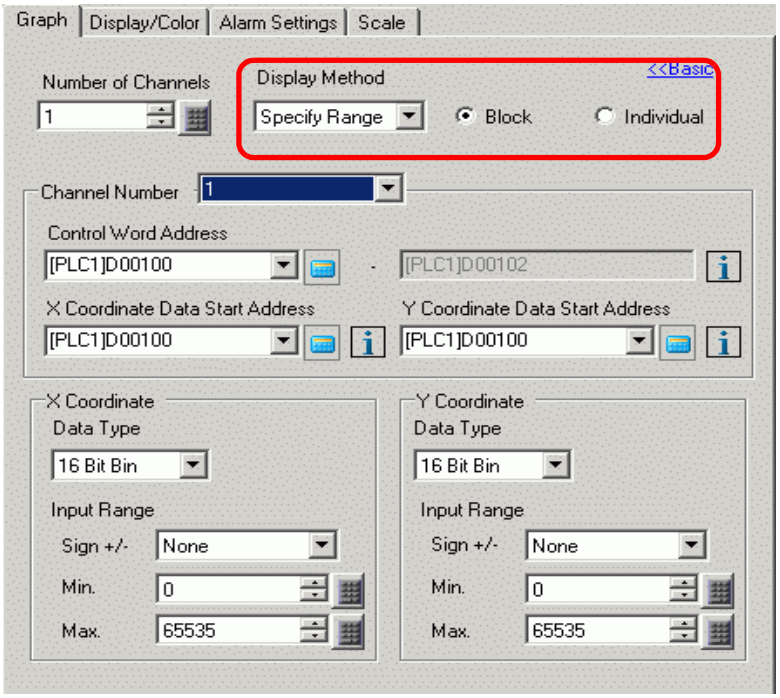
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Control Word Address</td><td>
Set the address that controls the displaying/clearing of the graph.
In addition, the following two addresses are used as a sequential address.
• Control Word Address +1: Status Address
• Control Word Address +2: Address for the Number of Coordinates (Displayed as the last address.)
Click the icon to display a composition of the address used.
Control Word Address
<table>
<tr><td>+0</td><td>Control</td></tr>
<tr><td>+1</td><td>Status</td></tr>
<tr><td>+2</td><td>Number of Coordinates (n)</td></tr>
</table>
• When bit 0 is ON ("1" is stored in the address), the graph will be displayed.
Control 15 03 02 01 00
• When bit 1 is ON ("2" is stored in the address), the displayed graph will be cleared.
Control 15 03 02 01 00
• When bit 0 and bit 1 are ON ("3" is stored in the address), the displayed graph will temporarily be cleared and then displayed again.
Control 15 03 02 01 00
This can be set to either a device/PLC address or GP internal device address.
☞ "18.10.1 Introduction" (page 18-43)
</td></tr>
<tr><td>X Coordinate Data Start Address</td><td>
Set the start address of the address area where X coordinate data is stored.
Click the icon to display a composition of the address used.
Y Coordinate Data Start Address
<table>
<tr><td>+0</td><td>X coordinate 1</td></tr>
<tr><td>+1</td><td>X coordinate 2</td></tr>
<tr><td>+2</td><td>X coordinate 3</td></tr>
<tr><td>:</td><td>:</td></tr>
</table>
When accessing a 16-bit device using 32-bit access, the composition of the address is as shown on the right.
Y Coordinate Data Start Address
<table>
<tr><td>+0</td><td>X coordinate 1</td></tr>
<tr><td>+2</td><td>X coordinate 2</td></tr>
<tr><td>+4</td><td>X coordinate 3</td></tr>
<tr><td>:</td><td>:</td></tr>
</table>
</td></tr>
</table>

Continued

<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Y Coordinate Data Start Address</td><td>Set the start address of the address area where Y coordinate data is stored.
Click the icon to display a composition of the address used.
Y Coordinate Data Start Address
<table><tr><td>+0</td><td>Y coordinate 1</td></tr><tr><td>+1</td><td>Y coordinate 2</td></tr><tr><td>+2</td><td>Y coordinate 3</td></tr><tr><td>:</td><td>:</td></tr></table>When accessing a 16-bit device using 32-bit access, the composition of the address is as shown on the right.
Y Coordinate Data Start Address
<table><tr><td>+0</td><td>Y coordinate 1</td></tr><tr><td>+2</td><td>Y coordinate 2</td></tr><tr><td>+4</td><td>Y coordinate 3</td></tr><tr><td>:</td><td>:</td></tr></table></td></tr>
<tr><td>X Coordinates/Y Coordinates</td><td>Set [Data Type] and [Input Range] for X and Y coordinates.</td></tr>
<tr><td>Data Type</td><td>Select the graph display data type from [16 Bit Bin], [16 Bit BCD], [32 Bit Bin], [32 Bit BCD], or [32 Bit Float].</td></tr>
<tr><td>Input Sign</td><td>Set whether graph display data can handle negative numeric data. This can only be set when the [Data Type] is [16 Bit Bin] or [32 Bit Bin].
• None
Only positive numeric data will be handled.
• 2's Complement
Negative numbers are handled with 2's complement.
• MSB Sign
Negative numbers are handled with MSB sign.</td></tr>
<tr><td>Min. Value/Max. Value</td><td>Select the input range for XY graph display data.
Each [Data Type] and [Input Sign] has a different size range.
<table><tr><th>Data Type</th><th>Input Sign</th><th>Range</th></tr><tr><td rowspan="3">16 Bit Bin</td><td>None</td><td>0 to 65535</td></tr><tr><td>2's Complement</td><td>–32768 to 32767</td></tr><tr><td>MSB Sign</td><td>–32767 to 32767</td></tr><tr><td rowspan="3">32 Bit Bin</td><td>None</td><td>0 to 4294967295</td></tr><tr><td>2's Complement</td><td>–2147483648 to 2147483647</td></tr><tr><td>MSB Sign</td><td>–2147483647 to 2147483647</td></tr><tr><td>16 Bit BCD</td><td>–</td><td>0 to 9999</td></tr><tr><td>32 Bit BCD</td><td>–</td><td>0 to 99999999</td></tr><tr><td>32 Bit Float</td><td>–</td><td>$-9.9e^{16}$ to $9.9e^{16}$</td></tr></table>
NOTE
• Values of X/Y coordinates correspond to the input range and are displayed on the graph as a value between 1 and 1,000.</td></tr>
</table>

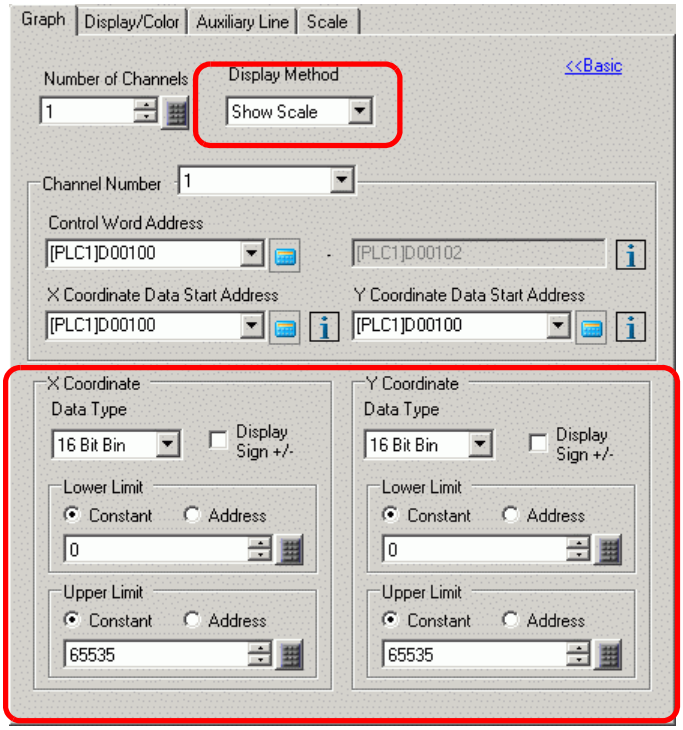
■ Graph/Extended

Configure input/display settings for each channel's Data Type, Input Sign, etc.



Setting	Description
Display Method	Select the setting method for the graph display range from [Specify Range] and [Show Scale]. ☞" ◆ Show Scale" (page 18-130) **NOTE** • When [Show Scale] is selected, the [Alarm Settings] tab is not displayed. • When [Specify Range] is selected, the [Auxiliary Line] tab is not displayed.
Block/Individual	Define the [Data Type] and [Input Range] for all the channels as a whole or separately when you select [Specify Range] in [Display Method].

◆ Show Scale



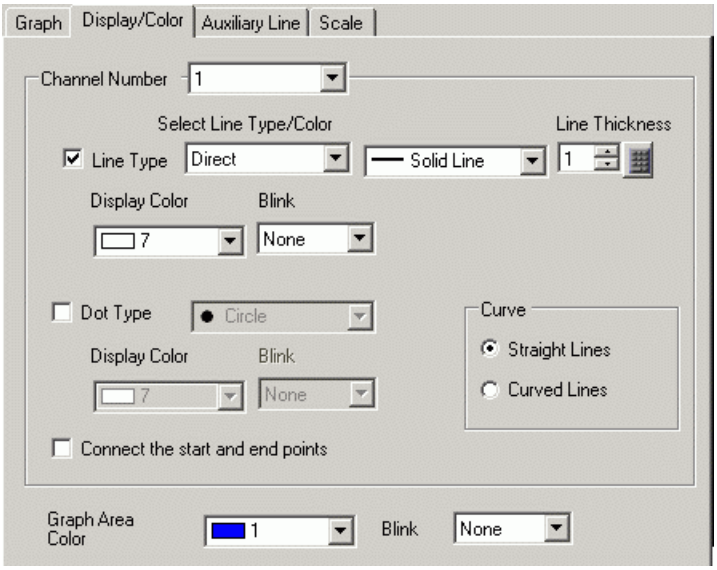
Setting	Description
X Coordinates/Y Coordinates	Set [Data Type] and [Upper Limit]/[Lower Limit] for X and Y coordinates.
Data Type	Choose the graph data type from [16 Bit Bin] or [32 Bit Bin].
Display Sign +/–	Set to display negative numbers.
Upper Limit/ Lower Limit	Select the method for setting the scale's upper and lower value from [Constant] or [Address], and set the Upper and Lower Limit. • Constant Specify a set constant as the Min/Max value. • Address Specify the address where the Upper/Lower Limit values are stored.

Data Type	Display Sign +/–	Range
16 Bit Bin	Cleared	0 to 65535
	Selected	–32768 to 32767
32 Bit Bin	Cleared	0 to 4294967295
	Selected	–2147483648 to 2147483647

NOTE

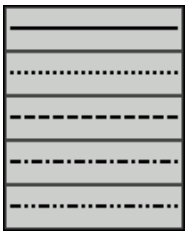
- If [Display Sign +/–] is set, negative numbers are handled with the 2's complement system.

■ Display/Color



Setting	Description
Channel Number	Select the Channel to configure the graph display and color.

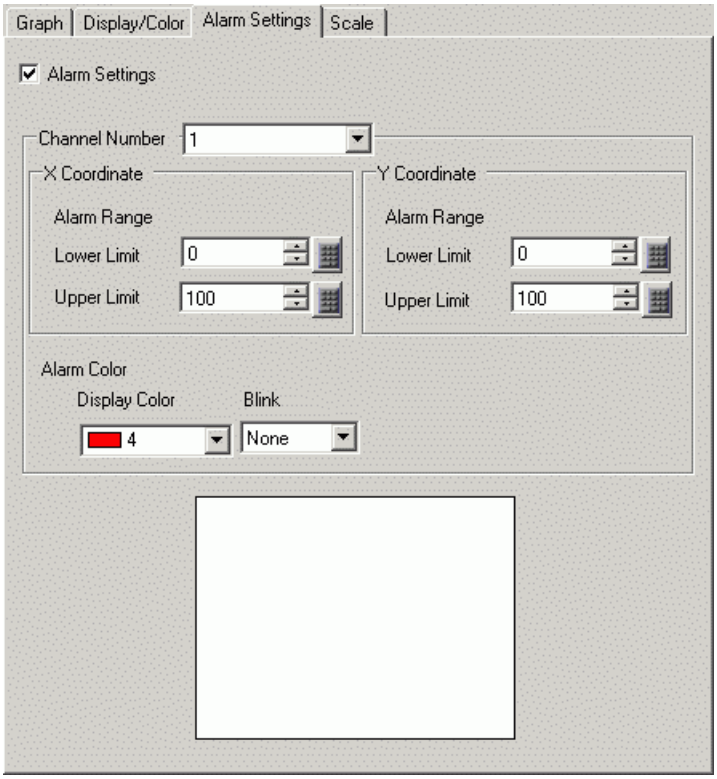
Continued

Setting	Description
Line Type	Specify whether to draw a line on the graph. When checked, set one of the following types for the line. • Direct •Line Type Select a type of the line from among the five patterns:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line •Line Thickness Set the line thickness from 1 to 2. •Display Color Set the line color. •Background Color If you selected a line type other than the solid line, set the line's background color. • Address •Display Color/Background Color and Line Type/Line Thickness Set the start address that specifies the display color/background color and line type/line thickness. The last address that specifies line type/line thickness as a sequential address. Click the icon to display a composition of the address used. Line type/line thickness address +0 Background Color | Display Color +1 | Line type/line thickness NOTE • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Pixel Size	Specify whether to show the points on the graph. When checked, select a dot type from among the 7 patterns: filled circle, filled triangle, filled square, circle, triangle, square, and X. The dot size is fixed at 5 pixels.
Display Color	Set the dot color.
Curve	Specify whether to curve the line within the display range when the data values exceeded the specified value of the display range.
Connect the start and end points	Specify whether to connect the start and end points of the graph to create a closed line.
Graph Area Color	Select a color for the Graph Display Area.

Continued

Setting	Description
Blink	Select the blink and blink speed. You can choose different blink settings for [Display Color], [Background Color], and [Graph Area Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Alarm



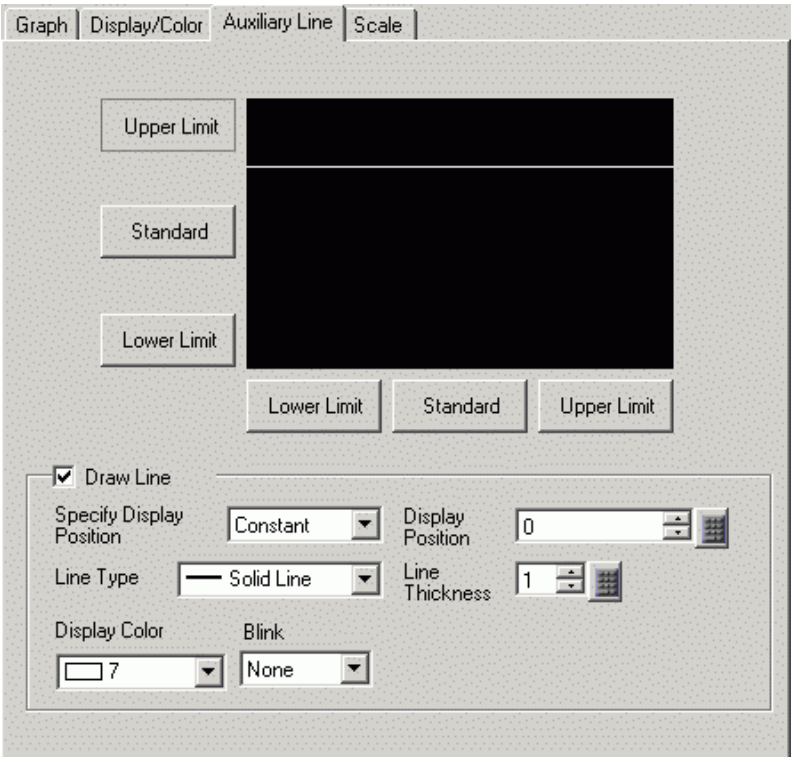
NOTE

- When [Show Scale] is selected for [Display Method] in the [Graph] tab, the [Alarm Settings] tab is not displayed.

Setting	Description
Alarm	If set, the displayed color changes when the value moves outside of a specified range.
Channel	Select the Channel to configure.
Upper Limit/ Lower Limit	Set the Alarm Display range for X and Y coordinates from 0 to 100.
Display Color	Select the Alarm Display color.
Background Color	Select the background color for displaying the alarm.
Blink	Select the blink and blink speed. The alarm color's [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)
Color Range Display Bar	Displays a sample for the alarm colors.

■ Auxiliary Line

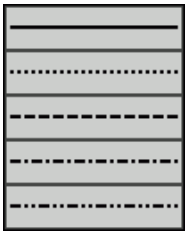
To use Auxiliary Lines, the [Display Method] must be set to [Show Scale].



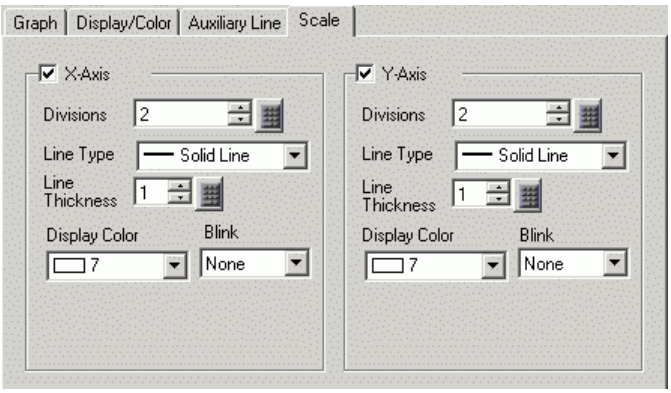
Setting	Description
Upper Limit/ Standard/Lower Limit	Select the auxiliary line to set.
Draw Line	Defines whether to draw the [Upper Limit], [Standard], and [Lower Limit] auxiliary lines in the selected positions.
Specify Display Position	Select the designation method of the auxiliary lines' display position from [Constant] or [Address]. • Constant Specify a set constant as the Display Position. • Address Specify the address where the Display Position is stored.
Display Position	Set the auxiliary line's Display Position. Each auxiliary line's setting range is as follows.

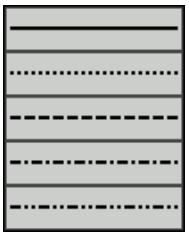
Data Type	Display Sign +/–	Setting Range
16 Bit Bin	Cleared	0 to 65535
16 Bit Bin	Selected	–32768 to 32767
32 Bit Bin	Cleared	0 to 4294967295
32 Bit Bin	Selected	–2147483648 to 2147483647

Continued

Setting	Description
Line Type	Select the auxiliary line type:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Line Thickness	Set the auxiliary line thickness from 1 to 2.
Display Color	Set the auxiliary line color.
Background Color	If you selected a line type other than a solid line, set the auxiliary line's background color.
Blink	Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

■ Scale



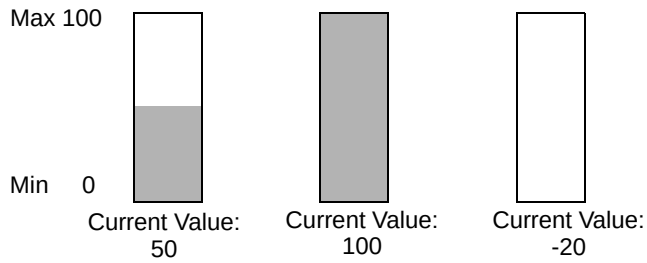
Setting	Description
X-axis/Y-axis	Set whether or not to display a scale for x-axis and y-axis.
Divisions	Set the number of scale divisions to be displayed from 2 to 100.
Line Type	Select a type of the line from among the five patterns:  Solid Line Dashed Line Dash Line Chain Line Two-Dot Chain Line **NOTE** • If the Graph screen is 16 pixels or less, any pattern other than a solid line may not properly display.
Line Thickness	Set the line thickness from 1 to 2.
Display Color	Set the line color.
Background Color	If you selected a line type other than the solid line, set the line's background color.
Blink	Select the blink and blink speed. You can choose different blink settings for the [Display Color], and [Background Color]. **NOTE** • There are cases where you can and cannot set Blink depending on the Display Unit and System Settings' [Color Settings]. ☞"8.5.1 Setting Colors ■ List of Compatible Colors" (page 8-36)

18.13 Restrictions

18.13.1 Restrictions for Graphs

- When a value outside of the set input range is collected, the Graph Display only shows values up to the maximum and down to the minimum.

  For example, when the input range Min = 0, Max = 100



- When corrupt BCD data is collected, it can not be displayed properly. When a value is invalid, the previous state displays. If the value is corrupt and no previous value exists, a value is then only displayed once a valid value is collected.

■ Restrictions on XY Graphs

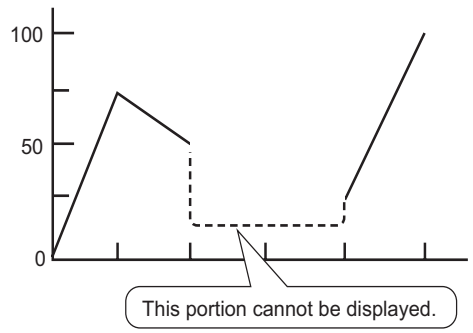
- For Historical Trend Graph, Data Block Display Graph, XY Historical Scatter Graph and XY Block Display Scatter Graph parts, a maximum of 8 graphs can be displayed on a single screen (including called screens and popup windows) at the same time.
- For Historical Trend Graph, Data Block Display Graph, XY Historical Scatter Graph and XY Block Display Scatter Graph parts, a maximum of 40 channels can be displayed on one display screen (including called screens and popup windows).
- Up to 10 channels can be set for one XY Historical Scatter Graph or XY Block Display Scatter Graph part.
- Coordinate points may be displayed even when the data values are out of range. Coordinate points of the graph data are calculated as a value between 1 and 1,000. As a result, data out of the range may be determined to be within the range.
- Graph will not be displayed when there is invalid data in either X-axis or Y-axis.
- The order of drawing for each graph is as follows:
  - XY scale
  - X- and Y-axis auxiliary lines.
  - Normalized Data
  - XY Historical Scatter Graph

  However, when the normalized data value is changed and only drawing action is performed (turn ON the bit "0"), the normalized data will be drawn on the XY Historical Scatter Graph.

18.13.2 Restrictions for Historical Trend Graphs

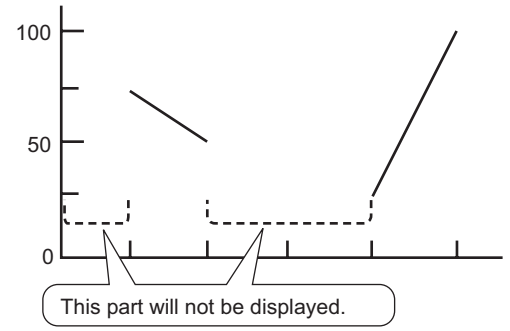
- A total of eight Historical Trend Graph parts can be displayed at the same time on a single screen. When you are using a window screen, the total number of Data Block Display Graph parts that can be displayed on the base screen and window screen together is 8. When Data Block Display Graph, XY Historical Scatter Graph and XY Block Display Scatter Graph parts are placed on the same screen, the total number of the graphs to be placed together is 8.
- The maximum number of channels (number of lines) that can be displayed on a single Historical Trend Graph is 20.
- The maximum number of channels (number of lines) that can be displayed on a single screen is 40. When you are using a window screen, the total number of channels that can be displayed on the base screen and window screen together is 40. The subsequent channels do not appear.
- To draw lines within the display area on the historical trends graph, place the graph on a base screen numbered 9000-9999. If you draw scale lines within the graph display area on a base screen numbered 1-8999, the scale lines will not be displayed on the GP. To display a graph with scale lines on a base screen numbered 1-8999, call up a screen with a number above 9000.
- When the sampling period is specified as 1 second or less, depending on the size of the graph display area used, scroll processing
  can take almost one second, and communication and tag processing can be affected. In this case, setting the sampling period to two or more seconds should correct the problem.
- If an error occurs when reading the data samples, the line on that portion of the graph is not displayed. If the error continues, that period does not appear on the graph.
  When the next sampled data displays on the historical trend graph, it displays as follows.

	Sampling Data
1st Sample	0
2nd Sample	75
3rd Sample	50
4th Sample	Readout Error
5th Sample	25
6th Sample	100



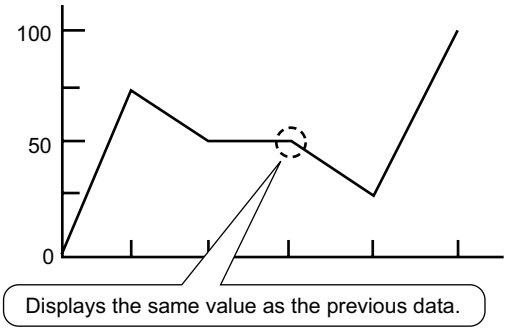
- If the [Data Type] of the historical trend graph part is set to [BCD] and the sampled data that includes A to Fh is stored, the graph will not be displayed.
  When the next sampled data displays on the historical trend graph, it displays as follows.

	Sampling Data
1st	-- (3Ah)
2nd	75 (75h)
3rd	50 (50h)
4th	-- (5Fh)
5th	25 (25h)
6th	100 (100h)



- If the [Data Type] of the historical trend graph part is set to [BCD] and the sampled data that includes A to Fh except BCD (except 0 to 9) is stored, the graph containing the previous sampled data will be displayed.
  When the next sampled data displays on the historical trend graph, it displays as follows.

	Sampling Data
1st Sample	0(0h)
2nd Sample	75(75h)
3rd Sample	50(50h)
4th Sample	-(5Fh)
5th Sample	25(25h)
6th Sample	100(100h)



  The fourth sample, 95(5Fh) is ignored, and the third sample, 50(32h), is shown in its place on the Graph.
- Set the [Data Type] on the Historical Trend Graph to match the data sample bit length. If the [Bit Length] is set to [16 Bit] and the [Data Type] is 32 bit, two Words' data are combined and handled as 32 bit.

Address No.		Sampling Data	
	1	D100	2 words' data is combined and displayed on the graph as 1 data.
	2	D101	
	3	D105	
	4	D200	
	5	D250	Because there is no address No. 6, that portion is handled as "0".

- If there are multiple Historical Trend Graphs with the same Part ID on the same screen, the graph that was placed will be considered valid. The second graph will not be displayed. The same is true for when loading the screen using Call Screen--the graph that is placed first will be displayed while the second graph will not be displayed.

- Even when Show Cursor is set in Historical Trend Graph, the cursor is not displayed for the sampling group for which [Use Memory Card as Backup Area] is not checked in Sampling Settings.
- When the number of sampling is 1, Thin Out Mode is disabled.

■ Restrictions on Displaying Historical Data

- Only one Historical Trend Graph part with a Display Historical Data function enabled can be placed on a Base screen.
- You cannot use Display Historical Data Settings on a window screen. The Display Historical Data function does not work.
- For the sampling group without Display Historical Data selected, Historical Display mode will not turn on, even if Display Historical Data is set in Historical Trend Graph.
- When you erase data samples stored in the GP, Historical Data cannot be displayed.
- The Number of Data (current data + historical data) that can be displayed in one channel with Display Historical Data is the amount in [Cycles] specified in the sampling settings. For the Historical Trend Graph [Data Samples], set a number less than [Cycles] in the sampling settings.
- The number of sets of sampled data that can be saved on the GP depends on the capacity of the backup SRAM [*1] and the intended use, as well as the sampling settings.
  ☞"24.9.1 Summary ■ Backup SRAM" (page 24-116)
  The table below shows the maximum number of samples when the backup SRAM is used only for backing up the sampling groups used in a line chart.

  The maximum number of samples per Number of Channels

Backup SRAM Size	1 Channels	10 Channels	20 Channels	30 Channels	40 Channels
320KB	65535	16265	8132	5421	4065
128KB	32180	6435	3217	2144	1608

  Setting Contents: Number of Sampling Groups: 1, Blocks: 1, Data Type: 16 Bit, Overwrite old data after finishing the specified no. of times, No Date Data, No Data Enabled/Disabled Flags
- Switches placed on a Historical Trend Graph are automatically grouped. You can change an individual Switch's size or attributes, but if you delete the Switch, the Graph is also deleted. You cannot ungroup.
- Do not use two different types of switches for the same Historical Trend Graph. The switch will not operate normally. For each Historical Trend Graph, set up no more than one [Historical Data Display] switch.
- When using a Switch Lamp [Special Switch] - [Historical Trend Graph Switch] for Display Historical Data, place the Special Switch and the trend graph with the Display Historical Data function on the same Base screen. If the Historical Trend Graph is placed on the Base Screen and the Special Switch on the Window Screen, they will not function.

*1 The capacity differs depending on the model. To check the capacity, go to the [Project (F)] menu, point to [Information (I)], select [Project Information (I)], and then select [SRAM Information].

- While in Display Historical Data mode, new samples will not be displayed even if they occur. The display will update when Display Historical Data mode is released. Even while in Display Historical Data mode, data sampling continues.
- Changing screen while in Display Historical Data mode cancels the mode.

◆ Restrictions on Using Memory Cards as a Backup Area

- In the Common Settings workspace, select a Sampling node and select the Mode tab. When its [Use Memory Card as Backup Area] check box is selected, the following restrictions apply to Historical Trend Graphs.
  - Only one Historical Trend Graph set for the sampling group with the [Use Memory Card as Backup Area] check box selected can be placed per base screen. When multiples are placed, the search function, Show Cursor, and Zoom In/Zoom Out will not work.
- When [Add Time Data] in sampling settings is not set, sampling data from date and time on the GP screen cannot be searched and displayed. In addition, Show Cursor, and Zoom In/Zoom Out are disabled. For displaying historical data, data in Backup SRAM only displays.
- If there are only two display points on the graph as a result of Zoom Display, further Zoom In will not work.
- The Display Historical Data function cannot be used in Window Screens, so the search function, Show Cursor, and Zoom In/Zoom out will not work.
- The [Selected Time] display cannot be set at the same time as an editable Sampling Data Display and CSV Display. When they are in the same screen, only the part that was set first (Selected Time Display or Sampling Data Display) will work.
- When the time on GP is changed to create a file earlier than the saved data, the file cannot be displayed in the graph.
- To display the sampled data obtained in another GP in the graph, the sampling group settings in the GP to be displayed in the graph needs to be the same as the sampling group settings in the GP in which the data was obtained.

■ Restrictions on XY Historical Scatter Graphs

- The maximum number of the display data is the Sampling Occurrences.
- When there are a number of drawing points (Sampling Occurrences), it will take some time to draw the graph for the first time.
  Examples of the time required for the first-time drawing

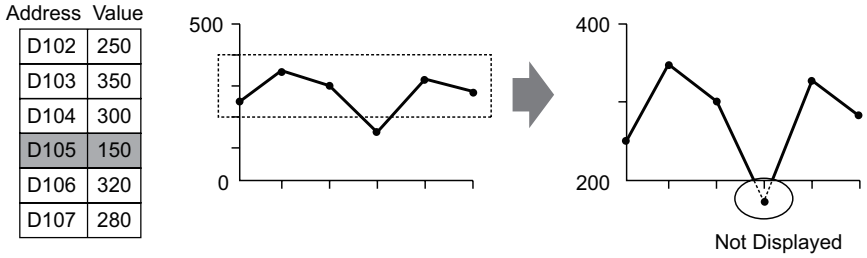
Number of Drawing Points	GP-3300 Series	GP-3500 Series
2000	Approx. 6 second	Approx. 3 second
10000	Approx. 25 second	Approx. 12 second

18.13.3 Data Block Display Graph Restrictions

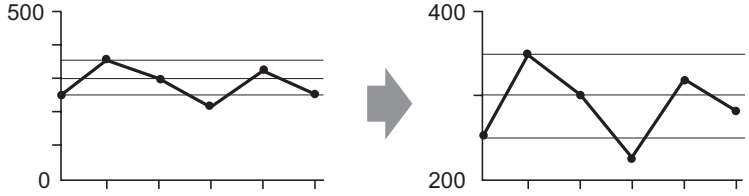
- A total of 8 Data Block Display Graph parts can be displayed at the same time on a single screen. When you are using a window screen, the total number of Data Block Display Graph, XY Historical Scatter Graph and XY Block Display Scatter Graph parts that can be displayed on the base screen and window screen together is 8. When Historical Trend Graph, XY Historical Scatter Graph and XY Block Display Scatter Graph parts are placed on the same screen, the total number of the graphs to be placed together is 8.
- The maximum number of channels (number of lines) that can be displayed on a single Data Block Display Graph is 20.
- The maximum number of channels (number of lines) that can be displayed on a single screen is 40. When you are using a window screen, the total number of channels that can be displayed on the base screen and window screen together is 40. When more than 40 trend graph lines are set up, the 41st and subsequent lines will not function.
- Variables for which an array setting is not specified cannot be displayed in Data Block Display Graph.

■ Restrictions on Scale Displays

- Data which is out of the scale's display range will not be shown.



- Show Scale's update timing (the timing of value reading) is the instant when the graph display is cleared or the screen is switched.
- When Show Scale is set, [Alarm] cannot be used.
- When Show Scale is set, [Fill Below Line] cannot be used.
- When auxiliary lines are set, any changes to Show Scale will also affect the horizontal auxiliary lines.



- If a set auxiliary line's value exceeds the graph display range, that auxiliary line is not displayed.
- When auxiliary lines are specified with [Address], the update timing (the timing of value reading) is the instant when the graph display is cleared or the screen is switched.

■ Restrictions on XY Block Display Scatter Graphs

- If there are multiple channels, when the clear bit for one channel is turned ON, the graphs for all channels will be cleared.
- If there are multiple channels, when Clear and Display is performed, only the specified channels will be displayed after clearing all the channels. If the same address is specified for multiple channels, only the channel for which a graph is displayed at last will be displayed. In order to display multiple channels at the same time, display each channel after clearing all channels.
- If there are multiple channels, when Clear and Display is performed, only the specified channels will be displayed after clearing all the channels. If the same address is specified for multiple channels, only the channel for which a graph is displayed at last will be displayed. In order to display multiple channels at the same time, display each channel after clearing all channels.
  The same procedure applies after clearing normalized data.

18.13.4 Restrictions on Auxiliary Line

- When a drawing is updated, the drawing is filled with a clear color, flickering may occur.
- When indirect addressing is applied on the auxiliary line, the auxiliary line will be drawn with a value of [0] if a communication error occurs.
- If a set auxiliary line's value exceeds the graph display range, that auxiliary line is not displayed.
- In XY Historical Scatter Graphs and XY Block Display Scatter Graphs, because the coordinate calculations between the scale and grids are different, even though they are used to display the same value, their positions may differ slightly.