

FATEC

**Mitsubishi Programmable Controllers
Training Manual
GENESIS64™ Basic
Course**

SAFETY PRECAUTIONS

(Always read these instructions before using the products.)

When designing the system, always read the relevant manuals and give sufficient consideration to safety.

During the exercise, pay full attention to the following points and handle the product correctly.

[EXERCISE PRECAUTIONS]

WARNING

- Do not touch the terminals while the power is on to prevent electric shock.
 - Before opening the safety cover, turn off the power or ensure the safety.
-

CAUTION

- Follow the instructor's direction during the exercise.
 - Do not remove the module of the demonstration machine or change wirings without permission.
Doing so may cause failures, malfunctions, personal injuries and/or a fire.
 - Turn off the power before mounting or removing the module.
Failure to do so may result in malfunctions of the module or electric shock.
 - When the demonstration machine (such as X/Y table) emits abnormal odor/sound, press the "Power switch" or "Emergency switch" to turn off.
 - When a problem occurs, notify the instructor as soon as possible.
-

REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
August 2020	SH(NA)-082347ENG-A	First edition
March 2023	SH(NA)-082347ENG-B	■Modified parts TRADEMARKS, RELEVANT MANUALS, TERMS, Section 1.1, 1.3, 2.1, 2.2, 3.1, 4.1, 4.2, 4.3, 4.4, 4.6, 4.7, 4.9, 4.11, 4.12, 4.13, 5.1, 5.2, 5.3, 5.4, 5.6, 5.8, 5.10, Appendix 1, 2 ■Added parts Section 4.5, 5.5 ■Deleted parts Section 1.4, Appendix 3, 4, 5, 6

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In some cases, trademark symbols such as [™] or [®] are not specified in this manual.

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INTRODUCTION

To help users acquire the knowledge required for configuring a high-functionality monitoring control system using GENESIS64™, this manual describes the functions and specifications of hardware and software used in the system and troubleshooting.

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
ICONICS Product Suite Getting Started [BCN-P5999-1584]	Functions and operation methods of GENESIS64™	PDF
GX Works3 Operating Manual [SH-081215ENG]	System configuration, parameter settings, and online operations of GX Works3	e-Manual PDF




e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
 - Other manuals can be accessed from the links in the manual.
 - The hardware specifications of each part can be found from the product figures.
 - Pages that users often browse can be bookmarked.
 - Sample programs can be copied to an engineering tool.
-

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
AlarmWorX™64 Logger	A tool for logging (recording) alarms and events
AlarmWorX™64 Viewer	A tool for displaying real-time and historical alarms and events in a list or chart to visualize the number of occurrences
AssetWorX™	A tool for centrally managing assets, from equipment to entire facility, using a hierarchical tree structure. Map the physical world to its digital twin according to the actual structure of the enterprise, company, process, factory, line, etc. Assets can be organized and configured in the Workbench, optionally including alarms, customizable colors, icons, and drag-and-drop functionalities.
Configuration personal computer	A personal computer to configure settings required for operating the MES interface module. This computer can be shared with a server.
Database (DB) / Relational database (RDB)	Data management method that follows relational data model logic. A piece of data is expressed as a collection of multiple items (fields) and a data collection is expressed as a table. Data can be easily merged and selected using key data.
Device memory / Device	Memory in a CPU module. There are two types of devices: bit device and word device.
Engineering tool	A tool for setting, programming, debugging, and maintaining programmable controllers. For the supported tools, refer to the following.  MELSEC iQ-R Module Configuration Manual
GENESIS64™	A package name for SCADA software
GraphWorX™64	A tool for creating graphics (Configuration mode) and visualizing the operation of the created graphics (Runtime mode). In Configuration mode, users can create graphics using 2D and 3D symbols (for example meters and pipes) and viewers (for example alarms and trends). In Runtime mode, users can visualize acquired data and created alarms/trends on the created screens. Also, users can control the programmable controller operation using buttons.
GridWorX™ Viewer	A tool for visualizing data acquired from the database on the monitoring screen
Hyper Alarm Server™	A tool for creating alarms. Users can create a complex logic of alarm occurrence conditions.
MES	An abbreviation for Manufacturing Execution Systems. MES is a system for controlling and monitoring the plant status in real time to optimize production activities. The system promptly responds to changes in a production plan and status and realizes the efficient production process.
MES interface module	An abbreviation for the RD81MES96 MES interface module
Mitsubishi Electric FA Connector	A communication driver for connecting GENESIS64™ and Mitsubishi Electric FA devices. The driver can be connected to MELSEC iQ-R and iQ-F series programmable controllers. It automatically detects devices on the same network.
RCPU	A generic term for MELSEC iQ-R series CPU modules and MELSEC iQ-R series C Controller modules
SQL	An abbreviation for Structured Query Language. This is a database language used for operating a relational database.
TrendWorX™64 Viewer	A tool for providing real-time and historical data trend displays. Past data can be compared with current data in the displayed trend.
Workbench	An integrated management application for GENESIS64™ product settings and runtime operation. This application provides a framework for security management, project management, and alarm settings.

MEMO

1 OVERVIEW

1.1 SCADA Software

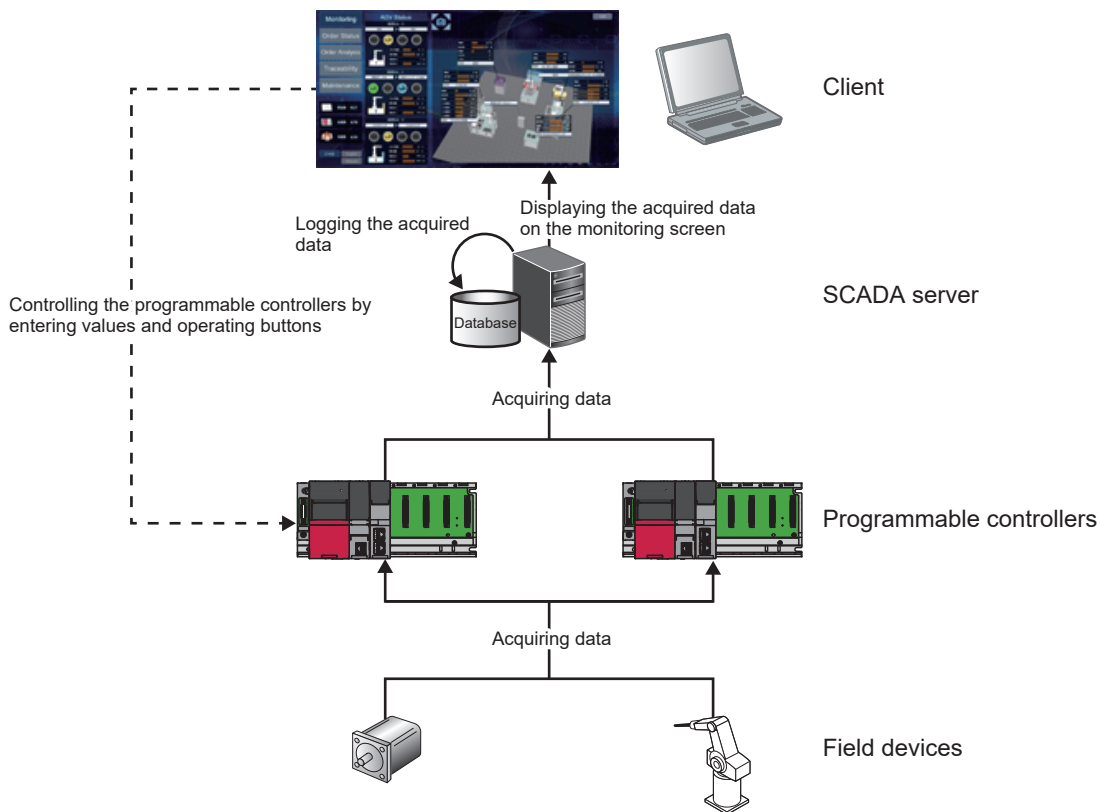
SCADA (Supervisory Control And Data Acquisition) software, installed on the computer, controls processes, monitors real-time data, and acquires data from equipment in industrial systems.

The following is an example of the basic SCADA system architecture. The system includes programmable controllers, a SCADA server, and a SCADA client.

In the system controlled by programmable controllers, the SCADA server collects the control data of the field devices from the programmable controllers.

The SCADA server logs the acquired data to its database. If an abnormal value is detected, the server records an alarm log. The SCADA system can also display data accumulated to servers other than the SCADA server.

A SCADA client displays the acquired data, such as lamp on/off information, number of production, and number of revolutions and operating status of the servo motor connected, on monitoring screens that include 2D and 3D animation. Users can issue control instructions to the programmable controllers by entering values and operating buttons on monitoring screens.



1.2 GENESIS64™

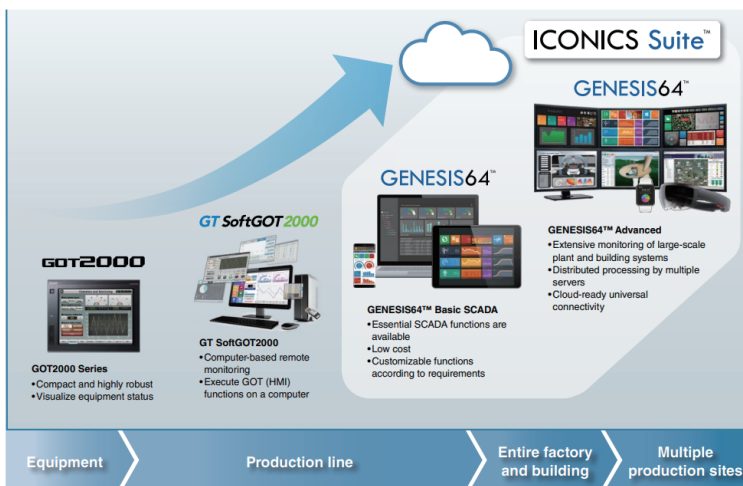
Mitsubishi Electric GENESIS64™ is the PC-based supervisory control and data acquisition (SCADA) software that improves the visibility of manufacturing operations. GENESIS64™ provides a highly functional monitoring system for various industries and purposes, such as manufacturing process and production management control at plants, air-conditioning/lighting/power control at buildings and factories, and public infrastructure system control.

Two software packages are available: GENESIS64™ Basic SCADA and GENESIS64™ Advanced.

GENESIS64™ Basic SCADA is an entry-level and cost-effective package with basic functions for monitoring and control.

GENESIS64™ Advanced is a package for large-scale systems that enable full-scale monitoring, analysis, and cloud collaboration on a personal computer.

GENESIS64™ has functions required for a variety of fields and systems. The functions are highly customizable. Users can add or change the functions as desired to configure their own systems. In addition, GENESIS64™ is highly compatible with the cloud and has advanced integration capabilities such as seamless data integration with business process management systems (for example ERP).



* ICONICS Suite™ is a generic term for the integrated monitoring solutions including GENESIS64™ as the main product.

Basic functions

Function	Application name	Description
Project management	Workbench	Manages projects for configuring GENESIS64™ related applications.
Graphic	GraphWorX™64	Creates and visualizes advanced graphics using 2D and 3D animation, symbols, and images.
Trend	TrendWorX™64	Displays advanced trend graphs that support split and overlapped displays.
Alarm	AlarmWorX™64 Hyper Alarm	Generates alarm notifications and displays alarms in a list. (Alarms can also be displayed in charts by type.)
Asset management	AssetWorX™	Centrally manages assets, from equipment to entire facility, using a hierarchical tree structure.

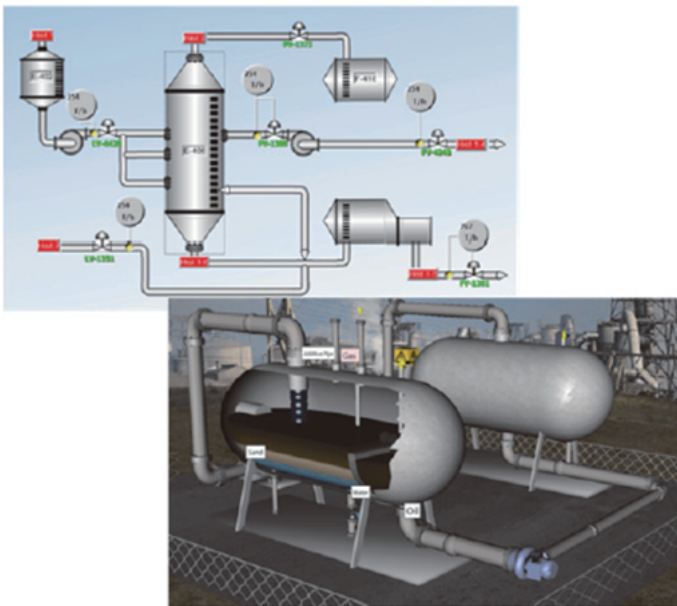
Features

Enhanced visibility and operability

3D graphics enable users to monitor devices from various angles with stereoscopic displays that are not achieved with 2D graphics.

3D graphic screens can be rotated, zoomed in, and zoomed out. In addition, the viewpoint of the screens can be shifted freely. Using these functions, users can monitor the entire facility as well as the details of equipment on 3D graphic screens.

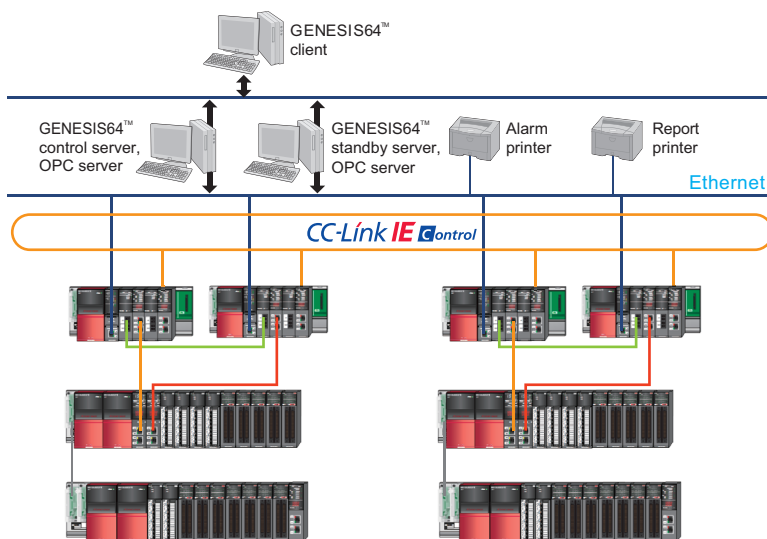
Combining 3D graphic screens with 2D graphic screens, which are excellent in monitoring the operating status of equipment and displaying measurement data, will enhance the visibility and operability of the monitoring screens.



Enhanced reliability

With GENESIS64™, users can flexibly configure a system depending on the scale of the monitoring object, from a standalone system to a large server-client system.

A redundant system can also be configured by having two servers, a control server and a standby server. This will enhance the reliability of the system.

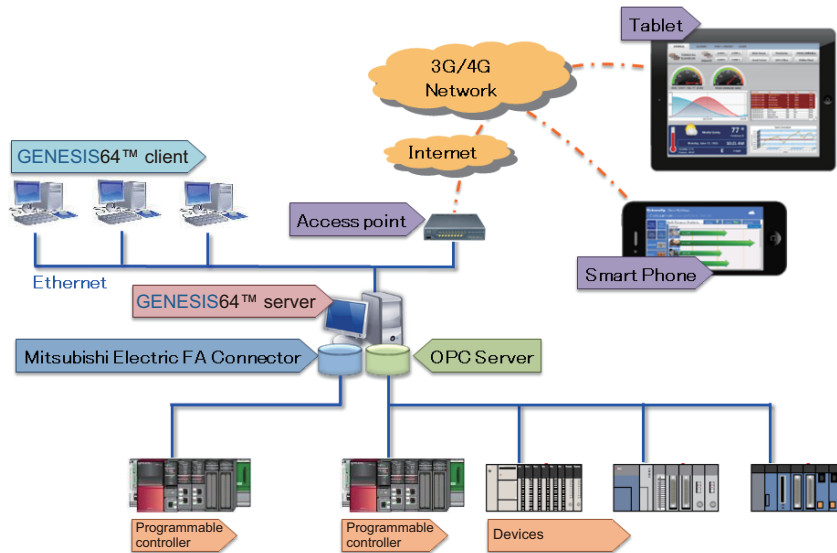


Web monitoring

A GENESIS64™ client system supports monitoring in a web browser.

Users can access the GENESIS64™ server, which works as a web server, from a client computer on the web and monitor data without installing software on the client computer.

Users can also monitor the operating status of equipment remotely on any mobile device such as a tablet or a smartphone.



Reduction of engineering working hours

Use of symbols pre-registered in the library reduces working hours required for designing monitoring screens.

Using the dynamic function, animation can be added to the symbols. In addition, registering tags to the symbols enables color switching and numerical display, which can reduce working hours required for creating scripts.

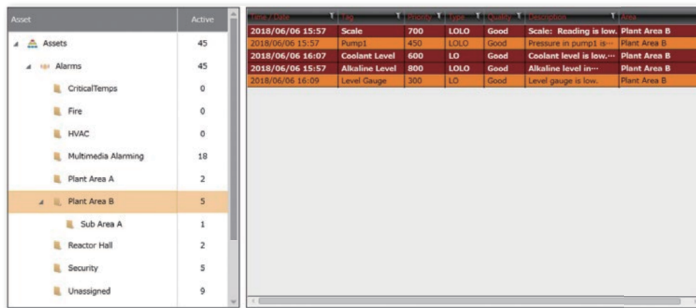
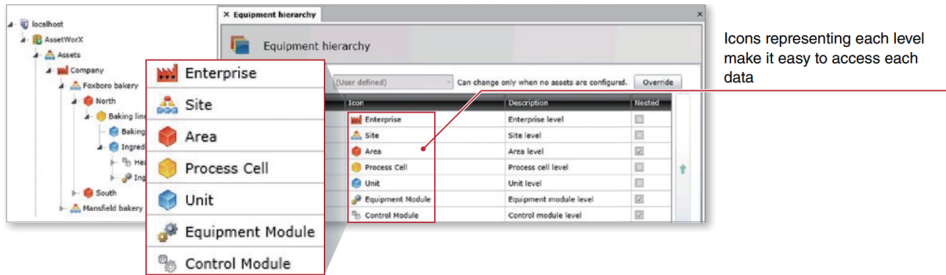


Asset management using a hierarchical tree structure

AssetWorX™ is an international standard ANSI/ISA-95*1 compliant asset management module. Map the physical world to its digital twin according to the actual structure of the enterprise, company, process, factory, line, etc. Assets can be organized and configured in the Workbench, optionally including alarms, customizable colors, icons, and drag-and-drop functionalities. The runtime component provides intuitive navigation and is perfectly suited for scaling large projects, which can be easily achieved using the Excel® based bulk asset configuration*2.

*1 International standard which defines equipment hierarchy models for physical assets in manufacturing.

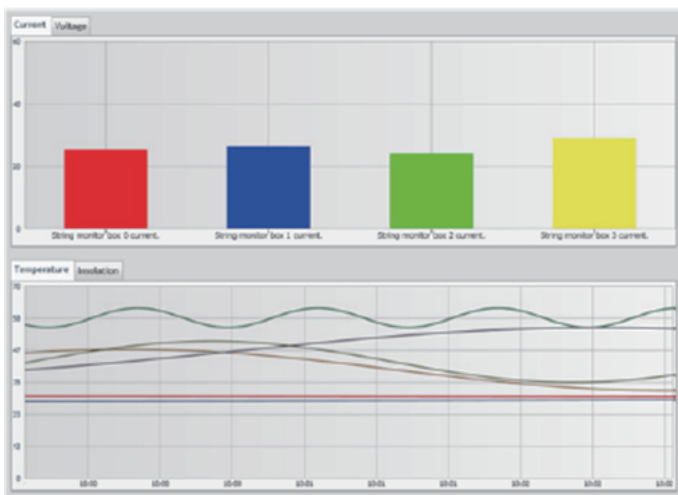
*2 This is not included in GENESIS64™ Basic SCADA.



AssetWorX™ further enhances visualization of alarms and trends on each level when combined with other functions such as AlarmWorX™ and TrendWorX™

Visualization of energy consumption

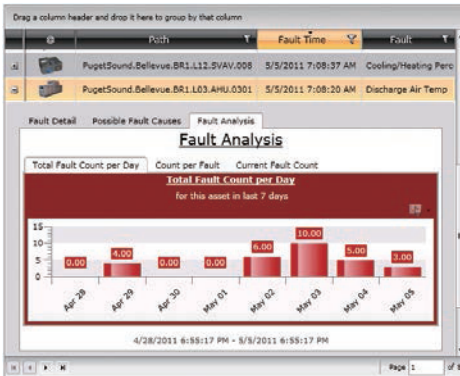
Energy consumption and CO2 emissions in the whole system or per equipment can be visualized by using a Mitsubishi Electric energy measurement device and Energy AnalytiX®, an application which displays and analyzes energy consumption.



Preventive maintenance

Preventive maintenance of the equipment and system can be performed by combining a MES interface module, a module which collects production control information, and Facility AnalytiX[®], an application which displays and analyzes failures and diagnostic information of connected devices.

The MES interface module automatically collects the operating status of the connected devices from enormous amount of data and uses them for the operating ratio improvement, preventive maintenance, and failure prediction.



1.3 System Configuration

The following is the basic system configuration diagram of GENESIS64™.

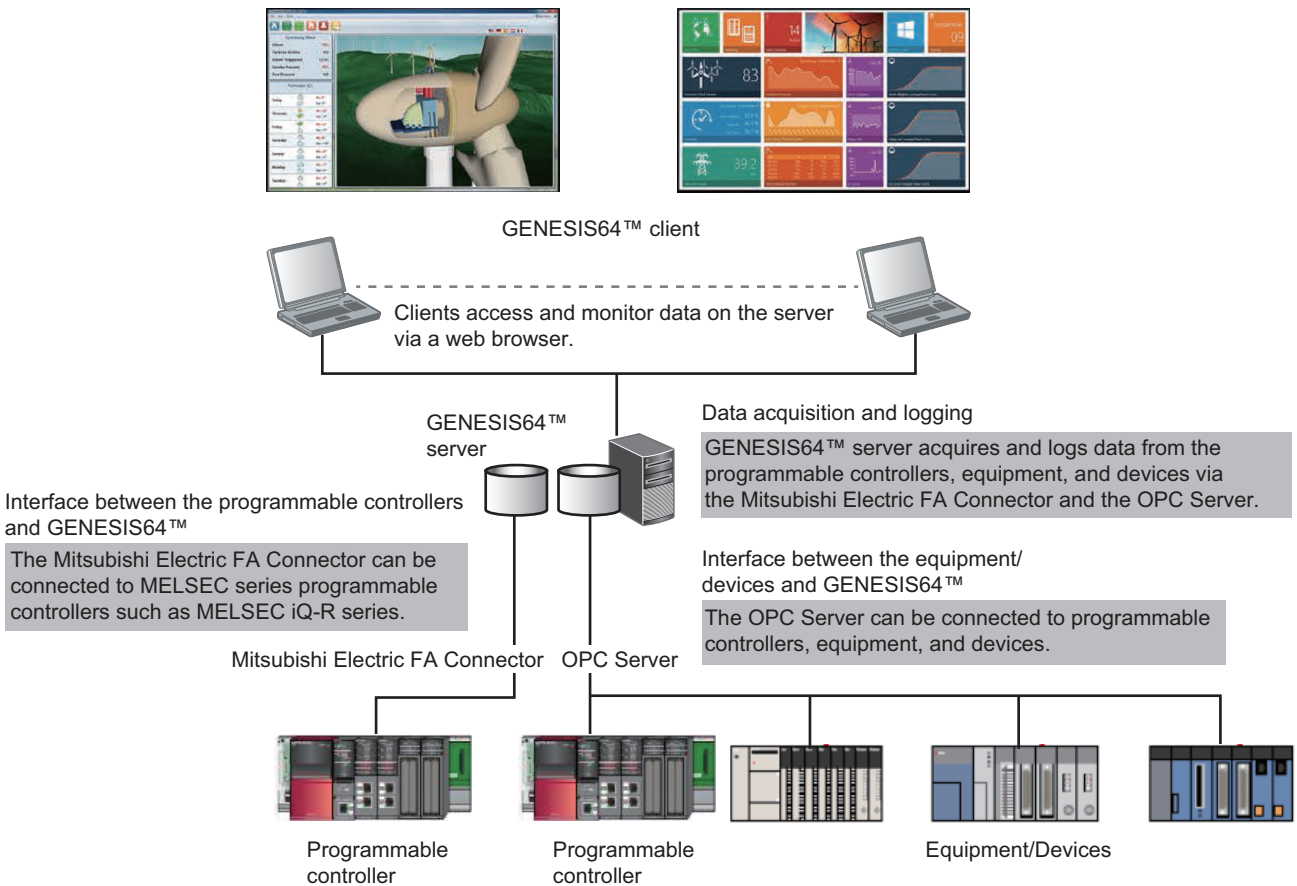
For the connection between GENESIS64™ and Mitsubishi Electric FA devices, the Mitsubishi Electric FA Connector, a communication driver for GENESIS64™, is used. For the connection between GENESIS64™ and equipment/devices at the production site, the OPC Server is used.

The GENESIS64™ server acquires and logs data via the Mitsubishi Electric FA Connector and the OPC Server.

A GENESIS64™ client is used to monitor data on screens. The client can access the GENESIS64™ server over a network.

Therefore, data can be monitored remotely using a general-purpose Web browser, such as Microsoft Edge, without installing dedicated software.

Data can also be monitored directly on the GENESIS64™ server.

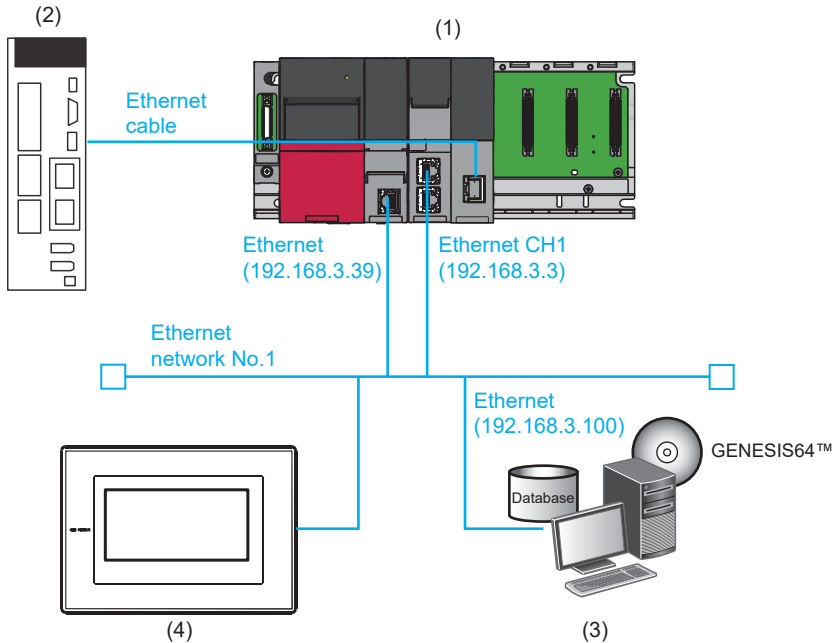


MEMO

2 STARTUP OF DEMONSTRATION MACHINE

2.1 System Configuration

This section describes the system configuration of the demonstration machine.



Device/software		Product name/description	Reference		
(1)	Programmable controller system	Main base unit	R35B	MELSEC iQ-R Module Configuration Manual	
		Power supply module	R61P		
		CPU module* ¹	R04CPU	MELSEC iQ-R MES Interface Module User's Manual (Startup)	
		MES interface module* ²	RD81MES96	—	
		Simple Motion module	RD77GF4 (CC-Link IE Field)	—	
		SD memory card	NZ1MEM-2GBSD	MELSEC iQ-R MES Interface Module User's Manual (Startup)	
(2)	MELSERVO AC servo	MELSERVO-J4	MR-J4-10GF1-RJ	—	
(3)	Personal computer (shared by a server and configuration personal computer)* ³		A personal computer on which Windows operates	MELSEC iQ-R MES Interface Module User's Manual (Startup)	
	Operating system		Microsoft Windows 10 Professional Operating System (64-bit version)		
	Relational database		Microsoft SQL Server** Express (** indicates the version.)		
	Engineering tool	GX Works3	SWnDND-GXW3 ('n' indicates the version.)		GX Works3 Installation Instructions GX Works3 Operating Manual
	SCADA software	GENESIS64™ Advanced	GEN64-APP		Page 9 OVERVIEW
(4)	GOT2000	GT2708-STBA	—	—	

*1 The IP address of the CPU module is '192.168.3.39'.

*2 The IP address of the MES interface module is '192.168.3.3'.

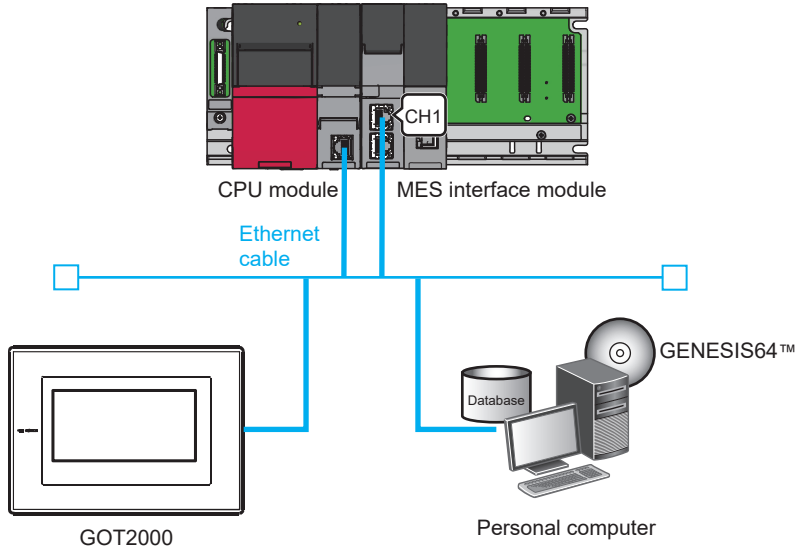
*3 The IP address of the personal computer is '192.168.3.100'.

2.2 Wiring

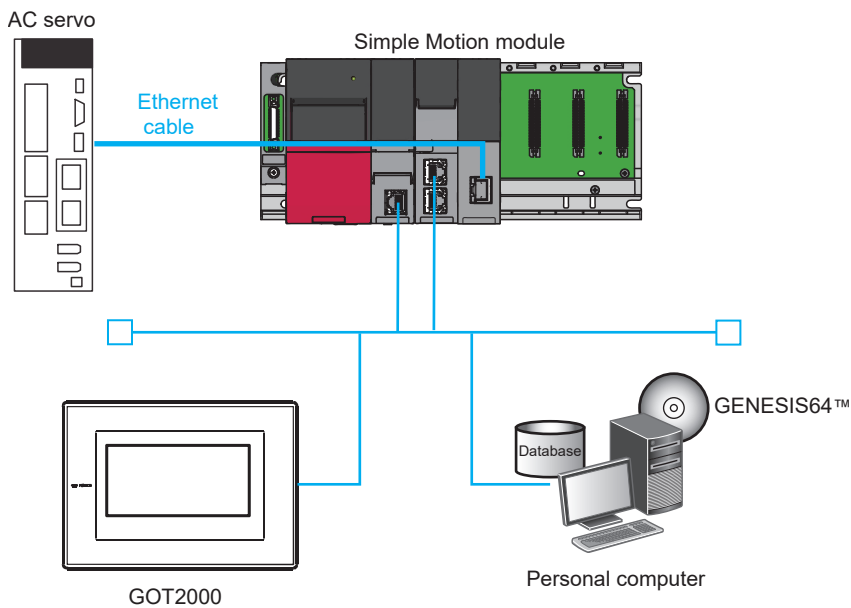
This section describes the wiring of the demonstration machine.

1. Connect the following devices to a hub with Ethernet cables.

- CPU module
- MES interface module (Connect to the Ethernet port (CH1).)
- GOT2000
- Personal computer



2. Connect the AC servo to the Simple Motion module with an Ethernet cable.



3 SETUP

3.1 Parameter Settings

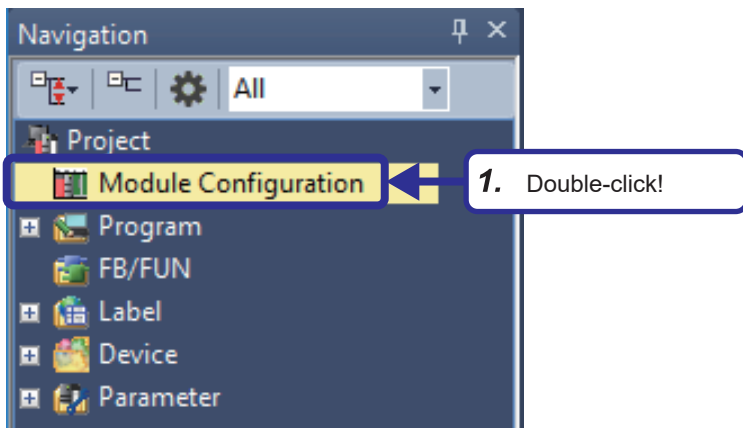
This section describes how to check parameters and write the parameters to the CPU module using the engineering tool.

Checking parameter settings

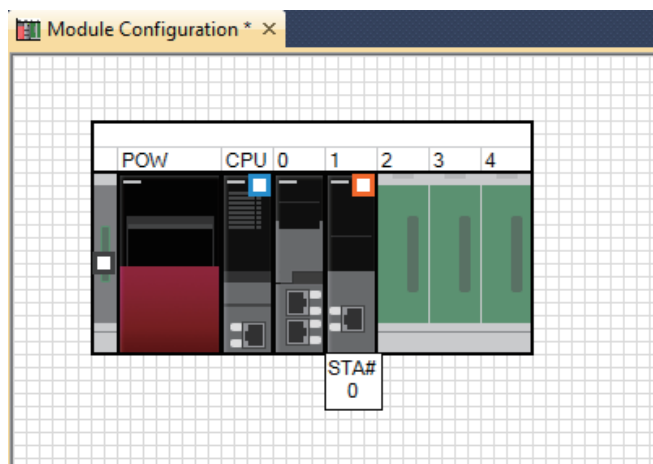
Parameters and a program used in the exercises have already been set in the project "school_GENESIS64.gx3". Check the parameters set in the project "school_GENESIS64.gx3".

3

Operating procedure

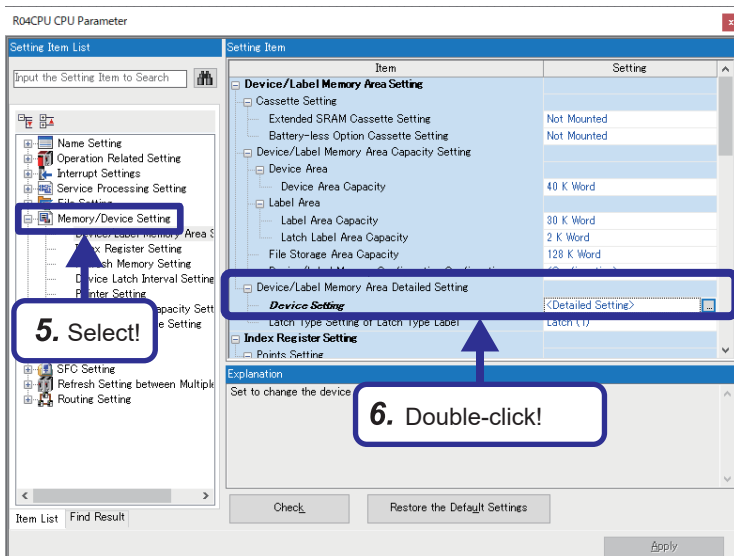
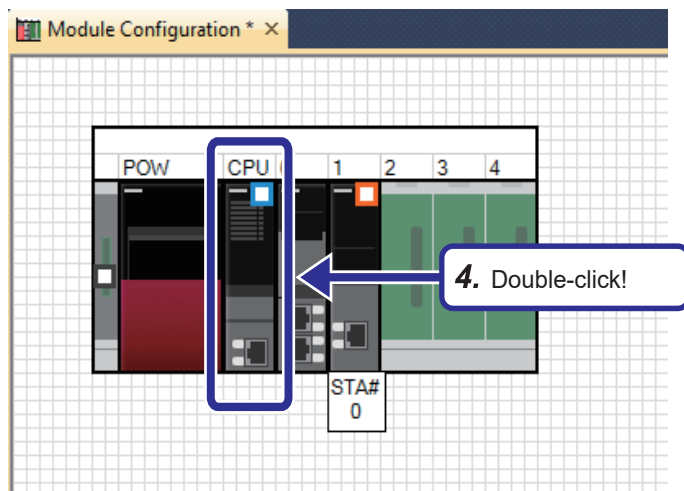
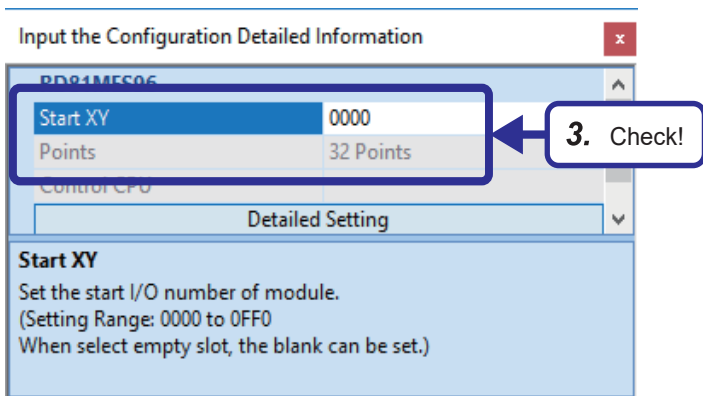


1. Open the project "school_GENESIS64.gx3", and double-click [Module Configuration] in the Navigation window. If a dialog box regarding the parameter information appears, click the [OK] button.



2. On the "Module Configuration" window, check that the power supply module "R61P" is mounted in the power supply slot, the CPU module "R04CPU" is mounted in the CPU slot, the MES interface module "RD81MES96" is mounted in slot No.0, and the Simple Motion module "RD77GF4" is mounted in slot No.1 (same system configuration as the actual demonstration machine).



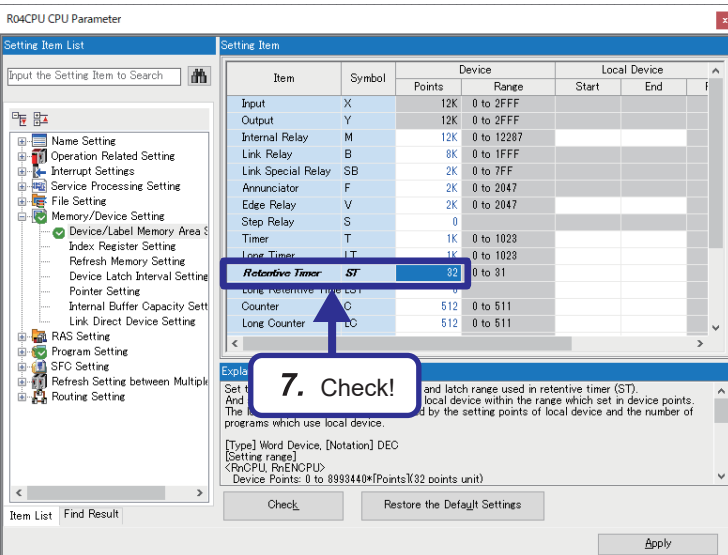


- On the "Input the Configuration Detailed Information" window, check that the start XY is set as follows:
[Settings]
"RD81MES96"
Start XY: 0000
"RD77GF4"
Start XY: 0020

- Double-click the CPU module "R04CPU".

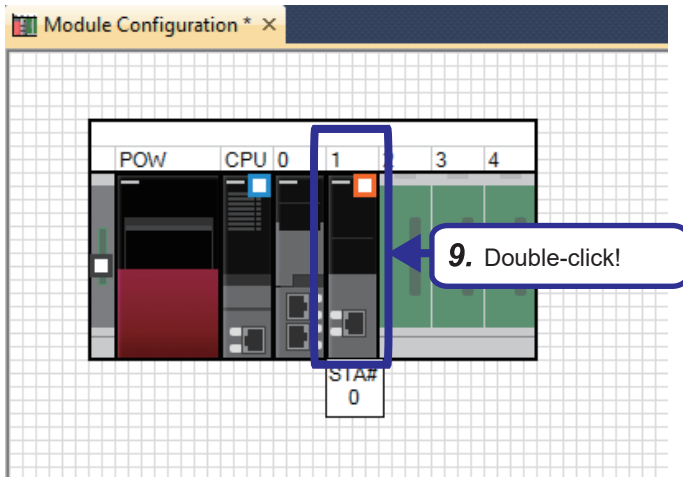
- Select "Memory/Device Setting" in the "Setting Item List" window.

- Double-click "Device Setting".

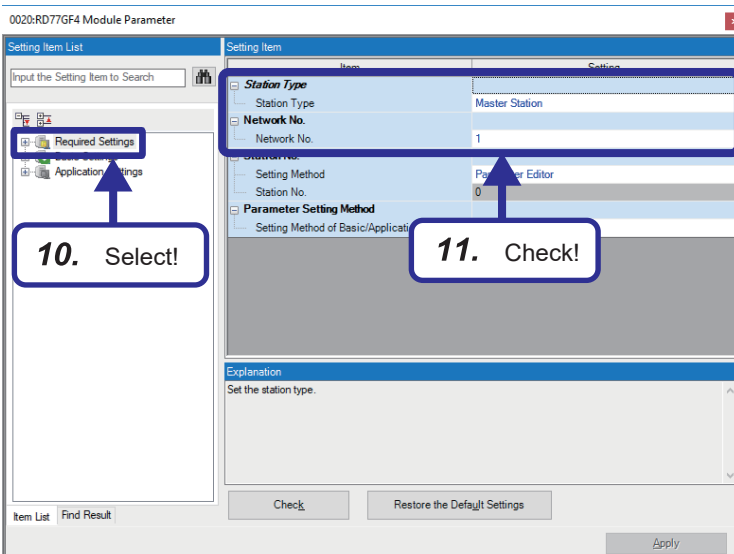


7. Check that the device points of the retentive timer is set as follows:
[Settings]
Points: 32
8. Close the "CPU Parameter" window.

3

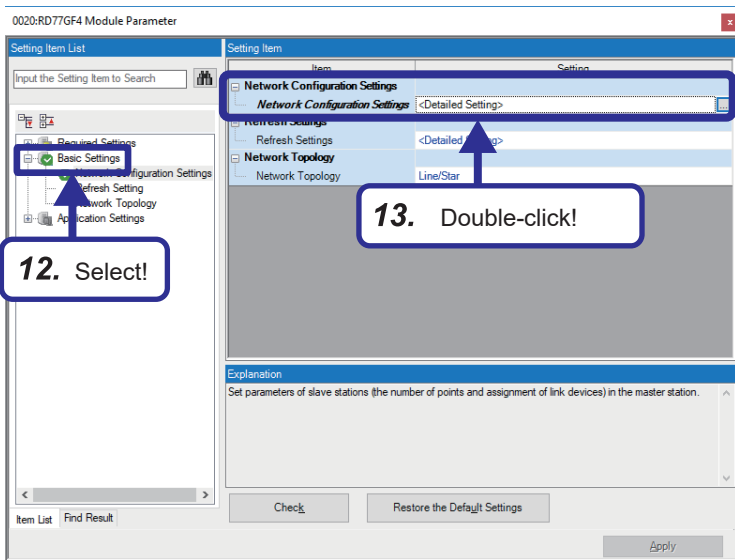


9. Double-click the Simple Motion module "RD77GF4".



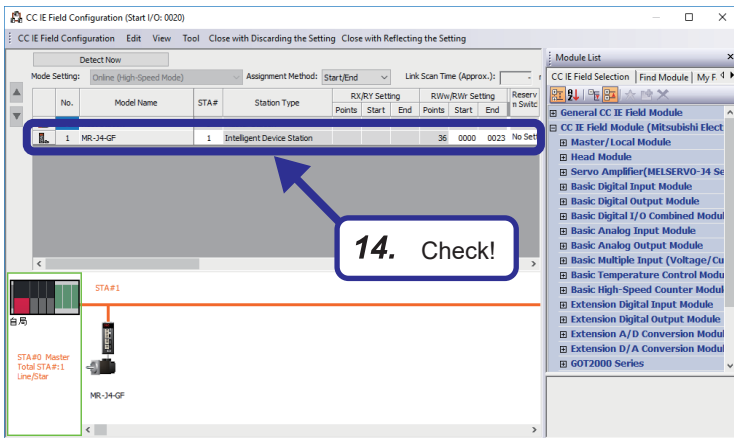
10. Select "Required Settings" in the "Setting Item List" window.
11. Check that the parameters are set as follows:
[Settings]
Station Type: Master Station
Network No.: 1





12. Select "Basic Settings" in the "Setting Item List" window.

13. Double-click "Network Configuration Settings".



14. "MR-J4-GF" is added to the station list on the "CC IE Field Configuration" window. Check that the parameters are set as follows:

[Settings]

RWw/RWr Setting Start: 0000

RWw/RWr Setting End: 0023

Sequence program

Devices used in the program


Device name	Description	Device name	Description
X400	Start	ST0	Timer
X410	Pause	M10	Timer start trigger
X420	Stop	D300	Volume of water in the tank
Y430	Operating status	D310	Volume of water in the container
Y440	Normal	D320	Flow rate
Y450	Error	D330	Air pressure in the tank
SM400	Always On	D340	Timer current value (for display on monitoring screens)

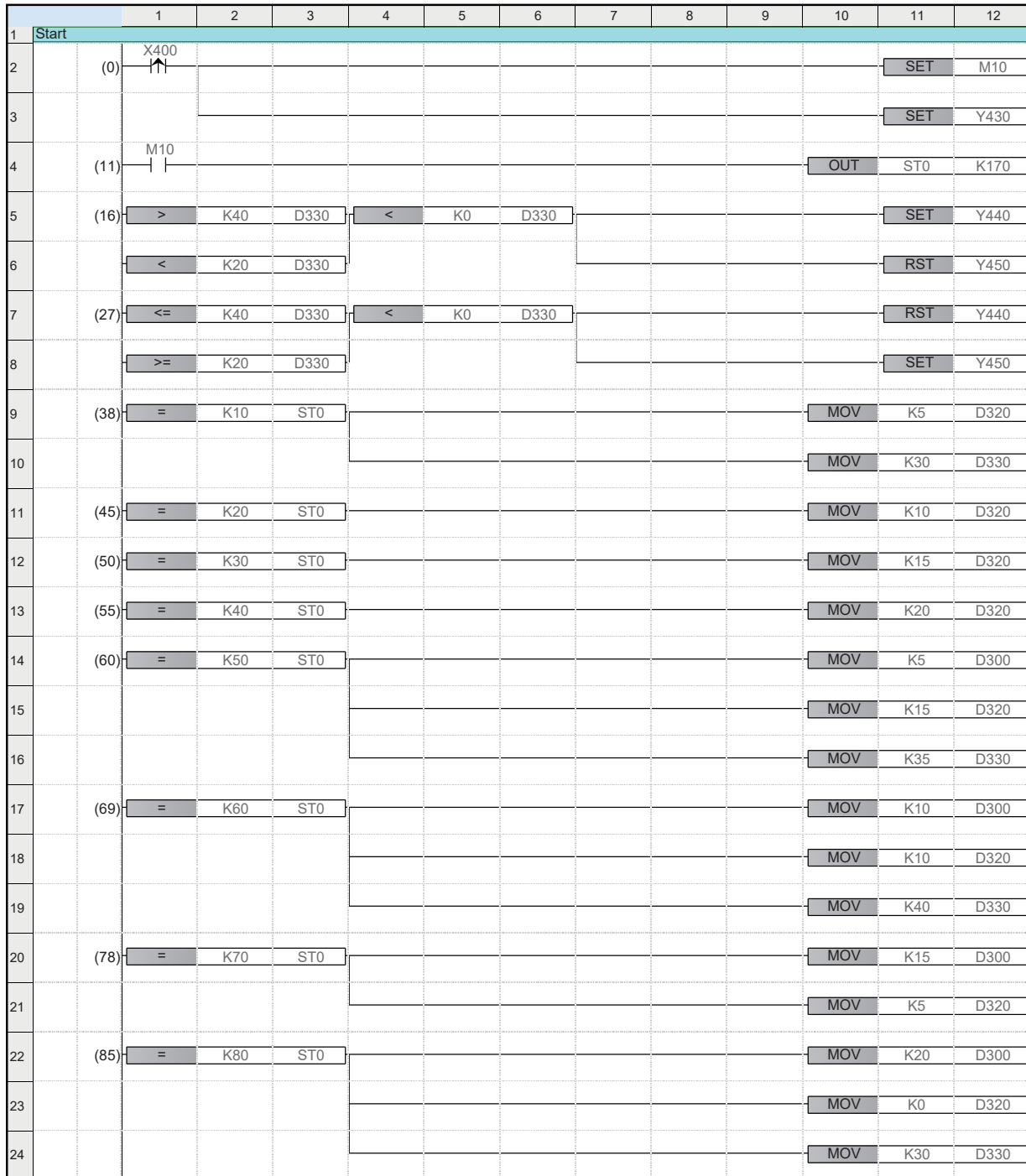
Precautions

- This manual does not cover the devices of the Simple Motion module and the servo amplifier. For details, refer to the user's manual for each module used.
- Programming is not included in this exercise. The pre-programmed project "school_GENESIS64.gx3" is used.

Sequence program

For details on each instruction, refer to the following.

 MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)



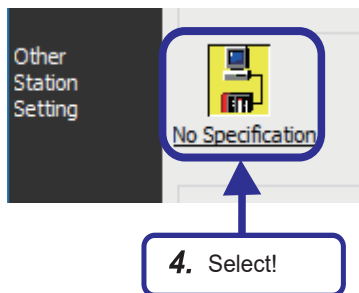
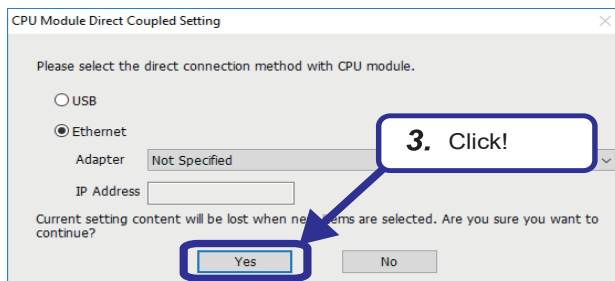
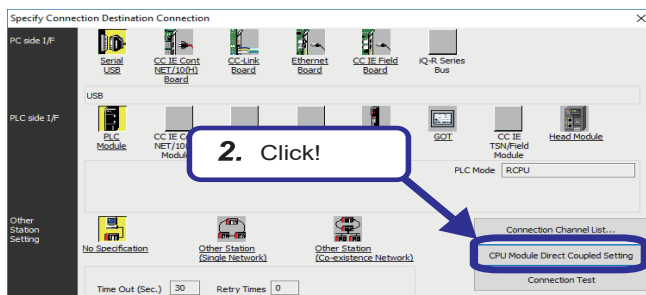
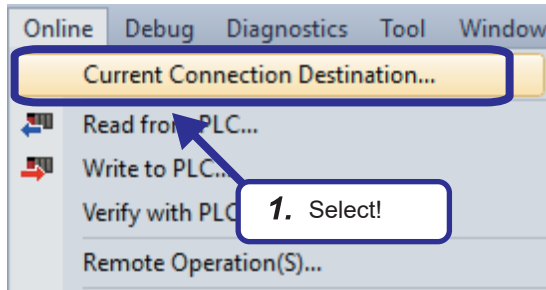
	1	2	3	4	5	6	7	8	9	10	11	12
25	(94)	=	K90	ST0						MOV	K15	D300
26										MOV	K5	D320
27										MOV	K25	D330
28	(103)	=	K100	ST0						MOV	K10	D300
29										MOV	K10	D320
30										MOV	K20	D330
31	(112)	=	K110	ST0						MOV	K5	D300
32										MOV	K15	D320
33	(119)	=	K120	ST0						MOV	K0	D300
34										MOV	K20	D320
35										MOV	K30	D330
36	(128)	=	K130	ST0						MOV	K5	D310
37										MOV	K15	D320
38	(135)	=	K140	ST0						MOV	K10	D310
39										MOV	K10	D320
40	(142)	=	K150	ST0						MOV	K15	D310
41										MOV	K5	D320
42	(149)	=	K160	ST0						MOV	K20	D310
43										MOV	K0	D320
44	(156)	=	K170	ST0						RST	ST0	
45										RST	D310	

	1	2	3	4	5	6	7	8	9	10	11	12
46	Pause											
47	(165)	X410 ↑↑									RST	M10
48											RST	Y430
49	Stop											
50	(176)	X420 ↑↑								MOV	K0	D300
51										MOV	K0	D310
52										MOV	K0	D320
53										MOV	K0	D330
54										RST	ST0	
55										RST	M10	
56										RST	Y430	
57										RST	Y440	
58										RST	Y450	
59	Post-processing											
60	(200)	SM400 								MOV	ST0	D340
61	(220)											[END]

Connection destination specification

This section describes how to specify the connection destination.

Operating procedure

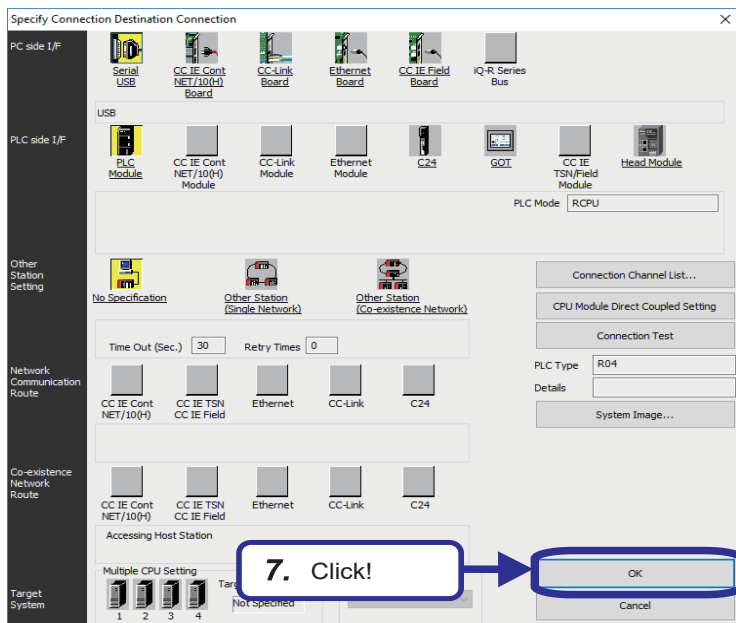
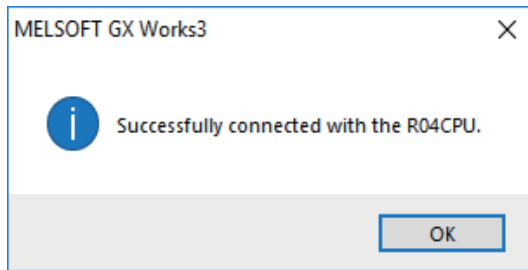
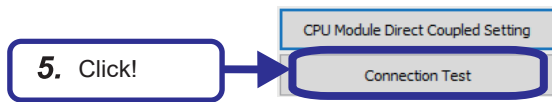


1. On the engineering tool, select [Online] ⇒ [Current Connection Destination] from the menu.

2. Click the [CPU Module Direct Coupled Setting] button on the "Specify Connection Destination Connection" window. The "CPU Module Direct Coupled Setting" dialog box appears.

3. Select a direct connection method with the CPU module, and click the [Yes] button.

4. Select "No Specification" for "Other Station Setting" on the "Specify Connection Destination Connection" window.



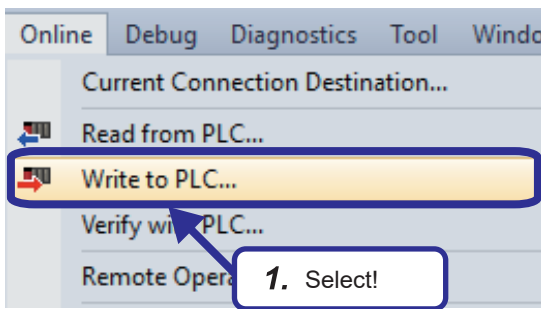
5. Click the [Connection Test] button.

6. Check that the connection with the CPU module has been successfully established.

7. Click the [OK] button.

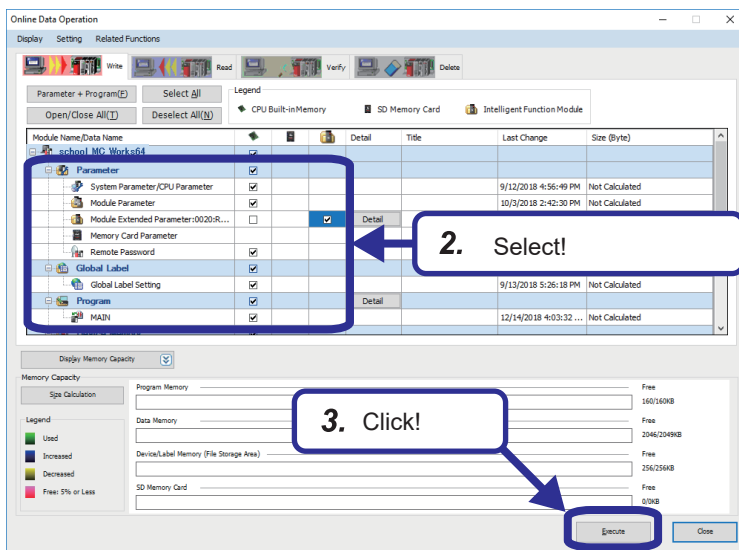
Writing parameters to the CPU module

Write the parameters set with GX Works3 to the CPU module.

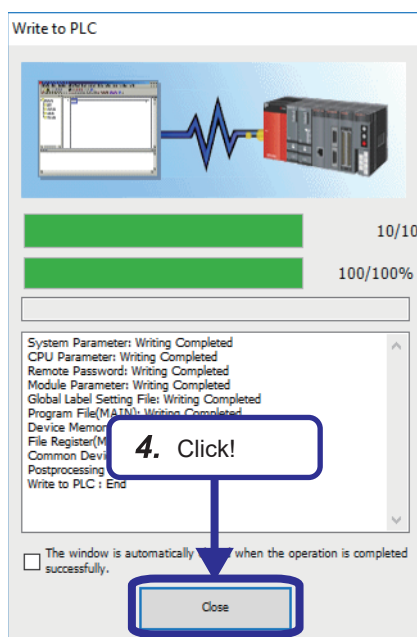


1. Open the project "school_GENESIS64.gx3". On the engineering tool, select [Online] ⇒ [Write to PLC] from the menu.

3



2. The "Online Data Operation" window appears. Select the write target items. The module extended parameters are written to the intelligent function module. Select the "Intelligent Function Module" checkbox.
3. Click the [Execute] button.



4. The "Write to PLC" window appears. When completed, a message, "Writing Completed", is displayed. Click the [Close] button.

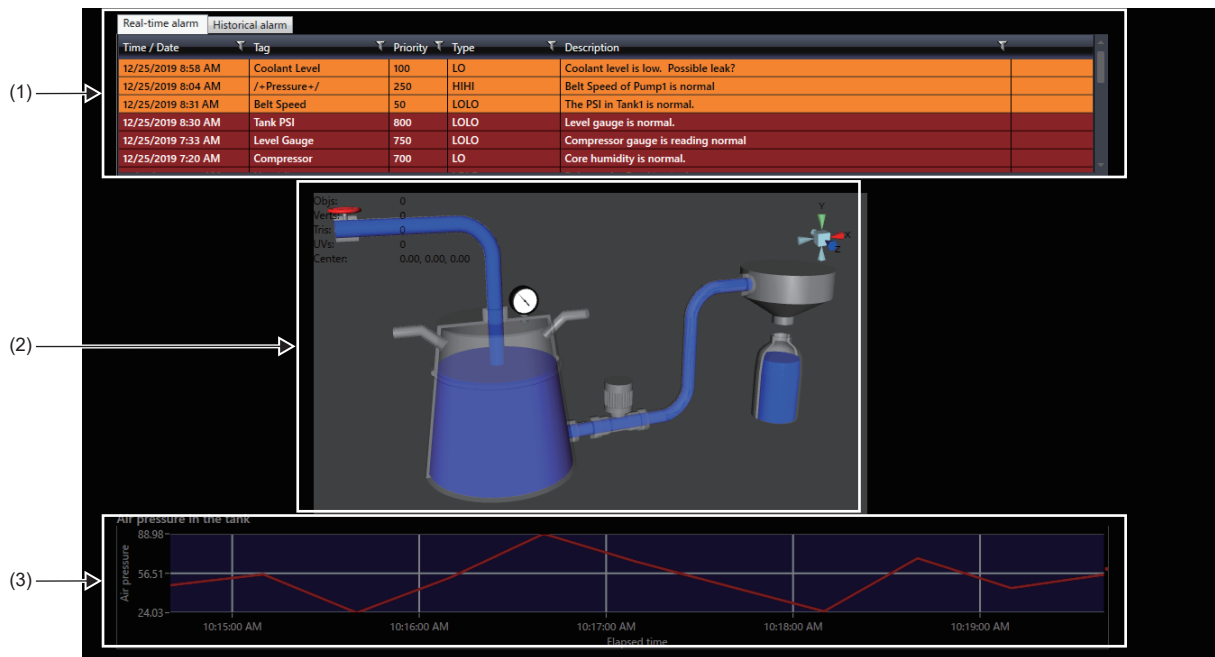
4 EXERCISE 1 CREATING AN OPERATION MONITORING SCREEN

4.1 Overview

In this exercise, we create a screen assuming a part of production process at a beverage factory and practice how to monitor the operating status of the system using animation, alarms, and trend graphs.

Screen to be created

The following is the screen to be created in this exercise.



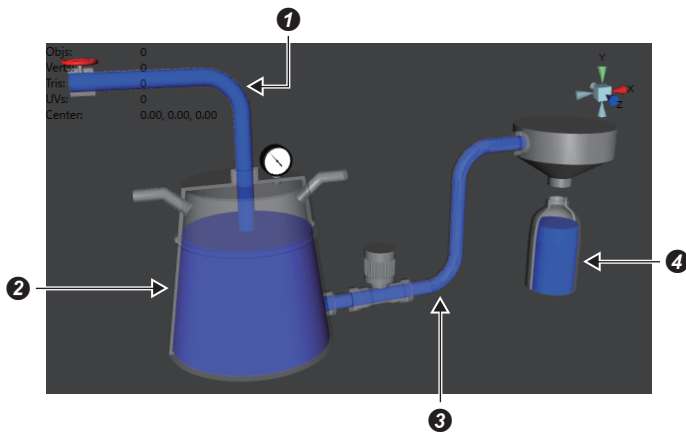
No.	Name	Description
(1)	Alarm ^{*1}	Real-time An alarm is displayed when the air pressure in the tank is abnormal. An alarm is generated by comparing the air pressure value with a threshold value. Only the latest alarm is displayed here.
		Historical An alarm is displayed when the air pressure in the tank is abnormal. An alarm is generated by comparing the air pressure value with a threshold value. The alarm history (all alarms occurred) is displayed here.
(2)	Graphic screen (3D viewport)	A part of production process is displayed in animation. The animation assumes a packaging process of water filtered in the tank.
(3)	Trend graph	The time series data of air pressure in the tank is displayed in a line graph.

*1 The display (real-time or historical) can be changed by switching tabs.

Operation to be checked

The screen created in this exercise operates as follows:

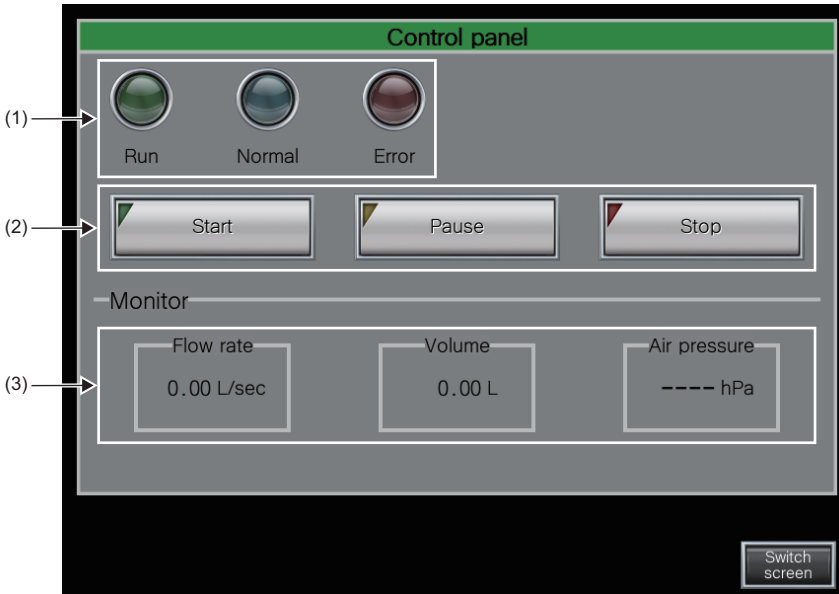
- Water starts to flow into the tank through Pipe A.
Flow of water: ① Pipe A → ② Tank → ③ Pipe B → ④ Container



2. The air pressure in the tank is displayed in a trend graph.
3. An alarm is displayed when the air pressure in the tank becomes above or below the threshold value at the time of water supply or drainage.

Operation of GOT screen

This section describes how to operate the GOT screen used in this exercise.
Use GOT2000.



No.	Name	Description	
(1)	Lamp	Run	This lamp is on during system operation.
		Normal	This lamp is on when the air pressure in the tank is normal.
		Error	This lamp turns on when the air pressure in the tank becomes abnormal.
(2)	Switch	Start	This switch starts the system and animation.
		Pause	This switch temporarily stops the system and animation.
		Stop	This switch stops the system and returns the animation back to default.
(3)	Numerical display	Flow rate	This area displays the flow rate within Pipe A or Pipe B.
		Volume	This area displays the volume of water in the tank.
		Air pressure	This area displays the air pressure in the tank.

Point

In this exercise, we use GOT to check operation. However, buttons and text objects can be placed also on the GraphWorX64™ screen in the same way as the GOT.

The GraphWorX™64 screen can also be used to check operation.



4.2 Creating a Project and Checking Operation

GENESIS64™ provides two modes: Configuration mode for engineering and Runtime mode for operation. The figures below show the data flow in each mode.

In Configuration mode, the Workbench, which is an integrated management application, is used to set a project.

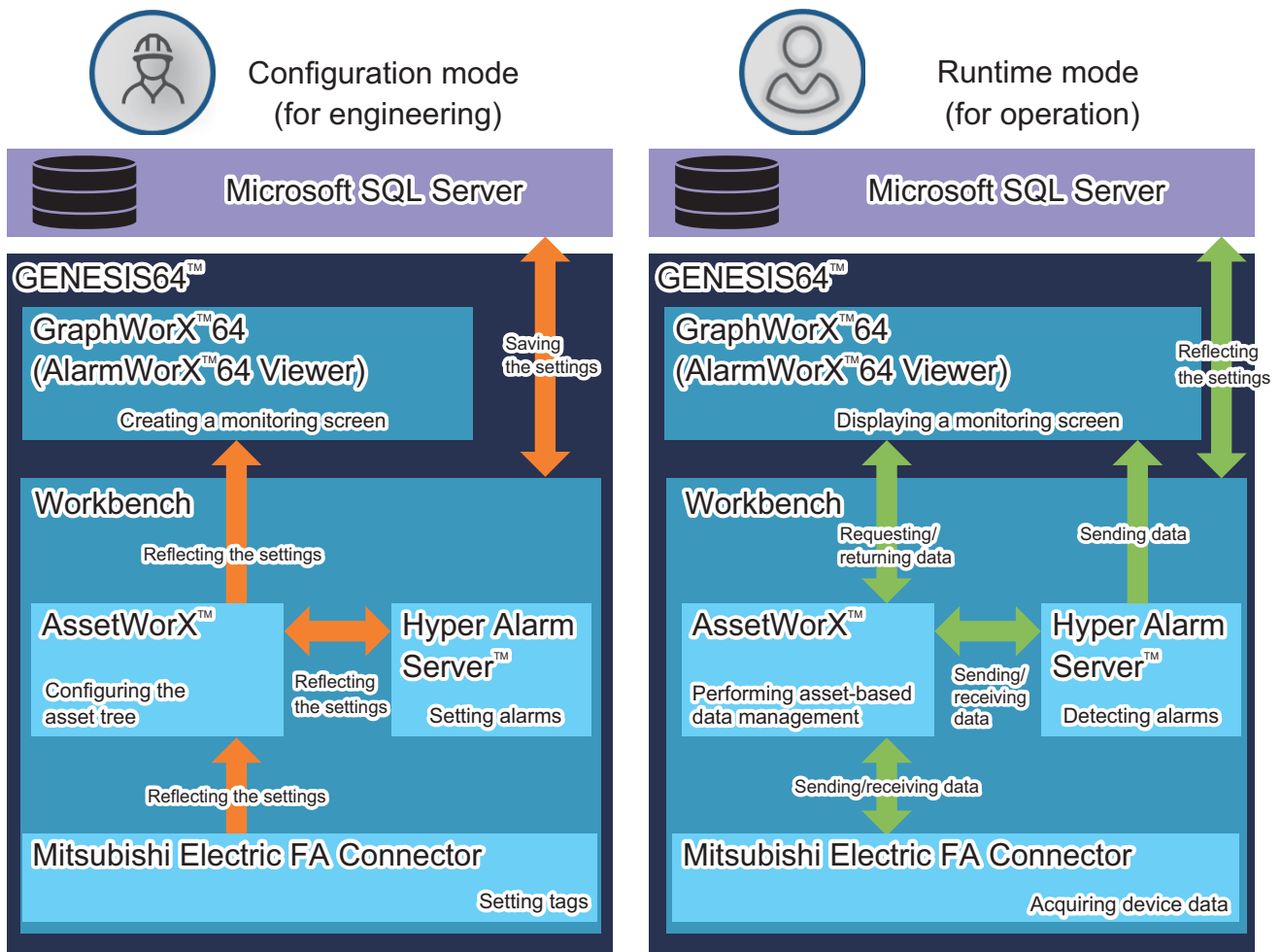
The settings configured in the Workbench are automatically stored in a Microsoft SQL Server database.

GraphWorX™ 64 is used to create graphic screens, set animations, place trend graphs, and perform other operations.

In Runtime mode, according to the settings configured and the graphic screens created in Configuration mode, GENESIS64™ requests data, displays the received data on the screen, and monitors alarms.

In this exercise, GENESIS64™ sends/receives asset management data to/from AssetWorX™. However, GENESIS64™ can also send/receives data directly to/from the Mitsubishi Electric FA Connector.*1

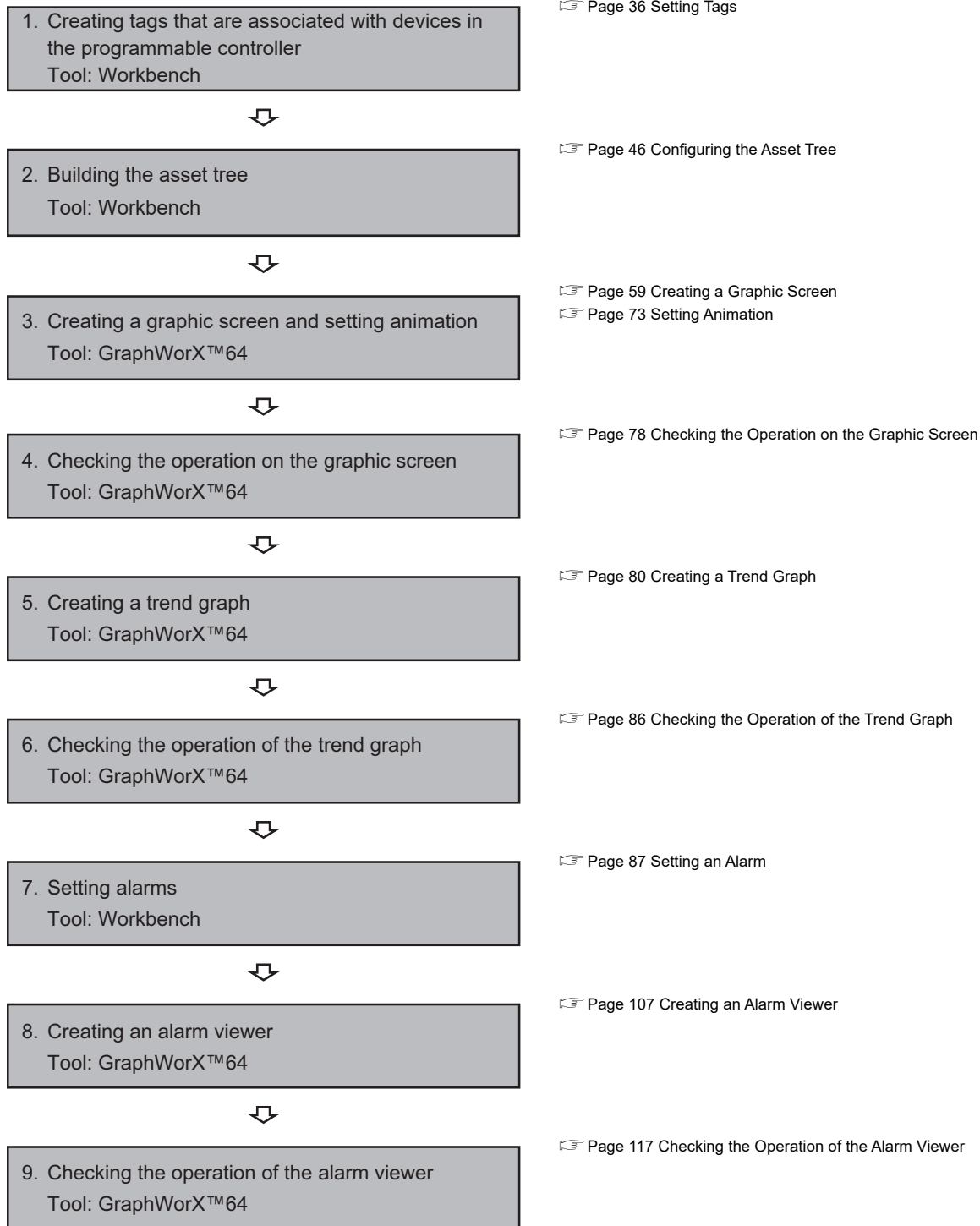
*1 GENESIS64™ Advanced only



4.3 Operating Procedure

The following is the operating procedure of this exercise.

Operating procedure



4.4 Setting Tags

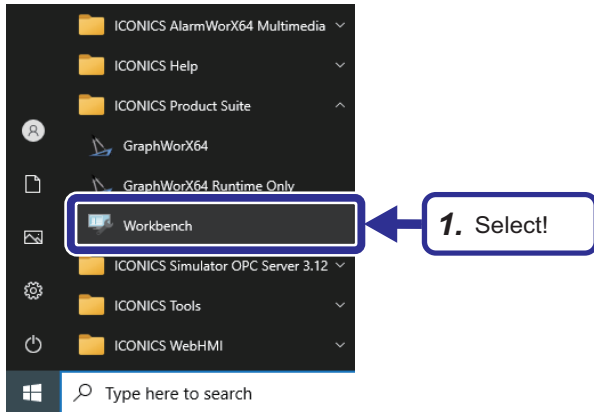
This section describes how to set tags in the Workbench.

By setting information on the demonstration machine and data of the devices used in the sequence program to the Mitsubishi Electric FA Connector in the form of tags, data can be sent/received to/from the demonstration machine.

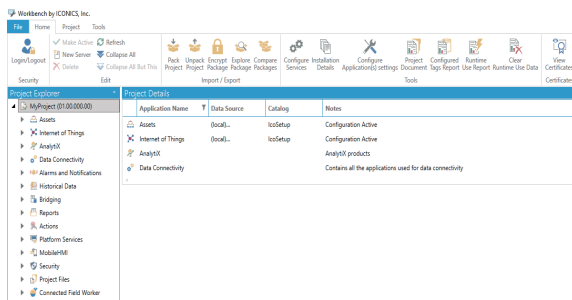
Starting the Workbench

Start the Workbench.

Operating procedure



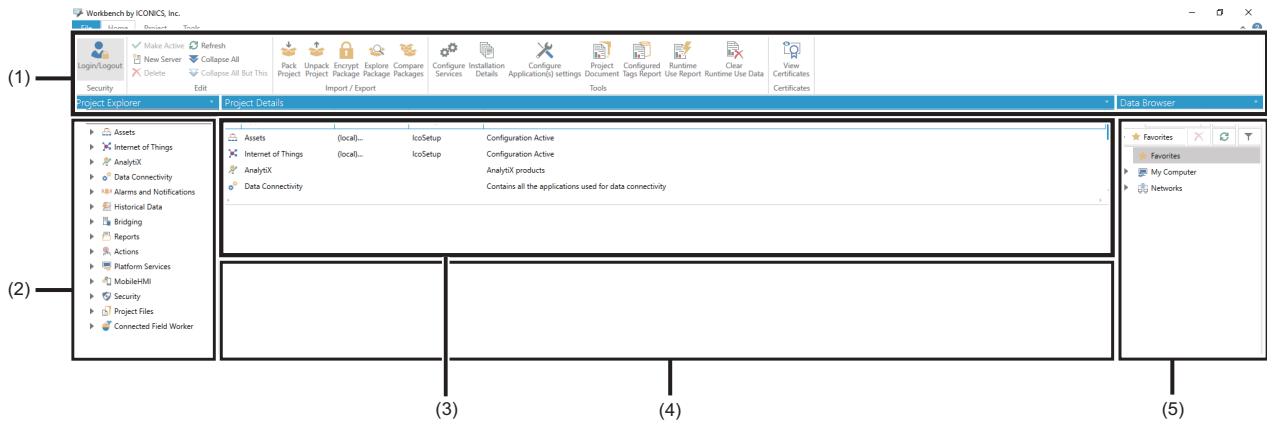
1. Select [ICONICS Product Suite] ⇒ [Workbench] from Windows® Start.



2. The Workbench starts up.

Screen configuration

The following is the screen configuration of the Workbench.



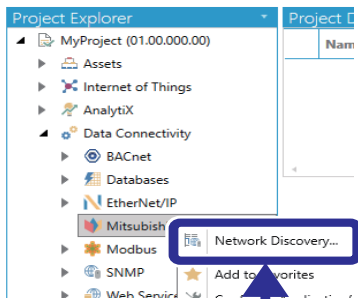
No.	Name	Description
(1)	Ribbon	A user interface to control the Workbench. Elements for managing databases and setting applications are placed on several tabs.
(2)	Project Explorer	A window that allows users to manage application settings, such as alarm settings and database connection settings
(3)	Project Details	A window that displays applications included in the item selected in the Project Explorer window and details of the selected application
(4)	Content area	An area for setting the application selected in the Project Explorer window
(5)	Docking window	A window that displays data browsers in the Workbench and tasks being executed
		Recent Tasks

Setting a communication target device

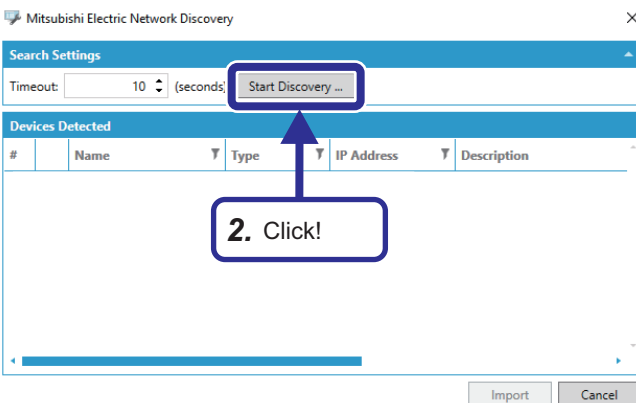
Set information on the demonstration machine so that the Mitsubishi Electric FA Connector can communicate with the demonstration machine.

(The IP address of the CPU module to be connected is '192.168.3.39'.)

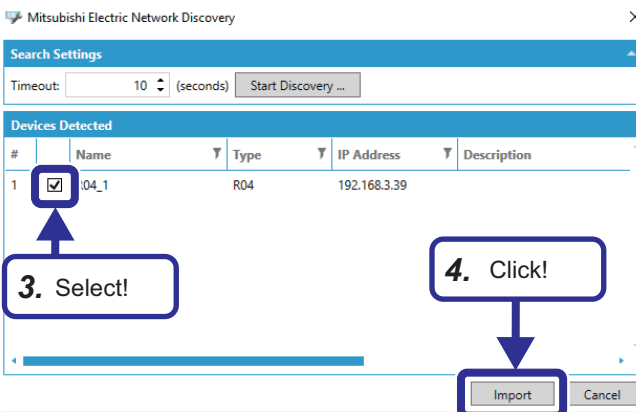
Operating procedure



1. Select!



2. Click!



3. Select!

4. Click!

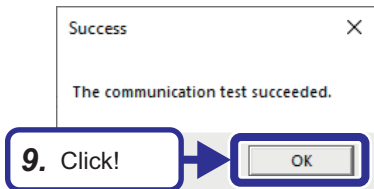
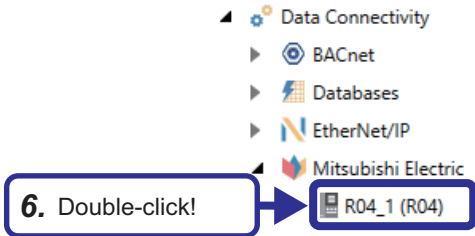
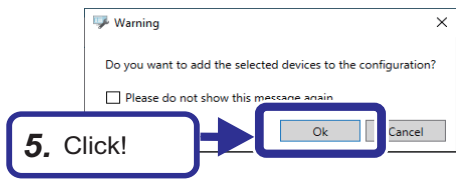


1. Select [MyProject (01.00.000.00)] ⇒ [Data Connectivity] ⇒ [Mitsubishi Electric] in the "Project Explorer" window. Right-click on [Mitsubishi Electric], and select [Network Discovery].

2. Click the [Start Discovery] button.

3. Select the CPU module of the demonstration machine.

4. Click the [Import] button.



5. Click the [OK] button.

6. Double-click [R04_1(R04)].

7. Click the "(Click to test the communication)" link of "Common Settings".

8. Check that the connection to the CPU module has been successfully established.

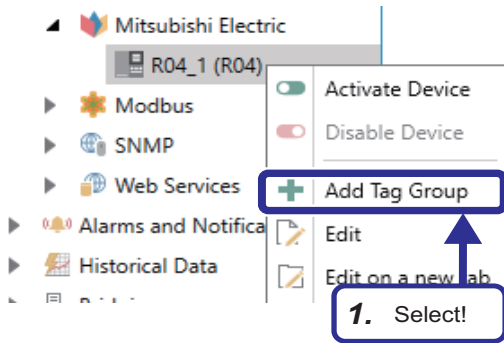
9. Click the [OK] button.

Creating tags

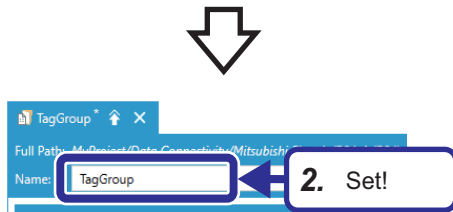
To send/receive data to/from the Mitsubishi Electric FA Connector, create tags and set devices used in the sequence program. In this exercise, we create one tag on the setting screen in the Workbench. For other tags, we define them in an external file and import them from the file to the Workbench.

Creating tags

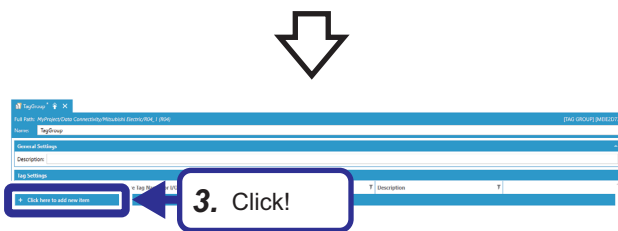
Operating procedure



1. Right-click on [R04_1(R04)], and select [Add Tag Group].

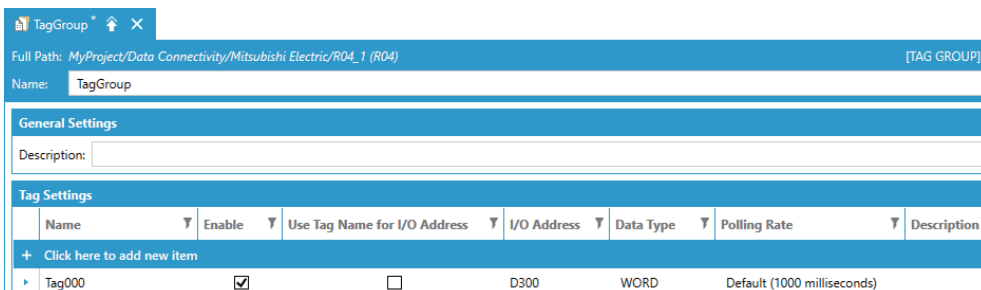


2. Set the following:
[Settings]
Name: TagGroup

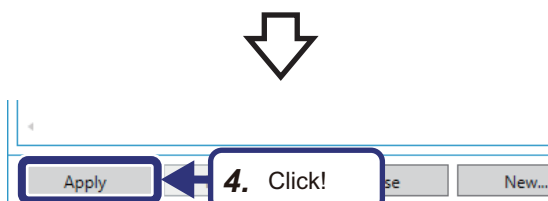


3. Click the "+ Click here to add new item" link under "Tag Settings", and set the following:

Settings						Description
Name	Enable	Use Tag name for I/O Address	I/O Address	Data Type	Polling Rate	
Tag000	Selected	Deselected	D300	WORD	Default (1000 milliseconds)	Volume of water in the tank

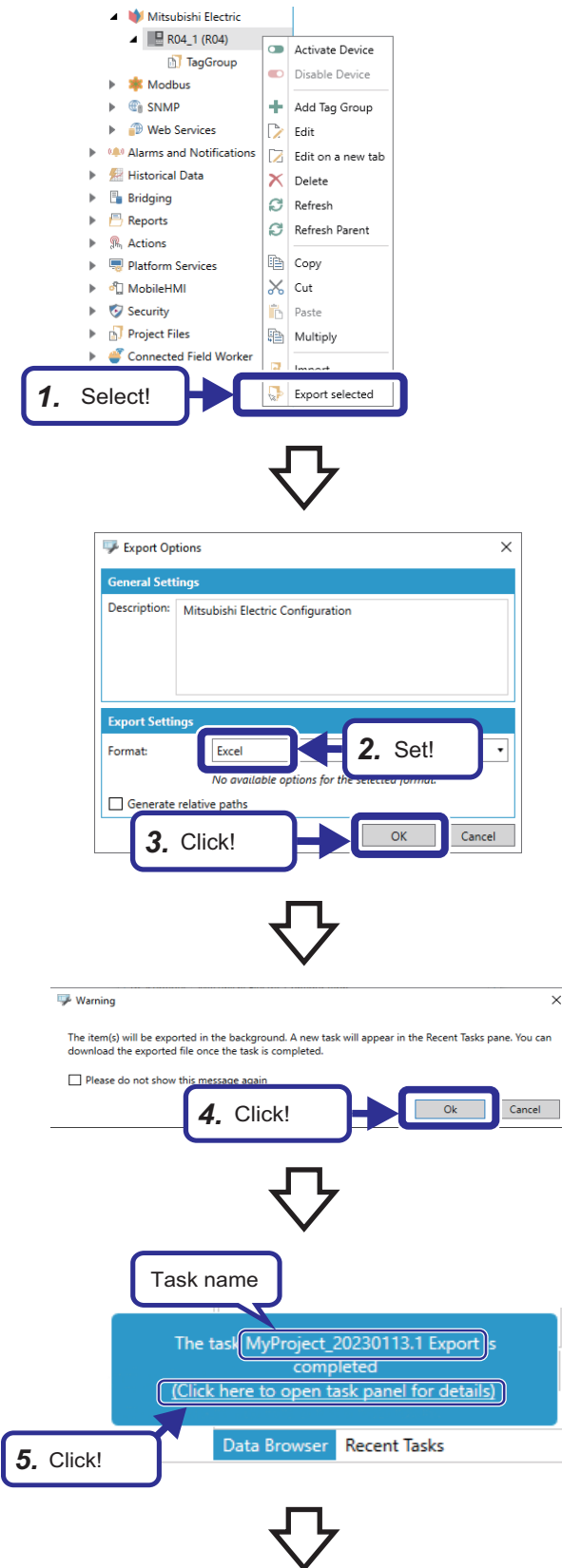


4. Click the [Apply] button.



Importing tags

Operating procedure



1. Right-click on [R04_1(R04)], and select [Export selected].

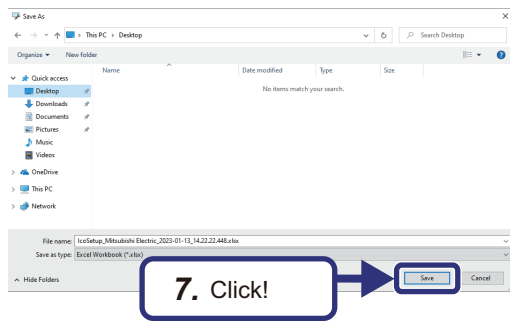
2. Set "Export Settings" as follows:
[Settings]
Format: Excel
3. Click the [OK] button.

4. Click the [OK] button.

5. The message on the left is displayed. Click the "(Click here to open task panel for details)" link.



- Right-click on the task name displayed in "Recent Tasks", and select [Download Export File].



- Specify the file save destination, and click the [Save] button.



- Open the file saved in Step 7 in Excel. The "MelcoMelsecTag" sheet is displayed.

	A	B	C	D	E	F	G	H
1	{LocationPath}	Name	Description	Enable	IoAddress	Data Type	PollingRate	Use Name As Io Address
2	¥[R04_1]¥TagGroup	Tag000		True	D300	2	1000	False
3								
4								
5								



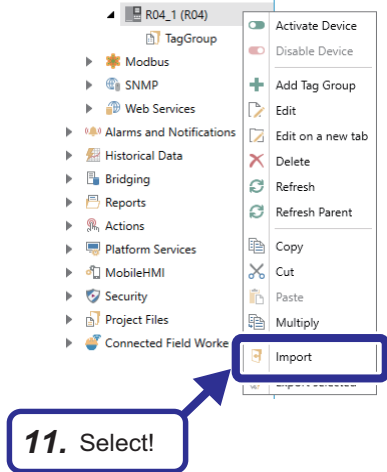
- Copy the 2nd row to the 3rd to 5th rows, and change the data as follows:

	A	B	C	D	E	F	G	H
1	{LocationPath}	Name	Description	Enable	IoAddress	Data Type	PollingRate	Use Name As Io Address
2	¥[R04_1]¥TagGroup	Tag000		True	D300	2	1000	False
3	¥[R04_1]¥TagGroup	Tag001		True	D310	2	1000	False
4	¥[R04_1]¥TagGroup	Tag002		True	D330	2	1000	False
5	¥[R04_1]¥TagGroup	Tag003		True	D340	2	1000	False

Target row	Settings	
	Name	IoAddress
3rd row	Tag001	D310
4th row	Tag002	D330
5th row	Tag003	D340

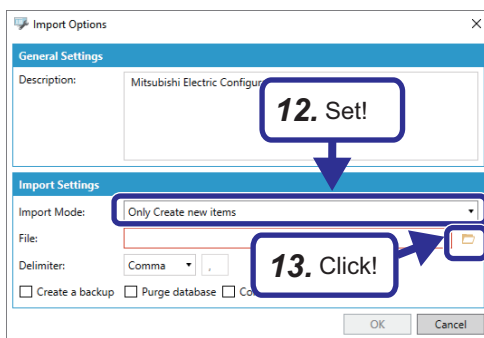
- Details of the tags to be added

Settings						Description
Name	Enable	Use Tag name for I/O Address	I/O Address	Data Type	Polling Rate	
Tag001	Selected	Deselected	D310	WORD	Default (1000 milliseconds)	Volume of water in the container
Tag002	Selected	Deselected	D330	WORD	Default (1000 milliseconds)	Air pressure in the tank
Tag003	Selected	Deselected	D340	WORD	Default (1000 milliseconds)	Timer current value




10. Save the changes to the file.

11. Return to the Workbench, right-click on [R04_1(R04)], and select [Import].



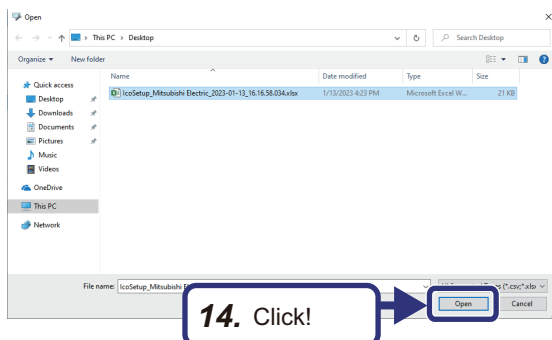
12. Set "Import Settings" as follows:
[Settings]

Only Create new items

13. Click  to open the "File" browser, and specify the file saved in Step 10.

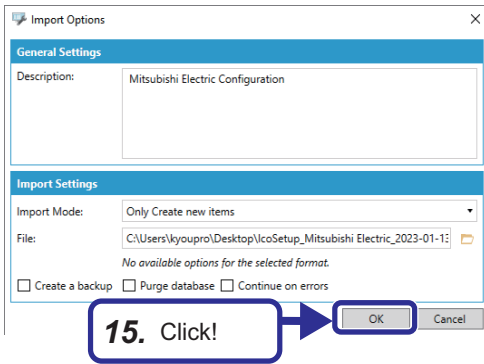


14. Click the [Open] button.

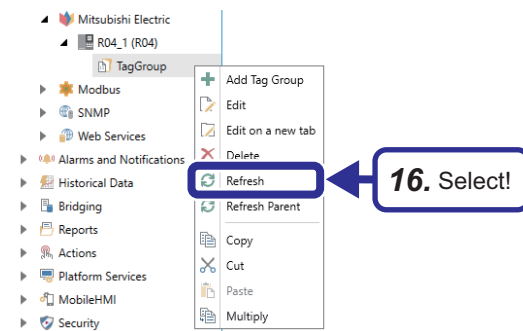
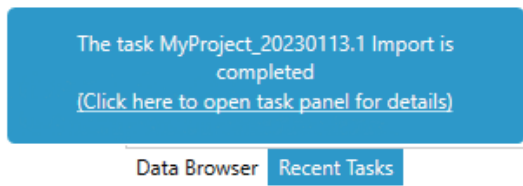




15. Click the [OK] button.



16. The message on the left is displayed. Right-click on [TagGroup], and select [Refresh].



17. Check that the tags are added.

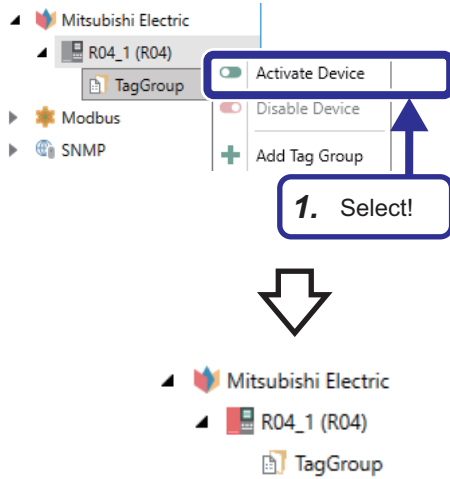
Tag Settings			
	Name	Enable	Use Tag Name for I/O Address
+ Click here to add new item			
	Tag000	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Tag001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Tag002	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Tag003	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Activating the device

Activate the device set to the Mitsubishi Electric FA Connector to start sending/receiving data to/from the demonstration machine.

Operating procedure



1. Right-click on [R04_1(R04)], and select [Activate Device].

2. Data communications with the CPU module start.

4

Point

When the device is active, the device settings cannot be changed. To change the device settings, select [Disable Device].

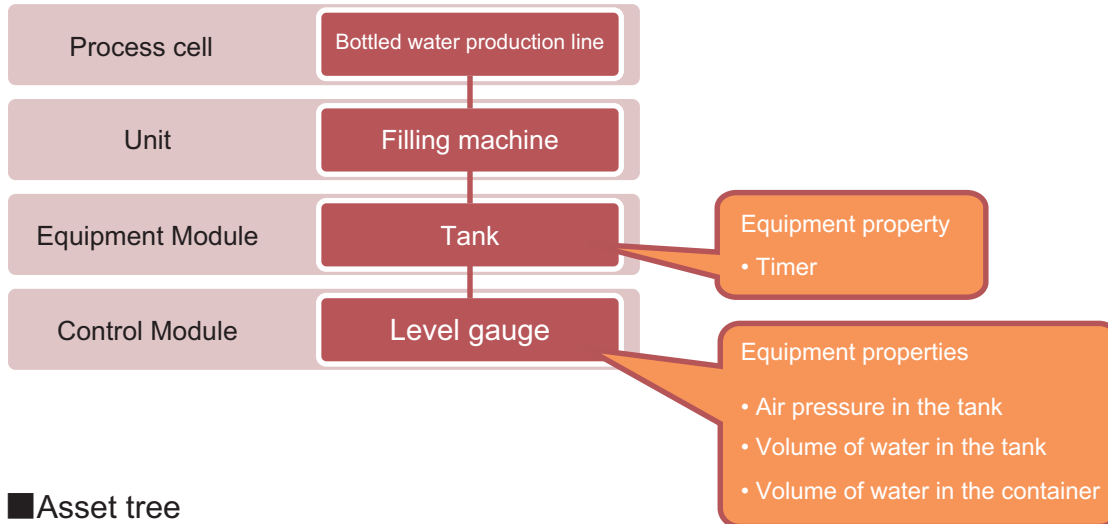
Even when the device is active, the tag settings can be changed.

4.5 Configuring the Asset Tree

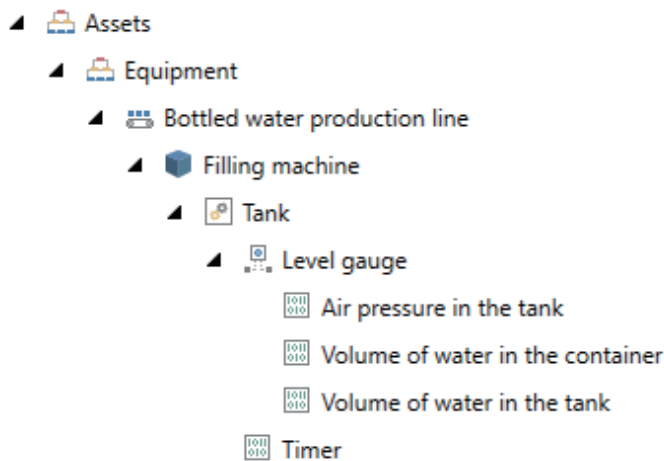
This section describes how to build an asset tree in the Workbench. In this exercise, we build the following asset tree.

■ Structure

Equipment hierarchy Equipment configuration



■ Asset tree



Data of equipment is managed as equipment properties. Data to be displayed on screens or in tables, such as programmable controller devices and data sources, is linked to the equipment properties.

Creating a database

Create a database to store asset tree settings and alarm settings.

One database stores the following settings:

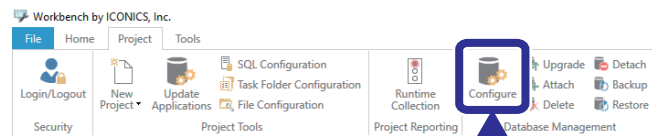
- Asset tree settings
- Real-time alarm settings
- Historical alarm settings

In this exercise, we set alarms in the asset tree. The asset tree settings and the real-time alarm settings need to be stored in the same database.

For how to set alarms, refer to the following.

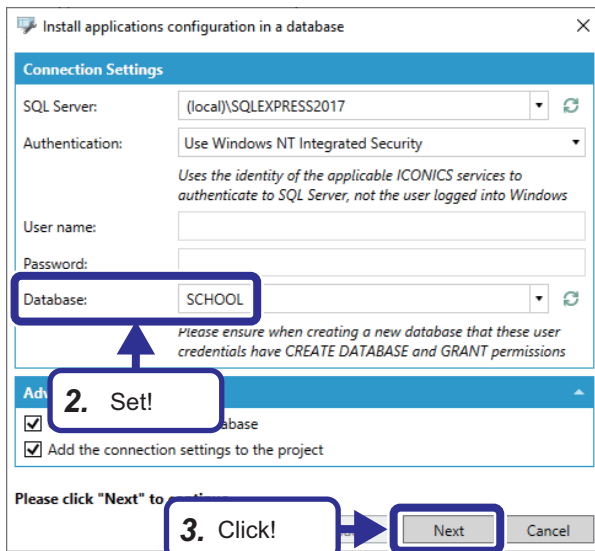
📖 Page 87 Setting an Alarm

Operating procedure



1. Click!

1. Start the Workbench, and click the [Configure] button in the [Project] tab.

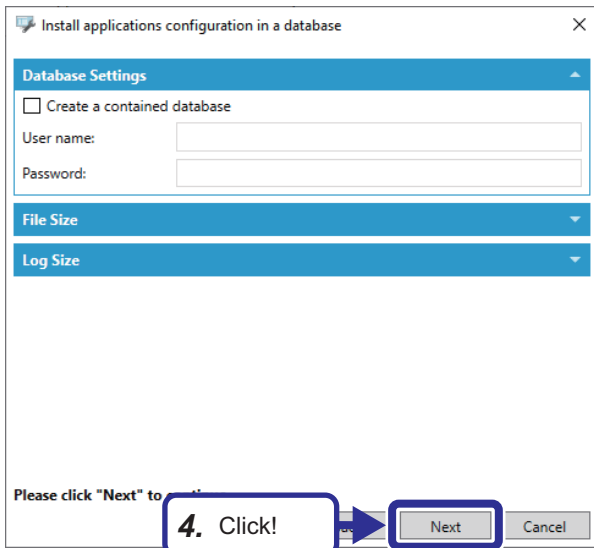


2. Set!

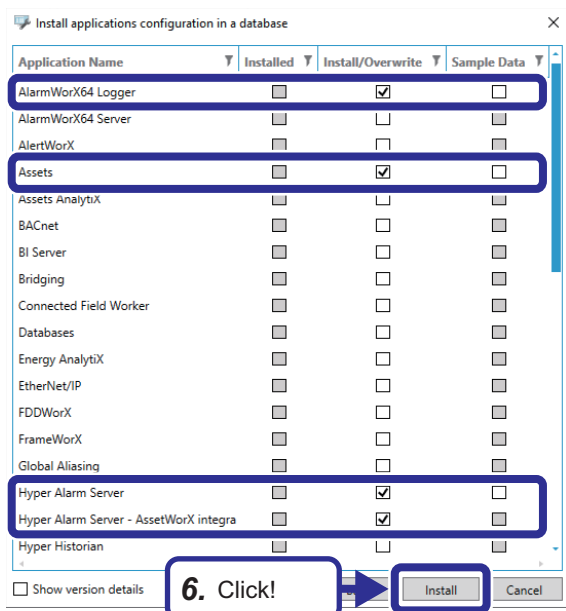
3. Click!

2. Set "Connection Settings" as follows:
[Settings]
Database: SCHOOL
3. Click the [Next] button.





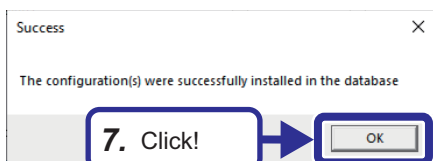
4. Click the [Next] button.



5. Set the installation target application options as follows:

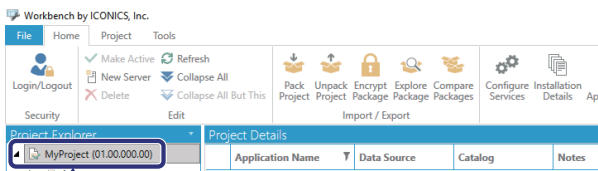
6. Click the [Install] button.

Settings		Settings to be stored
Application Name	Install/Overwrite	
AlarmWorX64 Logger	Selected	Historical alarm settings
Assets	Selected	Asset tree settings
Hyper Alarm Server	Selected	Real-time alarm settings
Hyper Alarm Server - AssetWorX integra	Selected	

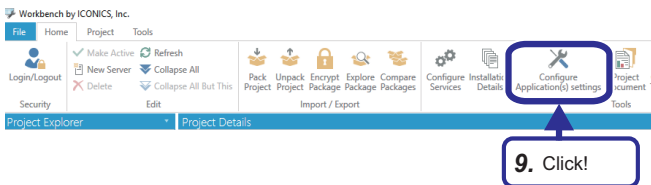


7. Click the [OK] button.

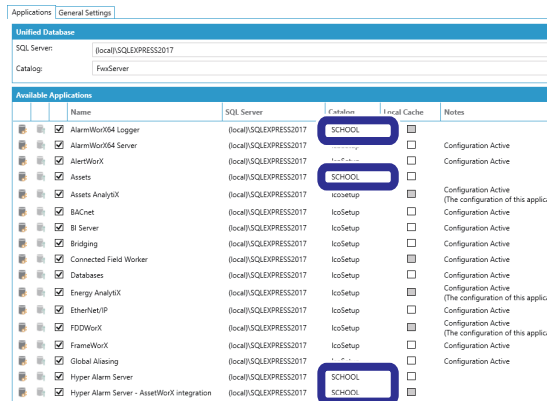




8. Select [MyProject (01.00.000.00)] in the "Project Explorer" window.



9. Click the [Configure Application(s) settings] button in the [Home] tab.



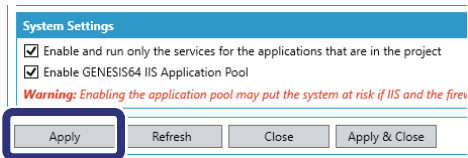
10. In the [Applications] tab, set a catalog for the applications as follows:

Settings	
Name	Catalog
AlarmWorX64 Logger	SCHOOL
Assets	SCHOOL
Hyper Alarm Server	SCHOOL
Hyper Alarm Server - AssetWorX integration	SCHOOL

Point

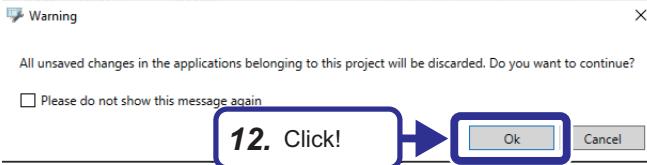
When setting real-time alarms to the asset tree as we do in this exercise, set the same catalog for the following applications.

- Assets
- Hyper Alarm Server™
- Hyper Alarm Server™ - AssetWorX™ integration



11. Click the [Apply] button.

11. Click!



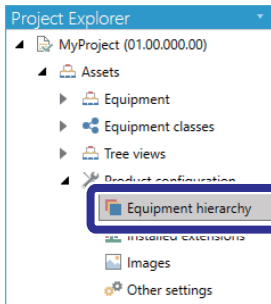
12. Click the [OK] button.

12. Click!

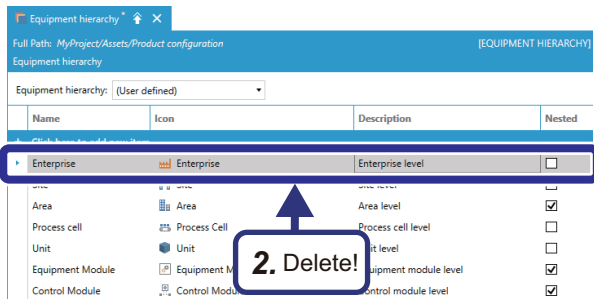
Creating an equipment hierarchy

Define tiers in the equipment hierarchy to control the asset tree structure in AssetWorX™.

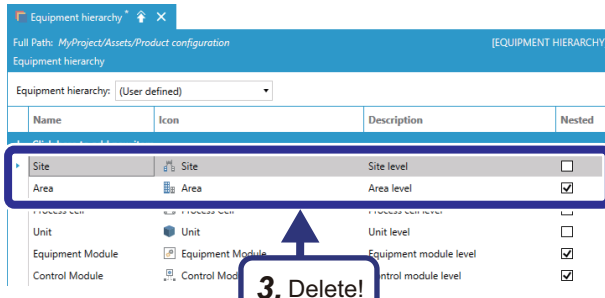
Operating procedure



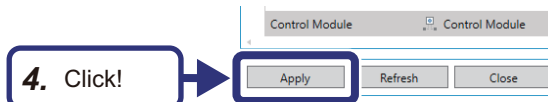
1. Double-click!



2. Delete!



3. Delete!



4. Click!

1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Assets] ⇒ [Product configuration] ⇒ [Equipment hierarchy] in the "Project Explorer" window. Double-click [Equipment hierarchy].

2. Select the 1st row, and press the **[Delete]** key.

3. Delete the rows named "Site" and "Area" in the same way as Step 2.

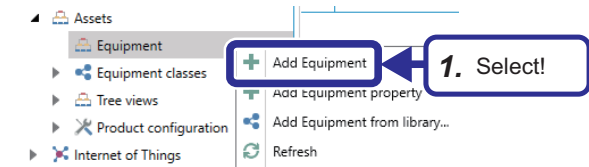
4. Click the [Apply] button.

Adding equipment to the asset tree

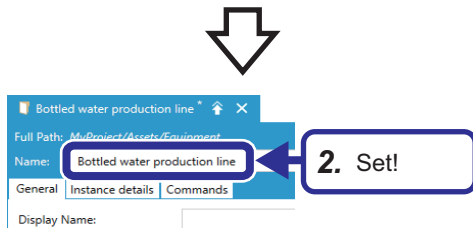
Build an asset tree in AssetWorX™.

Add pieces of equipment to the asset tree one by one.

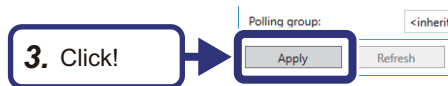
Operating procedure



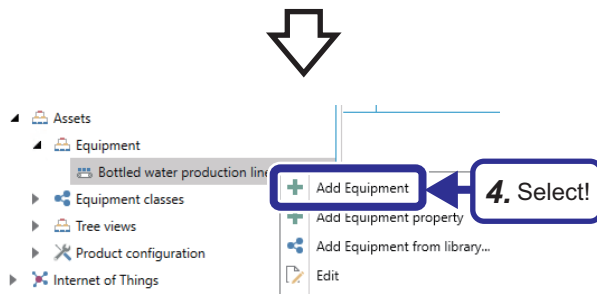
1. Select [MyProject (01.00.000.00)]⇒[Assets] ⇒ [Equipment] in the "Project Explorer" window. Right-click on [Equipment], and select [Add Equipment].



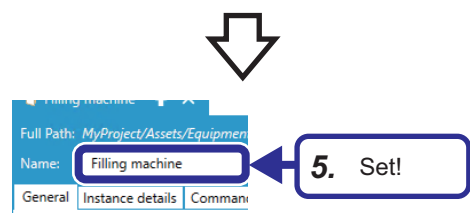
2. Set the following:
[Settings]
Name: Bottled water production line



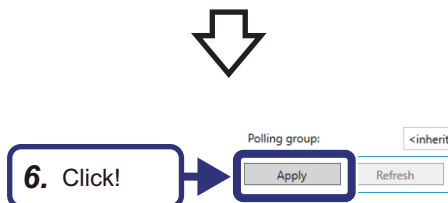
3. Click the [Apply] button.



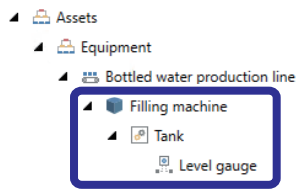
4. Right-click on [Bottled water production line], and select [Add Equipment].



5. Set the following:
[Settings]
Name: Filling machine



6. Click the [Apply] button.



7. Add [Tank] to [Filling machine] in the same way.
8. Add [Level gauge] to [Tank] in the same way.

Setting equipment properties

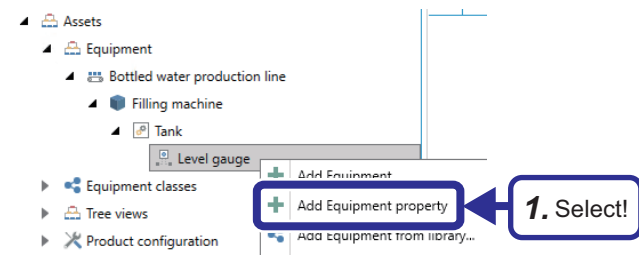
Set the data of equipment as equipment properties.

Link the equipment properties with the tags set to the Mitsubishi Electric FA Connector.

In this exercise, we create one equipment property on the setting screen in the Workbench. For other equipment properties, we define them in an external file and import them from the file to the Workbench.

Setting equipment properties

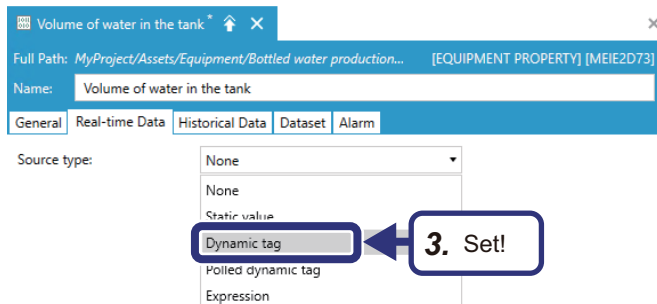
Operating procedure



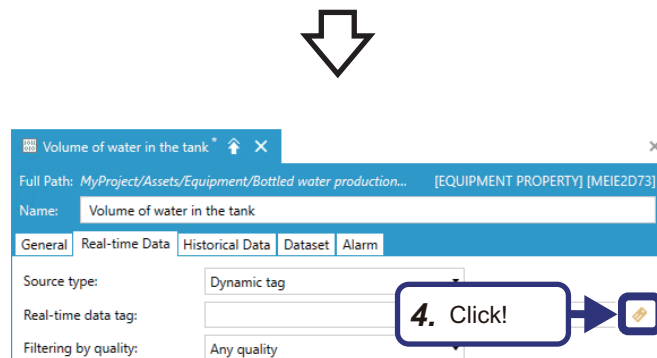
1. Right-click on [Level gauge], and select [Add Equipment property].




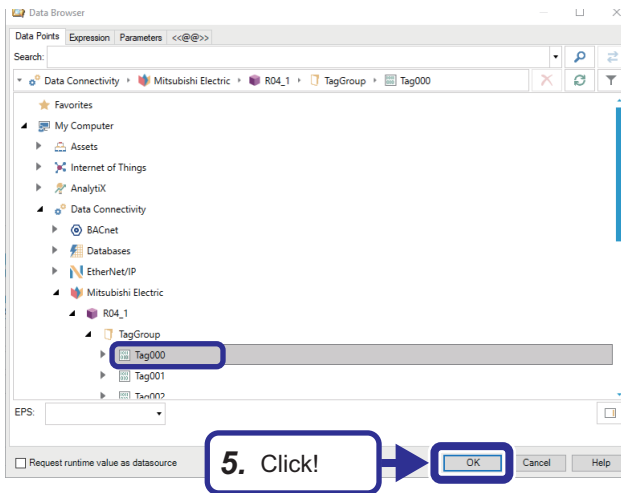
2. Set the following:
[Settings]
Name: Volume of water in the tank



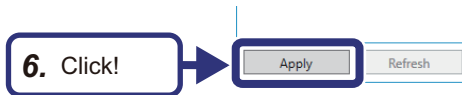
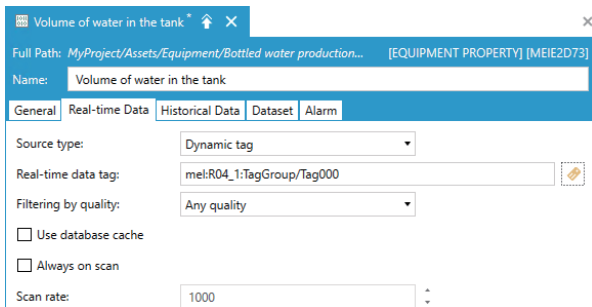
3. Set the following in the [Real-time Data] tab:
[Settings]
Source type: Dynamic tag



4. Click  to open the "Real-time Data" browser.



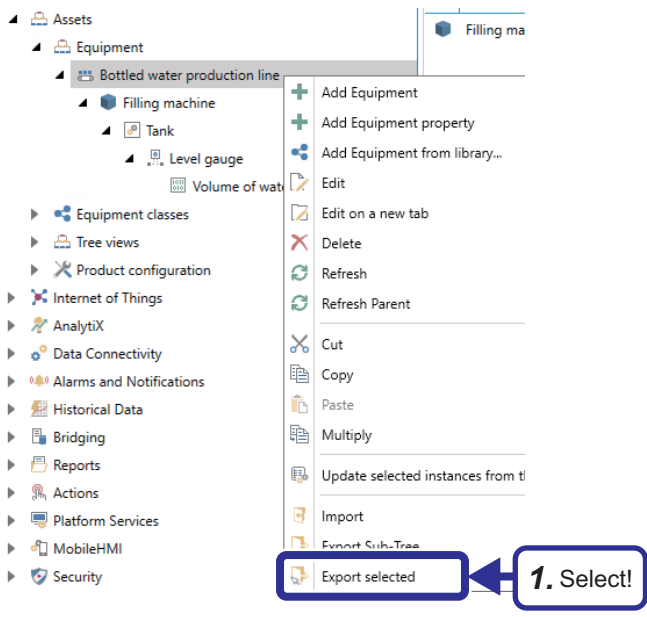
5. Select [My Computer] ⇒ [Data Connectivity] ⇒ [Mitsubishi Electric] ⇒ [R04_1] ⇒ [TagGroup] ⇒ [Tag000], and click the [OK] button.



6. Click the [Apply] button.

Importing equipment properties

Operating procedure



1. Right-click on [Bottled water production line], and select [Export selected].
2. Save the imported file referring to the procedure described on Page 41 Importing tags.



	A	B	C
1	{LocationPath}	Name	DisplayName
2	EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the tank	
3			

3. Open the file saved in Step 2 in Excel. The "EquipmentProperty" sheet is displayed.



	A	B	C	D	E	F	G	H
1	{LocationPath}	Name	DisplayName					
2	EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the container						
3	EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Air pressure in the tank						
4	EquipmentRoot\Bottled water production line\Filling machine\Tank	Timer						
5	EquipmentRoot\Bottled water production line\Filling machine\Tank	Timer						
6								

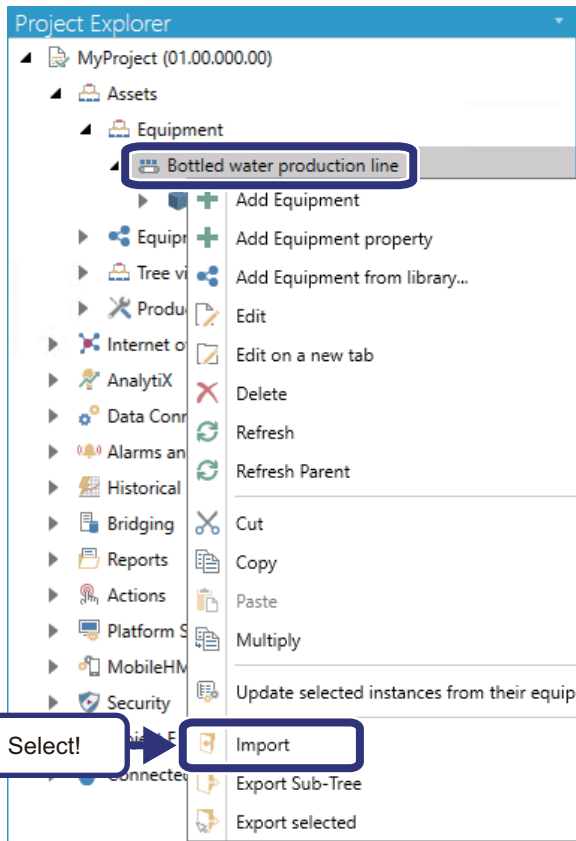
4. Copy the 2nd row to the 3rd to 5th rows, and change the data as follows:

Target row	Settings		
	{LocationPath}	Name	RealtimePointName
3rd row	Not changed	Volume of water in the container	mel:R04_1:TagGroup/Tag001
4th row	Not changed	Air pressure in the tank	mel:R04_1:TagGroup/Tag002
5th row	EquipmentRoot\Bottled water production line\Filling machine\Tank	Timer	mel:R04_1:TagGroup/Tag003

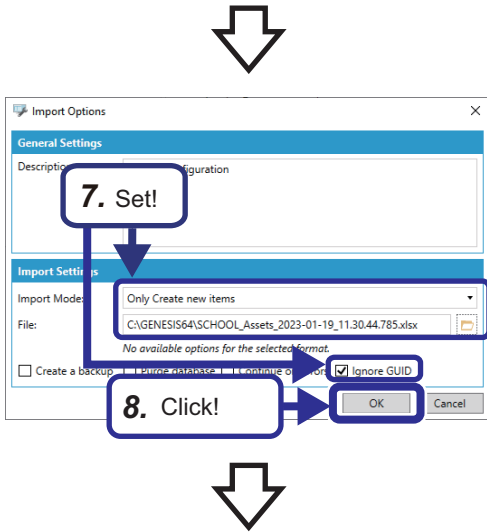
- Equipment properties to be added

Settings			
Target equipment	Name	Real-time Data	
		Source type	Real-time data tag
Level gauge	Volume of water in the container	Dynamic tag	Tag001
Level gauge	Air pressure in the tank	Dynamic tag	Tag002
Tank	Timer	Dynamic tag	Tag003

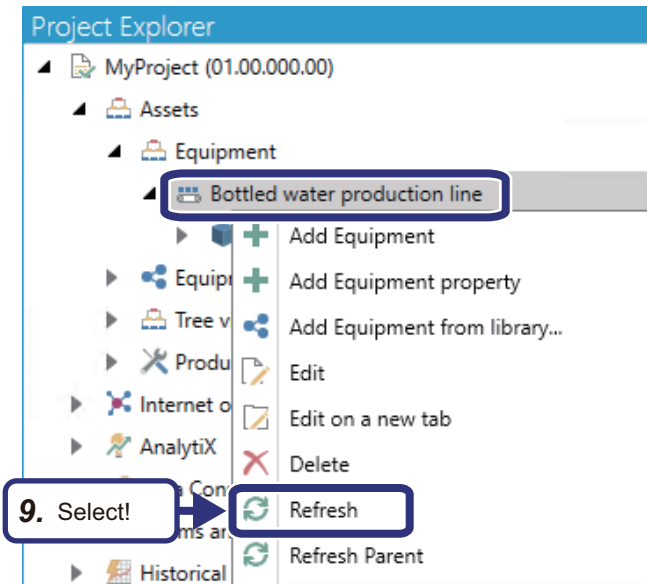




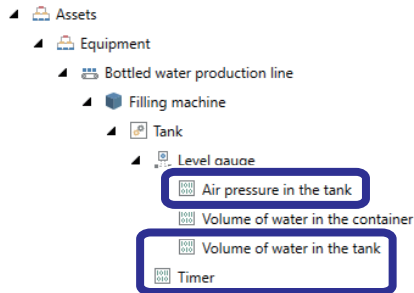
- 5. Save the changes to the file.
- 6. Return to the Workbench, right-click on [Bottled water production line], and select [Import].



- 7. Set "Import Settings" as follows:
[Settings]
Import Mode: Only Create new items
File: The file saved in Step 5
Ignore GUID: Selected
- 8. Click the [OK] button.

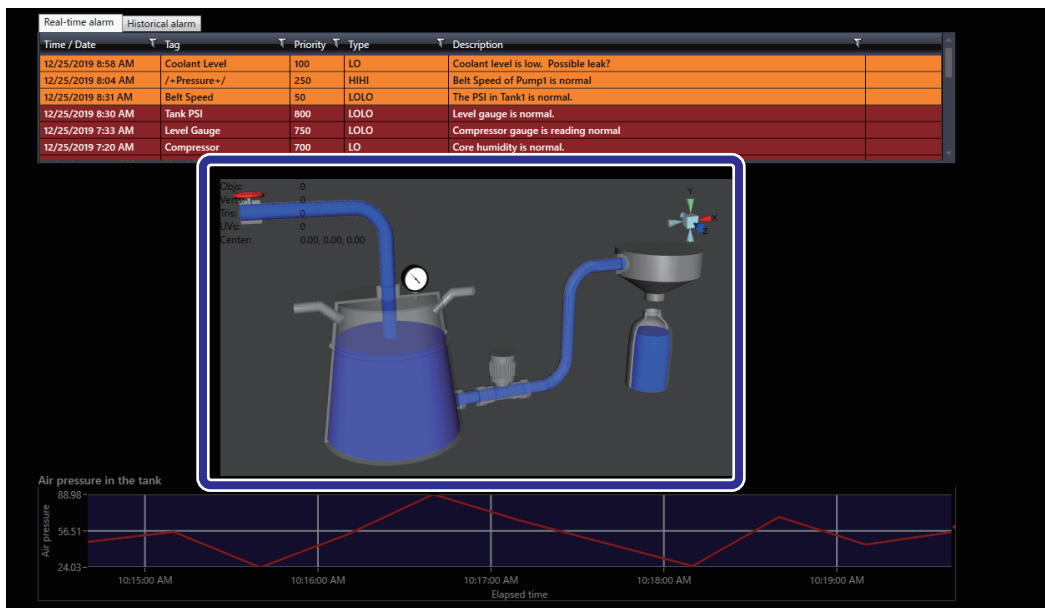


- The import completed message appears. Right-click on [Bottled water production line], and select [Refresh].
- Check that the equipment properties are added.



4.6 Creating a Graphic Screen

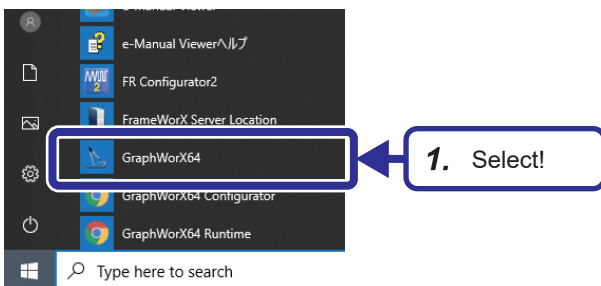
This section describes how to create a graphic screen using GraphWorX™ 64. In this exercise, 3D model data created in advance is used to create a graphic screen.



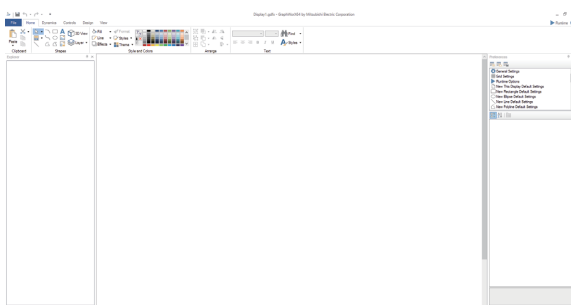
Starting GraphWorX™ 64

Start GraphWorX™ 64.

Operating procedure



1. Select [ICONICS Product Suite] ⇒ [GraphWorX64] from Windows® Start.



2. GraphWorX™ 64 starts up.

Screen configuration

The following is the screen configuration of GraphWorX™ 64.

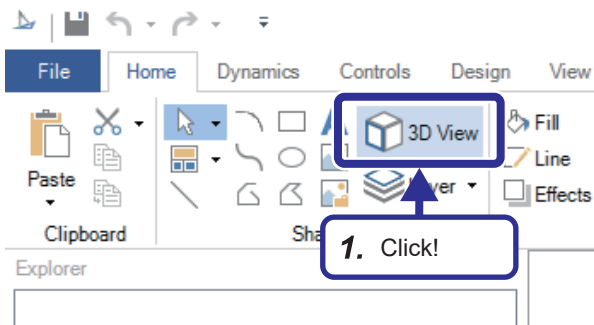


No.	Name	Description	
(1)	Ribbon	This area is used to operate GraphWorX™ 64, for example, adding objects and showing/hiding icons by switching tabs.	
(2)	Docking window	Explorer	This window lists all of the objects placed on the screen and is used to lock, show, and hide those objects. All of the components defined in GraphWorX™ 64 are listed here.
		Data Browser	
		Symbols	
		Toolbox	
(3)	Screen: Canvas	A user places graphics and objects here to create a monitoring screen.	
(4)	Docking window	Properties	This window is used to set properties and dynamics to the objects placed on the screen.
		Dynamics	
		Preferences	
(5)	Status bar	This area displays the status of GraphWorX™ 64.	

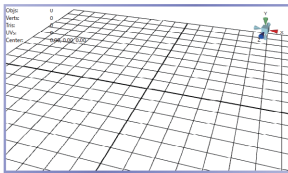
Importing 3D model data

Import the 3D model data of the factory system.

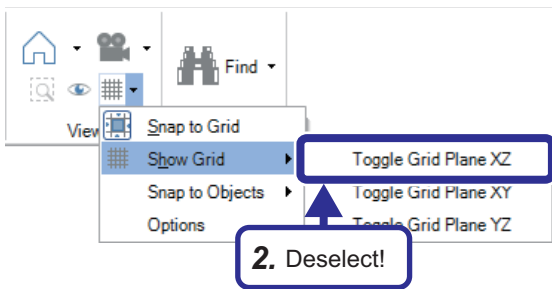
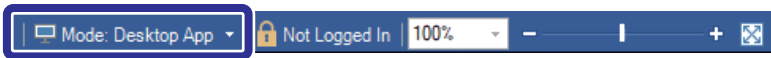
Operating procedure




1. Click the [3D View] button in the [Home] tab^{*1}, and drag the cursor to place the 3D view port in a desired size.

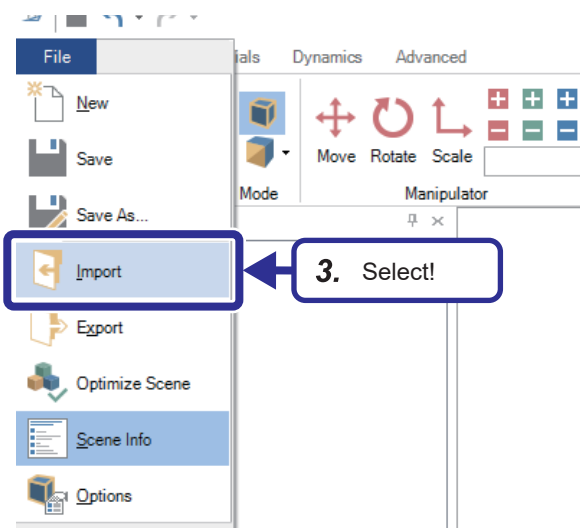


*1 The mode must be set to "Desktop App" in the status bar. (Default: Desktop App)

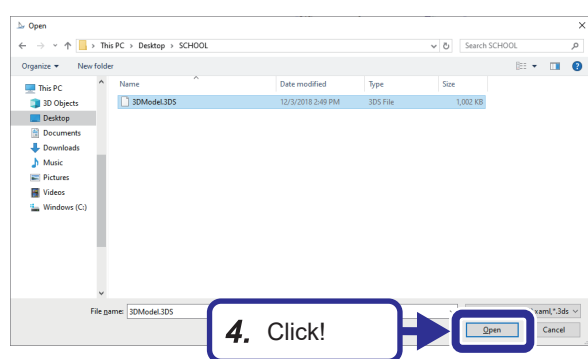


2. Click the  button in the [Home] tab, select [Show Grid], and deselect the [Toggle Grid Plane XZ] checkbox to hide the gridlines.

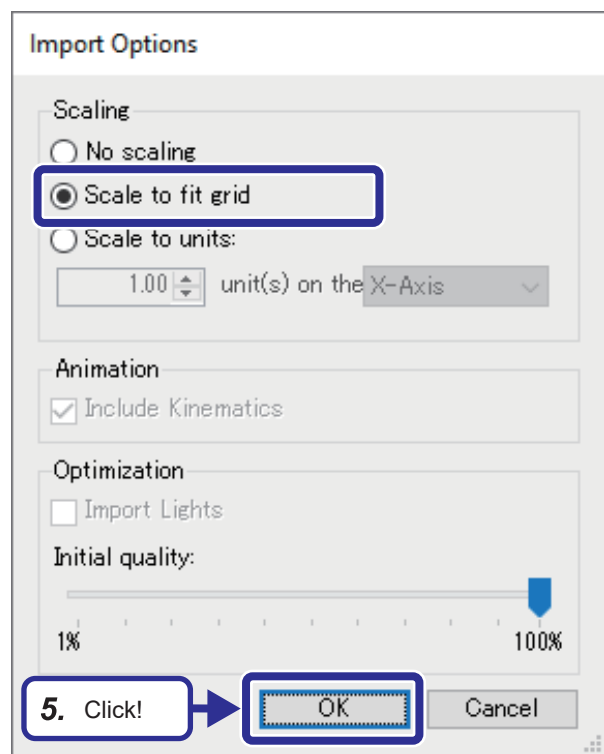




3. Select [File] ⇒ [Import] from the menu.

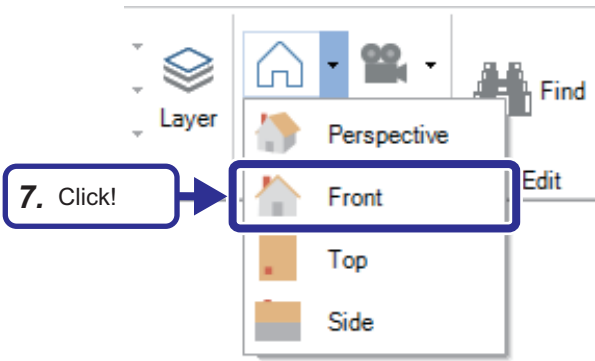


4. Select the "3DModel.3DS" file, and click the [Open] button.

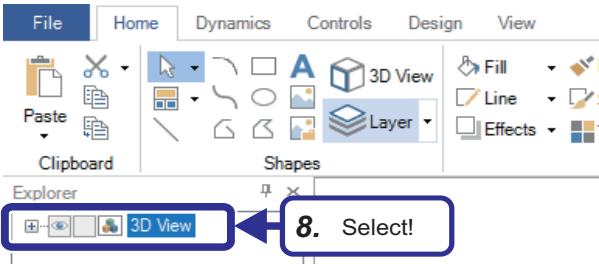
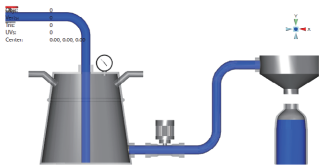


5. Select "Scale to fit grid", and click the [OK] button.

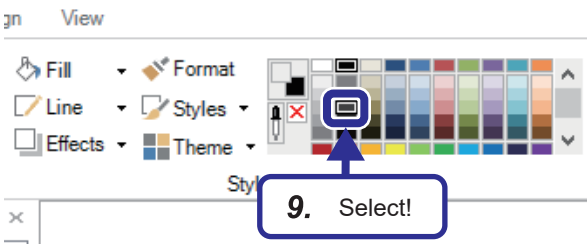




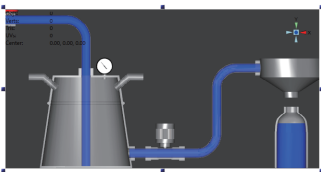
- 6. The 3D model data selected is imported to the 3D viewport.
- 7. Click the [Projection Modes] button in the [Home] tab, and select [Front].



- 8. Select [3D View].



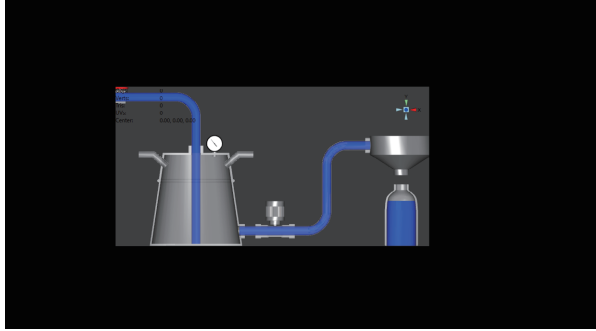
- 9. Select "Gray (R: 63, G: 63, B: 63)" from the color palette in the [Home] tab to change the background color of the 3D viewport.





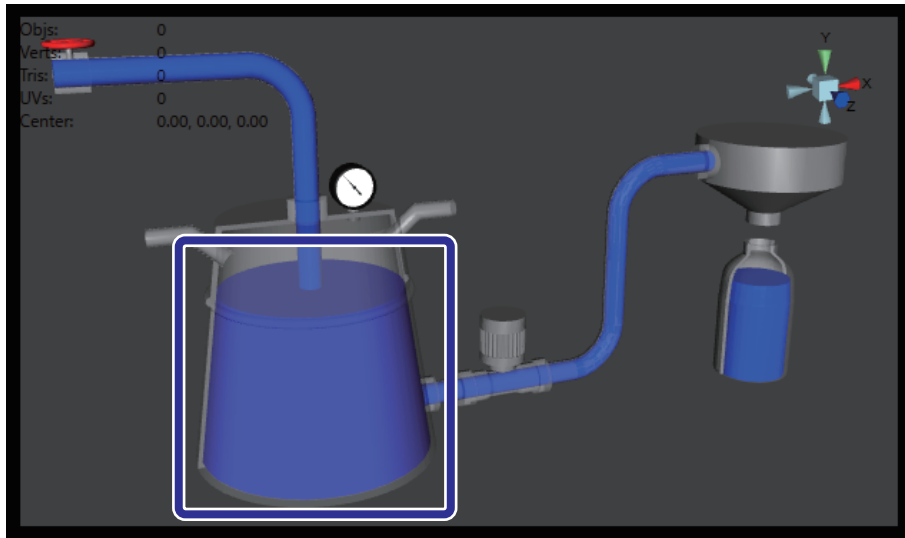
10. Select the GraphWorX™64 screen.

11. Select "Black (R: 0, G: 0, B: 0)" from the color palette in the [Home] tab to change the background color of the GraphWorX™64 screen.




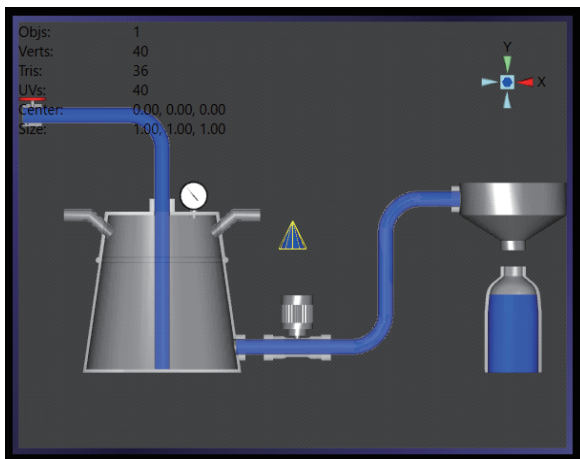
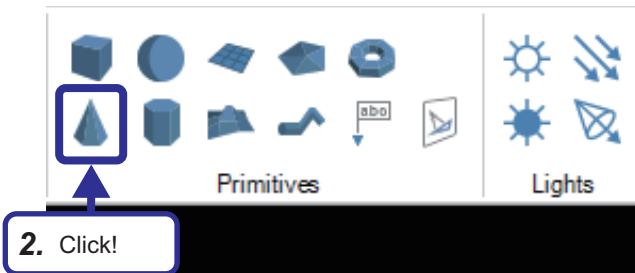
Creating a 3D object

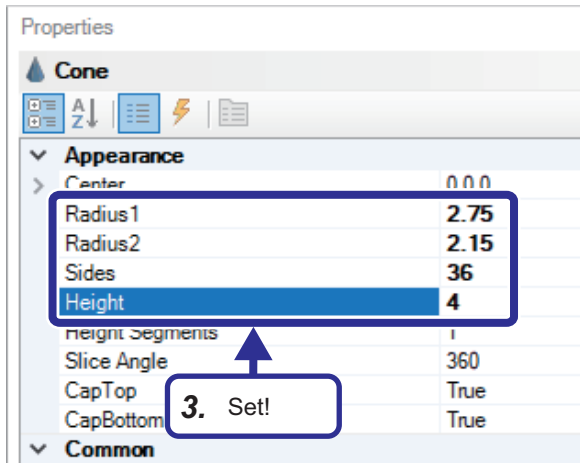
Create a 3D object for water in the tank.



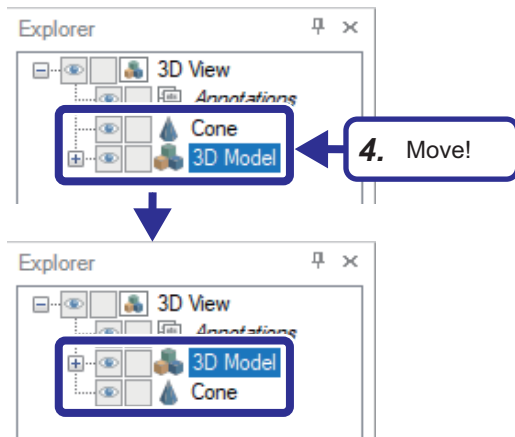
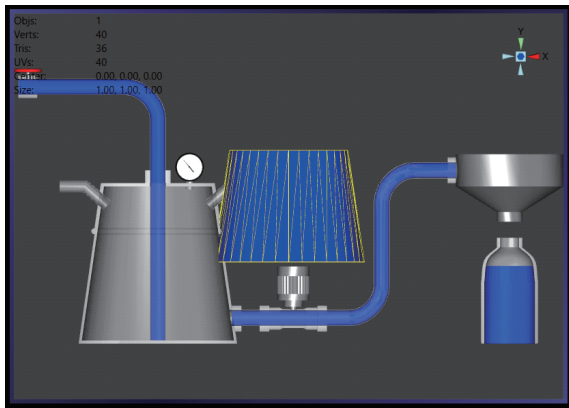
Operating procedure

1. Double-click the 3D object.
2. Click  in the [Home] tab.



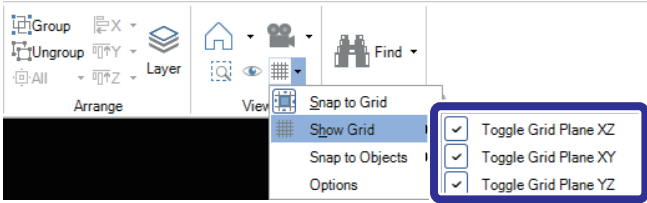


3. Select the [Properties] tab, and set "Appearance" as follows:
 [Settings]
 Radius1: 2.75
 Radius2: 2.15
 Sides: 36
 Height: 4

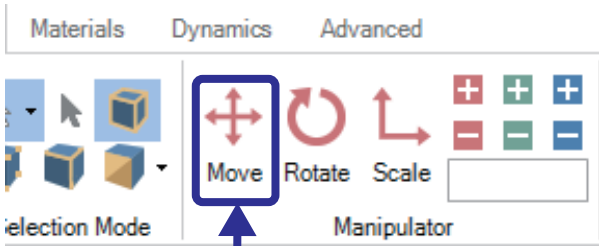
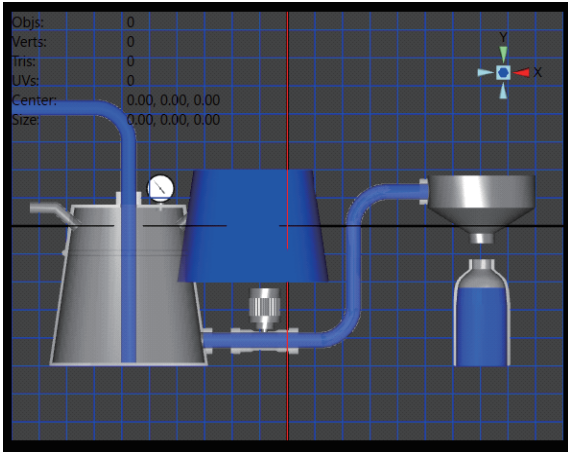


4. Move the [3D Model] hierarchy above the [Cone] hierarchy under [3D View] in the [Explorer] tab.






5. Select!

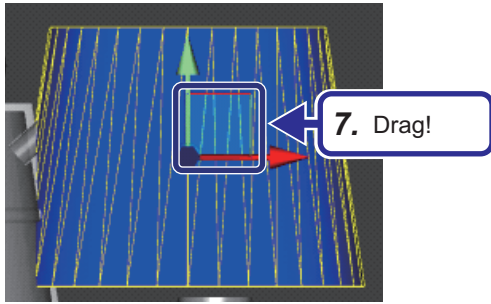


6. Click!

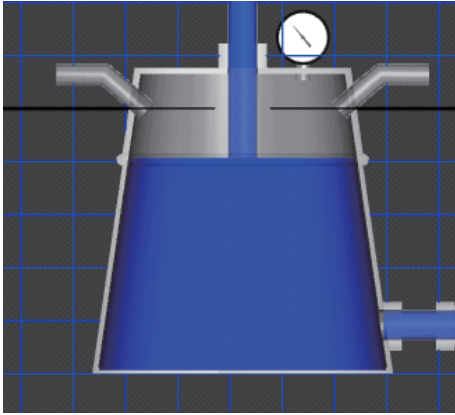


- 5. Click the  button in the [Home] tab, select [Show Grid], and select the [Toggle Grid Plane XZ] checkbox to show the gridlines. In the same way, select the [Toggle Grid Plane XY] and [Toggle Grid Plane YZ] checkboxes to show the respective gridlines.

- 6. Click the [Move] button in the [Home] tab.

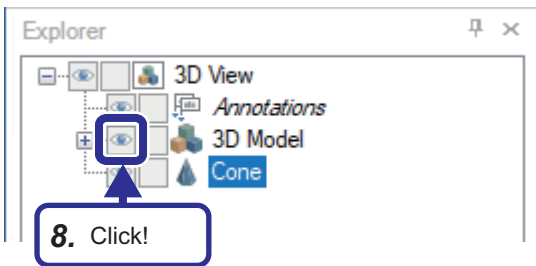


7. Select the cone object. The move manipulator icon appears on the selected object. Click and drag the icon to move the object, and align the object position to the bottom of the tank.

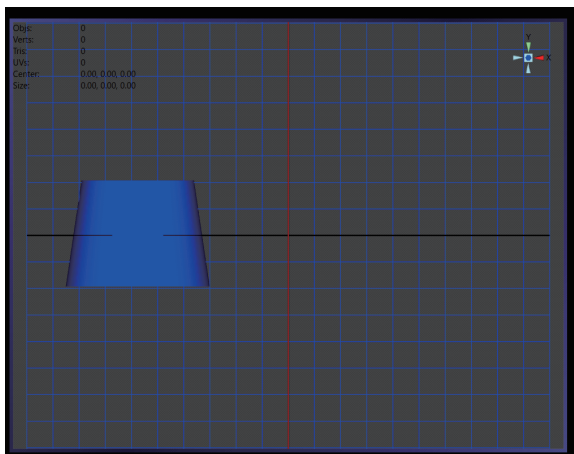


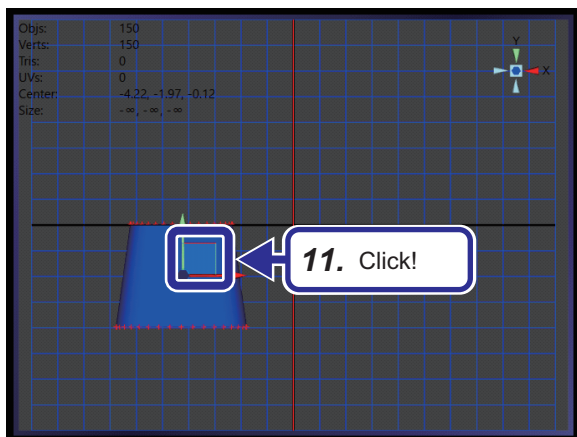
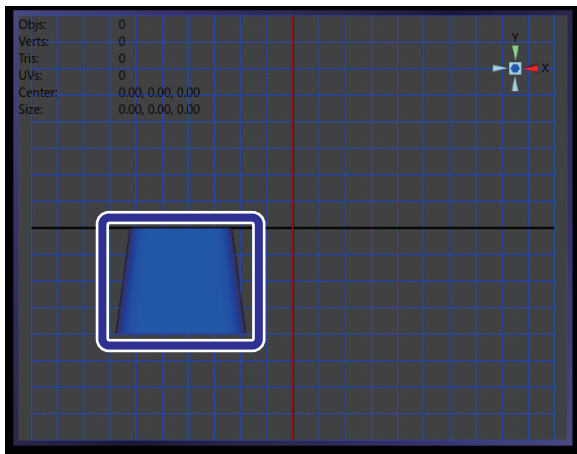
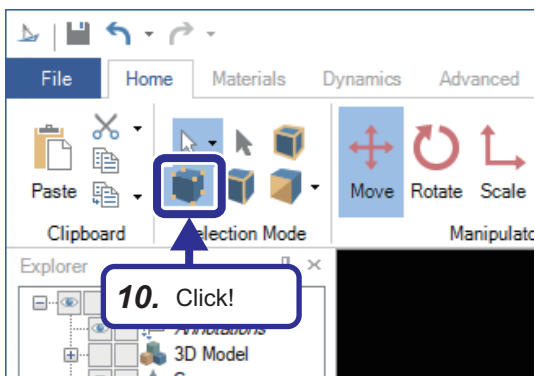
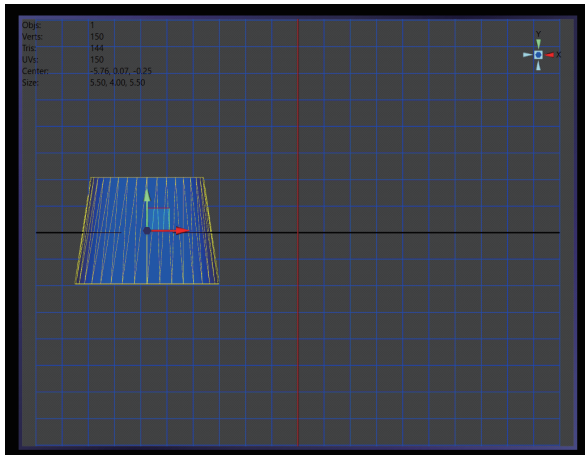
Point

To align the object more precisely, hold down the **[Alt]** key and the scroll wheel at the same time, and click and drag the object. The object can be moved freely (up or down, left or right) with a clicked point as a center.




8. Select [3D View] ⇒ [3D Model] in the [Explorer] tab, and click of [3D Model] to hide the 3D model object.

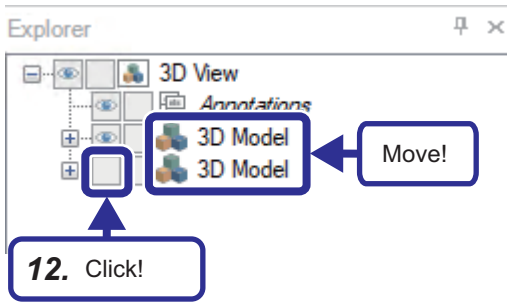




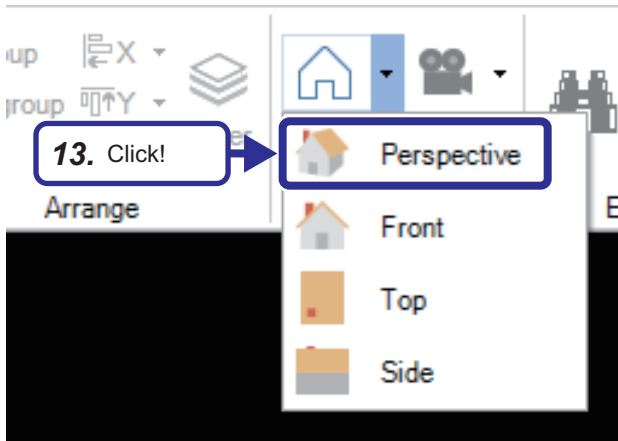
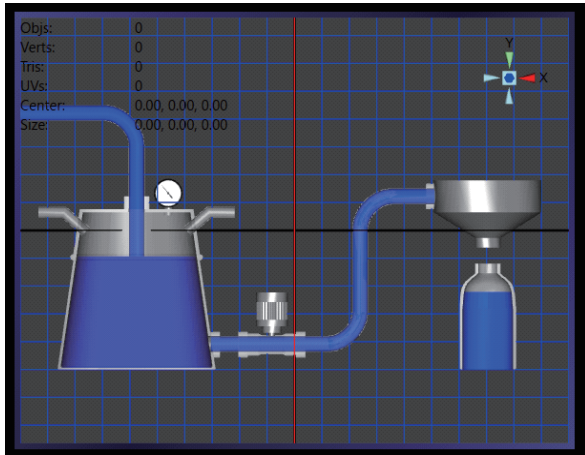
9. Check the gridlines and the object position, and move the object so that its position is aligned with the hidden tank position. (Display the 3D model object again as necessary.)

10. Click  (Only vertices can be selected) in the [Home] tab.

11. Select the object, and click the light blue area enclosed by the X- and Y-axis arrows.

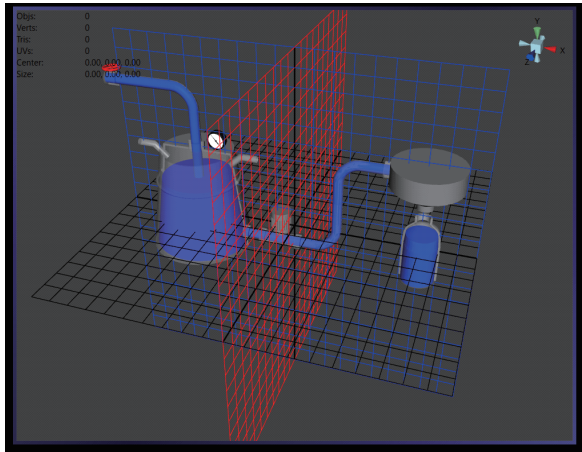


12. Move the lower [3D Model] (Tank) hierarchy above the upper [3D Model] (Cone) hierarchy in the [Explorer] tab in the same way as Step 4. Then, click of [3D Model] to show the 3D model object.

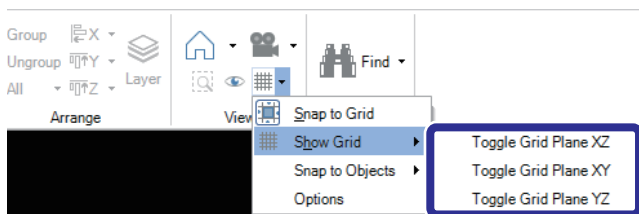



13. Click the [Projection Modes] button in the [Home] tab, and select [Perspective].



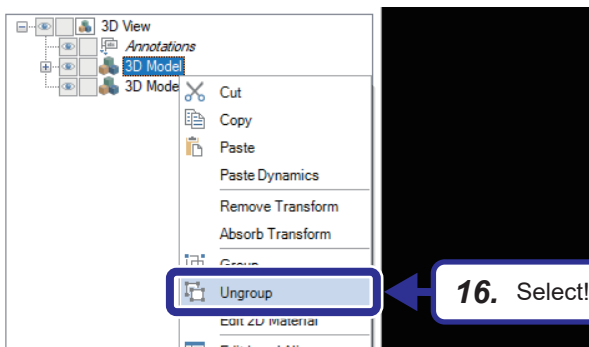
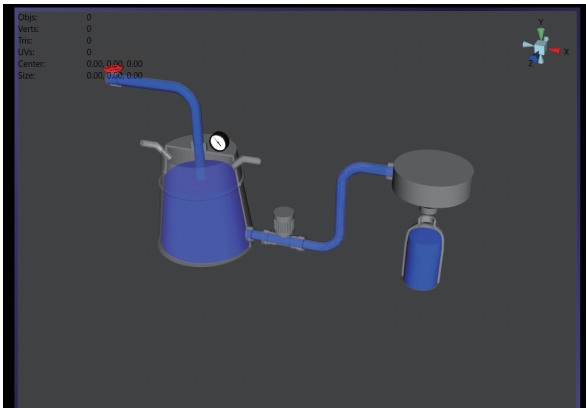


- 14.** Check that the corn object position is aligned with the tank position referring to the gridlines.



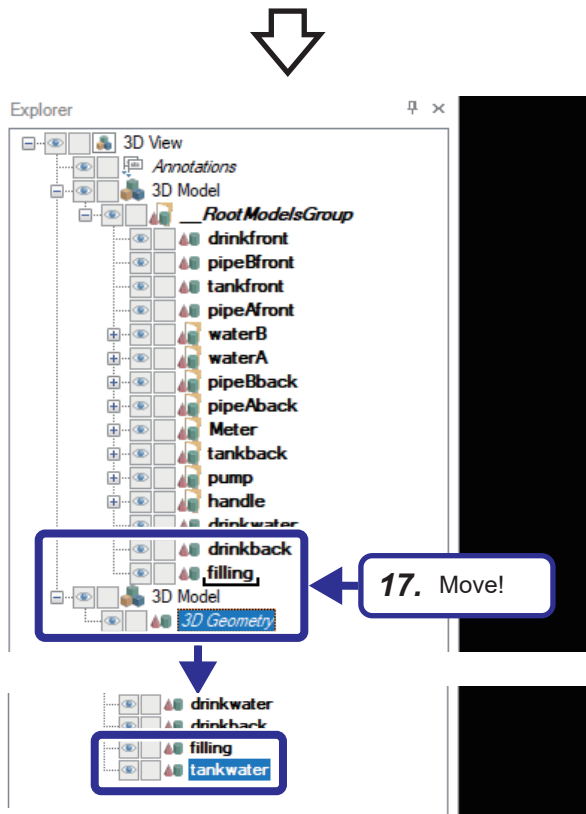
- 15.** Click the  button in the [Home] tab, select [Show Grid], and deselect the [Toggle Grid Plane XZ] checkbox to hide the gridlines. In the same way, deselect the [Toggle Grid Plane XY] and [Toggle Grid Plane YZ] checkboxes to hide the respective gridlines.

15. Deselect!

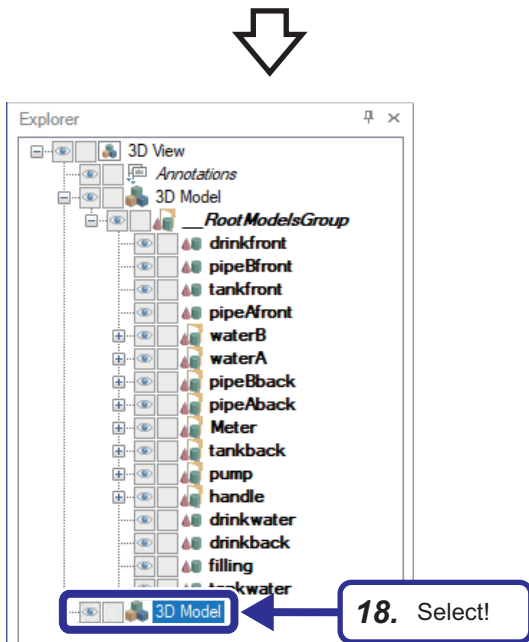


- 16.** Select [3D View] ⇒ [3D Model] in the [Explorer] tab, right-click on [3D Model], and select [Ungroup]. (The imported 3D model object is ungrouped.)

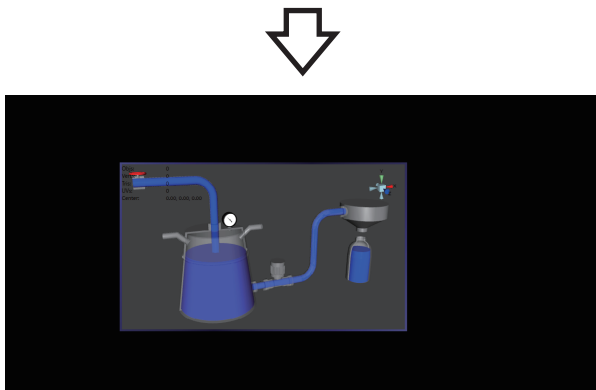
16. Select!



17. Select the [3D Geometry] hierarchy in [3D View] ⇒ [3D Model], move the hierarchy into [3D View] ⇒ [3D Model] ⇒ [__RootModelsGroup], and change the object name to "tankwater" in the [Explorer] tab. (Move the object created using GraphWorX™64 into the imported 3D model hierarchy.)



18. Select [3D View] ⇒ [3D Model] in the [Explorer] tab, and press the **[Delete]** key. (Delete the emptied 3D model hierarchy.)



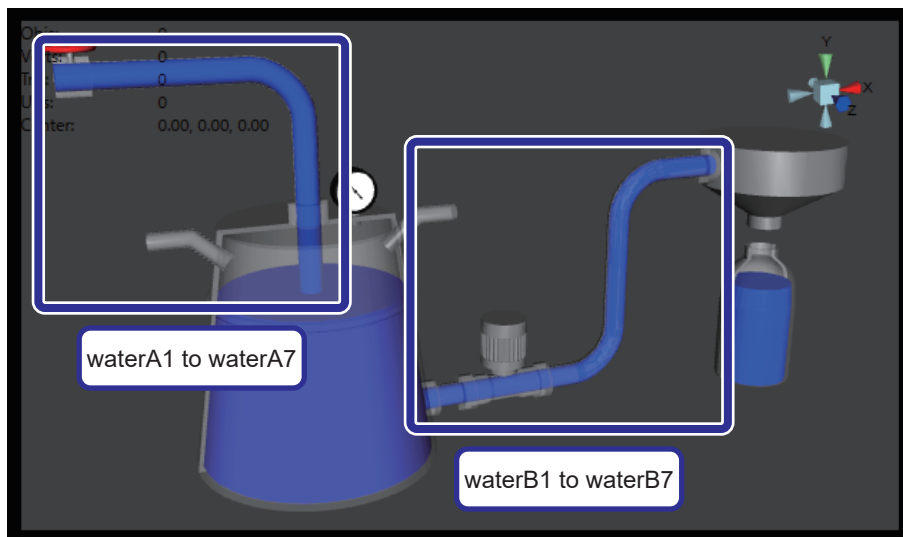
19. Click the 3D model holding down the **[Alt]** key, and drag it in order to adjust the center.

4.7 Setting Animation

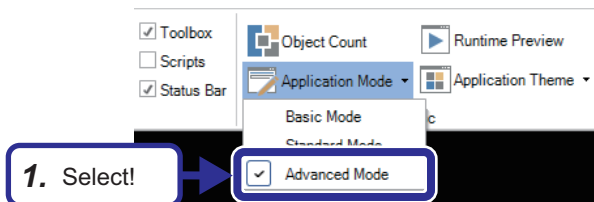
This section describes how to set dynamic parameters to the created objects. By setting dynamic parameters, the objects behave in conjunction with the real-time data of the equipment properties.

Setting the Hide dynamic

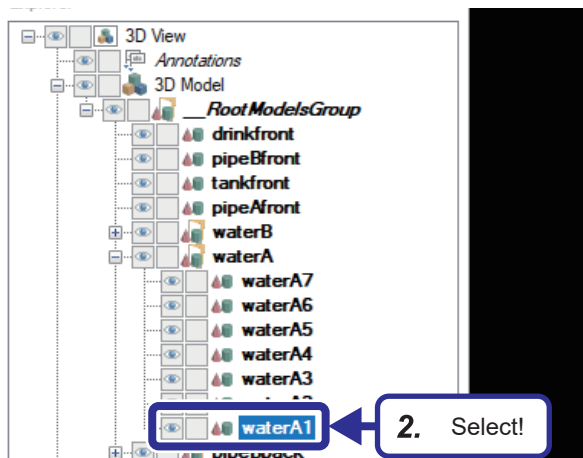
Set a dynamic for switching the show/hide status of objects to create animation. The animation of the water flowing in the pipe is realized by switching the show/hide status of multiple objects with a lapse of time.



Operating procedure

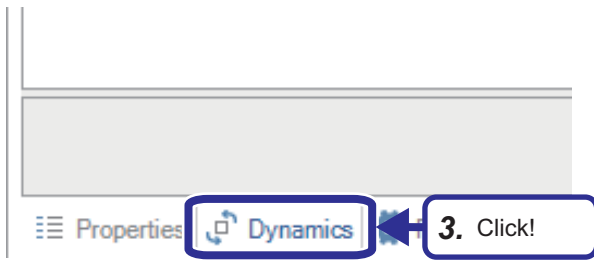


1. Select "Advanced Mode" for "Application Mode" in the [View] tab.

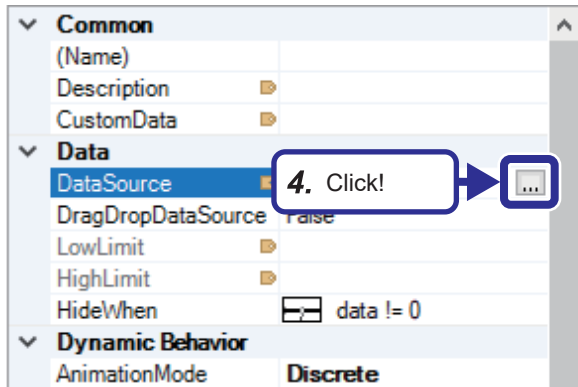


2. Select [3D View] ⇒ [3D Model] ⇒ [_RootModelsGroup] ⇒ [waterA] ⇒ [waterA1] in the [Explorer] tab.

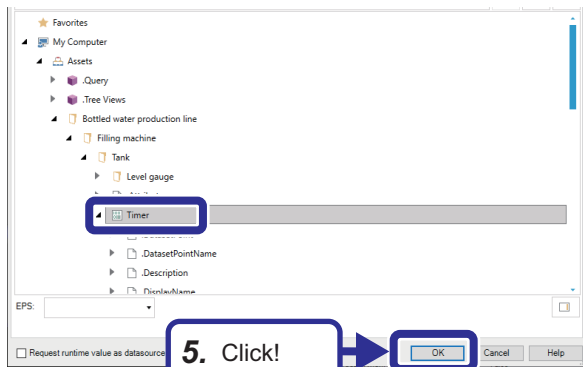




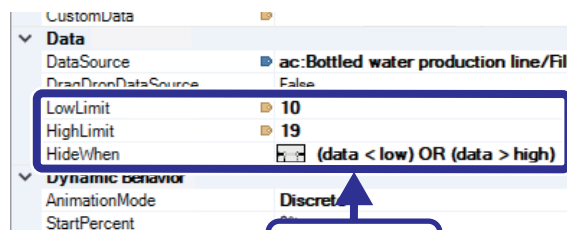
3. Click the [Dynamics] tab.



4. Select [Data] ⇒ [DataSource], and click .

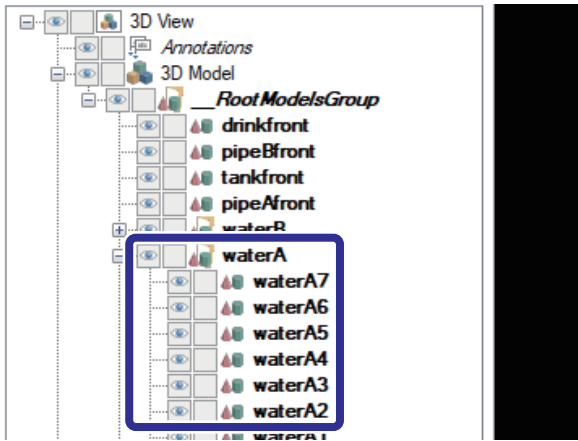


5. Select [My Computer] ⇒ [Assets] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Timer], and click the [OK] button.



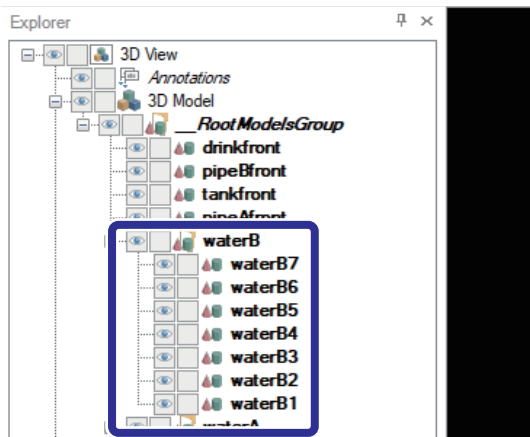
6. Set "Data" as follows:
 [Settings]
 LowLimit: 10
 HighLimit: 19
 HideWhen: (data < low) OR (data > high)





7. Also set parameters to other objects in the same hierarchy in the [Explorer] tab as follows:

Object name	Data			
	DataSource	LowLimit	HighLimit	HideWhen
waterA2	[Assets] ⇒ [Bottled water production line]	20	29	(data < low) OR (data > high)
waterA3	⇒ [Filling machine] ⇒ [Tank] ⇒ [Timer]	30	39	(data < low) OR (data > high)
waterA4		40	49	(data < low) OR (data > high)
waterA5		50	59	(data < low) OR (data > high)
waterA6		60	69	(data < low) OR (data > high)
waterA7		70	79	(data < low) OR (data > high)



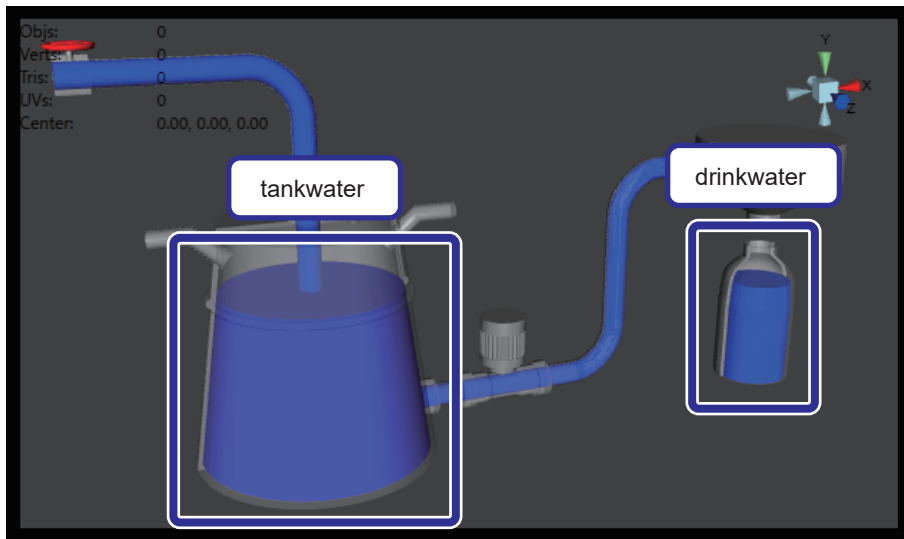
8. Also set parameters to the objects in the [waterB] hierarchy in the [Explorer] tab in the same way.

Object name	Data			
	DataSource	LowLimit	HighLimit	HideWhen
waterB1	[Assets] ⇒ [Bottled water production line]	90	99	(data < low) OR (data > high)
waterB2	⇒ [Filling machine] ⇒ [Tank] ⇒ [Timer]	100	109	(data < low) OR (data > high)
waterB3		110	119	(data < low) OR (data > high)
waterB4		120	129	(data < low) OR (data > high)
waterB5		130	139	(data < low) OR (data > high)
waterB6		140	149	(data < low) OR (data > high)
waterB7		150	159	(data < low) OR (data > high)

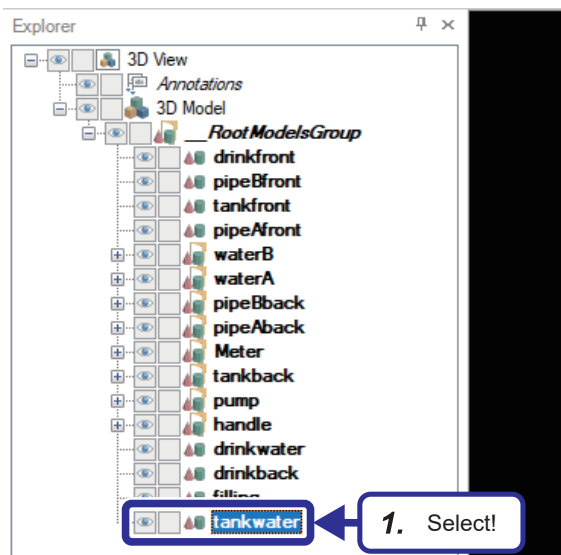
Setting the Size dynamic

Set a dynamic for resizing objects in animation.

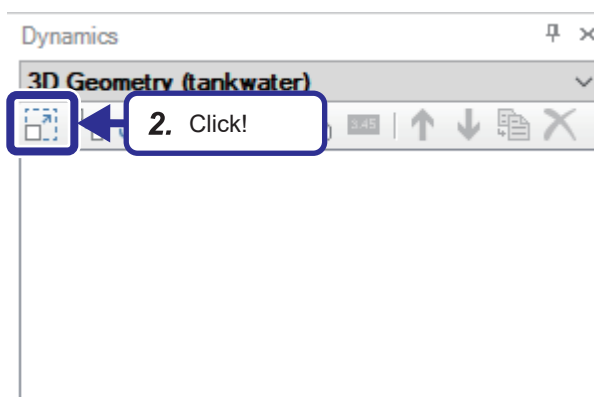
The animation of the water being filled in the tank and container is realized by resizing objects.




Operating procedure



1. Select [3D View] ⇒ [3D Model] ⇒ [__RootModelsGroup] ⇒ [tankwater] in the [Explorer] tab.

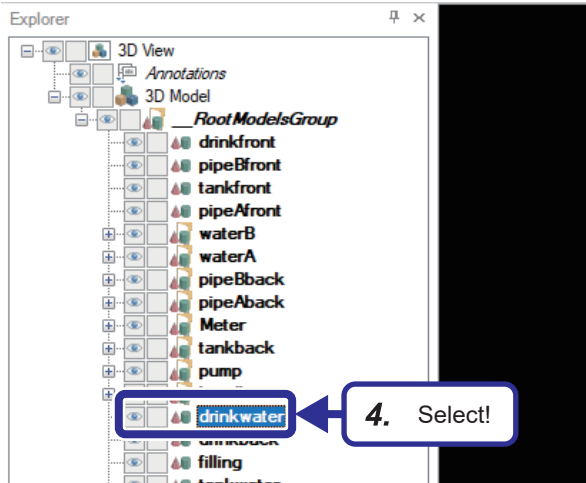


2. Select the [Dynamics] tab, and click .

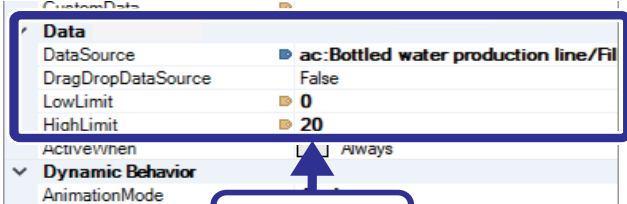




3. Set!



4. Select!



5. Set!

- Set "Data" as follows in the same way as for the Hide dynamic parameters:
[Settings]
DataSource: [Assets] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Level gauge] ⇒ [Volume of water in the tank]
LowLimit: 0
HighLimit: 20

- Select [3D View] ⇒ [3D Model] ⇒ [__RootModelsGroup] ⇒ [drinkwater] in the [Explorer] tab.

4

- Set "Data" as follows in the same way as for the Hide dynamic parameters:
[Settings]
DataSource: [Assets] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Level gauge] ⇒ [Volume of water in the container]
LowLimit: 0
HighLimit: 20

4.8 Checking the Operation on the Graphic Screen

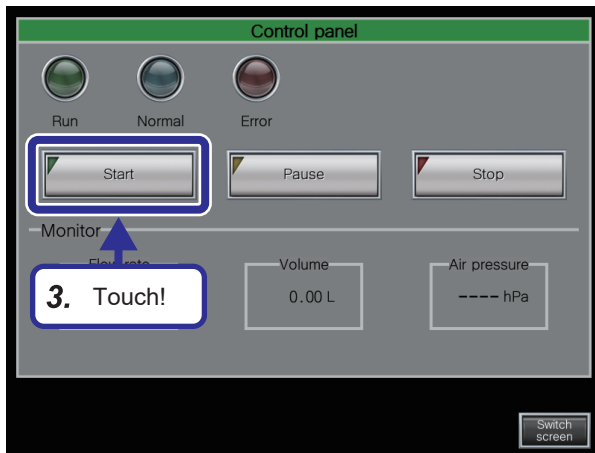
This section describes how to check the operation on the graphic screen in Runtime mode.

Operating procedure

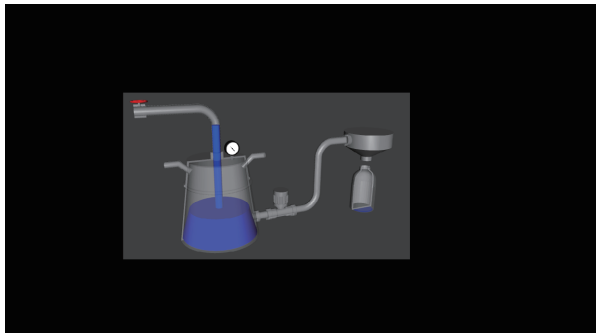
1. Set the RUN/STOP/RESET switch of the CPU module to the RUN position.
2. Click the [Runtime] button.

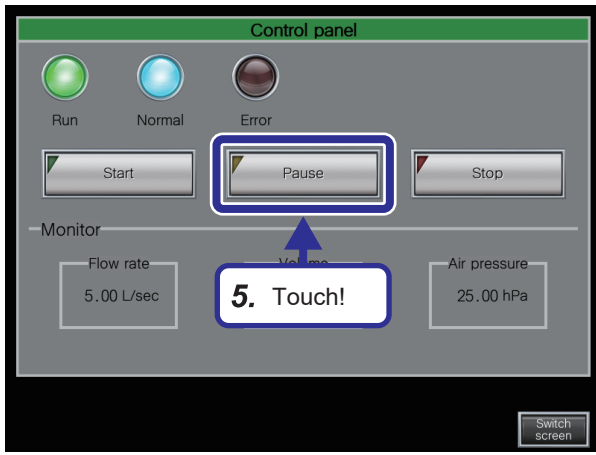


3. Touch the [Start] button on the GOT.



4. The system starts its operation and the animation starts.
[Lamp]
Run: On

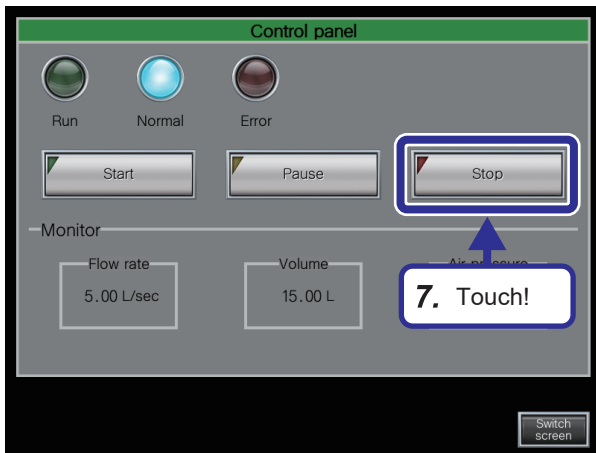




5. Touch the [Pause] button on the GOT.



6. The system stops its operation and the animation stops.
[Lamp]
Run: Off



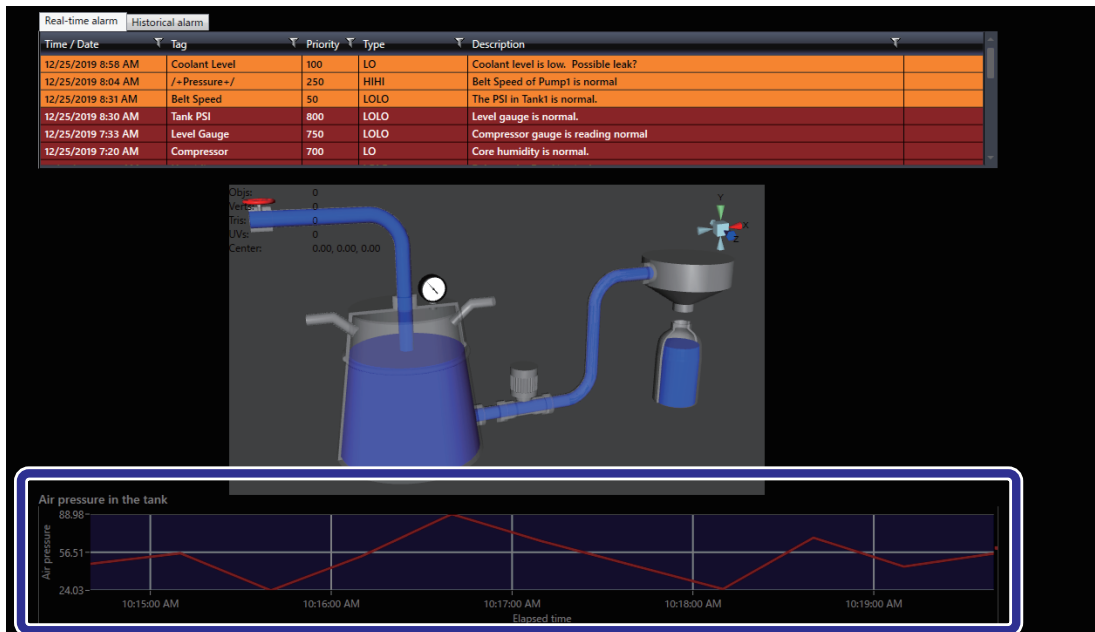
7. Touch the [Stop] button on the GOT.



8. The system stops its operation and the animation returns to default.
[Lamp]
Run: Off

4.9 Creating a Trend Graph

This section describes how to create a trend graph using the TrendWorX™64 Viewer.



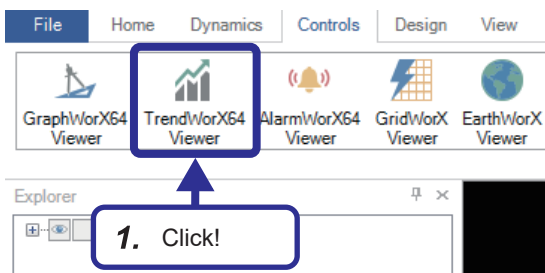
Setting a trend graph

Display the air pressure in the tank in a trend graph.

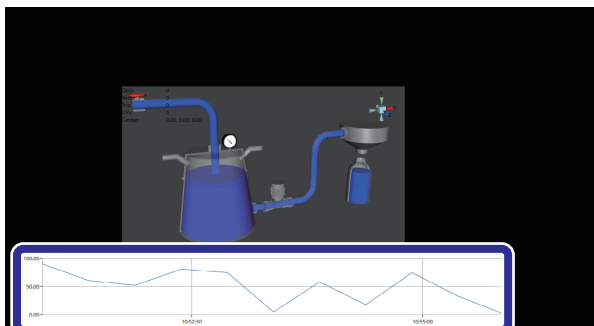
A trend graph displays the air pressure in the tank when equipment properties are set.

Placing a trend graph viewer

Operating procedure

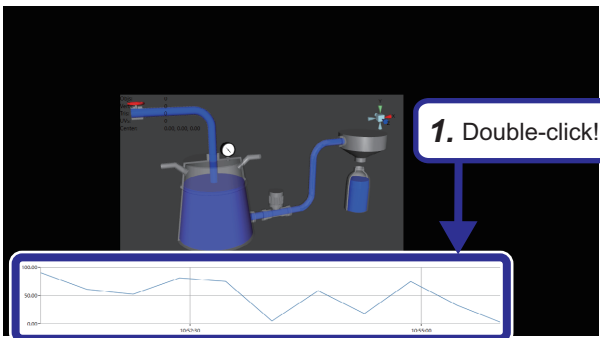


1. Click the [TrendWorX64 Viewer] button in the [Controls] tab, and drag the cursor to place the viewer in a desired size.

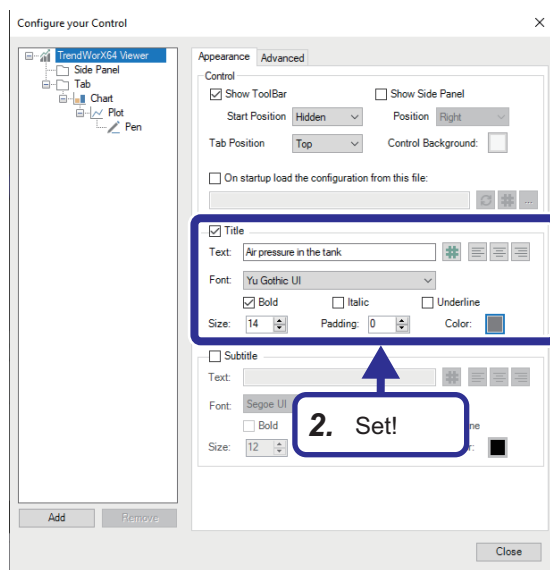



Setting a trend graph (TrendWorX™ 64 Viewer)

Operating procedure



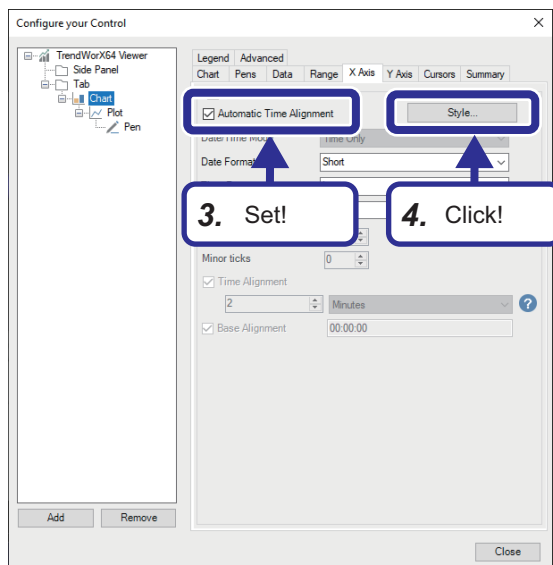
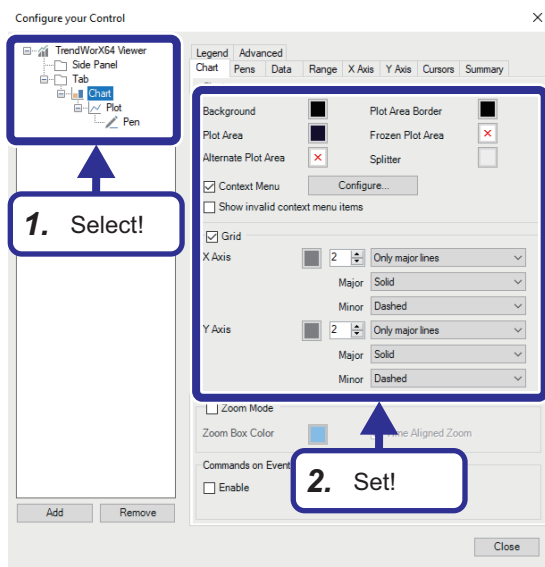
1. Double-click the trend graph viewer.



2. Set the following in the [Appearance] tab:
[Settings]
Title: Selected
Text: Air pressure in the tank
Text justification:  (left align)
Bold: Selected
Size: 14
Color: Gray (R: 127, G: 127, B: 127)

Setting a trend graph (chart)

Operating procedure

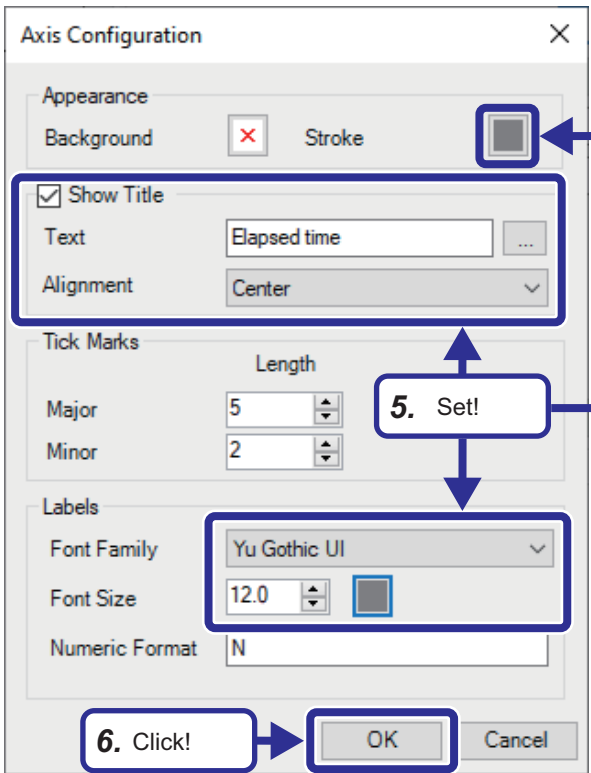


1. Select [TrendWorX64 Viewer] ⇒ [Tab] ⇒ [Chart] in the tree.

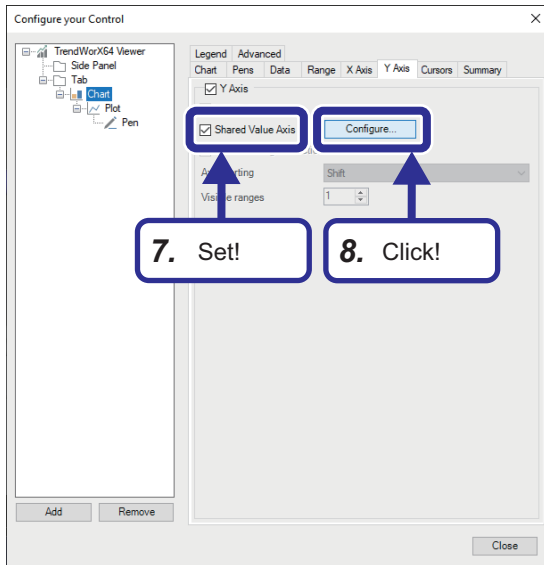
2. Set the following in the [Chart] tab:
[Settings]
Background: Black (R: 0, G: 0, B: 0)
Plot Area: Navy (R: 0, G: 16, B: 48)
"X Axis"
Color: Gray (R: 127, G: 127, B: 127)
Stroke thickness: 2
"Y Axis"
Color: Gray (R: 127, G: 127, B: 127)
Stroke thickness: 2

3. Set the following in the [X Axis] tab:
[Settings]
Automatic Time Alignment: Selected

4. Click the [Style] button.

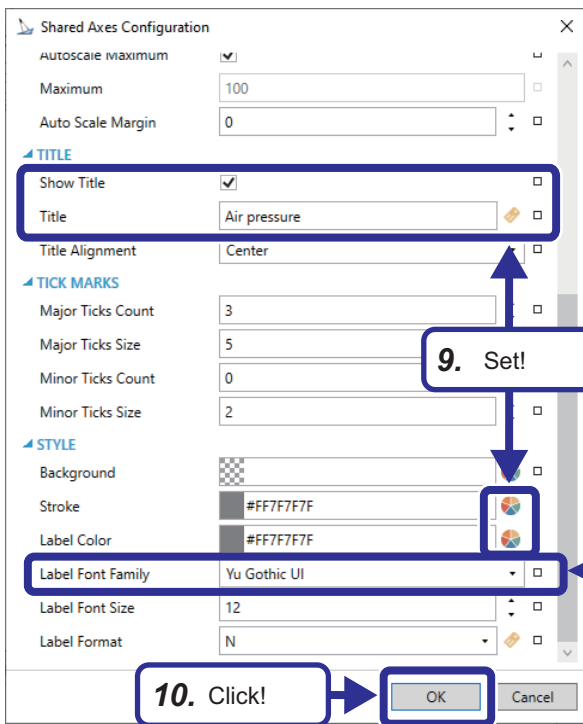


- 5. Set "Axis Configuration" as follows:
[Settings]
"Appearance"
Stroke: Gray (R: 127, G: 127, B: 127)
"Show Title"
Show Title: Selected
Text: Elapsed time
"Labels"
Font Family: Yu Gothic UI
Color: Gray (R: 127, G: 127, B: 127)
- 6. Click the [OK] button.



- 7. Set the following in the [Y Axis] tab:
[Settings]
Shared Value Axis: Selected
- 8. Click the [Configure] button.

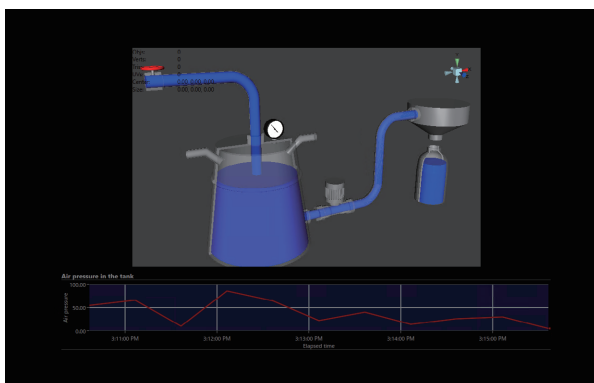
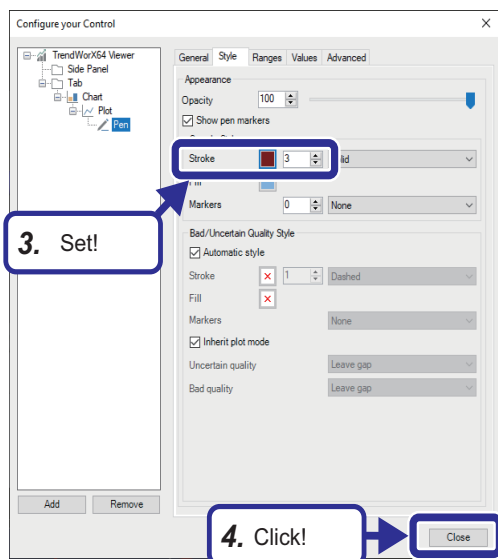
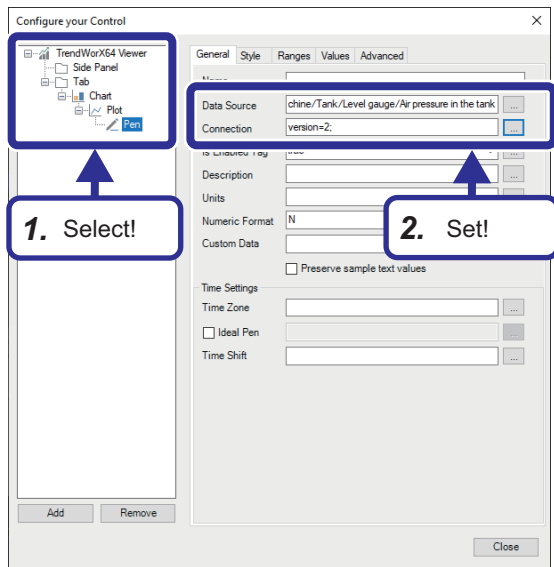




9. Set "Shared Axis Configuration" as follows:
 [Settings]
 "TITLE"
 Show Title: Selected
 Title: Air pressure
 "STYLE"
 Stroke: Gray (R: 127, G: 127, B: 127)
 Label Color: Gray (R: 127, G: 127, B: 127)
 Label Font Family: Yu Gothic UI
10. Click the [OK] button.

Setting a trend graph (pen)

Operating procedure



1. Select [TrendWorX64 Viewer] ⇒ [Tab] ⇒ [Chart] ⇒ [Plot] ⇒ [Pen] in the tree.
2. Set the following in the [General] tab:
[Settings]
Data Source: [Assets] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Level gauge] ⇒ [Air pressure in the tank]
Connection: Autodetect

4

3. Set the following in the [Style] tab:
[Settings]
Stroke: Red (R: 128, G: 0, B: 0)
Stroke thickness: 3
4. Click the [Close] button.

5. A trend graph is created based on the settings.

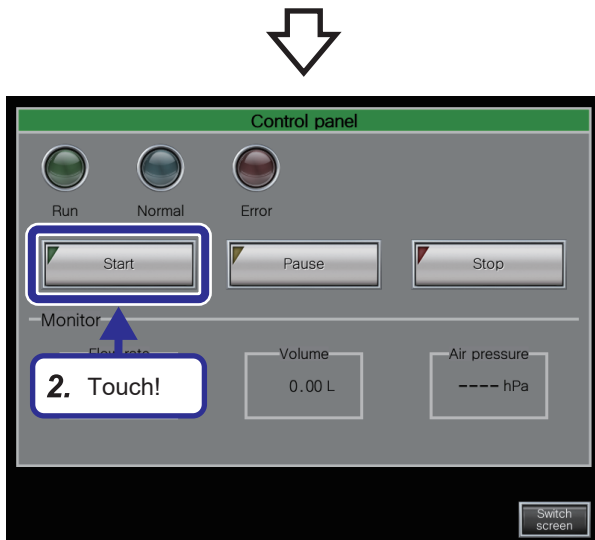
4.10 Checking the Operation of the Trend Graph

This section describes how to check the operation of the created trend graph in Runtime mode.

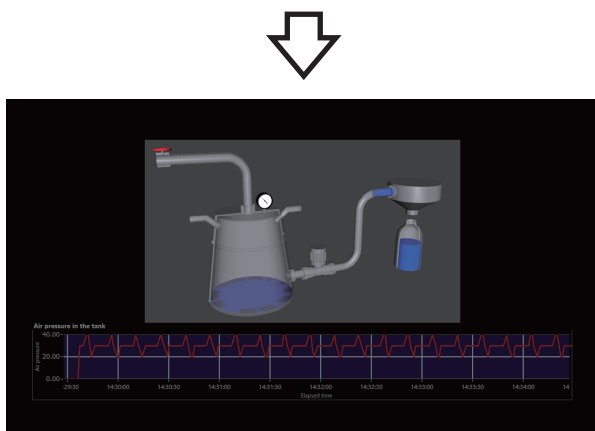
Operating procedure



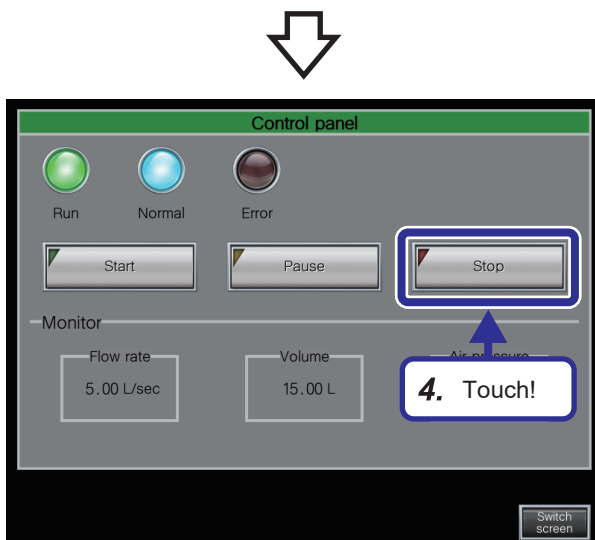
1. Click the [Runtime] button.



2. Touch the [Start] button on the GOT.



3. Change of the trend graph can be monitored in accordance with the animation.



4. Touch the [Stop] button on the GOT.

4.11 Setting an Alarm

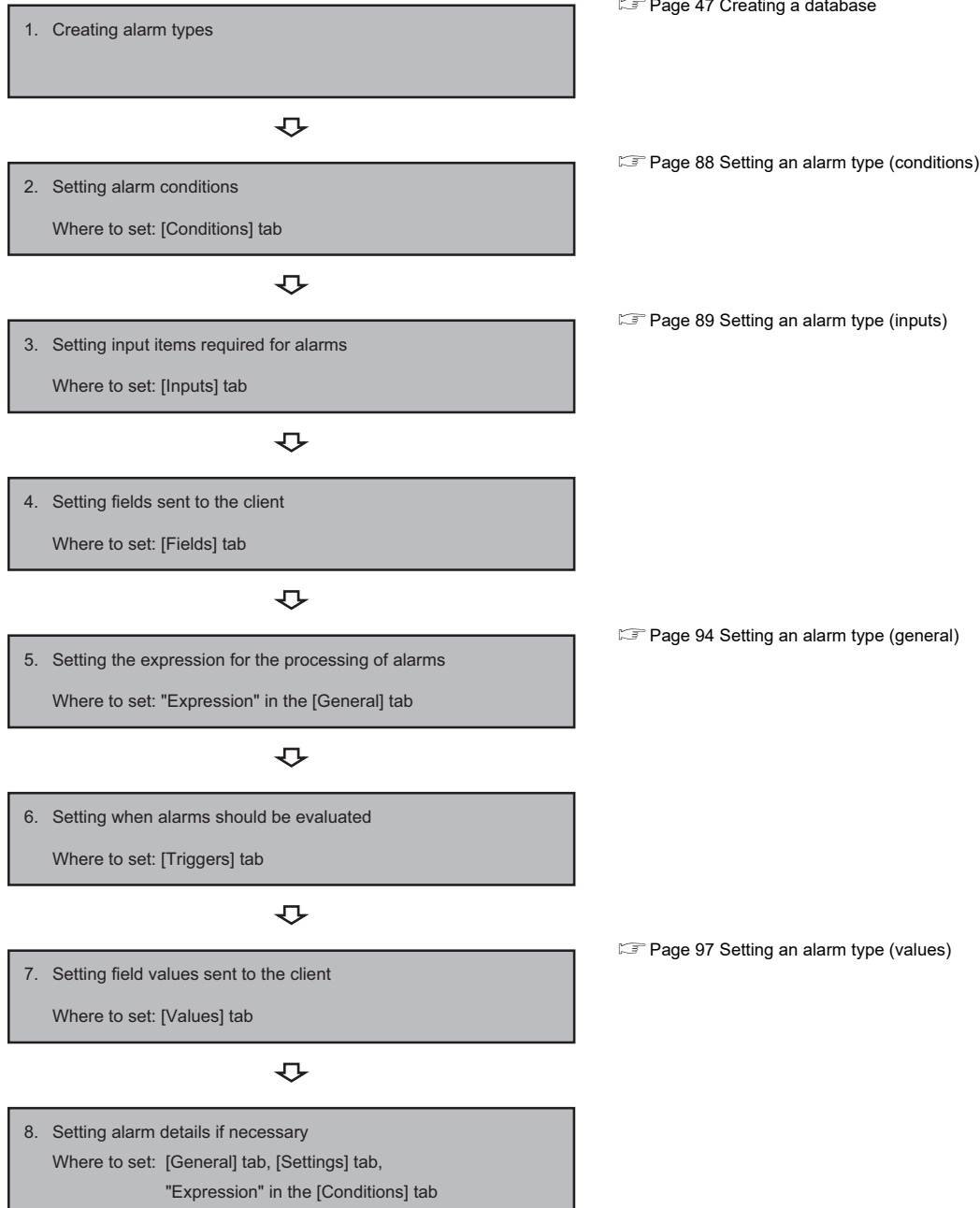
Setting a real-time alarm

Set a real-time alarm using the Hyper Alarm Server™.

Setting an alarm type

Create an alarm type (alarm definition) using the Hyper Alarm Server™.

The following is the alarm type setting procedure.



In this exercise, we add settings to the existing high limit alarm so that the low low limit and low limit alarms can also be detected. (We change the settings of the alarm type "Limit".)

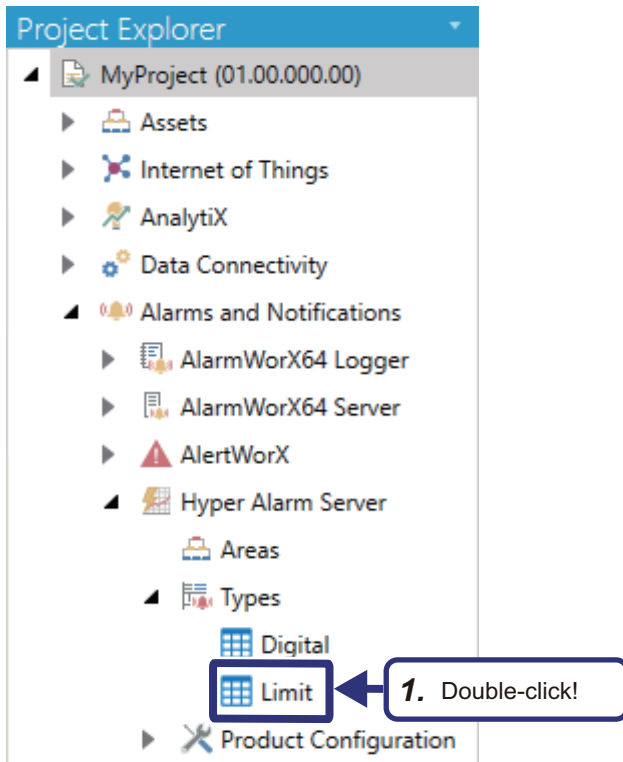
The settings in the following tabs remain unchanged.

- [Fields] tab
- [Triggers] tab
- [Settings] tab

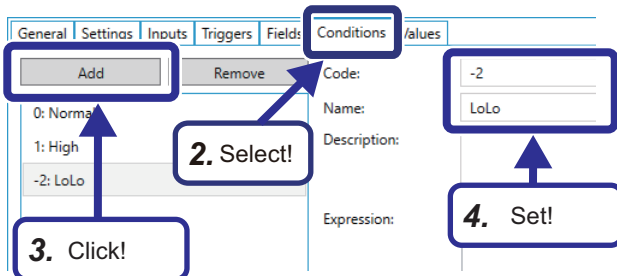
Setting an alarm type (conditions)

Add the low low limit and low limit alarm conditions.

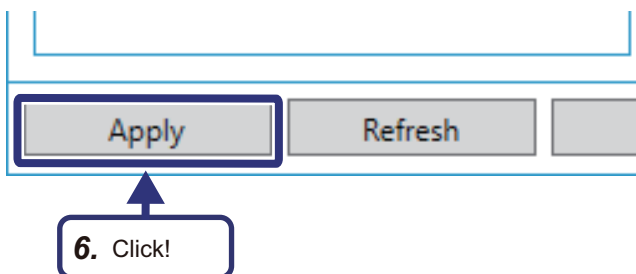
Operating procedure



1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [Types] ⇒ [Limit] in the "Project Explorer" window. Double-click [Limit].



2. Select the [Conditions] tab.
3. Click the [Add] button.
4. Set [Code] and [Name] as follows:
[Settings]
Code: -2
Name: LoLo
5. Add the settings to the Lo limit alarm condition in the same way.
[Settings]
Code: -1
Name: Lo
6. Click the [Apply] button.



Point

- At least one normal condition and one alarm condition must be set.
- Set "0" to the code for the normal condition.

Setting an alarm type (inputs)

Add values to the input items required for the low low limit and low limit alarms.

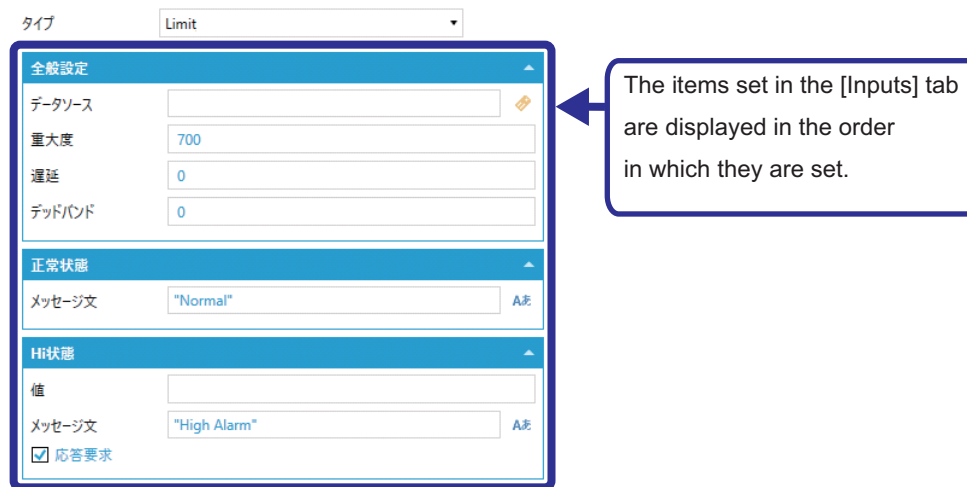
The values set in the [Inputs] tab are displayed on the alarm setting screen. (For details, refer to Page 102 Setting an Alarm.)

■[Inputs] tab

General Settings	Data Source
General Settings	Severity
General Settings	Delay
General Settings	Deadband
Return To Normal	Message Text
Hi Condition	Value
Hi Condition	Message Text
Hi Condition	Requires Ack

■Alarm setting screen

タイプ Limit



In this exercise, we add values for the LoLo and Lo conditions.

Input item		Description
Category	Display Name	
General Settings	Data Source	Data source of the alarm
	Severity	Severity of the alarm
	Delay	Alarm delay ^{*1} setting
	Deadband	Deadband of the alarm
LoLo Condition	Value	Threshold value for the low low limit alarm
	Message Text	Message text for the low low limit alarm
	Requires Ack	Setting of the low low limit alarm acknowledgment response request ^{*2}
Lo Condition	Value	Threshold value for the low limit alarm
	Message Text	Message text for the low limit alarm
	Requires Ack	Setting of the low limit alarm acknowledgement response request ^{*2}
Return To Normal	Message Text	Message text for the normal condition
Hi Condition	Value	Threshold value for the high limit alarm
	Message Text	Message text for the high limit alarm
	Requires Ack	Setting of the high limit alarm acknowledgement response request ^{*2}

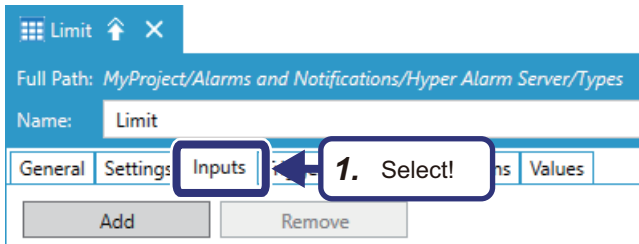
*1 This is a wait time before the alarm status changes.

*2 This is set to determine whether to require an alarm acknowledgement response.

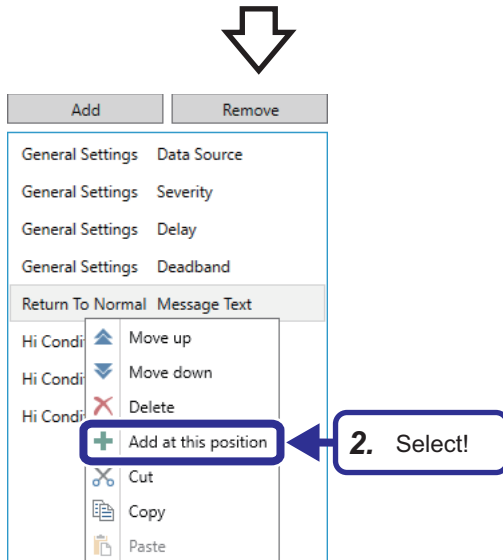
false (Deselected on the alarm setting screen): When an alarm is cleared, the alarm will no longer be displayed.

true (Selected on the alarm setting screen): Even after an alarm is cleared, the alarm will continue to be displayed until an alarm acknowledgement response is returned.

Operating procedure




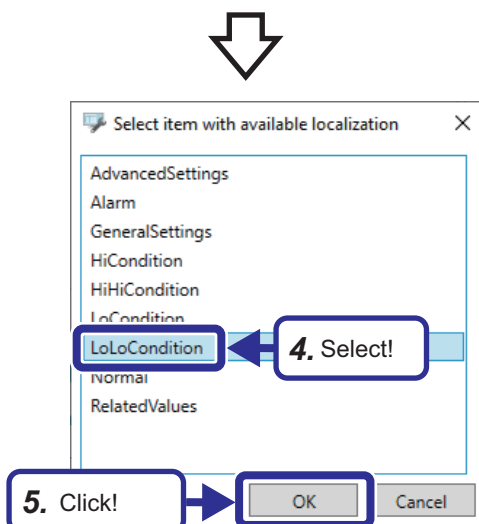
1. Select the [Inputs] tab.



2. Right-click on the [Return To Normal] row, and select [Add at this position].



3. Click  to open the "Category" browser.



4. Select "LoLoCondition".

5. Click the [OK] button. The selected category is enclosed in dollar signs as shown below.

カテゴリ: \$LoLoCondition\$
名前:

Category: \$LoLoCondition\$

Name: New Input

Display Name: 6. Click!

Description:


Input Type: Dynamic

Constant Type: Void

Browse Types: None

Default Value:

Is Main Input

6. Click  to open the "Display Name" browser.

Select item with available localization

- BaseText
- DataSource
- Deadband
- DefaultDisplay
- Delay
- Instructions
- MessageText
- RequiresAck
- Severity
- Value**

7. Select!

8. Click!

7. Select "Value".

8. Click the [OK] button. The selected display name is enclosed in dollar signs as shown below.

Name:

Display Name: \$Value\$

Description:

Category: \$LoLoCondition\$

Name: LoLoValue

Display Name: \$Value\$

Description:

Input Type: Constant

Constant Type: Float64 (64 bit floating point number double precision)

Browse Types: None

Default Value:

Is Main Input

9. Set!

9. Set the following:

[Settings]

Name: LoLoValue

Input Type: Constant

Constant Type: Float64 (64 bit floating point number double precision)

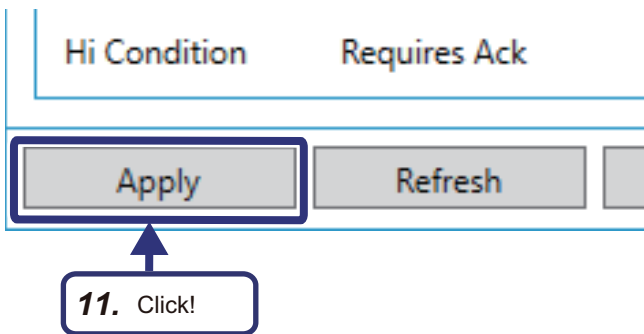
10. Set parameters for other input items in the same way.

General Settings	Data Source
General Settings	Severity
General Settings	Delay
General Settings	Deadband
LoLo Condition	Value
LoLo Condition	Message Text
LoLo Condition	Requires Ack
Lo Condition	Value
Lo Condition	Message Text
Lo Condition	Requires Ack
Return To Normal	Message Text
Hi Condition	Value
Hi Condition	Message Text
Hi Condition	Requires Ack

Settings						
Category	Name	Display Name	Input Type	Constant Type	Browse Types	Default Value
\$LoLoCondition\$	LoLoMessageText	\$MessageText\$	Constant	Character (single character)	Language Aliases	"LoLo Alarm"
\$LoLoCondition\$	LoLoRequiresAck	\$RequiresAck\$	Constant	Boolean	None	true
\$LoCondition\$	LoValue	\$Value\$	Constant	Float64 (64 bit floating point number double precision)	None	Blank
\$LoCondition\$	LoMessageText	\$MessageText\$	Constant	Character (single character)	Language Aliases	"Lo Alarm"
\$LoCondition\$	LoRequiresAck	\$RequiresAck\$	Constant	Boolean	None	true



11. Click the [Apply] button.



- Category, Display Name: Names of the input items displayed on the alarm setting screen^{*1}. The following items are provided in GENESIS64™ and can be selected from the "Select item with available localization" dialog box. When you set names on your own, directly enter the names. (Neither dollar signs nor double quotes are required.)

<Category>	<Display Name>
Select item with available localization	Select item with available localization
AdvancedSettings	BaseText
Alarm	DataSource
GeneralSettings	Deadband
HiCondition	DefaultDisplay
HiHiCondition	Delay
LoCondition	Instructions
LoLoCondition	MessageText
Normal	RequiresAck
RelatedValues	Severity
	Value

- Name: An input value identification name (variable) used inside alarm type configuration
- Description: A description of the input item. This appears as a tooltip at entry on the alarm setting screen^{*1}.
- Input Type: An input type. Select one of the following values: "Constant", "Dynamic", or "Historical".
- Constant Type: A data type. This item is set when "Input Type" is set to "Constant".
- Browse Types: Language alias browser^{*2} or file browser to be used to select a value on the alarm setting screen^{*1}
- Default Value: A default value for the given input. When "Constant Type" is set to "Character (single character)", the entered values need to be enclosed in double quotes.
- Is Main Input: Select this checkbox to use the settings configured^{*1} in the [Real-time Data] or [Historical Data] tab^{*3} of AssetWorX™ as the main input. This can be set to only one input item of each alarm type. For the alarm type "Limit", this is set to "Data Source" in the "General Settings" category.

*1 For details, refer to Page 102 Setting an Alarm.

*2 This browser is used to switch the display language on the graphic screen. (The browser is not used in this exercise.)

*3 When "Input Type" is set to "Dynamic", the settings in the [Real-time Data] tab are used. When "Input Type" is set to "Static", the settings in the [Historical Data] tab are used.

Setting an alarm type (general)

Add the low low limit and low limit alarm conditions to the expression for the processing of alarms.

In the [General] tab, set an expression that determines which of the conditions set in the [Condition] tab is used for which alarm.

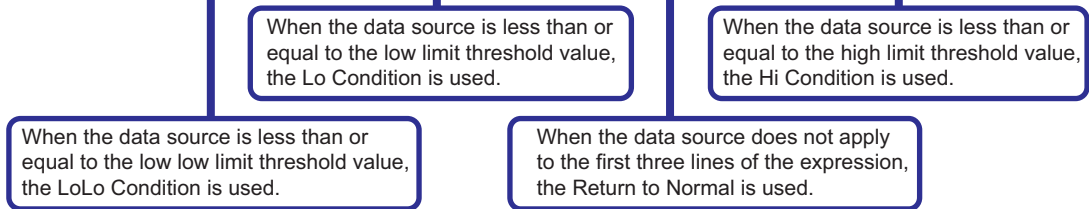
In this exercise, the following expression is set.

■[General] tab

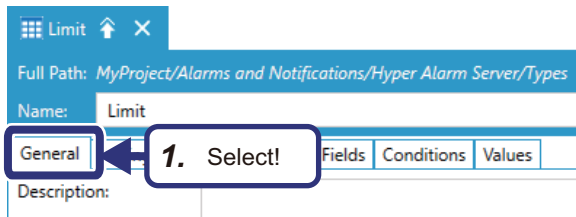
```
Expression
IFQ {{DataSource}} >= {{HiValue}} THEN 1 /* Hi Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoLoValue}} THEN -2 /* LoLo Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoValue}} THEN -1 /* Lo Alarm condition code */
ELSE 0 /* normal condition code */
```

■[Conditions] tab

-2: LoLo
-1: Lo
0: Normal
1: High



Operating procedure



1. Select the [General] tab.

2. Set "Expression" as follows:

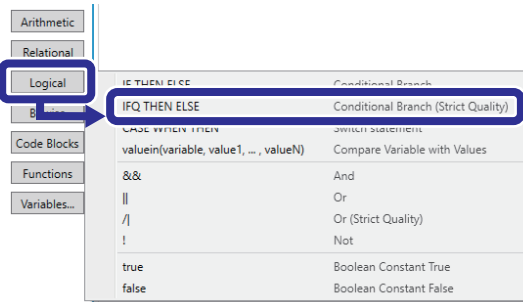
```

Expression
IFQ {{DataSource}} >= {{HiValue}} THEN 1 /* Hi Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoLoValue}} THEN -2 /* LoLo Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoValue}} THEN -1 /* Lo Alarm condition code */
ELSE 0 /* normal condition code */
    
```

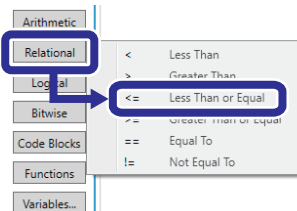
4

Point

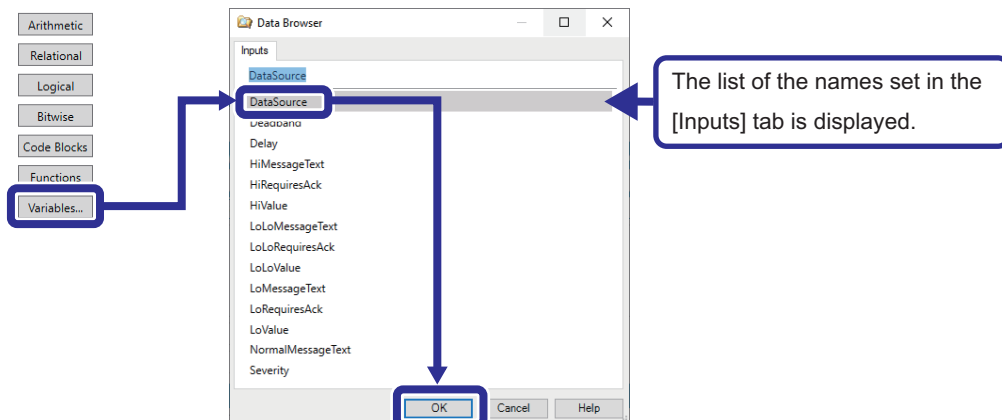
- A logical expression can also be entered by selecting it from the menu that appears when the [Logical] button is clicked.



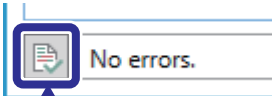
- An operator can also be entered by selecting it from the menu that appears when the [Relational] button is clicked.




- The segments enclosed in double curly brackets are variables (the names set in the [Inputs] tab). Each of the names can be entered also by selecting it from the data browser that appears when the [Variables] button is clicked.

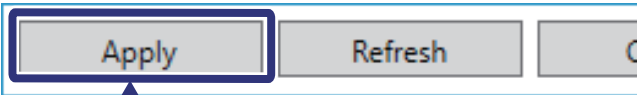


- The segments enclosed in a pair of a slash with an asterisk are comments that help understand the expression. The comments should be entered manually.



3. Click!

3. Click  to check that the expression has no error.



4. Click!

4. Click the [Apply] button.

Setting an alarm type (values)

Set field values for the low low limit and low limit alarm conditions.

In this exercise, we set values to the fields that have already been set in the [Fields] tab. The entered values are used as the field values as they are.

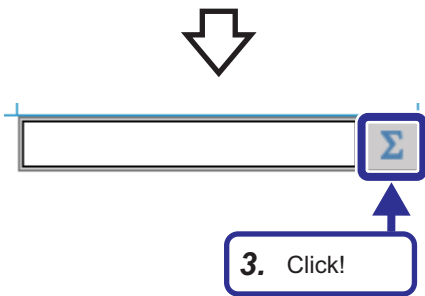
Operating procedure

Condition Name	Severity	Message	RequiresAck
LoLo	{{Severity}}		
Lo	{{Severity}}	{{NormalMessageText}}	false
Normal	{{Severity}}	{{HiMessageText}}	{{HiRequiresAck}}
High			

1. Select!

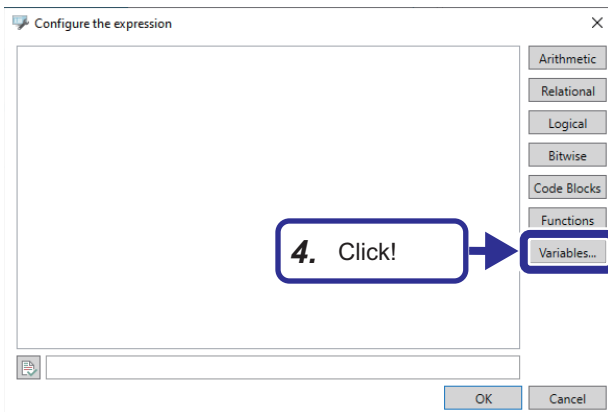
2. Double-click!

1. Select the [Values] tab.
2. Double-click the cell of the "LoLo" row in the "Message" column.



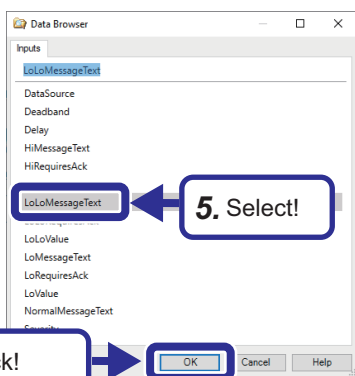
3. Click!

3. Click .



4. Click!

4. Click the [Variables] button.

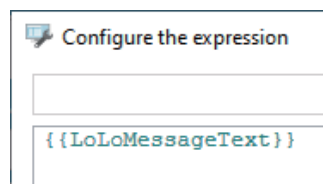


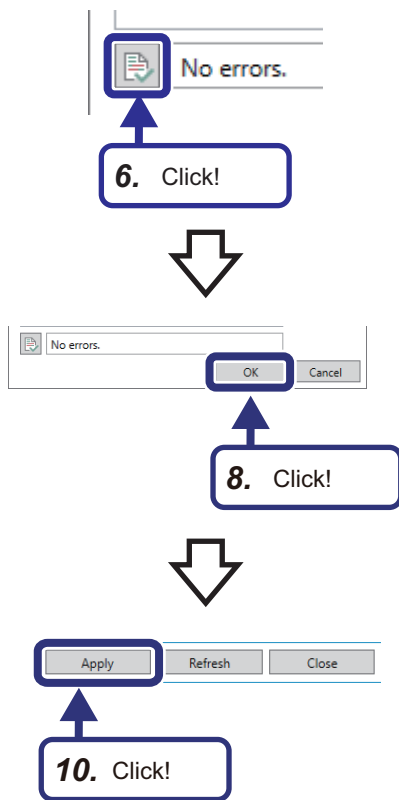
5. Select!

6. Click!

OK

5. Select "LoLoMessageText".
6. Click the [OK] button. The selected value is enclosed in double curly brackets as shown below.





7. Click to check that the expression has no error.

8. Click the [OK] button.

9. Set a value to the other items in the same way.

10. Click the [Apply] button.

Target row	Settings	
Condition Name	Message	RequiresAck
LoLo	Set	{{LoLoRequiresAck}}
Lo	{{LoMessageText}}	{{LoRequiresAck}}

Condition Name	Severity	Message	RequiresAck
LoLo	{{Severity}}	{{LoLoMessageText}}	{{LoLoRequiresAck}}
Lo	{{Severity}}	{{LoMessageText}}	{{LoRequiresAck}}
Normal	{{Severity}}	{{NormalMessageText}}	false
High	{{Severity}}	{{HiMessageText}}	{{HiRequiresAck}}

Point

- The default values set in the [Field] tab are displayed in blue. When edited, the values are displayed in black.

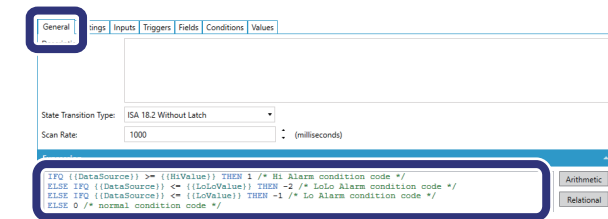
Setting an alarm type (expression of the condition)

Add expressions to the low limit and low limit alarm conditions.

The expression in the [Conditions] tab is set to switch the condition of an alarm after the condition has been evaluated with the expression in the [General] tab. Set the expression only when necessary.

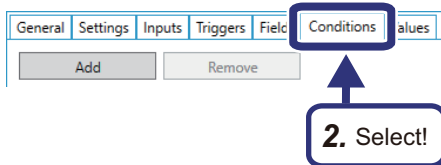
In this exercise, we set an expression considering a deadband.

Operating procedure



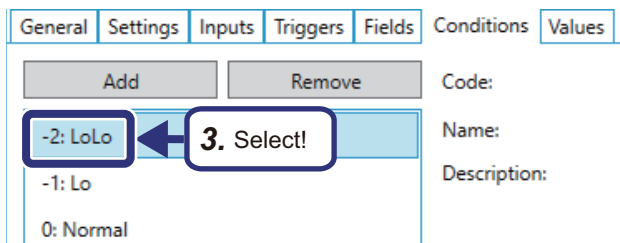
1. Copy!

1. Copy the expression in the [General] tab.

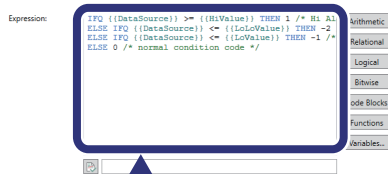


2. Select!

2. Select the [Conditions] tab.



3. Select "-2:LoLo".



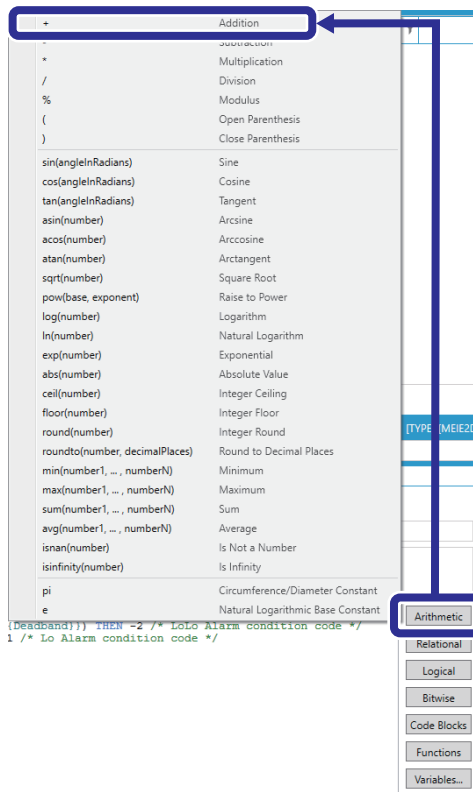
4. Paste!

4. Paste the expression copied in Step 1 into the "Expression" field.

5. Add the segments of the expression (within the frames below) referring to the procedure described on Page 94 Setting an alarm type (general).

```
IFQ {{DataSource}} >= {{HiValue}} THEN 1 /* Hi Alarm condition code */
ELSE IFQ {{DataSource}} <= ({{LoLoValue}} + {{Deadband}}) THEN -2 /* LoLo Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoValue}} THEN -1 /* Lo Alarm condition code */
ELSE 0 /* normal condition code */
```

- An expression can be entered also by selecting it from the menu that appears when the [Arithmetic] button is clicked.





No errors.

6. Click!

- 6. Click to check that the expression has no error.
- 7. Paste the expression copied in Step 1 into the "Expression" field for "-1:Lo", and add the segments of the expression (within the frames below).

```
IFQ {{DataSource}} >= {{HiValue}} THEN 1 /* Hi Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoLoValue}} THEN -2 /* LoLo Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoValue}} + {{Deadband}} THEN -1 /* Lo Alarm condition code */
ELSE 0 /* normal condition code */
```



No errors.

8. Click!

- 8. Click to check that the expression has no error.
- 9. Paste the expression copied in Step 1 into the "Expression" field for "1:Hi", and add the segments of the expression (within the frames below).

```
IFQ {{DataSource}} >= {{HiValue}} - {{Deadband}} THEN 1 /* Hi Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoLoValue}} THEN -2 /* LoLo Alarm condition code */
ELSE IFQ {{DataSource}} <= {{LoValue}} THEN -1 /* Lo Alarm condition code */
ELSE 0 /* normal condition code */
```



No errors.

10. Click!

- 10. Click to check that the expression has no error.



Apply Refresh Close

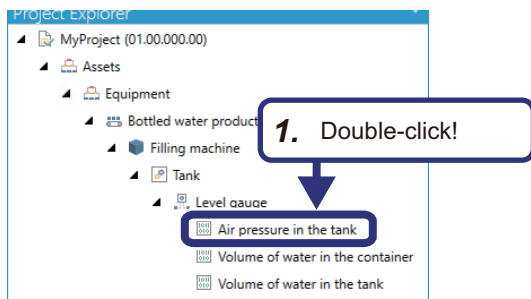
11. Click!

- 11. Click the [Apply] button.

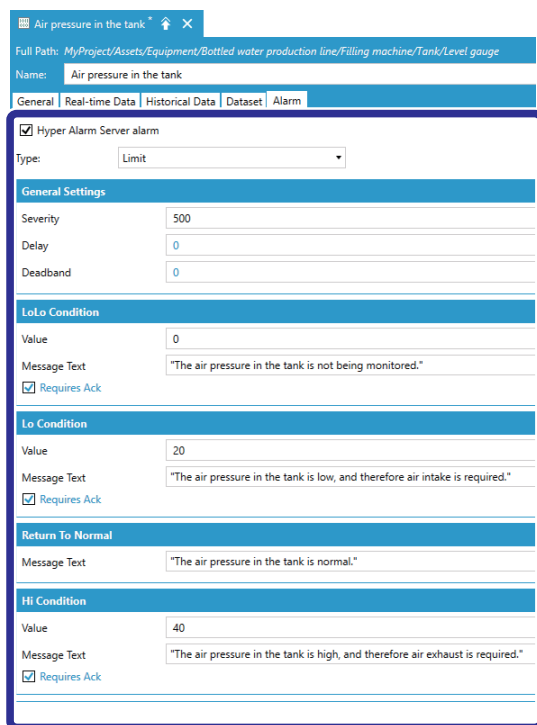
Setting an alarm

Set threshold values and alarm messages to be displayed to the equipment properties using AssetWorX™.

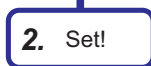
Operating procedure



1. Select [MyProject (01.00.000.00)]⇒[Assets] ⇒ [Equipment] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Level gauge] ⇒ [Air pressure in the tank] in the "Project Explorer" window. Double-click on [Air pressure in the tank].



2. Select the [Alarm] tab, and set the following:
[Settings]
Hyper Alarm Server alarm: Selected
Type: Limit
"General Settings"
Severity: 500
"LoLo Condition"
Value: 0
Message Text: "The air pressure in the tank is not being monitored."
"Return To Normal"
Message Text: "The air pressure in the tank is normal."
"Hi Condition"
Value: 40
Message Text: "The air pressure in the tank is high, and therefore air exhaust is required."



3. Click the [Apply] button.

Point

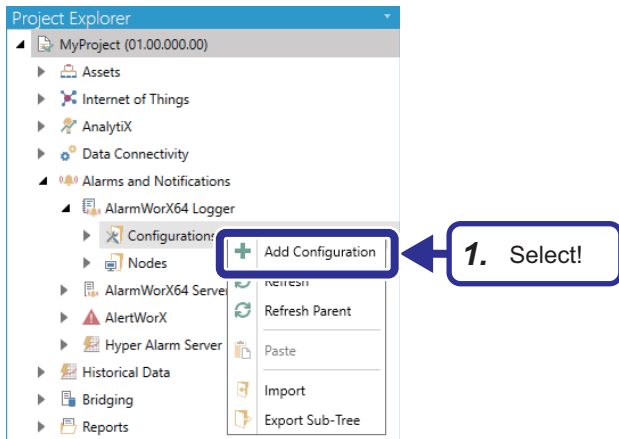
- The default values set to the alarm type are displayed in blue. When edited, the values are displayed in black.
- When "Constant Type" is set to "Character (single character)", the entered values need to be enclosed in double quotes.

Setting a historical alarm

Set a historical alarm using the AlarmWorX™ 64 Logger.
Specify alarms to be logged, and set logging configuration and a table for storing alarms.

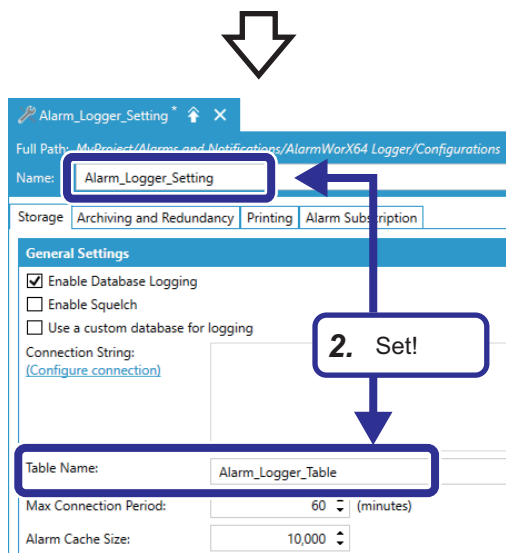
Setting an alarm configuration

Operating procedure

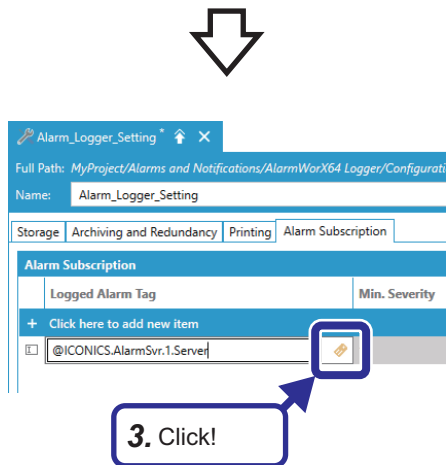



1. Select [MyProject (Ver. 01.00.000.00)] ⇒ [Alarms and Notifications] ⇒ [AlarmWorX64 Logger] ⇒ [Configurations] in the "Project Explorer" window. Right-click on [Configurations], and select [Add Configuration].

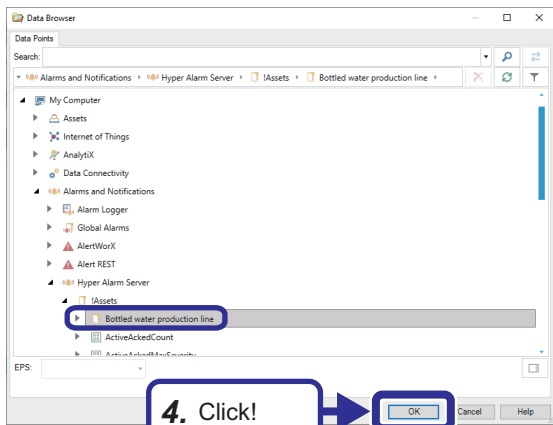
4



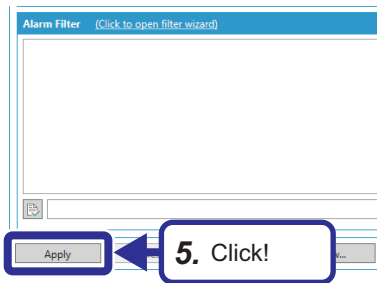
2. Set the following:
[Settings]
Name: Alarm_Logger_Setting
Table Name: Alarm_Logger_Table



3. Select the [Alarm Subscription] tab, and click .



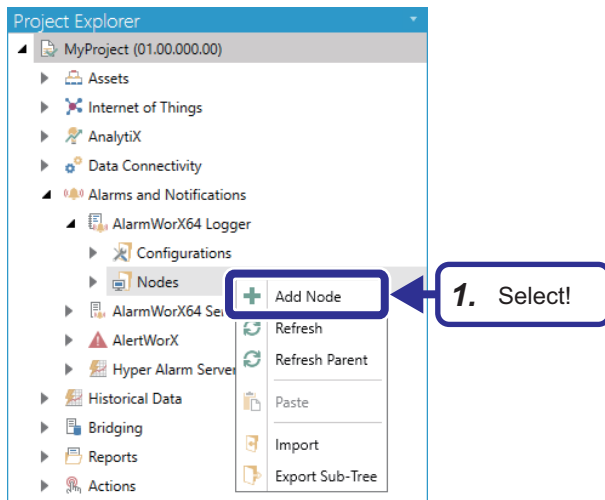
4. Select [My Computer] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [!Assets] ⇒ [Bottled water production line], and click the [OK] button.



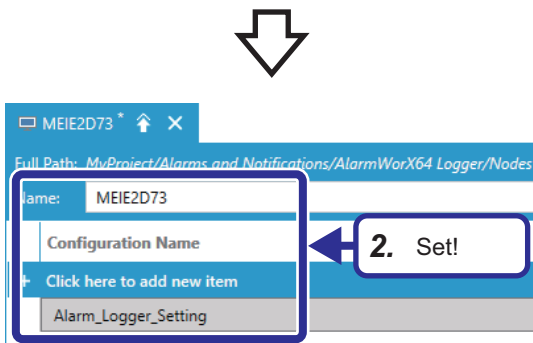
5. Click the [Apply] button.

Adding a node

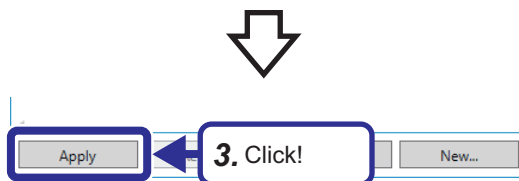
Operating procedure



1. Select [AlarmWorX64 Logger] ⇒ [Nodes]. Right-click on [Nodes], and select [Add Node].



2. Set the following:
[Settings]
Name: Personal computer model name*¹
Configuration Name: Alarm_Logger_Setting
^{*1} Enter the model name of the personal computer used.

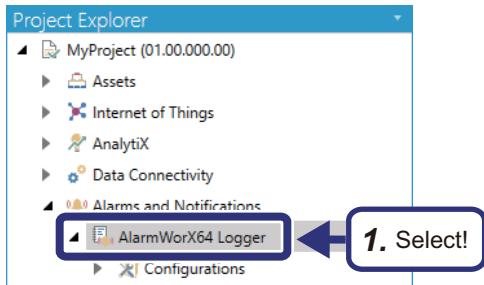


3. Click the [Apply] button.

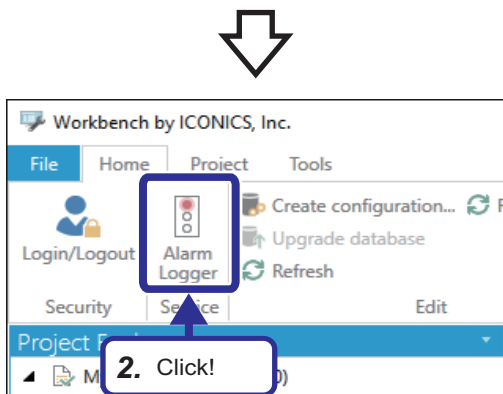
Setting the AlarmWorX™ 64 Logger

Operate the AlarmWorX™ 64 Logger in the background.
Switch the icon to green to start operation.

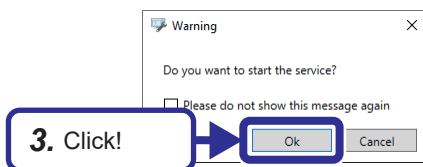
Operating procedure



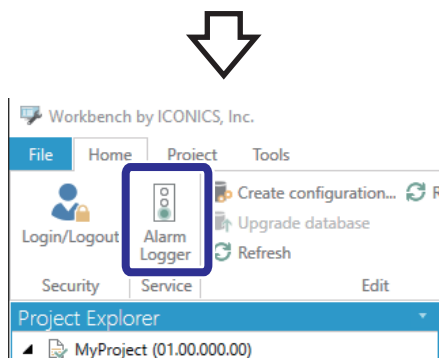
1. Select [AlarmWorX64 Logger].



2. Click the [Alarm Logger] icon in the [Home] tab.



3. Click the [OK] button.



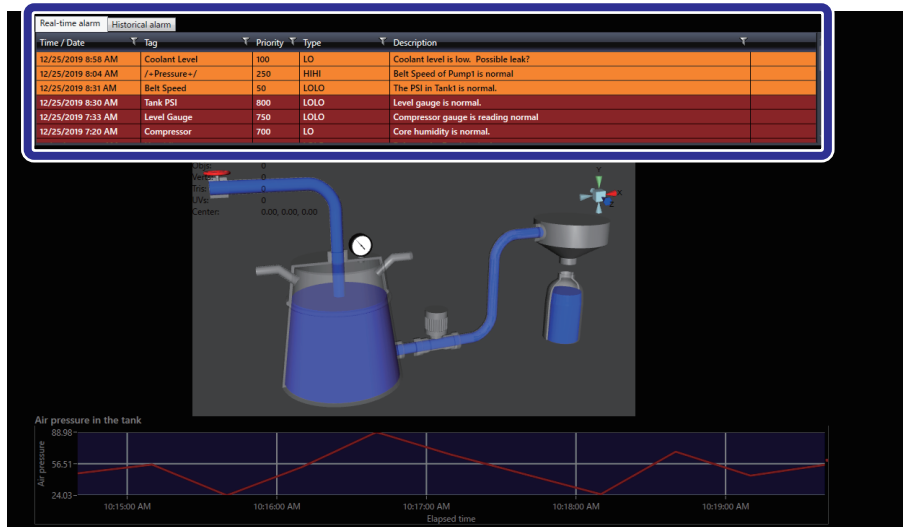
4. Check that the [Alarm Logger] icon has turned green.

4.12 Creating an Alarm Viewer

This section describes how to create an alarm viewer using the AlarmWorX™64 Viewer. Both real-time and historical alarms can be viewed by switching tabs.

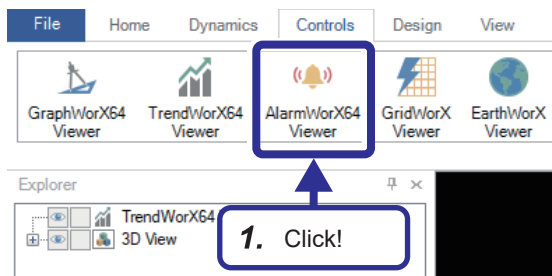
Creating a real-time alarm viewer

A real-time alarm viewer displays the latest alarm occurred when the air pressure in the tank becomes abnormal.

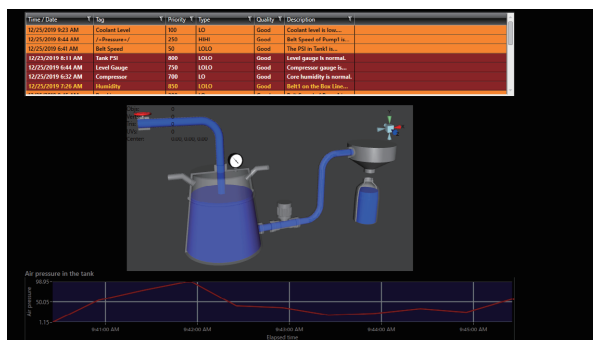


Placing an alarm viewer

Operating procedure

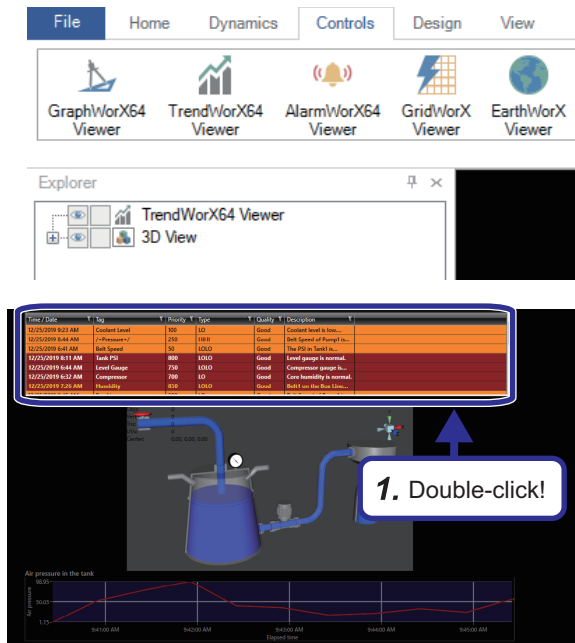


1. Click the [AlarmWorX64 Viewer] button in the [Controls] tab, and drag the cursor to place the viewer in a desired size.

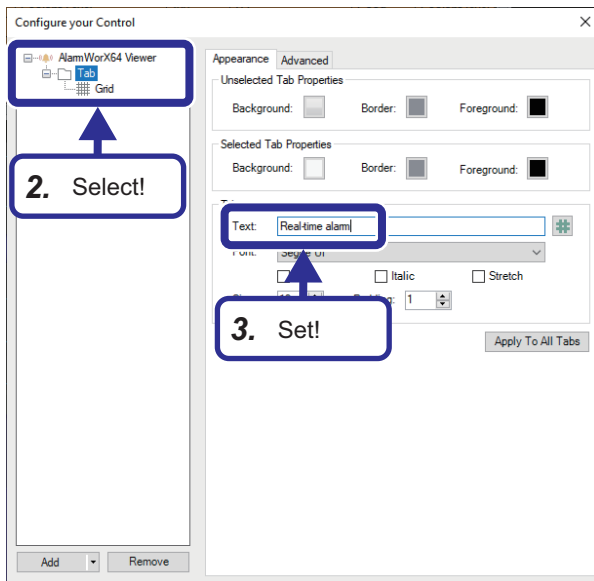


Setting an alarm viewer (tab)

Operating procedure



1. Double-click the alarm viewer.

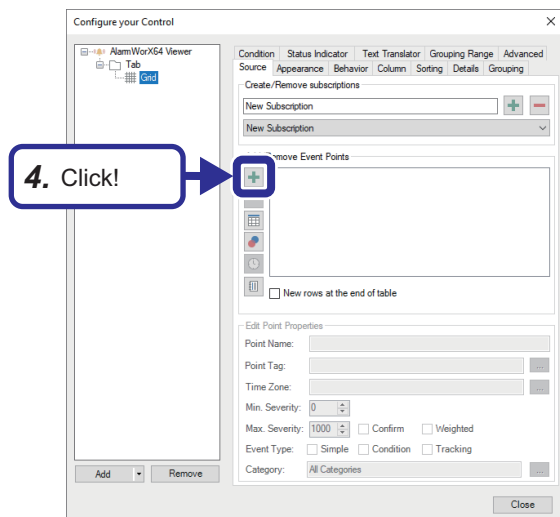
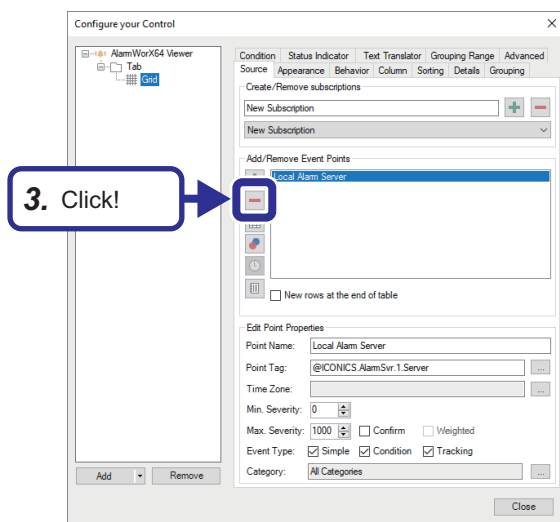
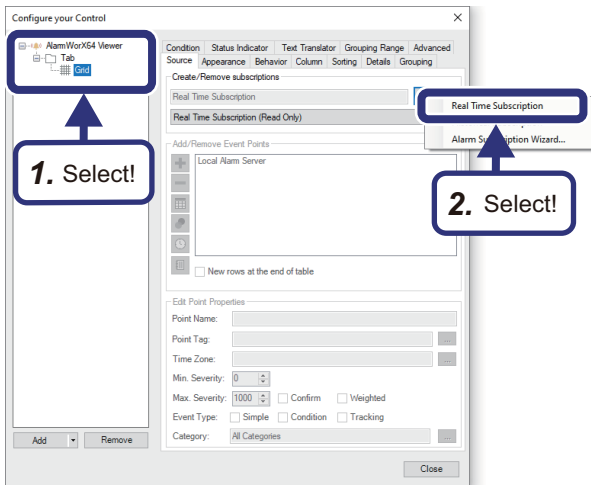



2. Select [AlarmWorX64 Viewer] ⇒ [Tab] in the tree.


3. Set the following in the [Appearance] tab:
[Settings]
Text: Real-time alarm

Setting an alarm viewer (grid)

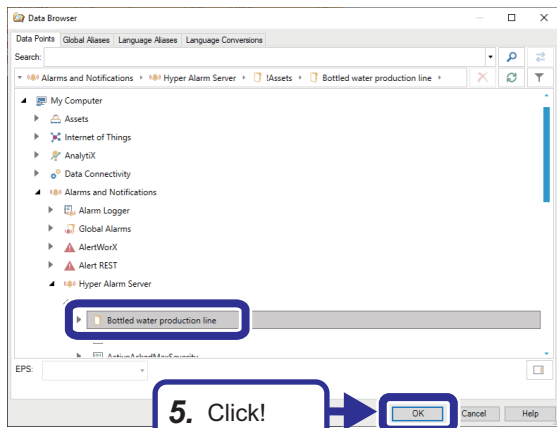
Operating procedure



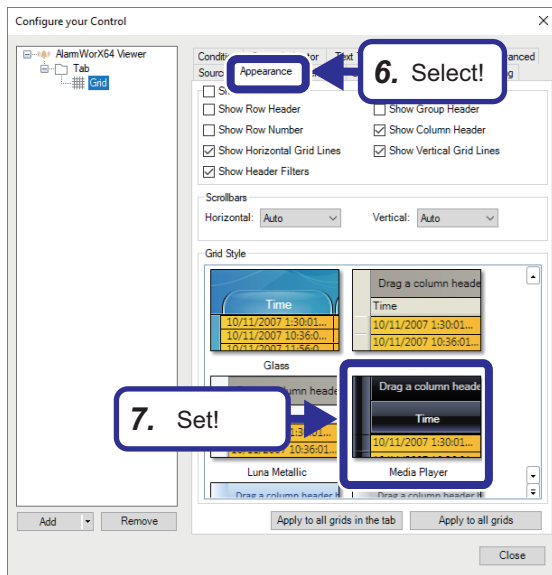
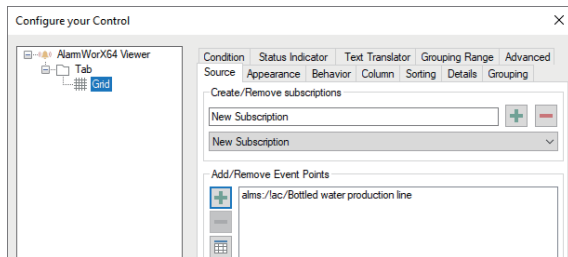
1. Select [AlarmWorX64 Viewer] ⇒ [Tab] ⇒ [Grid] in the tree.
2. Click , and select [Real Time Subscription].

3. Select "Local Alarm Server", and click .

4. Click .

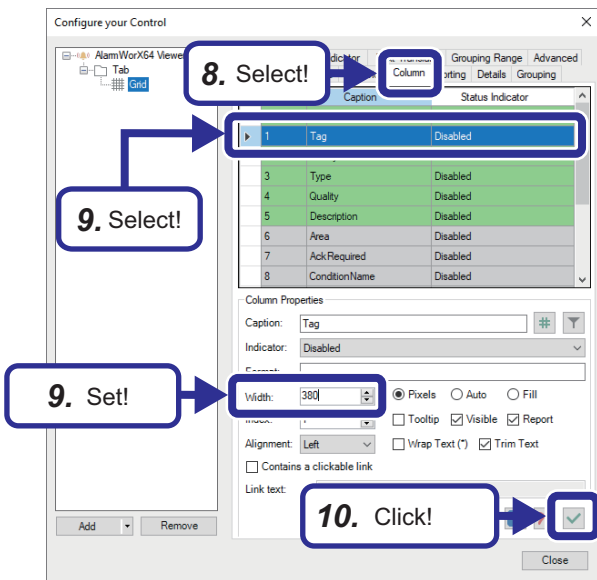


5. Select [My Computer] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [Assets] ⇒ [Bottled water production line], and click the [OK] button.

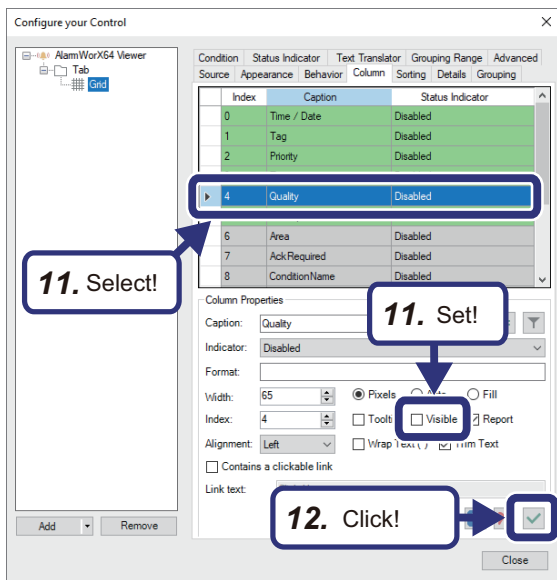


6. Select the [Appearance] tab.
7. Set the following:
[Settings]
Grid Style: Media Player

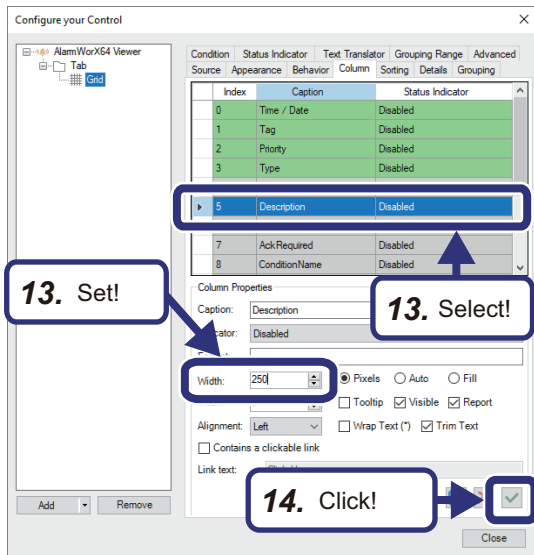




8. Select the [Column] tab.
9. Select "Tag", and set the following:
[Settings]
Width: 380
10. Click .



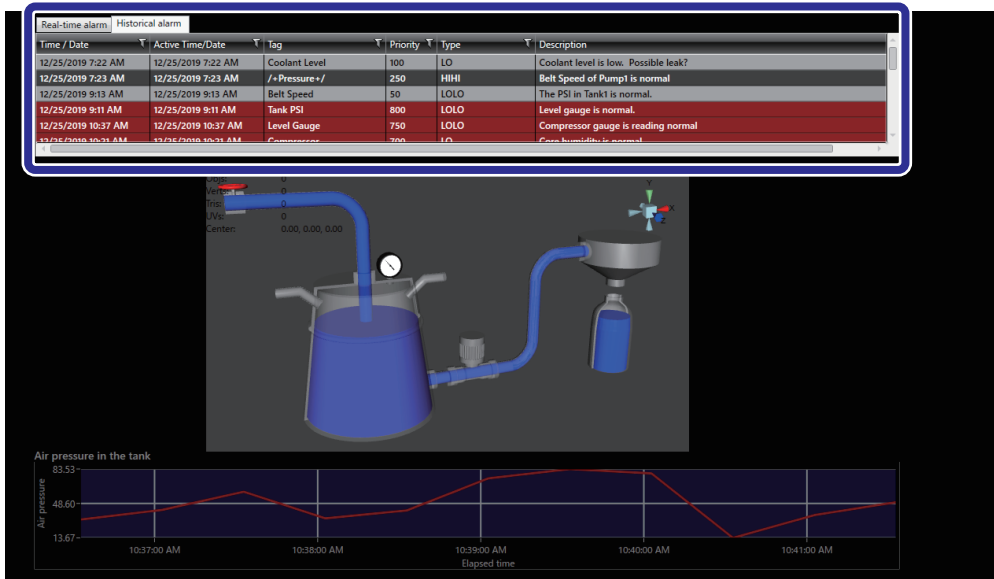
11. Select "Quality", and set the following:
[Settings]
Visible: Deselected
12. Click .



13. Select "Description", and set the following:
[Settings]
Width: 250
14. Click .

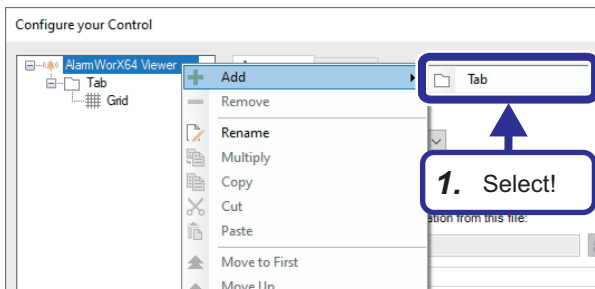
Creating a historical alarm viewer

A historical alarm viewer displays all alarms occurred when the air pressure in the tank becomes abnormal.



Adding a tab

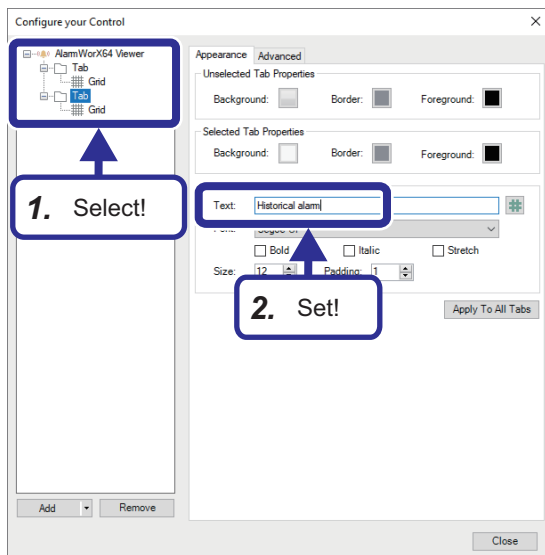
Operating procedure



1. Right-click on [AlarmWorX64 Viewer] in the tree, and select [Add] ⇒ [Tab].

Setting an alarm viewer (tab)

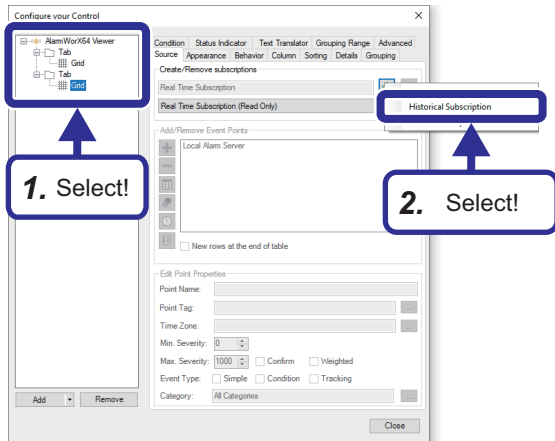
Operating procedure




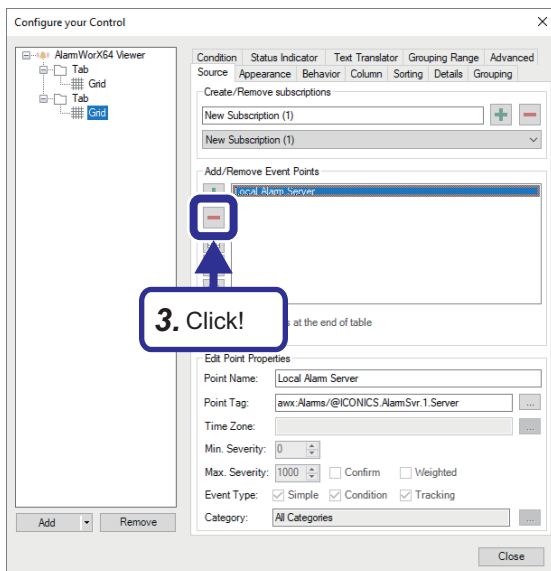
1. Select the added tab.
2. Set the following in the [Appearance] tab: [Settings] Text: Historical alarm


Setting an alarm viewer (grid)

Operating procedure

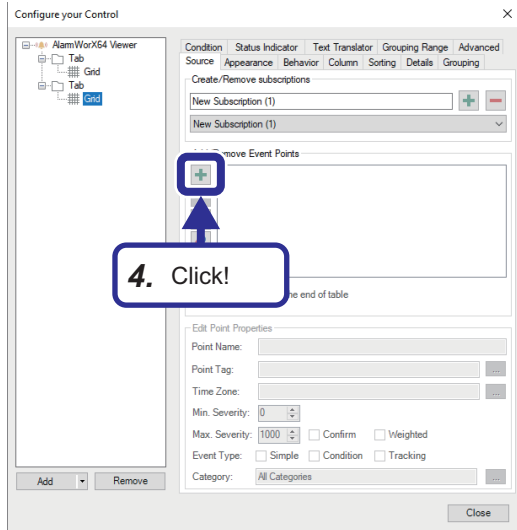


1. Select [Grid] of the added tab.
2. Click , and select [Historical Subscription].

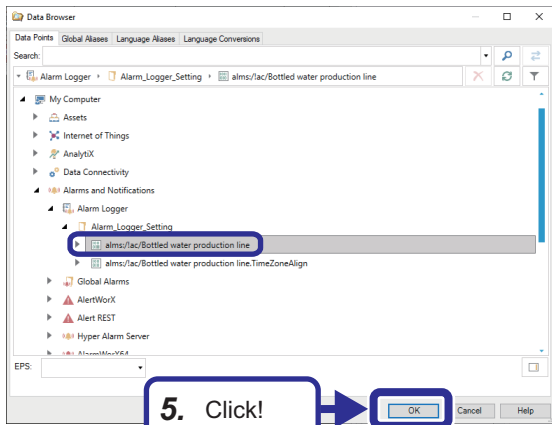



3. Select "Local Alarm Server", and click .

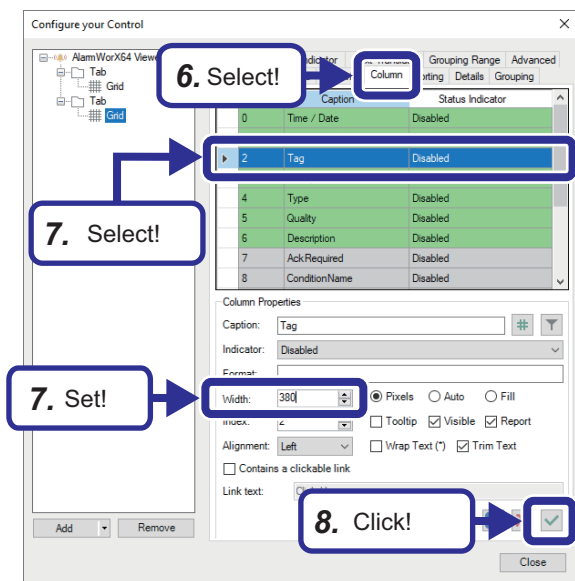
4. Click .

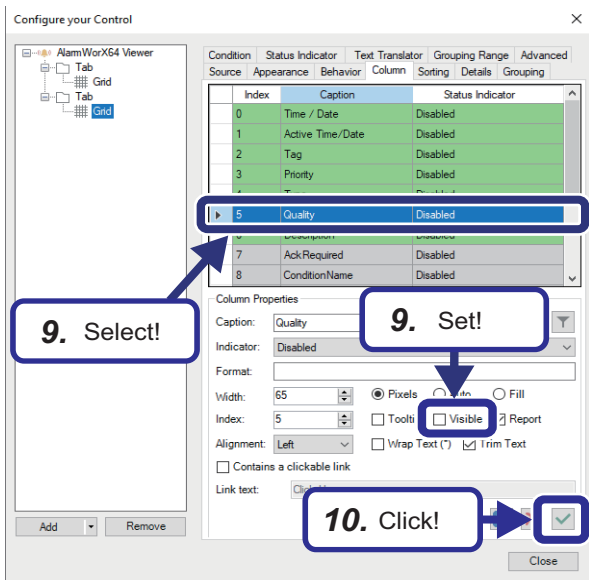


5. Select [My computer] ⇒ [Alarms and Notifications] ⇒ [Alarm Logger] ⇒ [Alarm_Logger_Setting] ⇒ [alms:/!ac/Bottled water production line], and click the [OK] button.

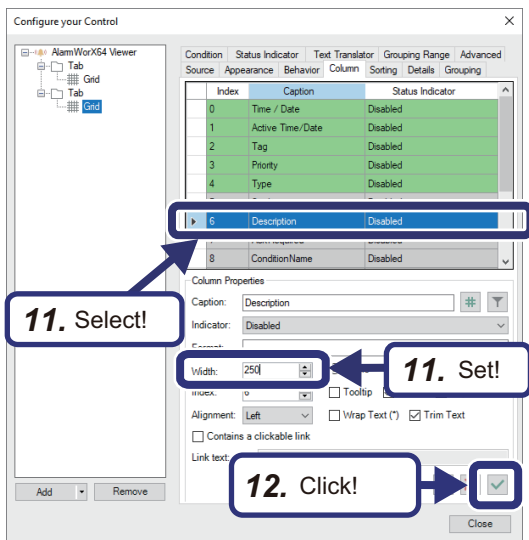


6. Select the [Column] tab.
7. Select "Tag", and set the following:
[Settings]
Width: 380
8. Click .

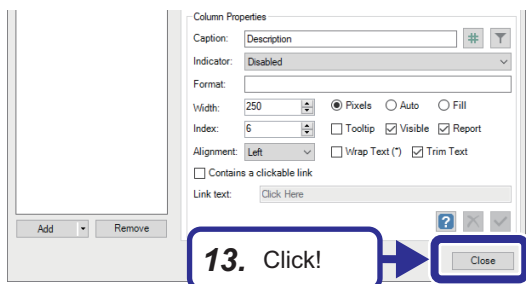




- 9. Select "Quality", and set the following:
[Settings]
Visible: Deselected
- 10. Click .



- 11. Select "Description", and set the following:
[Settings]
Width: 250
- 12. Click .



- 13. Click the [Close] button.

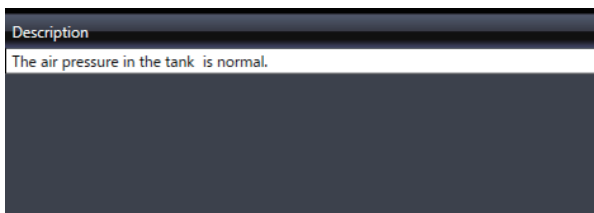
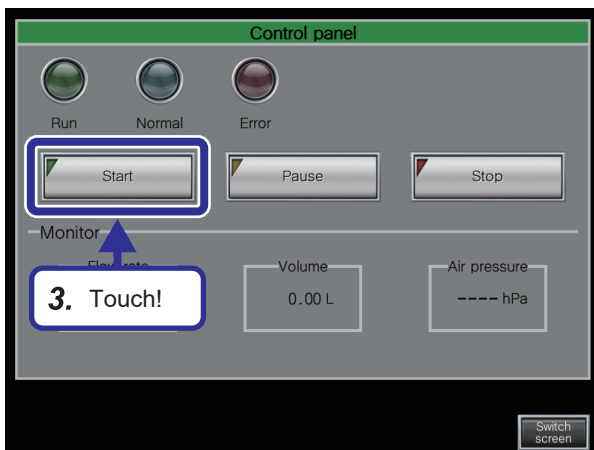
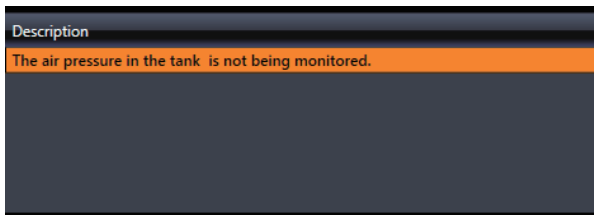


4.13 Checking the Operation of the Alarm Viewer

This section describes how to check the operation of the created alarm viewer in Runtime mode.

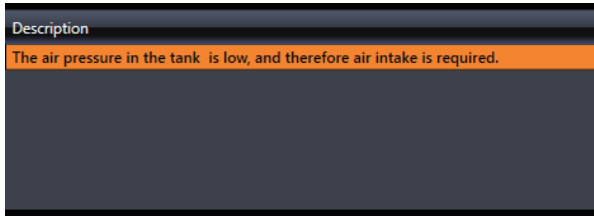
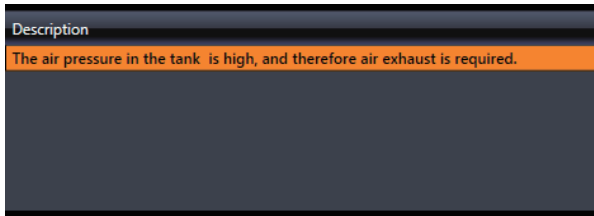
Operating procedure

1. Click the [Runtime] button.



2. The following message is displayed in the real-time alarm viewer before the system starts its operation.
[Alarm]
The air pressure in the tank is not being monitored.
[Lamp]
Normal: Off
Error: On
3. Touch the [Start] button on the GOT.

4. The following message is displayed in the real-time alarm viewer when the air pressure in the tank is normal.
[Alarm]
The air pressure in the tank is normal.
[Lamp]
Normal: On
Error: Off



Time / Date	Active Time/Date	Alarm Tag	Priority	Type	Description
12/25/2019 10:46 AM	12/25/2019 10:46 AM	Alarm_Tag	500	LO	The air pressure in the tank is normal.
12/25/2019 10:46 AM	12/25/2019 10:46 AM	Alarm_Tag	500	LO	The air pressure in the tank is low, and therefore air intake is required.
12/25/2019 10:46 AM	12/25/2019 10:46 AM	Alarm_Tag	500	HI	The air pressure in the tank is normal.
12/25/2019 10:46 AM	12/25/2019 10:46 AM	Alarm_Tag	500	HI	The air pressure in the tank is high, and therefore air exhaust is required.
12/25/2019 10:45 AM	12/25/2019 10:45 AM	Alarm_Tag	500	LO	The air pressure in the tank is normal.
12/25/2019 10:45 AM	12/25/2019 10:45 AM	Alarm_Tag	500	LO	The air pressure in the tank is low, and therefore air intake is required.

5. The following message is displayed in the real-time alarm viewer when the air pressure in the tank is abnormal.

[Alarm]


The air pressure in the tank is low, and therefore air intake is required.

The air pressure in the tank is high, and therefore air exhaust is required.

[Lamp]

Normal: Off

Error: On

Point  The real-time alarm is regularly updated. To check the current alarm, touch the [Pause] button on the GOT.

6. Click the [Historical alarm] tab.

7. You can view all the alarms occurred.

5 EXERCISE 2 DIRECT CONNECTION USING MES INTERFACE MODULE

5.1 Overview

In this exercise, we visualize data stored in an SQL Server database with GENESIS64™. We use the data stored in an SQL Server database by the MES interface module.

The data collection operation by the MES interface module described here is the same operation that we provide in the basic training course for the MES interface module.

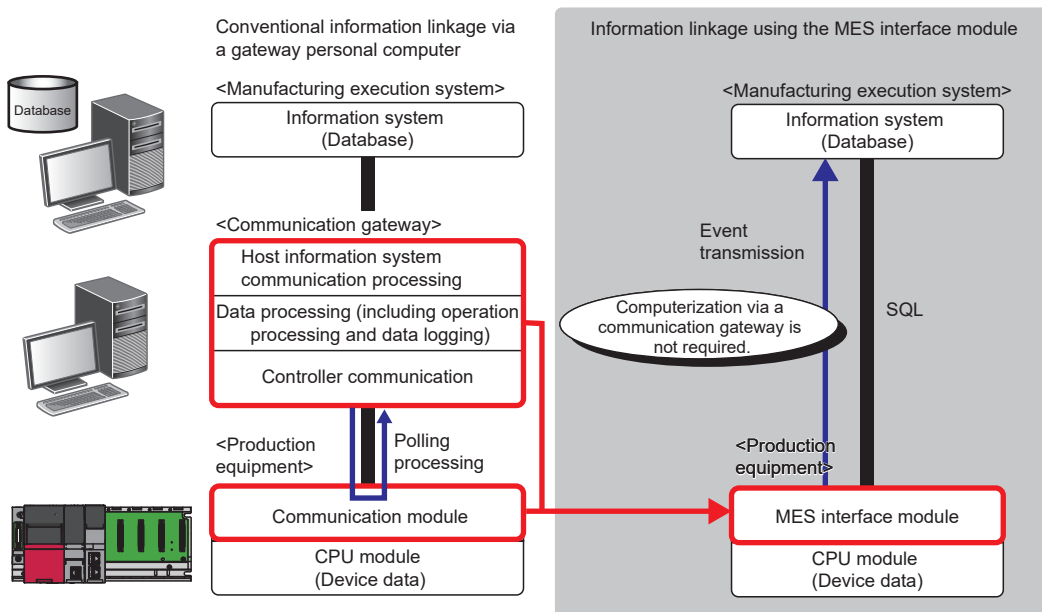
Precautions

- The following operations are not included in this exercise: setting SQL Server, setting the MES interface module, and creating a database table. (These operations are explained in the basic training course for the MES interface module.)
- Before starting this exercise, write the project created using GX Works3, "school_MES.gx3", to the CPU module. For the writing method, refer to the following.

☞ Page 29 Writing parameters to the CPU module

MES interface module

The MES Interface module enables improved productivity and product quality through its direct connectivity between the programmable controller of production equipment and the information system database. Conventionally, a gateway personal computer that performs polling processing for checking the devices and programs of the programmable controller was required to link information. With the MES interface module, however, information can be linked directly between the programmable controller and the database when an event-driven condition is satisfied. The direct connection with the database using the MES interface module will decrease system complexity, improve reliability, and reduce the risk of losing data. This enables users to reduce the total system configuration and maintenance cost.

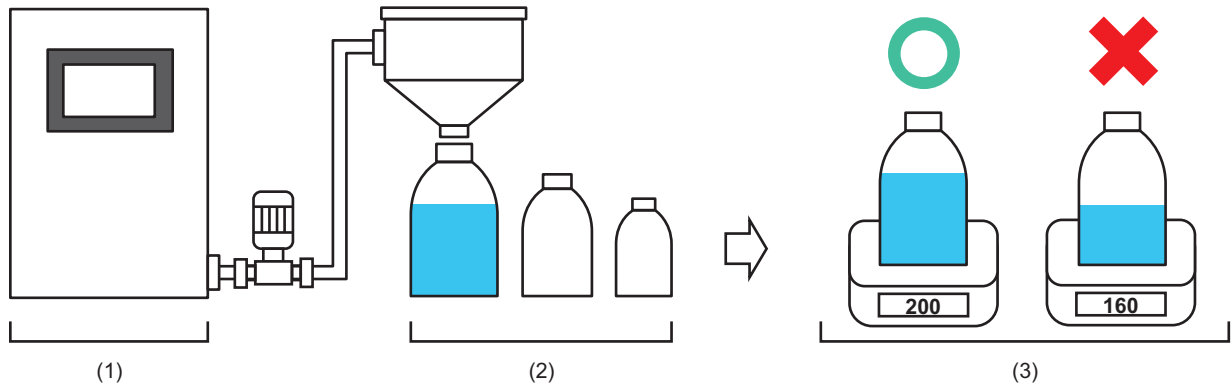


Operation explained in the basic training course for the MES interface module

The following is the simple data collection operation explained in the basic training course for the MES interface module.

■ Overview

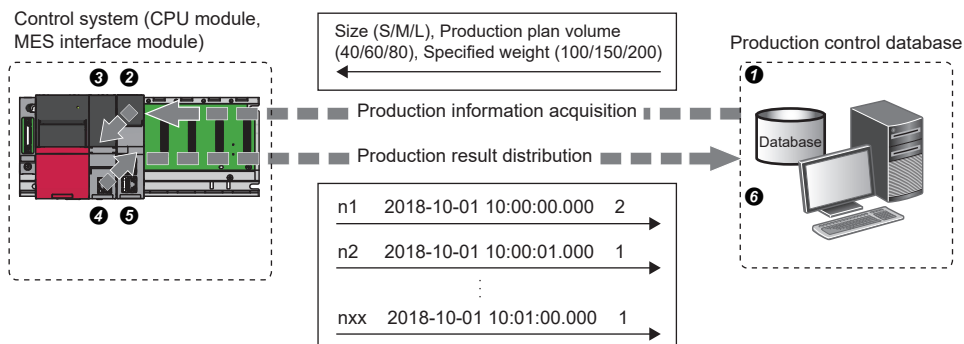
The water filling process automated by the programmable controller system is used as an example to explain the data collection operation.



Process	Description
(1) Production control	Inputs production patterns and starts/stops the production.
(2) Production	Fills water into large, medium, or small containers based on the operation pattern selected.
(3) Quality determination	Inspects the volume of water in containers and rejects non-conforming containers.

■ Operation

The following shows the operation between the control system and the production control database.



- Select a production pattern (1, 2, or 3) on the GOT.
 - Pattern 1: Filling water into small containers (size: S, production plan volume: 40, specified weight: 100)
 - Pattern 2: Filling water into medium containers (size: M, production plan volume: 60, specified weight: 150)
 - Pattern 3: Filling water into large containers (size: L, production plan volume: 80, specified weight: 200)
- Touch the [Production information acquisition] button on the GOT.
- Acquire the production information.
 - Database → 2 MES interface module → 3 CPU module
 - The MES interface module acquires the production information (size, production plan volume, and specified weight) from a table in the production control database before starting the production.
 - Water is filled into containers in accordance with the production plan volume. Finished containers are inspected. If the volume of water in a container is less than the specified value (weight), the container is rejected. The first letter of each container ID indicates the size.
- Touch the [Production start] button on the GOT.
- Distribute the production results.
 - CPU module → 5 MES interface module → 6 Database
 - The MES interface module collects data, such as container IDs, production date and time, and quality determination results, and transfers the data to the production control database.

■ Data to be stored in the database

The following data is stored in the tables of the database.

- Project table

Production information: Production pattern, size, production plan volume, specified weight
(The values are fixed.)

Pattern	Size	ProductionPlanVolume	SpecifiedWeight
1	S	40	100
2	M	60	150
3	L	80	200

- Judgement table

Production results: Container ID, production date and time, quality determination result, total number of accepted products, total number of rejected products

ContainerID	DateAndTime	QualityDetermination	TotalNumberOfAcceptedProducts	TotalNumberOfRejectedProducts
S1	2019/12/25 14:11:10	1	1	0
S2	2019/12/25 14:11:10	1	2	0
S3	2019/12/25 14:11:10	1	3	0
S4	2019/12/25 14:11:10	1	4	0
S5	2019/12/25 14:11:10	1	5	0
S6	2019/12/25 14:11:10	2	5	1
S7	2019/12/25 14:11:10	1	6	1
S8	2019/12/25 14:11:10	1	7	1
S9	2019/12/25 14:11:10	1	8	1
S10	2019/12/25 14:11:10	1	9	1

■ Devices used in the sequence program

Device name	Description	Device name	Description
X20	Ready	M4	Production end trigger
X21	Synchronization flag	C0	The contact turns on when the count value reaches the value set in D100.
X200	Production start	D0, D1000	Production pattern
X300	Production information reset	D100	Production plan volume
Y20	Programmable controller ready	D110	Specified weight
Y21	All axes servo ON	D120	Production size
SM400	Always On	D129	Random number
SM403	After RUN, OFF for 1 scan only	D130	Random number (container weight)
SM415	Repeatedly turns on/off at an interval specified in SD415.	D140	Quality determination result
SM705	Number of conversion digits selection	D150	Total number of accepted products
SD415	'n' for the 2n ms clock	D160	Total number of rejected products
M1	Production start trigger	D200	Total production
M2	Quality determination start trigger	D210	Container ID (size part)
M3	Quality determination result storing trigger	D211	Container ID (numerical part)

Precautions

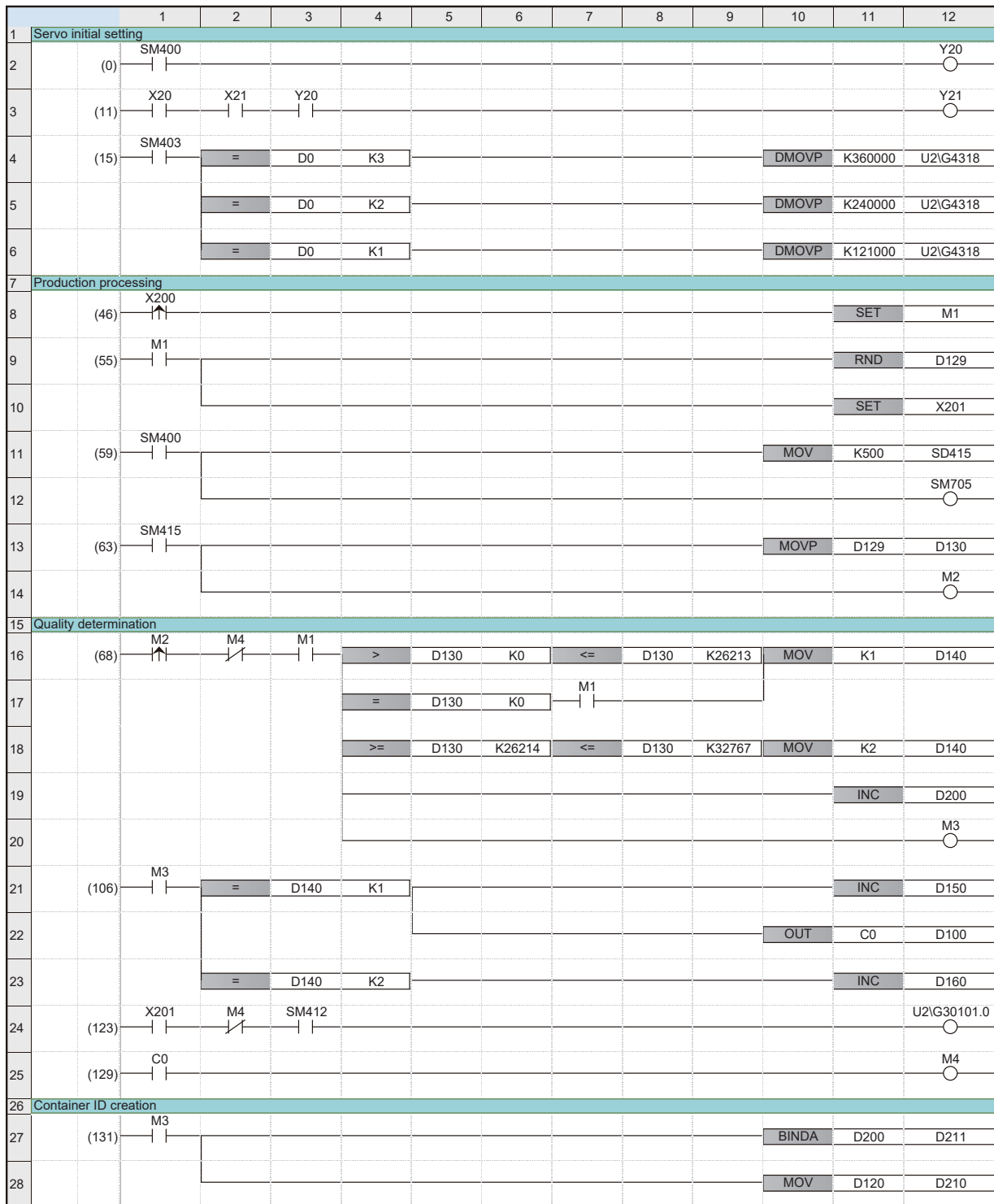
- This manual does not cover the devices of the Simple Motion module and the servo amplifier. For details, refer to the user's manual for each module used.
- Programming is not included in this exercise. The pre-programmed project "school_MES.gx3" is used.

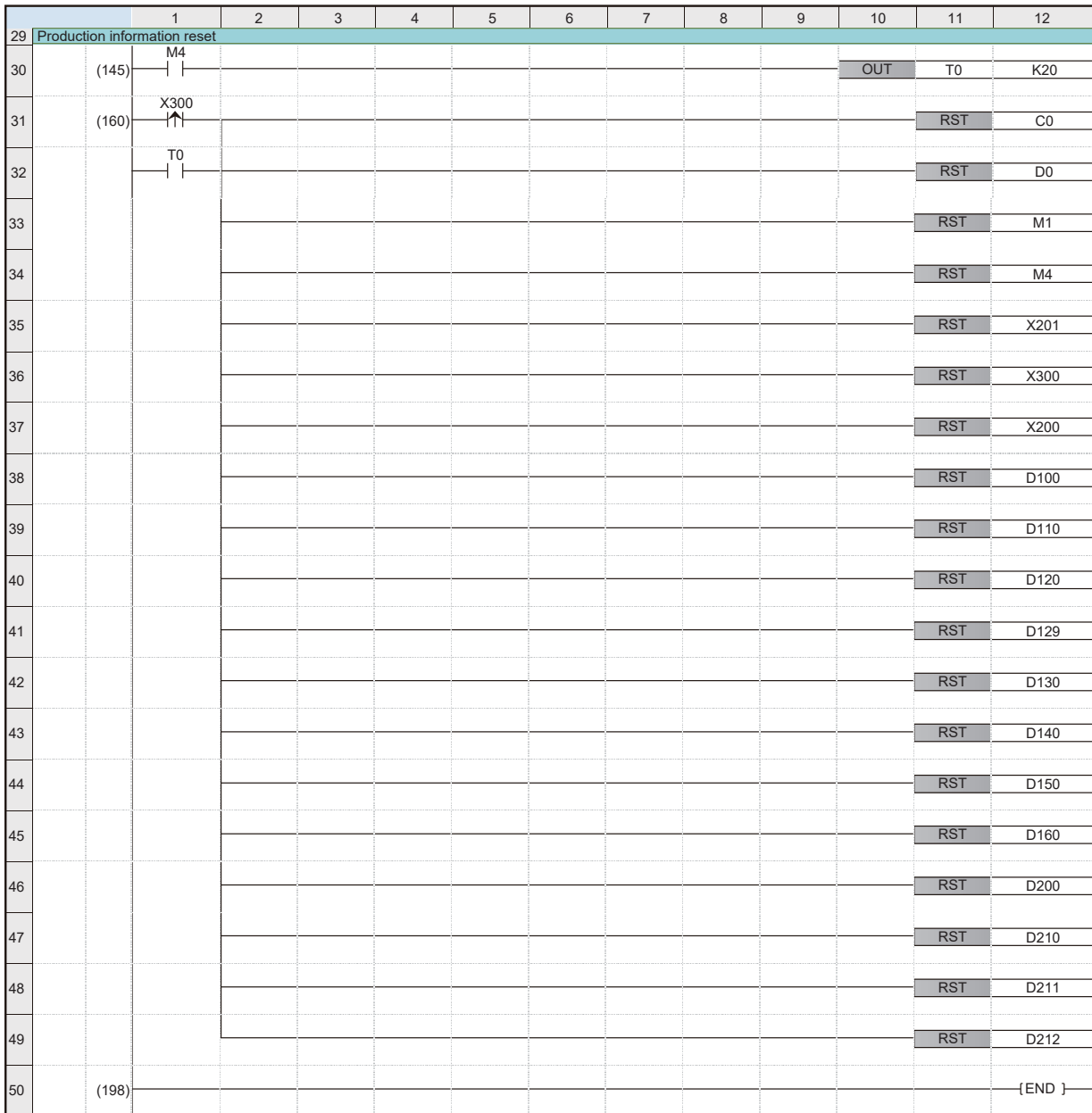
■ Sequence program

For details on each instruction, refer to the following.

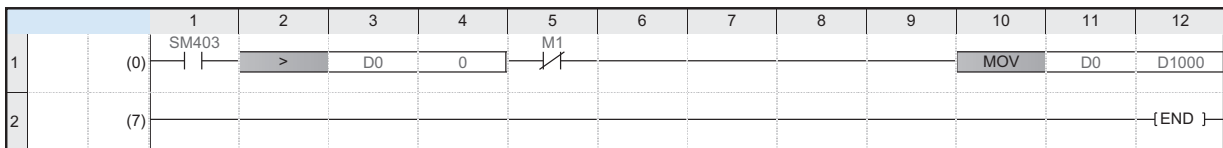
📖 MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

- MES





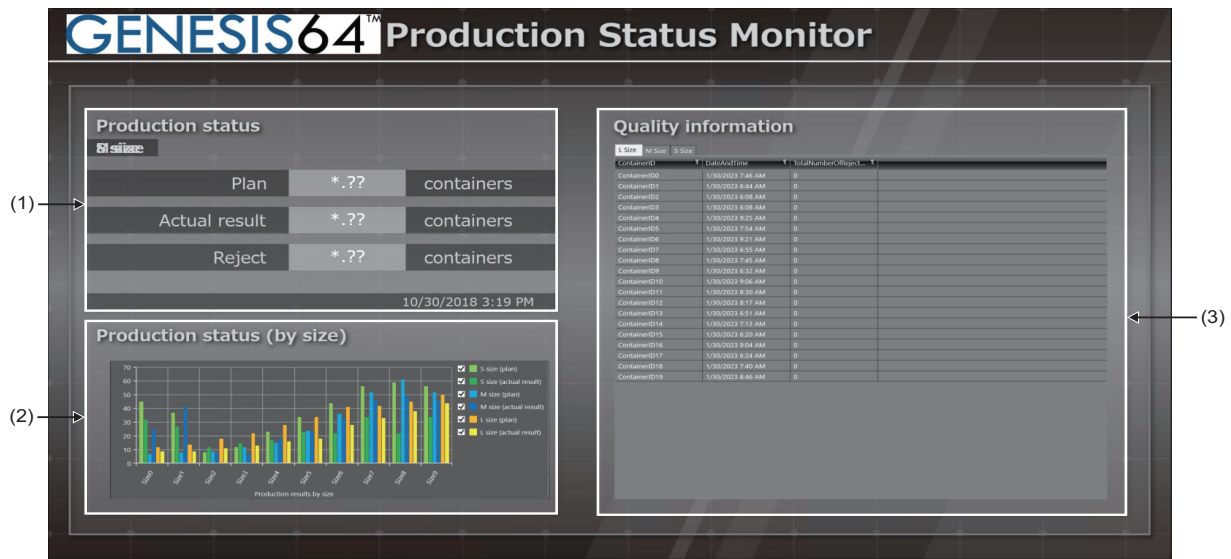
• GENESIS64™



Screen to be created

The following is the screen to be created in this exercise.

This section describes how to display data stored in the database on the Production Status Monitor screen.



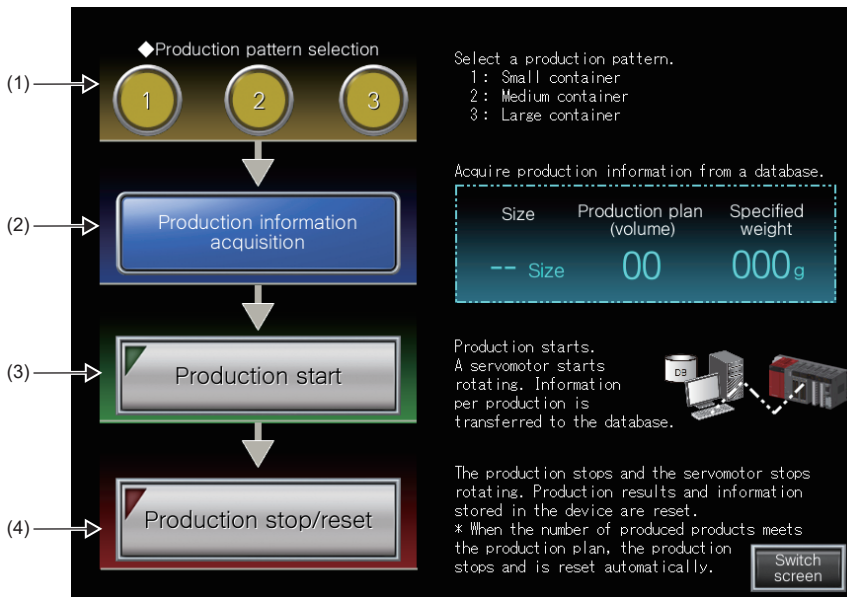
No.	Name	Description
(1)	Production status	The production plan volume and the number of accepted/rejected products per production pattern are displayed in numerical values. The display can be switched for each pattern.
(2)	Production status (by size)	The production plan volume and the number of accepted products per production pattern are displayed in a bar graph.
(3)	Quality information*1	Historical information on rejected products is displayed in a list.

*1 The display can be changed by switching tabs.

Operation of GOT screen

This section describes how to operate the GOT screen.

Use GOT2000.

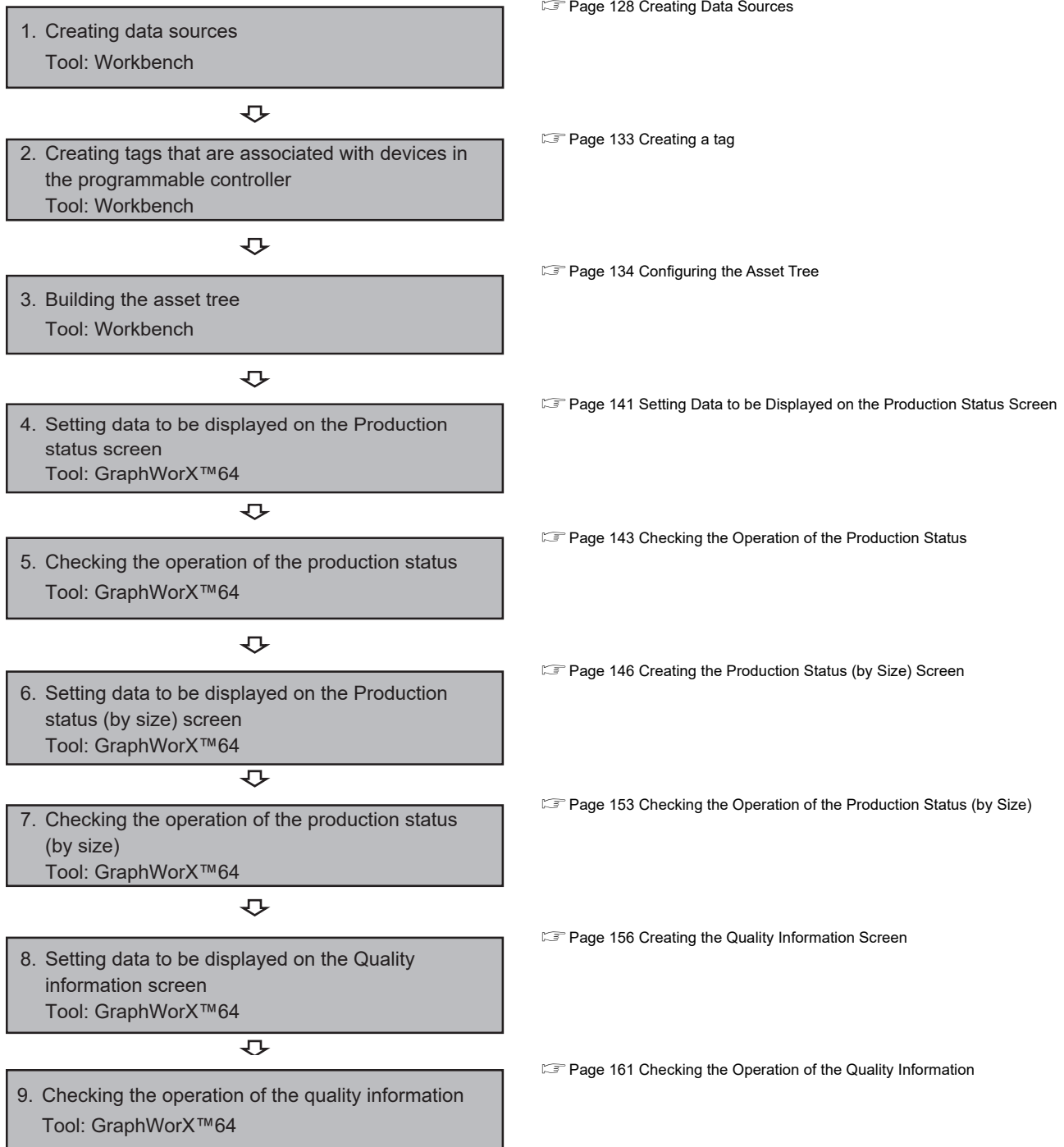


No.	Name	Description
(1)	Production pattern selection	Selects a production pattern. 1: Small container 2: Medium container 3: Large container
(2)	Production information acquisition	Acquires the production information of the selected production pattern.
(3)	Production start	Starts the production based on the acquired production information.
(4)	Production stop/reset	Stops the production.

5.2 Operating Procedure

The following is the operating procedure of this exercise.

Operating procedure



5.3 Creating Data Sources

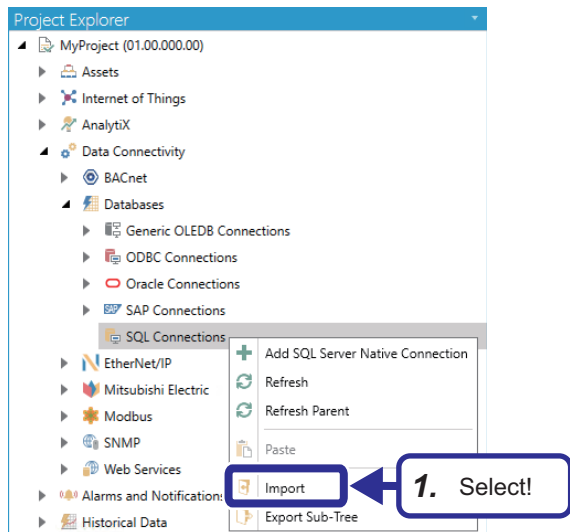
This section describes how to import project data in the Workbench and create data sources.

Data sources define which information is acquired from which database and have been set in the project data.

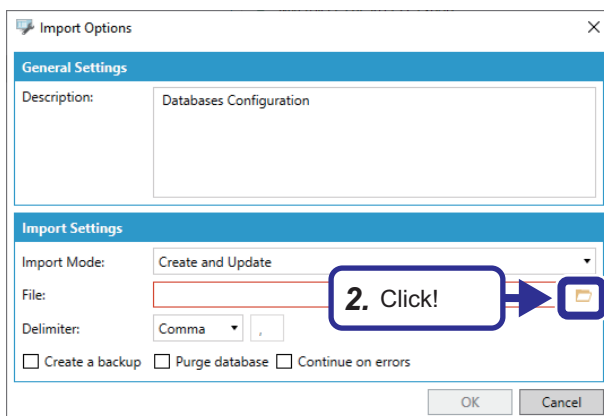
Importing project data

Import project data in the Workbench.

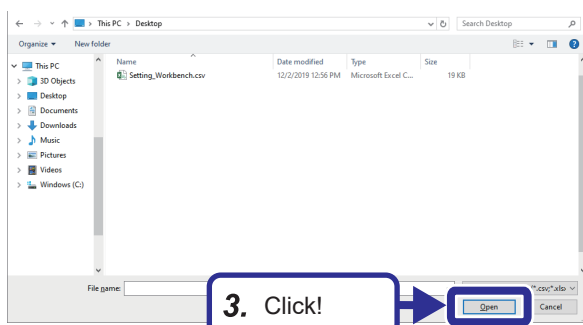
Operating procedure



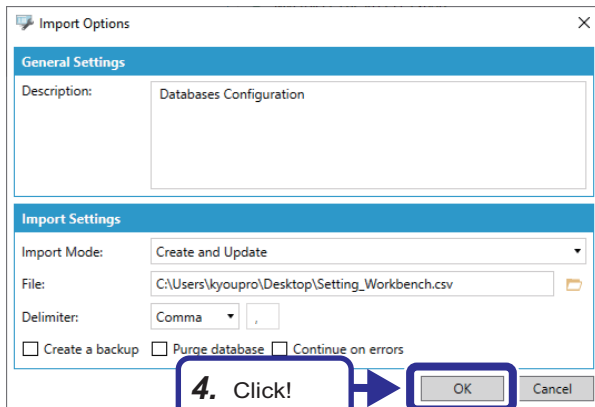
1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Data Connectivity] ⇒ [Databases] ⇒ [SQL Connections] in the "Project Explorer" window. Right-click on [SQL Connections], and select [Import].



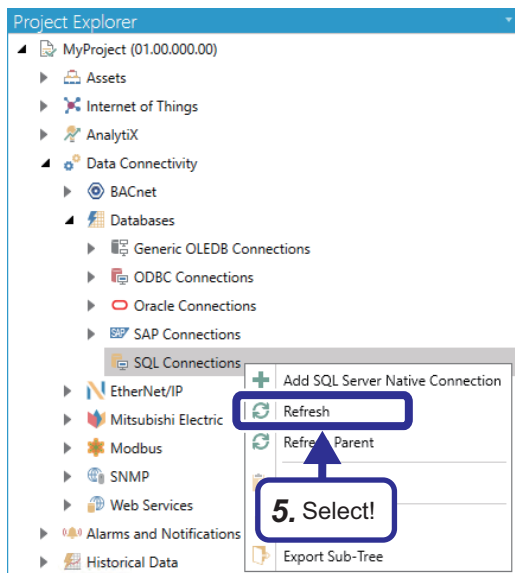
2. Click  to open the "File" browser.



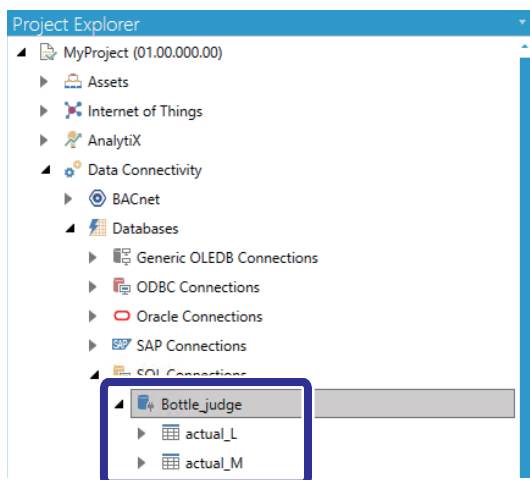
3. Select the "Setting_Workbench.csv" file, and click the [Open] button.



4. Click the [OK] button.



5. Right-click on [SQL Connections] in the "Project Explorer" window, and select [Refresh].



6. The imported data sources are displayed in the "Project Explorer" window.

Setting data

The following are the details of the imported data sources.

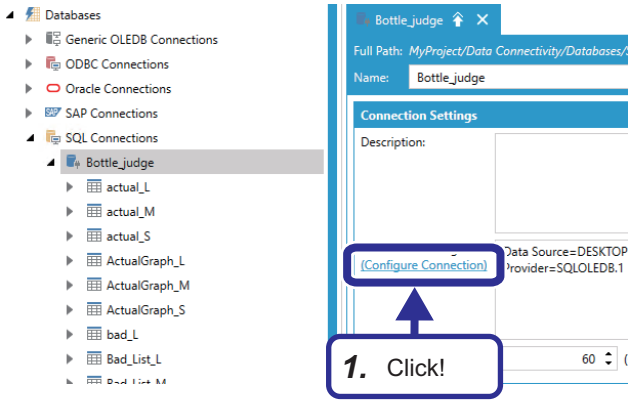
Data source name	Description	Table	Displayed location in the screen																																																																							
actual_□*1	Acquires the total number of accepted products from the Judgement table.	<ul style="list-style-type: none"> Project table <table border="1"> <thead> <tr> <th>Pattern</th> <th>Size</th> <th>ProductionPlanVolume</th> <th>SpecifiedWeight</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>S</td> <td>40</td> <td>100</td> </tr> <tr> <td>2</td> <td>M</td> <td>60</td> <td>150</td> </tr> <tr> <td>3</td> <td>L</td> <td>80</td> <td>200</td> </tr> </tbody> </table> Judgement table <table border="1"> <thead> <tr> <th>ContainerID</th> <th>DateAndTime</th> <th>QualityDetermination</th> <th>TotalNumberOfAcceptedProducts</th> <th>TotalNumberOfRejectedProducts</th> </tr> </thead> <tbody> <tr> <td>S1</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>S2</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>2</td> <td>0</td> </tr> <tr> <td>S3</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>3</td> <td>0</td> </tr> <tr> <td>S4</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>4</td> <td>0</td> </tr> <tr> <td>S5</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>5</td> <td>0</td> </tr> <tr> <td>S6</td> <td>2019/12/25 14:11:10</td> <td>2</td> <td>5</td> <td>1</td> </tr> <tr> <td>S7</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>6</td> <td>1</td> </tr> <tr> <td>S8</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>7</td> <td>1</td> </tr> <tr> <td>S9</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>8</td> <td>1</td> </tr> <tr> <td>S10</td> <td>2019/12/25 14:11:10</td> <td>1</td> <td>9</td> <td>1</td> </tr> </tbody> </table> 	Pattern	Size	ProductionPlanVolume	SpecifiedWeight	1	S	40	100	2	M	60	150	3	L	80	200	ContainerID	DateAndTime	QualityDetermination	TotalNumberOfAcceptedProducts	TotalNumberOfRejectedProducts	S1	2019/12/25 14:11:10	1	1	0	S2	2019/12/25 14:11:10	1	2	0	S3	2019/12/25 14:11:10	1	3	0	S4	2019/12/25 14:11:10	1	4	0	S5	2019/12/25 14:11:10	1	5	0	S6	2019/12/25 14:11:10	2	5	1	S7	2019/12/25 14:11:10	1	6	1	S8	2019/12/25 14:11:10	1	7	1	S9	2019/12/25 14:11:10	1	8	1	S10	2019/12/25 14:11:10	1	9	1	Production status
Pattern	Size		ProductionPlanVolume	SpecifiedWeight																																																																						
1	S		40	100																																																																						
2	M		60	150																																																																						
3	L		80	200																																																																						
ContainerID	DateAndTime		QualityDetermination	TotalNumberOfAcceptedProducts	TotalNumberOfRejectedProducts																																																																					
S1	2019/12/25 14:11:10		1	1	0																																																																					
S2	2019/12/25 14:11:10	1	2	0																																																																						
S3	2019/12/25 14:11:10	1	3	0																																																																						
S4	2019/12/25 14:11:10	1	4	0																																																																						
S5	2019/12/25 14:11:10	1	5	0																																																																						
S6	2019/12/25 14:11:10	2	5	1																																																																						
S7	2019/12/25 14:11:10	1	6	1																																																																						
S8	2019/12/25 14:11:10	1	7	1																																																																						
S9	2019/12/25 14:11:10	1	8	1																																																																						
S10	2019/12/25 14:11:10	1	9	1																																																																						
ActualGraph_□*1	Acquires the size from the Project table and the total number of accepted products from the Judgement table.		Production status (by size)																																																																							
bad_□*1	Acquires the total number of rejected products from the Judgement table.		Production status																																																																							
Bad_List_□*1	Acquires the container ID, production date and time, and total number of rejected products from the Judgement table.		Quality information																																																																							
Plan_□*1	Acquires the production plan volume from the Project table.		Production status																																																																							
PlanGraph_□*1	Acquires the size and production plan volume from the Project table.		Production status (by size)																																																																							

*1 □ indicates the size (S/M/L).

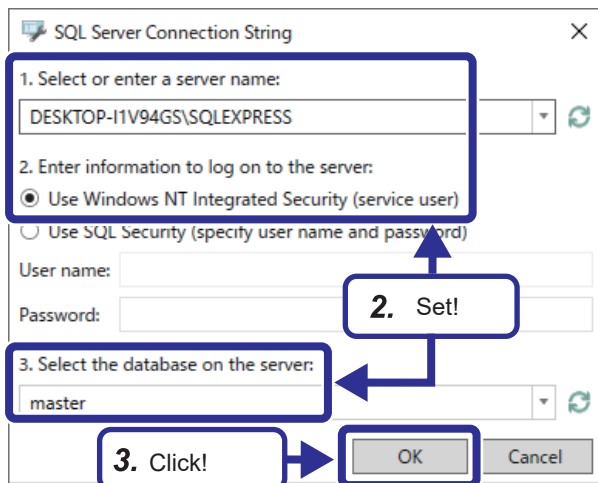
Setting a database to be connected

Set a connection target database of the imported data sources in accordance with the personal computer used as a database server.

Operating procedure



1. Double-click [Bottle_judge], and click "(Configure Connection)".



2. Set the SQL Server connection settings as follows: [Settings]

Select or enter a server name:

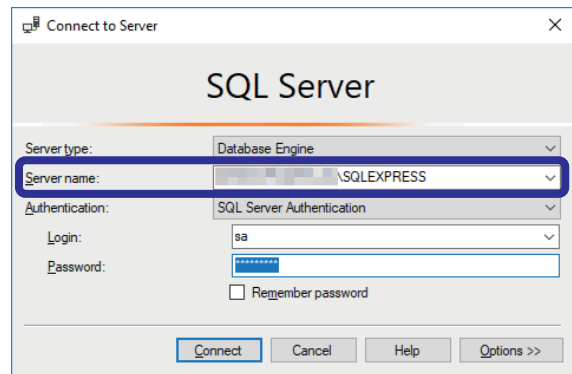
(Personal computer name used as a database server)\(SQL Server instance name)^{*1*2}

Enter information to log on to the server:

Use Windows NT Integrated Security (service user)

Select the database on the server: master

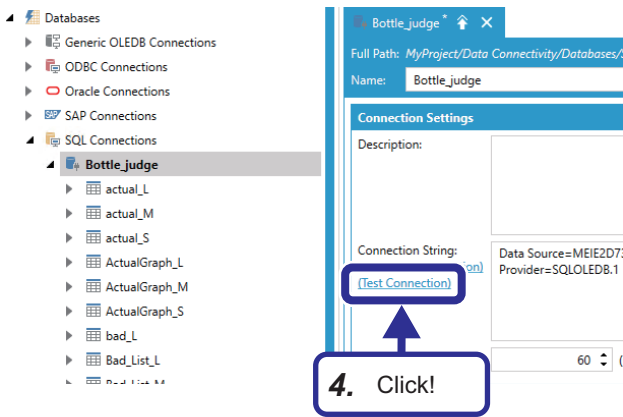
- *1 The server name can be checked by starting SQL Server Management Studio.



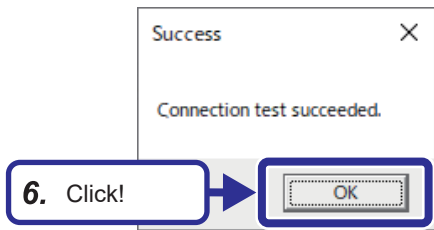
- *2 In the window shown on the left, the following are set:
 Personal computer name: DESKTOP-I1V94GS
 Instance name: SQLEXPRESS

3. Click the [OK] button.





4. Click "(Test Connection)".



5. Check that the connection with the database has been successfully established.

6. Click the [OK] button.



7. Click the [Apply] button.

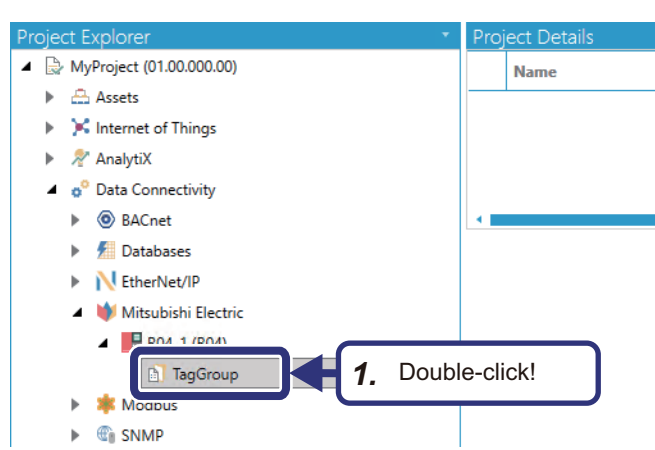
5.4 Setting a Tag

This section describes how to set a tag in the Workbench.

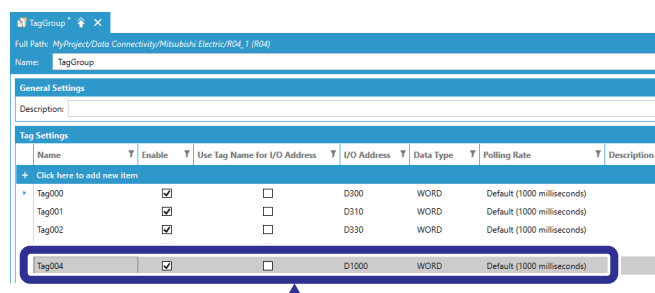
Creating a tag

Add a tag to be used in Exercise 2 to the communication target device used in Exercise 1. Set a device for switching the production status between the production patterns as a tag.

Operating procedure



1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Data Connectivity] ⇒ [Mitsubishi Electric] ⇒ [R04_1(R04)] ⇒ [TagGroup] in the "Project Explorer" window. Double-click [TagGroup].



2. Click the "+ Click here to add new item" link under "Tag Settings", and set the following:

Settings						Description
Name	Enable	Use Tag name for I/O Address	I/O Address	Data Type	Polling Rate	
Tag004	Selected	Deselected	D1000	WORD	Default (1000 milliseconds)	Production pattern



3. Click the [Apply] button.



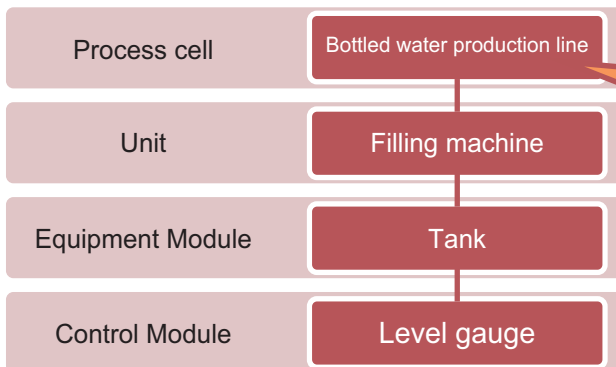
5.5 Configuring the Asset Tree

This section describes how to build an asset tree in the Workbench.

Add the following equipment properties to be used in Exercise 2 to the asset tree built in Exercise 1.

Structure

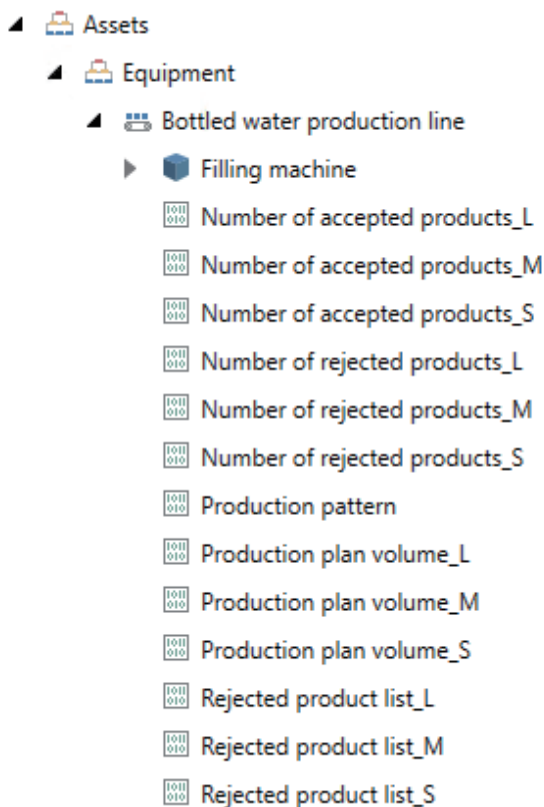
Equipment hierarchy Equipment configuration



Equipment properties

- Production plan volume_S
- Production plan volume_M
- Production plan volume_L
- Number of accepted products_S
- Number of accepted products_M
- Number of accepted products_L
- Number of rejected products_S
- Number of rejected products_M
- Number of rejected products_L
- Rejected product list_S
- Rejected product list_M
- Rejected product list_L
- Production pattern

Asset tree



Setting equipment properties

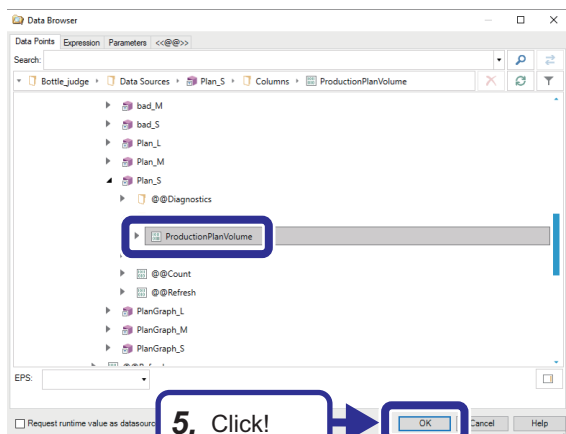
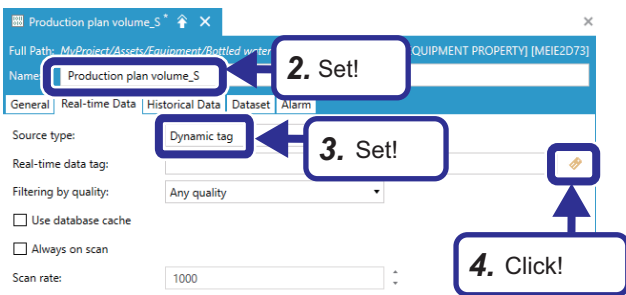
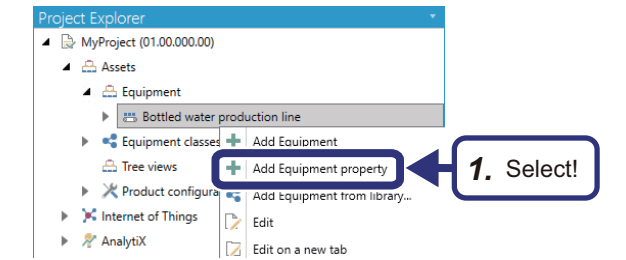
Set the data of equipment as equipment properties.

Link equipment properties with data sources and tags set to the Mitsubishi Electric FA Connector.


In this exercise, we set equipment properties related to the production pattern and S size on the setting screen in the Workbench. For the properties related to the M size and L size, we define them in an external file and import them from the file.

Setting equipment properties

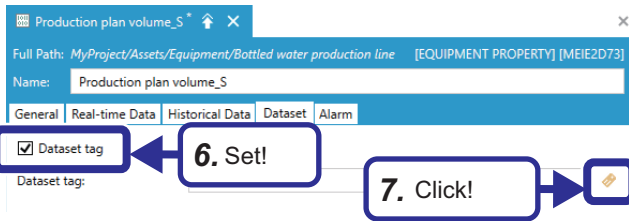
Operating procedure




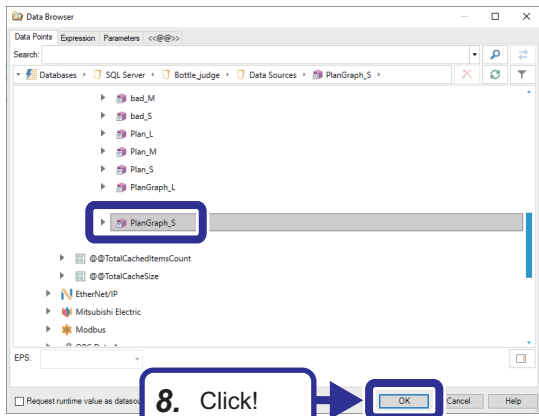
1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Assets] ⇒ [Equipment] ⇒ [Bottled water production line] in the "Project Explorer" window. Right-click on [Bottled water production line], and select [Add Equipment property].

2. Set the following:
[Settings]
Name: Production plan volume_S
3. Set the following in the [Real-time Data] tab:
[Settings]
Source type: Dynamic tag
4. Click  to open the "Real-time data" browser.

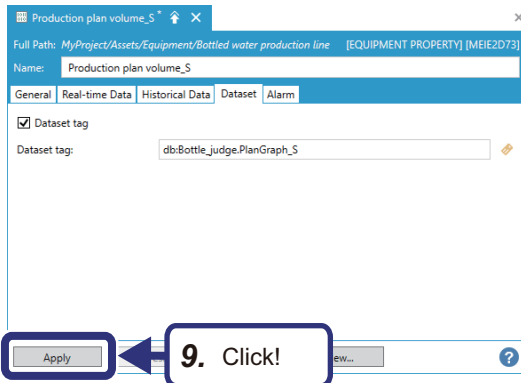
5. Select [My Computer] ⇒ [Data Connectivity] ⇒ [Databases] ⇒ [SQL Server] ⇒ [Bottle_judge] ⇒ [Data Sources] ⇒ [Plan_S] ⇒ [Columns] ⇒ [ProductionPlanVolume], and click the [OK] button.



6. Set the following in the [Dataset] tab:
[Settings]
Dataset tag: Selected
7. Click  to open the "Dataset tag" browser.



8. Select [My Computer] ⇒ [Data Connectivity] ⇒ [Databases] ⇒ [SQL Server] ⇒ [Bottle_judge] ⇒ [Data Sources] ⇒ [PlanGraph_S], and click the [OK] button.



9. Click the [Apply] button.

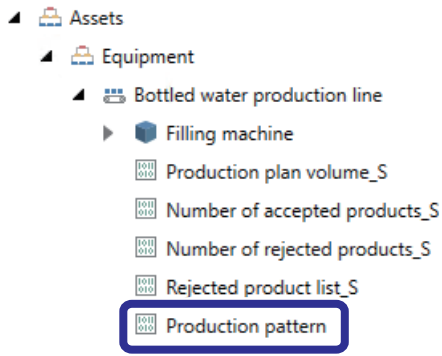
Point 

Set the [Real-time Data] tab to reference values on the graphic screen (for example, Process Point).
Set the [Dataset] tab to reference data sets on the graphic screen (for example, GridWorX™ Viewer).

10. Set the following equipment properties in the same way.

Target equipment	Settings			
	Name	Real-time Data		Dataset
		Source type	Real-time data tag	Dataset tag
Bottled water production line	Number of accepted products_S	Dynamic tag	[actual_S] ⇒ [Columns] ⇒ [TotalNumberOfAcceptedProducts]	Selected [ActualGraph_S]
Bottled water production line	Number of rejected products_S	Dynamic tag	[bad_S] ⇒ [Columns] ⇒ [TotalNumberOfRejectedProducts]	Not set
Bottled water production line	Rejected product list_S	Not set		Selected [Bad_List_S]





11. Set the following equipment property referring to the procedure described on Page 54 Setting equipment properties.

Target equipment	Settings		
	Name	Real-time Data	
		Source type	Real-time data tag
Bottled water production line	Production pattern	Dynamic tag	Tag004

Importing equipment properties

Operating procedure

	A	B	C
1	[LocationPath]	Name	DisplayName
2	\EquipmentRoot\Bottled water production line	Production plan volume_S	
3	\EquipmentRoot\Bottled water production line	Number of accepted products_S	
4	\EquipmentRoot\Bottled water production line	Number of rejected products_S	
5	\EquipmentRoot\Bottled water production line	Rejected product list_S	
6	\EquipmentRoot\Bottled water production line	Production pattern	
7	\EquipmentRoot\Bottled water production line\Filling machine\Tank	Timer	
8	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the tank	
9	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the container	
10	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Air pressure in the tank	
11			

1. Export [Bottled water production line] referring to the procedure described on Page 56 Importing equipment properties.
2. Open the file exported in Step 1 in Excel. The "EquipmentProperty" sheet is displayed.
3. Copy the 2nd to 5th rows to the 11th to 14th rows, and change the data as follows:

	A	B	C
1	[LocationPath]	Name	DisplayName
2	\EquipmentRoot\Bottled water production line	Production plan volume_S	
3	\EquipmentRoot\Bottled water production line	Number of accepted products_S	
4	\EquipmentRoot\Bottled water production line	Number of rejected products_S	
5	\EquipmentRoot\Bottled water production line	Rejected product list_S	
6	\EquipmentRoot\Bottled water production line	Production pattern	
7	\EquipmentRoot\Bottled water production line\Filling machine\Tank	Timer	
8	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the tank	
9	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Volume of water in the container	
10	\EquipmentRoot\Bottled water production line\Filling machine\Tank\Level gauge	Air pressure in the tank	
11	\EquipmentRoot\Bottled water production line	Production plan volume_M	
12	\EquipmentRoot\Bottled water production line	Number of accepted products_M	
13	\EquipmentRoot\Bottled water production line	Number of rejected products_M	
14	\EquipmentRoot\Bottled water production line	Rejected product list_M	
15			

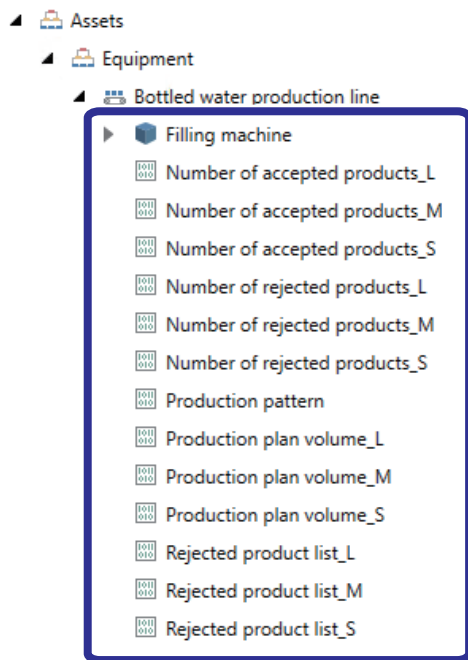
	O	Re
	db:TimePointName	
	db: Bottle_judge_Plan_S[ProductionPlanVolume][0]	
	db: Bottle_judge_actual_S[TotalNumberOfAcceptedProducts][0]	
	db: Bottle_judge_bad_S[TotalNumberOfRejectedProducts][0]	
	meIR04.1.TagGroup/Tag004	
	meIR04.1.TagGroup/Tag003	
	meIR04.1.TagGroup/Tag000	
	meIR04.1.TagGroup/Tag001	
	db: Bottle_judge_Plan_M[ProductionPlanVolume][0]	
	db: Bottle_judge_actual_M[TotalNumberOfAcceptedProducts][0]	
	db: Bottle_judge_bad_M[TotalNumberOfRejectedProducts][0]	

	AF	Re
	db: Bottle_judge_PlanGraph_S	0
	db: Bottle_judge_ActualGraph_S	0
	db: Bottle_judge_Bad_List_S	0
		0
		0
		0
		0
		0
		0
		0
	db: Bottle_judge_PlanGraph_M	0
	db: Bottle_judge_ActualGraph_M	0
	db: Bottle_judge_Bad_List_M	0

Target row	Settings		
	Name	RealtimePointName	DatasetPointName
11th row	Production plan volume_M	db: Bottle_judge.Plan_M[ProductionPlanVolume][0]	db: Bottle_judge.PlanGraph_M
12th row	Number of accepted products_M	db: Bottle_judge.actual_M[TotalNumberOfAcceptedProducts][0]	db: Bottle_judge.ActualGraph_M
13th row	Number of rejected products_M	db: Bottle_judge.bad_M[TotalNumberOfRejectedProducts][0]	Not changed
14th row	Rejected product list_M	Not changed	db: Bottle_judge.Bad_List_M

- Equipment properties to be added

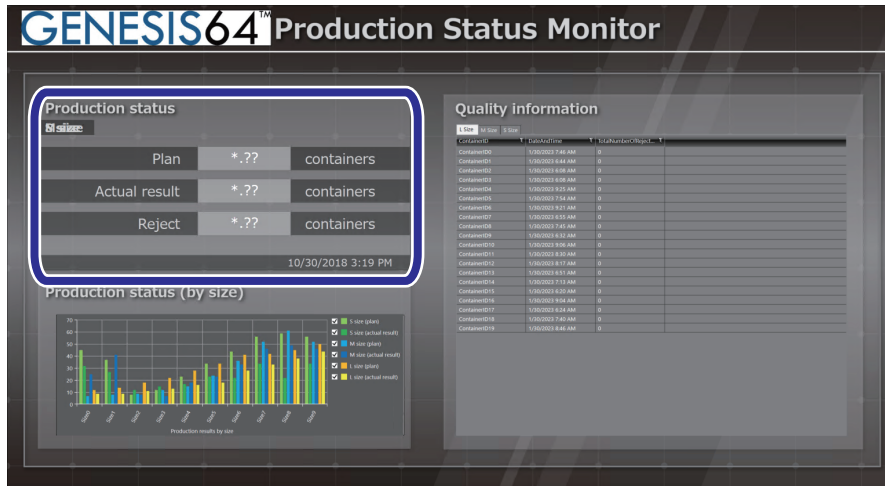
Settings					
Target equipment	Name	Real-time Data		Dataset	
		Source type	Real-time data tag	Dataset tag	
Bottled water production line	Production plan volume_M	Dynamic tag	[Plan_M] ⇒ [Columns] ⇒ [ProductionPlanVolume]	Selected	[PlanGraph_M]
Bottled water production line	Number of accepted products_M	Dynamic tag	[actual_M] ⇒ [Columns] ⇒ [TotalNumberOfAcceptedProducts]	Selected	[ActualGraph_M]
Bottled water production line	Number of rejected products_M	Dynamic tag	[bad_M] ⇒ [Columns] ⇒ [TotalNumberOfRejectedProducts]	Not set	
Bottled water production line	Rejected product list_M	Not set		Selected	[Bad_List_M]



5. Save the changes to the file.
6. Import the file saved in Step 5 to [Bottled water production line] referring to the procedure described on Page 56 Importing equipment properties.
7. Check that the equipment properties are added.

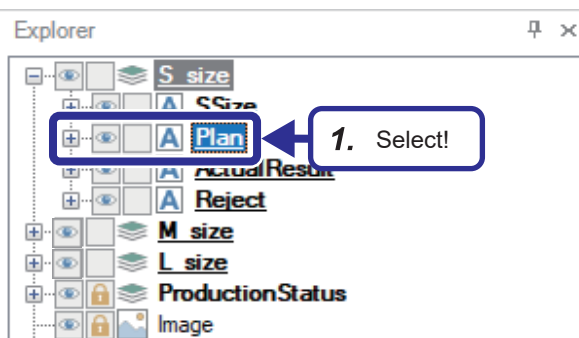
5.6 Setting Data to be Displayed on the Production Status Screen

This section describes how to display data stored in the database on the Production status screen using GraphWorX™64. Display the values stored in the tables of the database for the following layered objects.

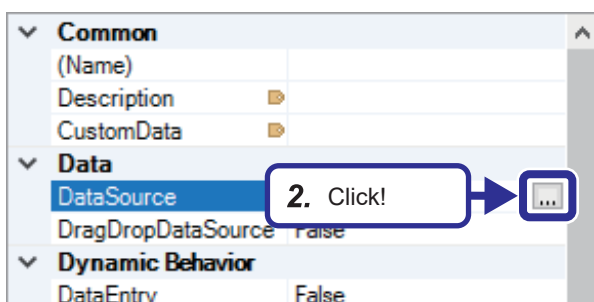


Object name		Display content
S_size	Plan	Production plan volume of the production pattern 1 (S size)
	Actual result	Total number of accepted products of the production pattern 1 (S size)
	Reject	Total number of rejected products of the production pattern 1 (S size)
M_size	Plan	Production plan volume of the production pattern 2 (M size)
	Actual result	Total number of accepted products of the production pattern 2 (M size)
	Reject	Total number of rejected products of the production pattern 2 (M size)
L_size	Plan	Production plan volume of the production pattern 3 (L size)
	Actual result	Total number of accepted products of the production pattern 3 (L size)
	Reject	Total number of rejected products of the production pattern 3 (L size)

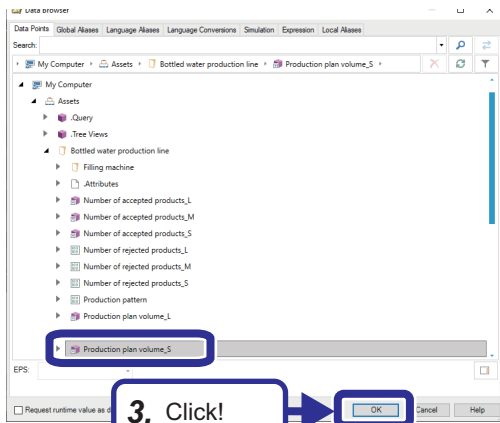
Operating procedure



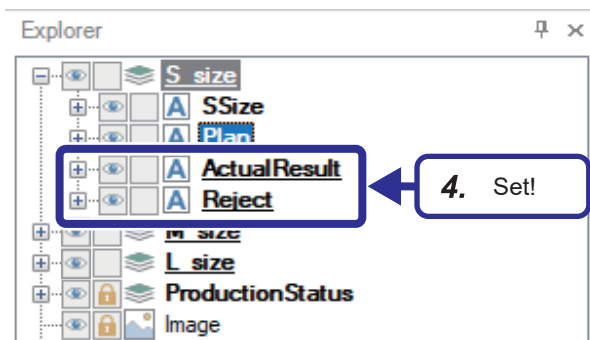
1. Open the "Template.gdfx" file, and select [S_size] ⇒ [Plan] in the [Explorer] tab.



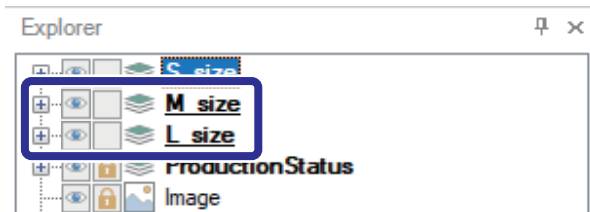
2. Select [Data] ⇒ [DataSource] in the [Dynamics] tab, and click [...].



3. Select [My Computer] ⇒ [Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_S], and click the [OK] button.



4. Set [ActualResult] and [Reject] in the same way.
 [Settings]
 [ActualResult]
 DataSource: [Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_S]
 [Reject]
 DataSource: [Assets] ⇒ [Bottled water production line] ⇒ [Number of rejected products_S]



5. Set items for M size and L size in the same way.

Object name		Data
		DataSource
M_size	Plan	[Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_M]
	Actual result	[Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_M]
	Reject	[Assets] ⇒ [Bottled water production line] ⇒ [Number of rejected products_M]
L_size	Plan	[Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_L]
	Actual result	[Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_L]
	Reject	[Assets] ⇒ [Bottled water production line] ⇒ [Number of rejected products_L]

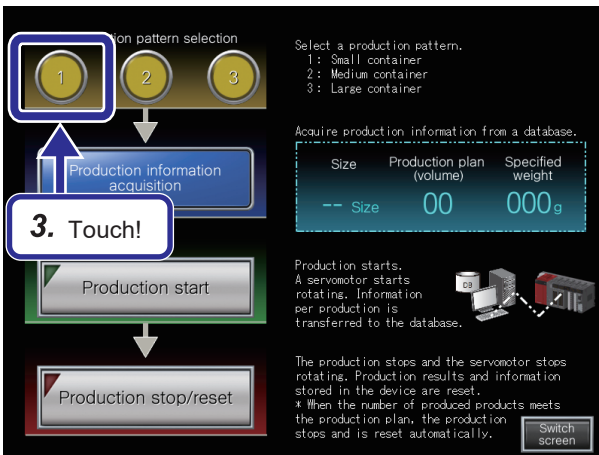
5.7 Checking the Operation of the Production Status

This section describes how to check the operation of the production status in Runtime mode.

Operating procedure

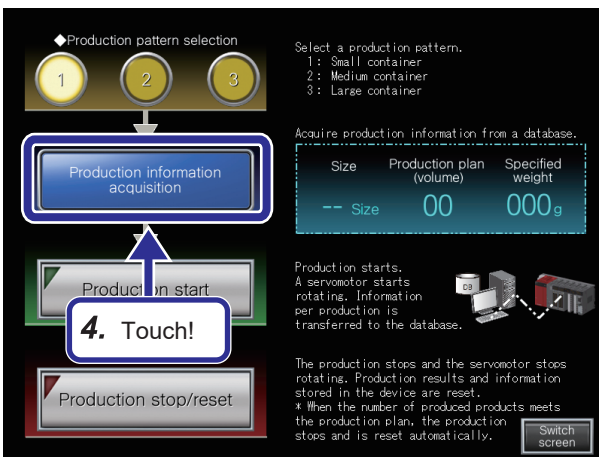


1. Write the project for Exercise 2, "school_MES.gx3" to the CPU module, and set the RUN/STOP/RESET switch of the CPU module to the RUN position. For the writing method, refer to the following.
 ↳ Page 29 Writing parameters to the CPU module
2. Click the [Runtime] button.



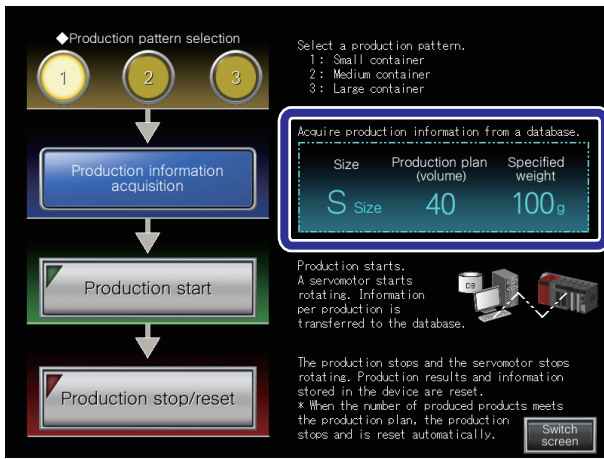
3. Touch the [1] button of "Production pattern selection" on the GOT.

5

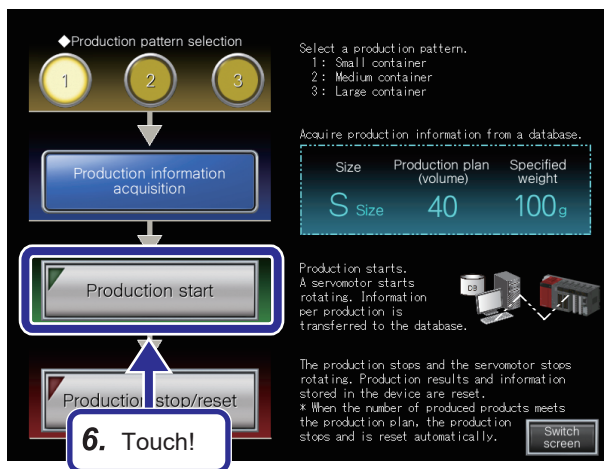


4. Touch the [Production information acquisition] button.





- The production information on the production pattern 1, which has been acquired from the database, is displayed.



- Touch the [Production start] button on the GOT.

Point

When the [Production start] button is touched, the following operations are performed.

- Small containers are produced every about one second.
- ID numbers are assigned to the finished containers. (ID number: 'Size' + 'Number', for example, S1, S2, S3)
- Non-conforming containers are rejected.
- When the number of accepted products reaches the production plan volume, the production stops.
- The number of revolutions of the servo motor differs depending on the production pattern. (Small container: One revolution, Medium container: Two revolutions, Large container: Three revolutions)
- When the production stops, the servo motor also stops.



Production status		
S size		
Plan	40.00	containers
Actual result	32.00	containers
Reject	4.00	containers
12/25/2019 2:32 PM		

- The production progress can be checked in real time on the screen of GraphWorX™ 64.



Production status		
M size		
Plan	60.00	containers
Actual result	28.00	containers
Reject	4.00	containers
12/25/2019 2:32 PM		



◆ Production pattern selection

1 2 3

Select a production pattern.
1: Small container
2: Medium container
3: Large container

Production information acquisition

9. Touch!

Production start

Production stop/reset

Acquire production information from a database.

Size	Production plan (volume)	Specified weight
M Size	60	150g

Production starts.
A servomotor starts rotating. Information per production is transferred to the database.

The production stops and the servomotor stops rotating. Production results and information stored in the device are reset.
* When the number of produced products meets the production plan, the production stops and is reset automatically.

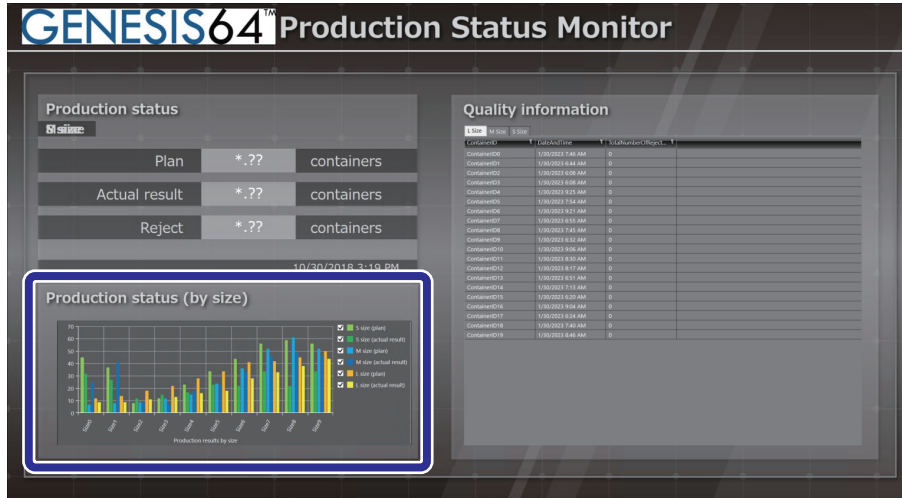
Switch screen

8. Touch the [Production stop/reset] button on the GOT.
Check the operation of different production patterns in the same way.

9. Touch the [Production stop/reset] button on the GOT.

5.8 Creating the Production Status (by Size) Screen

This section describes how to display data stored in the database on the Production status (by size) screen using the GridWorX™ Viewer.

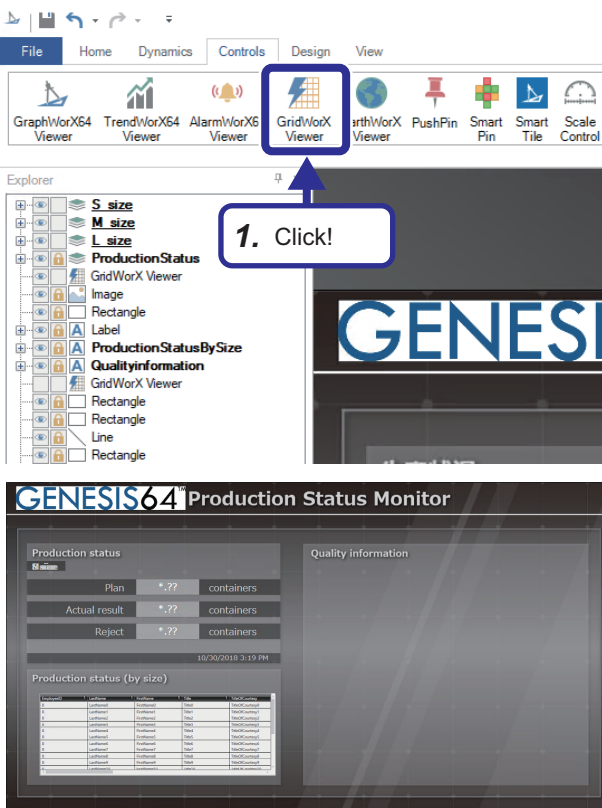


Setting a graph

Set a bar graph display for the production plan volume and actual result per production pattern.

Placing a graph

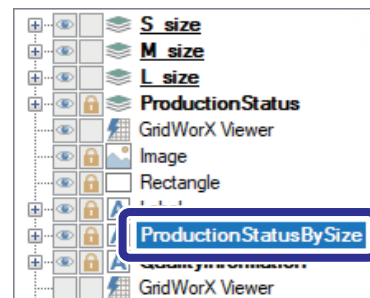
Operating procedure



1. Click the [GridWorX Viewer] button in the [Controls] tab, and drag the cursor to place the graph in a desired size.

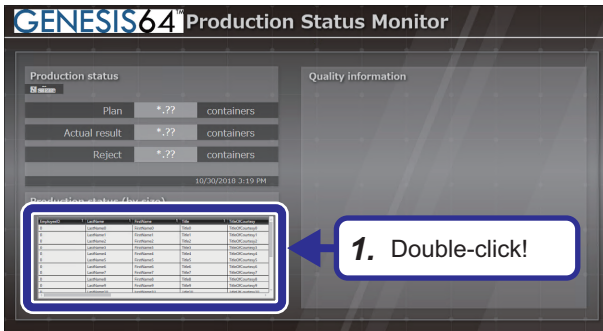
Point

If [S_size] is selected in the [Explorer] tab, the graph is created within the selected layer. The graph is not even displayed depending on the production pattern. In this exercise, place the graph with [ProductionStatusBySize] being selected.

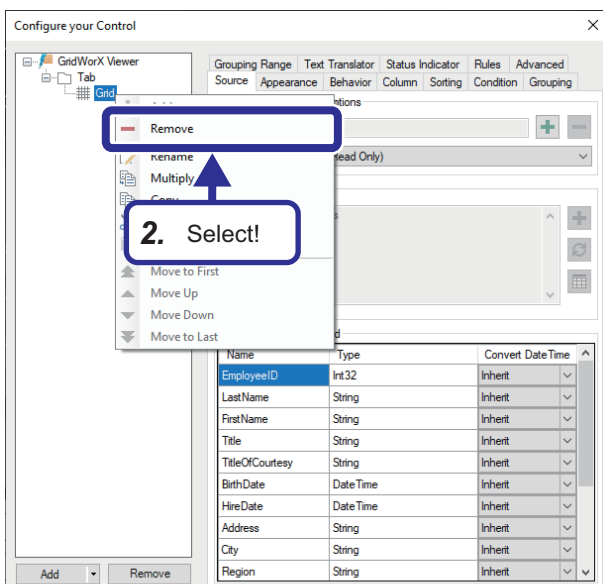


Adding a chart

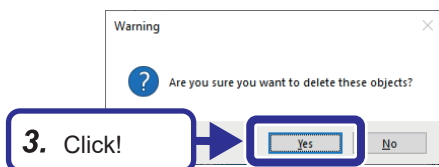
Operating procedure



1. Double-click the grid viewer.

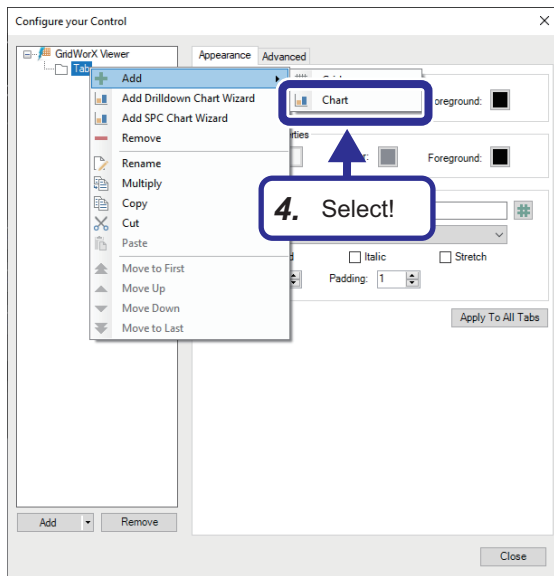


2. Select [GridWorX Viewer] ⇒ [Tab] ⇒ [Grid]. Right-click on [Grid], and select [Remove].



3. Click the [Yes] button.

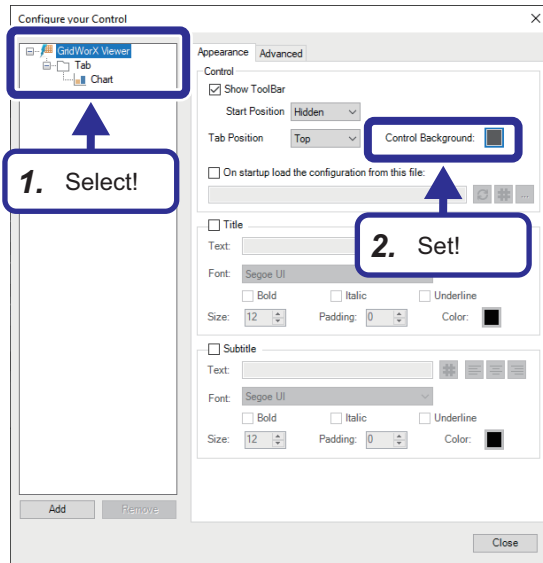
5



4. Select [GridWorX Viewer] ⇒ [Tab]. Right-click on [Tab], and select [Add] ⇒ [Chart].

Setting a graph (GridWorX™ Viewer)

Operating procedure

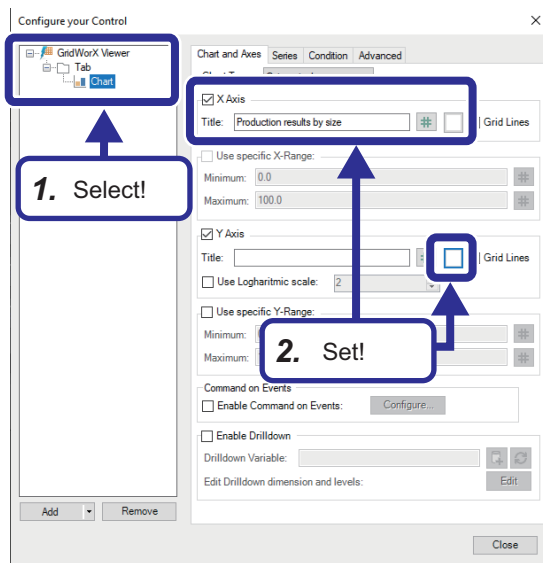


1. Select [GridWorX Viewer] in the tree.
2. Set the following in the [Appearance] tab:
[Settings]
Control Background: Gray (R: 89, G: 89, B: 89)

5

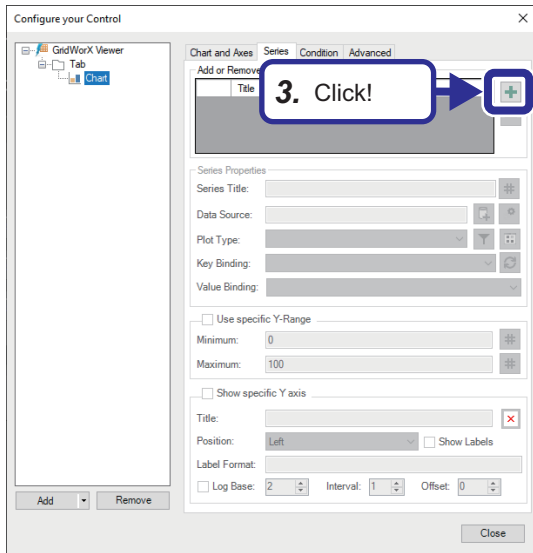
Setting a graph (chart)

Operating procedure

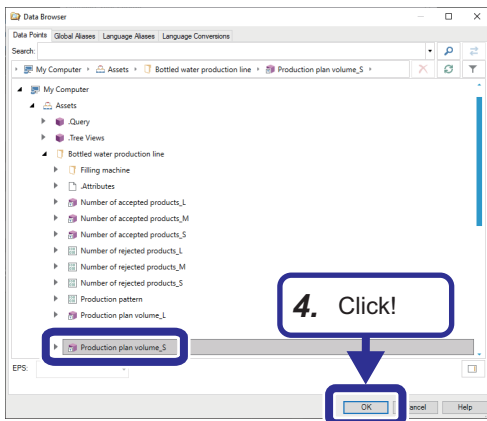


1. Select [GridWorX Viewer] ⇒ [Tab] ⇒ [Chart] in the tree.
2. Set the following in the [Chart and Axis] tab:
[Settings]
"X Axis"
Title: Production results by size
Color: White (R: 255, G: 255, B: 255)
"Y Axis"
Color: White (R: 255, G: 255, B: 255)

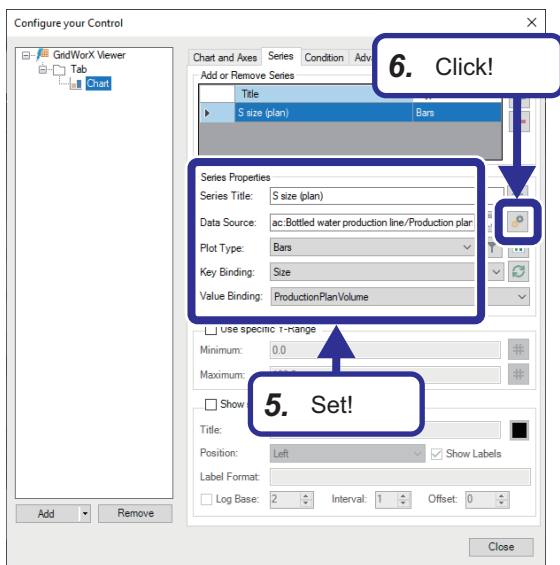




3. Select the [Series] tab, and click .



4. Select [My Computer] ⇒ [Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_S], and click the [OK] button.

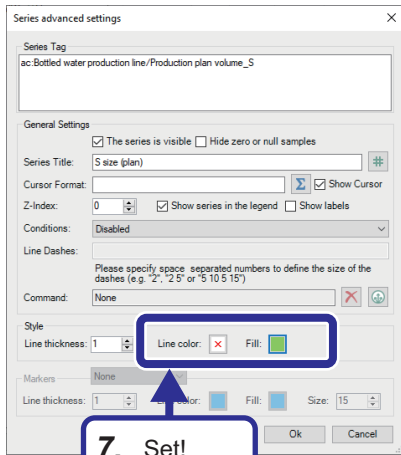


5. Set "Series Properties" as follows:
 [Settings]
 Series Title: S size (plan)
 Plot Type: Bars
 Key Binding: Size
 Value Binding: ProductionPlanVolume

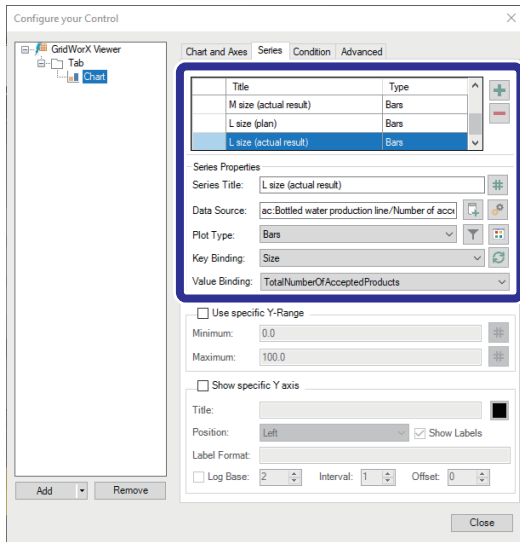
6. Click .



- 7. Set "Style" as follows:
 [Settings]
 Line color: None
 Fill: Yellow green (R: 146, G: 208, B: 80)

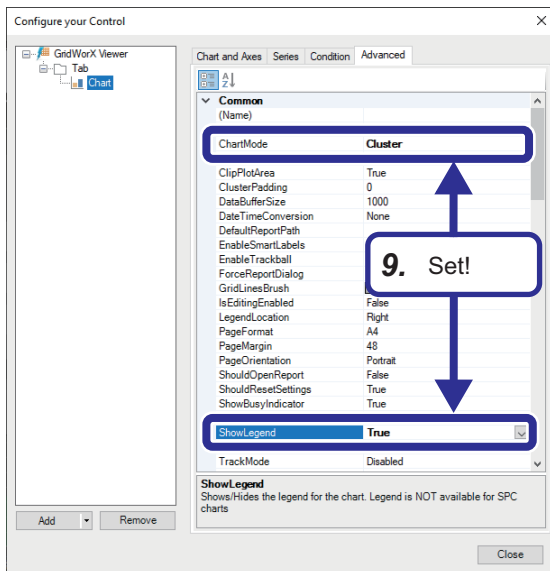


- 8. Set other "Series Properties" and "Style" as follows in the same way:

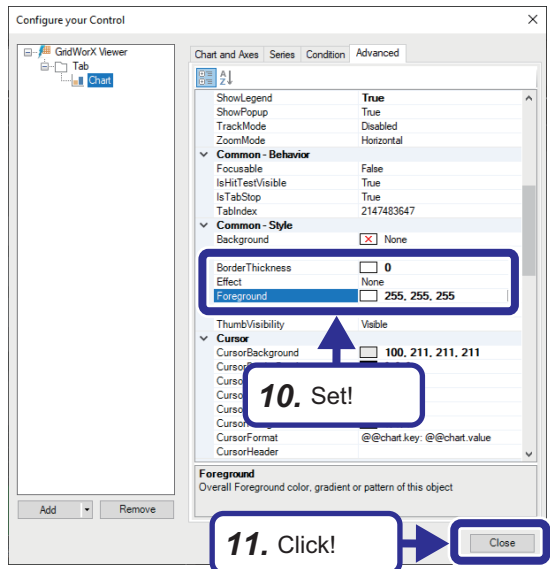


Data Source	Series Properties				Style	
	Series Title	Plot Type	Key Binding	Value Binding	Line color	Fill
[Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_S]	S size (actual result)	Bars	Size	TotalNumberOfAcceptedProducts	None	Green (R: 0, G: 176, B: 80)
[Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_M]	M size (plan)	Bars	Size	ProductionPlanVolume	None	Light blue (R: 0, G: 176, B: 240)
[Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_M]	M size (actual result)	Bars	Size	TotalNumberOfAcceptedProducts	None	Blue (R: 0, G: 112, B: 192)
[Assets] ⇒ [Bottled water production line] ⇒ [Production plan volume_L]	L size (plan)	Bars	Size	ProductionPlanVolume	None	Orange (R: 255, G: 192, B: 0)
[Assets] ⇒ [Bottled water production line] ⇒ [Number of accepted products_L]	L size (actual result)	Bars	Size	TotalNumberOfAcceptedProducts	None	Yellow (R: 255, G: 255, B: 0)

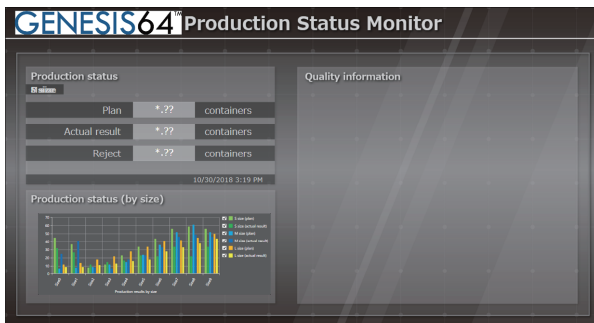




9. Select the [Advanced] tab, and set "Common" as follows:
 [Settings]
 ChartMode: Cluster
 ShowLegend: True



10. Set "Common-Style" as follows:
 [Settings]
 BorderThickness: 0
 Foreground: White (R: 255, G: 255, B: 255)
11. Click the [Close] button.



12. A graph is created based on the settings.

5.9 Checking the Operation of the Production Status (by Size)

This section describes how to check the operation of the production status (by size) in Runtime mode.

At the start of this exercise, the past production data (actual results) has already been displayed in a bar graph on the screen. When new containers are produced in this exercise, the past production data is reset and the count starts from zero.

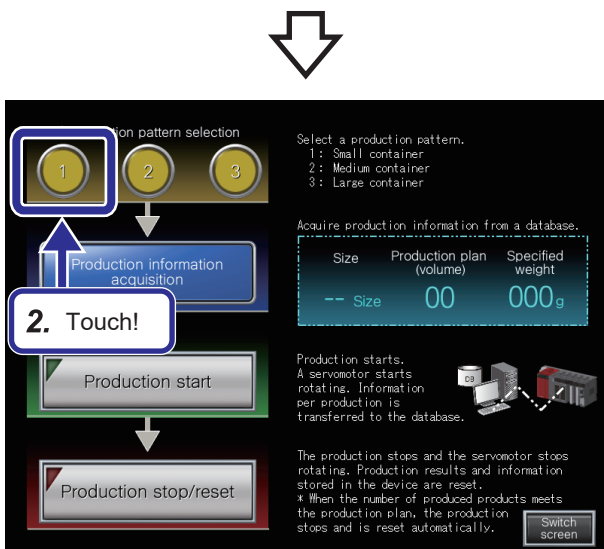
Operating procedure

1. Click the [Runtime] button.

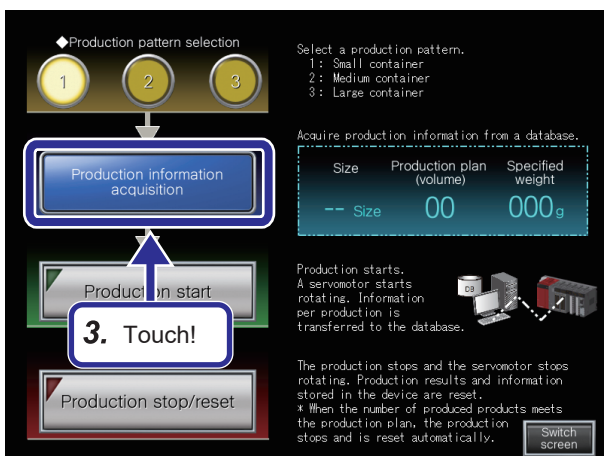


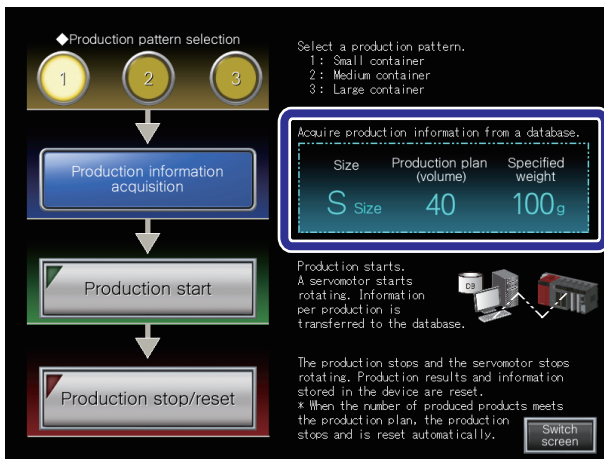
5

2. Touch the [1] button of "Production pattern selection" on the GOT.

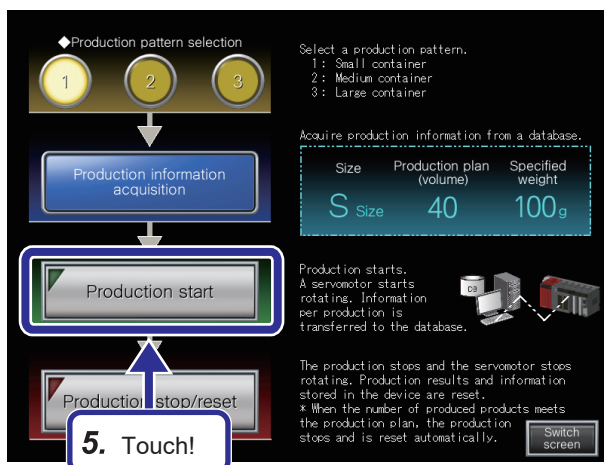


3. Touch the [Production information acquisition] button.

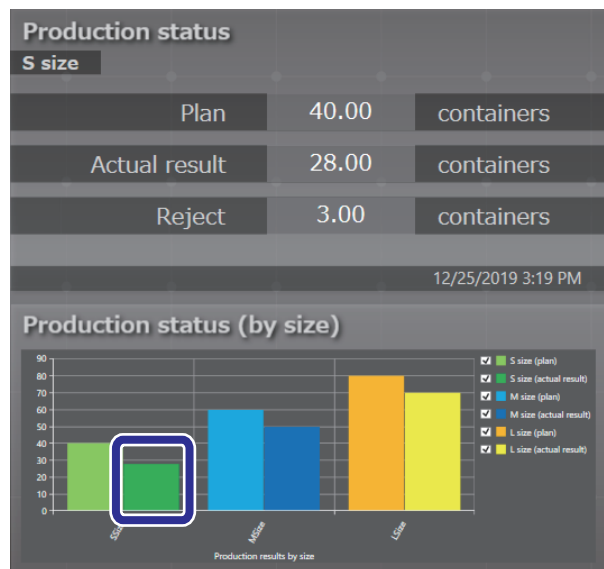




- The production information on the production pattern 1, which has been acquired from the database, is displayed.

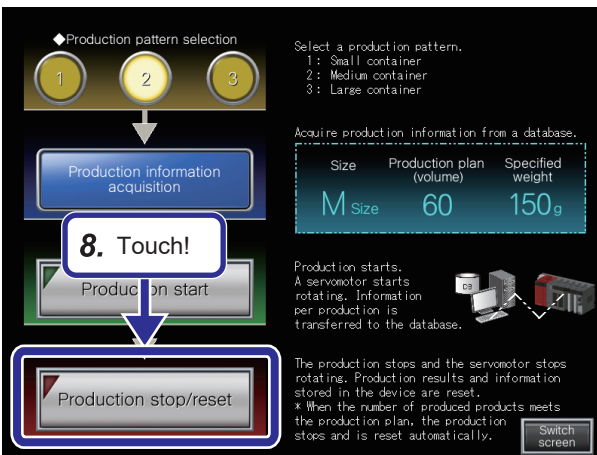
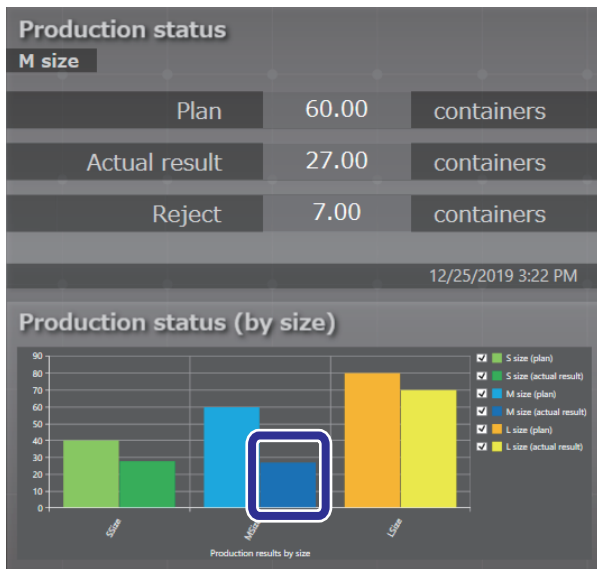


- Touch the [Production start] button on the GOT.



- The actual result of S size container production can be checked in real time on the screen of GraphWorX™64.



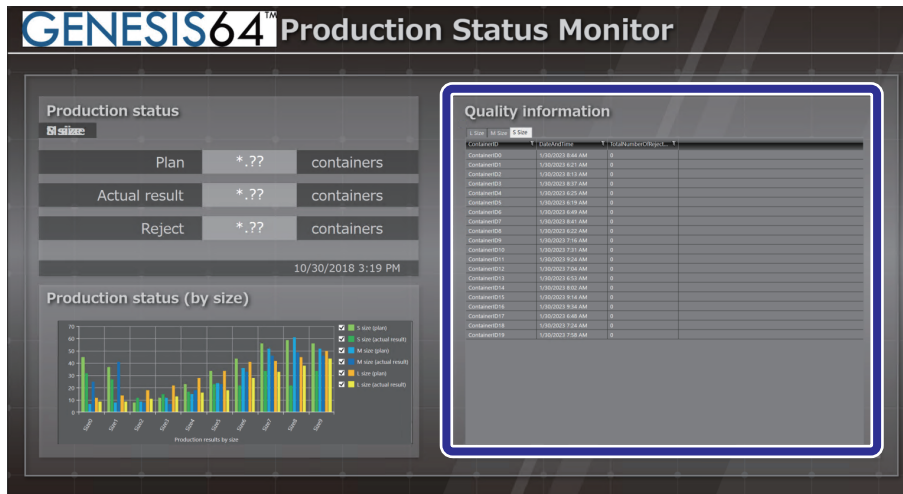


7. Touch the [Production stop/reset] button on the GOT.
Check the operation of different production patterns in the same way.

8. Touch the [Production stop/reset] button on the GOT.

5.10 Creating the Quality Information Screen

This section describes how to display data stored in the database on the Quality information screen using the GridWorX™ Viewer.

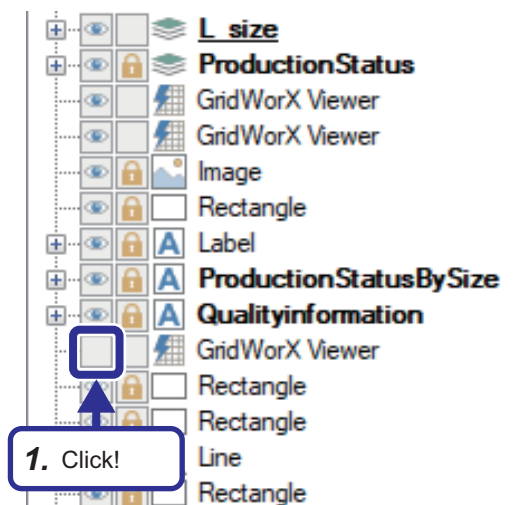


Setting data to be displayed on the Quality information screen

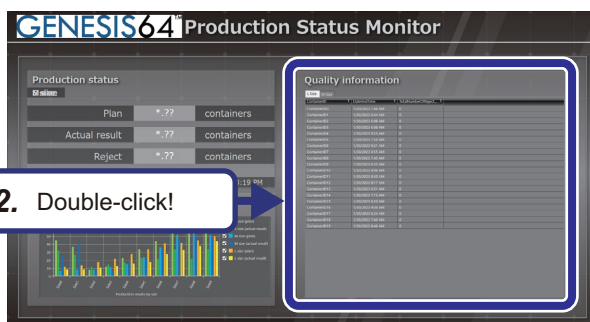
Add quality information of S size containers to those of M/L size containers.

Adding a tab

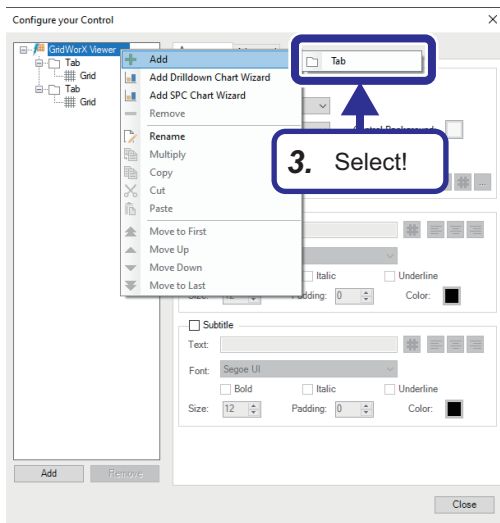
Operating procedure



1. Click of [GridWorX Viewer] in the [Explorer] tab to show the objects.



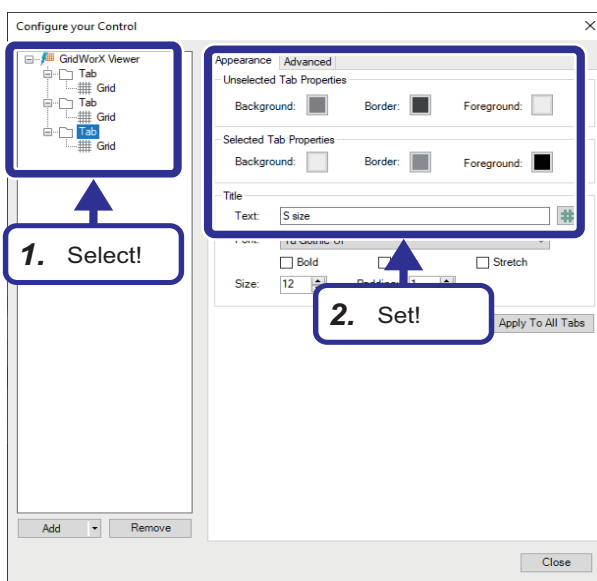
2. Double-click the grid viewer.



3. Right-click on [GridWorX Viewer] in the tree, and select [Add] ⇒ [Tab].

Setting a table (tab)

Operating procedure

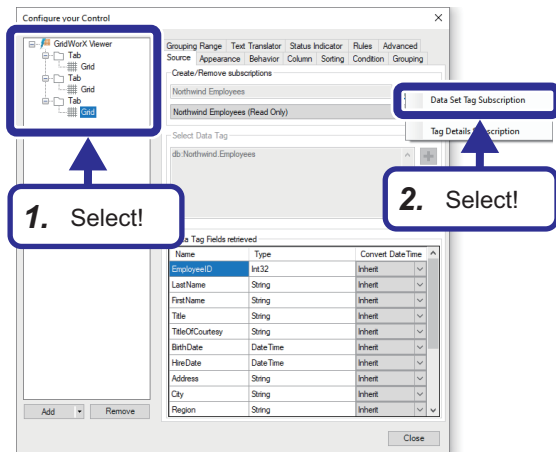



1. Select the added tab.
2. Set the following in the [Appearance] tab:
[Settings]
"Unselected Tab Properties"
Background: Gray*¹ (R: 127, G: 127, B: 127)
Border: Black (R: 63, G: 63, B: 63)
Foreground: White (R: 242, G: 242, B: 242)
"Selected Tab Properties"
Background: White (R: 242, G: 242, B: 242)
"Title"
Text: S size

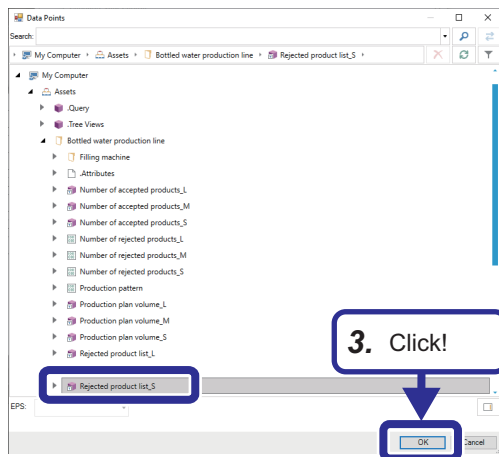
*1 Set the color in the [Solid Color] tab.

Setting a table (grid)

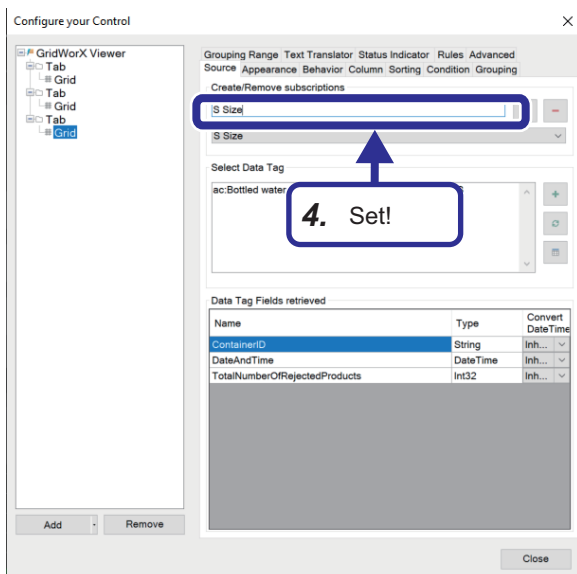
Operating procedure



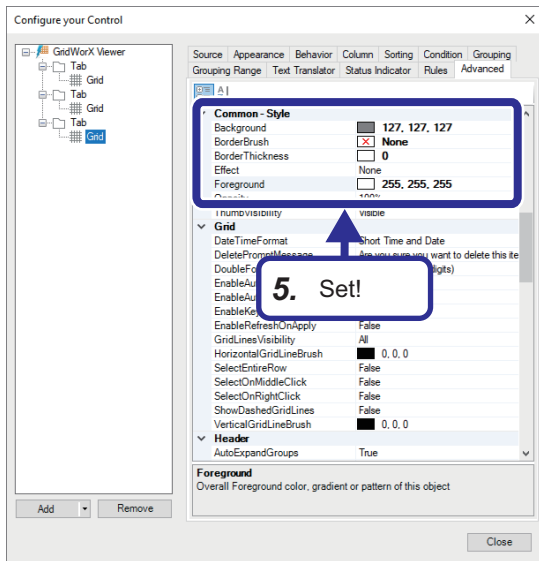
1. Select [Grid] of the added tab.
2. Click , and select [Data Set Tag Subscription].



3. Select [My Computer] ⇒ [Assets] ⇒ [Bottled water production line] ⇒ [Rejected product list_S], and click the [OK] button.



4. Set the following in the [Source] tab: [Settings]
Create/Remove subscriptions: S Size



5. Select the [Advanced] tab, and set "Common-Style" as follows:

[Settings]

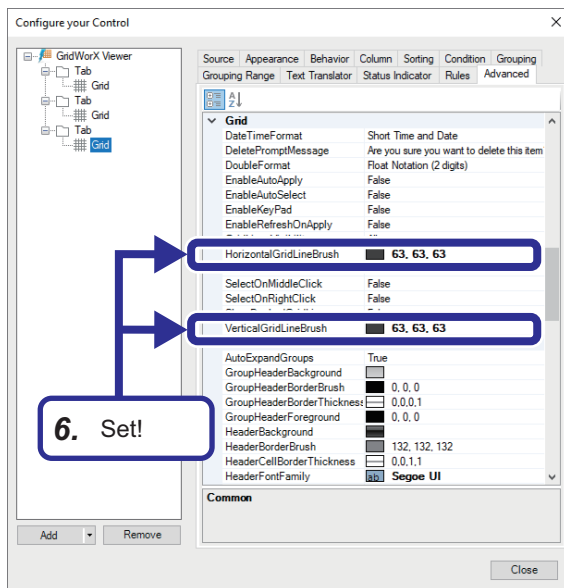
Background: Gray (R: 127, G: 127, B: 127)

BorderBrush: None

BorderThickness: 0

Foreground: White (R: 255, G: 255, B: 255)

5



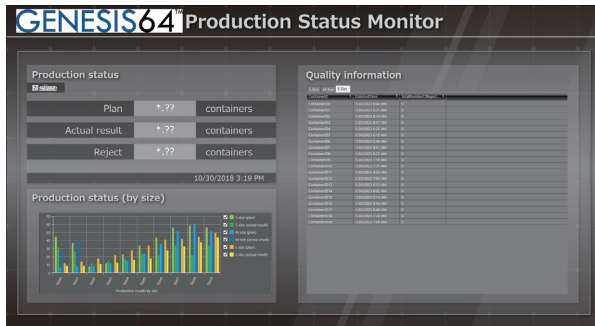
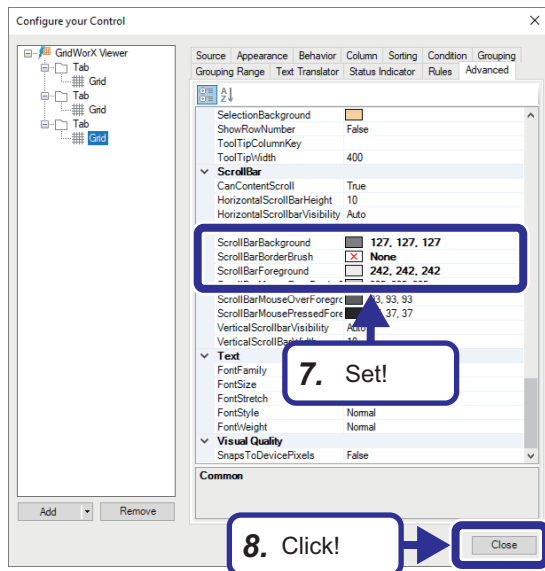
6. Set "Grid" as follows:

[Settings]

HorizontalGridLineBrush: Black (R: 63, G: 63, B: 63)

VerticalGridLineBrush: Black (R: 63, G: 63, B: 63)





7. Set "ScrollBar" as follows:
[Settings]
ScrollBarBackground: Gray (R: 127, G: 127, B: 127)
ScrollBarBorderBrush: None
ScrollBarForeground: White (R: 242, G: 242, B: 242)
8. Click the [Close] button.

9. A table is created based on the settings.

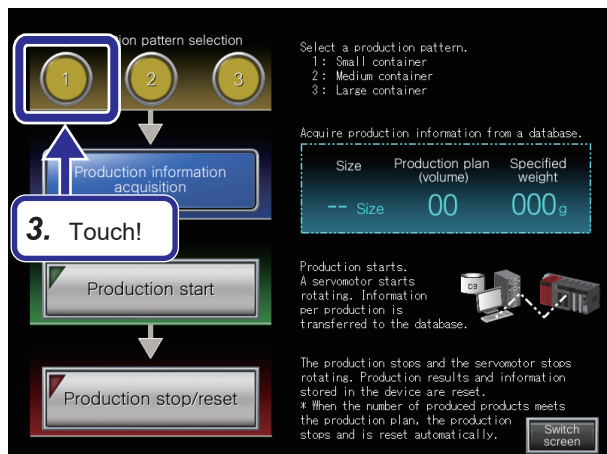
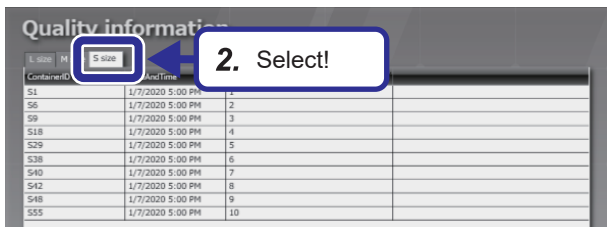
5.11 Checking the Operation of the Quality Information

This section describes how to check the operation of the quality information in Runtime mode.

At the start of this exercise, the past production data (quality information) has already been displayed in a list on the screen. When new containers are produced in this exercise, rejected container information is added to the list.

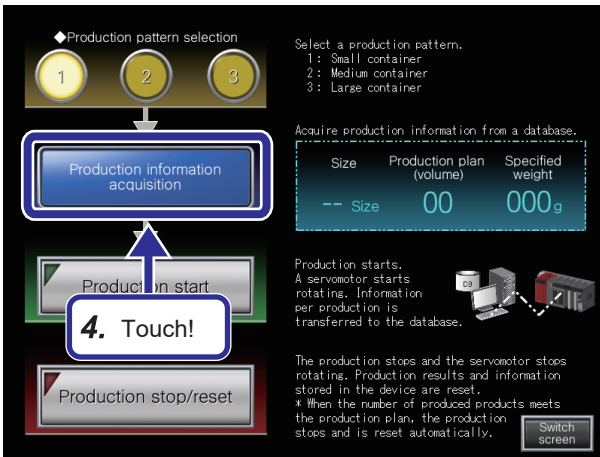
Operating procedure

1. Click the [Runtime] button.

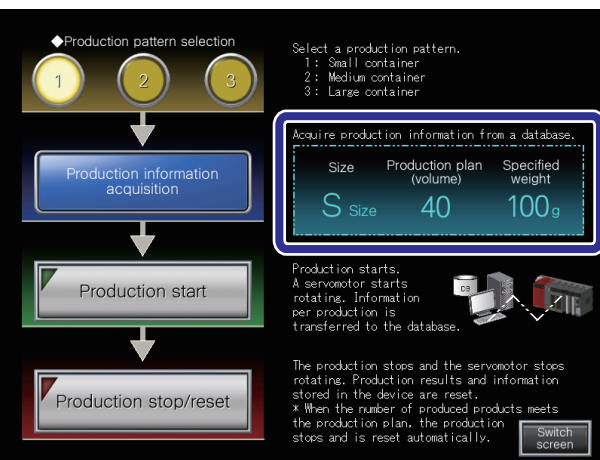


2. Select the [S size] tab to switch the screen for the S size quality information.

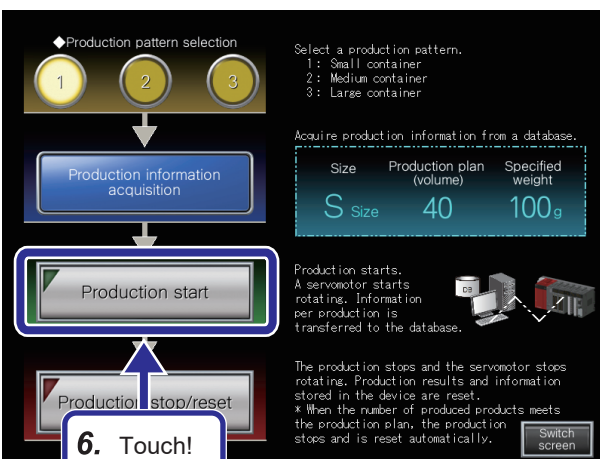
3. Touch the [1] button of "Production pattern selection" on the GOT.



4. Touch the [Production information acquisition] button.



5. The production information on the production pattern 1, which has been acquired from the database, is displayed.



6. Touch the [Production start] button on the GOT.

Quality information

ContainerID	DateAndTime	TotalNumberOfRejectedProducts
S51	1/7/2020 5:00 PM	1
S6	1/7/2020 5:00 PM	2
S9	1/7/2020 5:00 PM	3
S18	1/7/2020 5:00 PM	4
S29	1/7/2020 5:00 PM	5
S38	1/7/2020 5:00 PM	6
S40	1/7/2020 5:00 PM	7
S42	1/7/2020 5:00 PM	8
S48	1/7/2020 5:00 PM	9
S55	1/7/2020 5:00 PM	10
S7	1/7/2020 5:30 PM	1
S12	1/7/2020 5:30 PM	2
S26	1/7/2020 5:30 PM	3



Quality information

ContainerID	DateAndTime	TotalNumberOfRejectedProducts
M3	1/7/2020 6:00 PM	1
M12	1/7/2020 6:00 PM	2
M22	1/7/2020 6:00 PM	3
M26	1/7/2020 6:00 PM	4
M39	1/7/2020 6:00 PM	5
M50	1/7/2020 6:00 PM	6
M5	1/7/2020 6:30 PM	1
M25	1/7/2020 6:30 PM	2
M44	1/7/2020 6:30 PM	3



Production pattern selection

Select a production pattern.
1: Small container
2: Medium container
3: Large container

Acquire production information from a database.

Size	Production plan (volume)	Specified weight
M Size	60	150g

9. Touch!

Production starts. A servomotor starts rotating. Information per production is transferred to the database.

The production stops and the servomotor stops rotating. Production results and information stored in the device are reset. * When the number of produced products meets the production plan, the production stops and is reset automatically.

Switch screen

7. The rejected container information is added and checked in real time on the screen of GraphWorX™ 64.

8. Touch the [Production stop/reset] button on the GOT. Check the operation of different production patterns in the same way.

5

9. Touch the [Production stop/reset] button on the GOT.

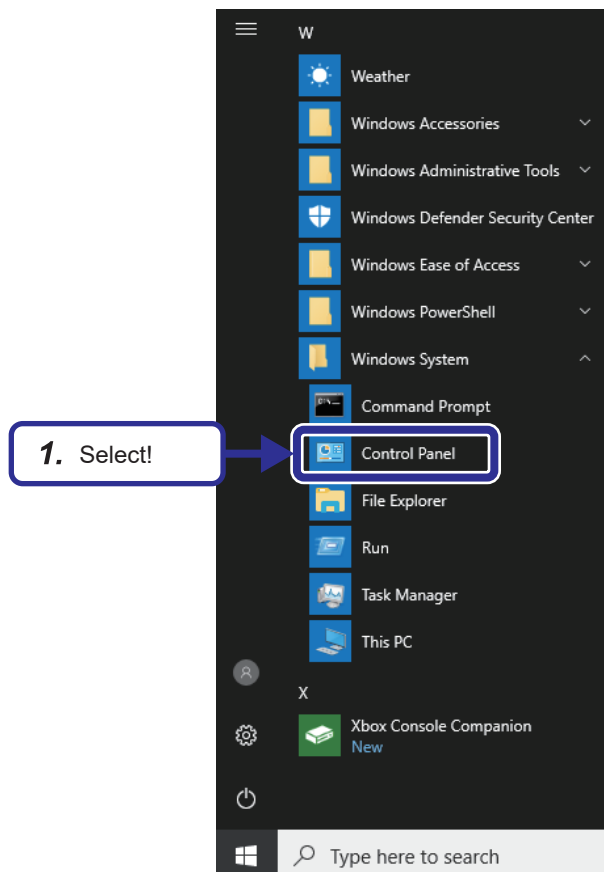
MEMO

APPENDICES

Appendix 1 TCP/IP Settings on a Personal Computer

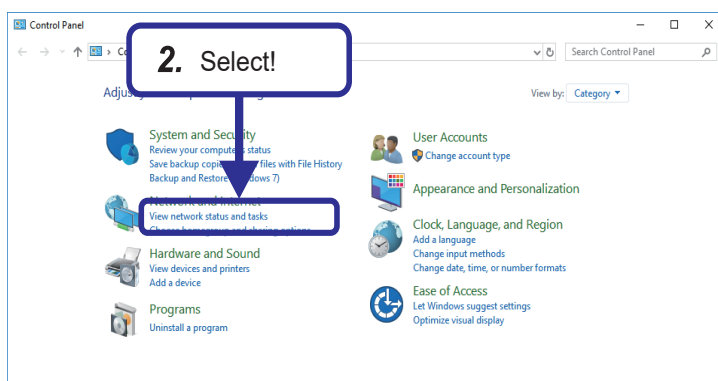
This section describes how to change TCP/IP settings on a personal computer running Microsoft® Windows® 10.

Operating procedure



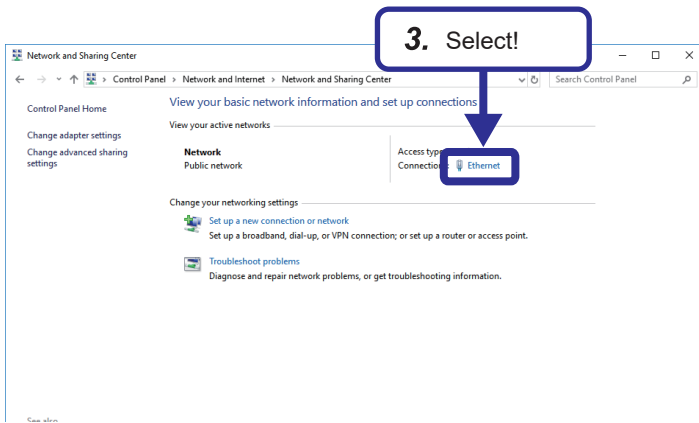
1. Open the Start menu of Windows®, and select [Windows System] ⇒ [Control Panel].

A

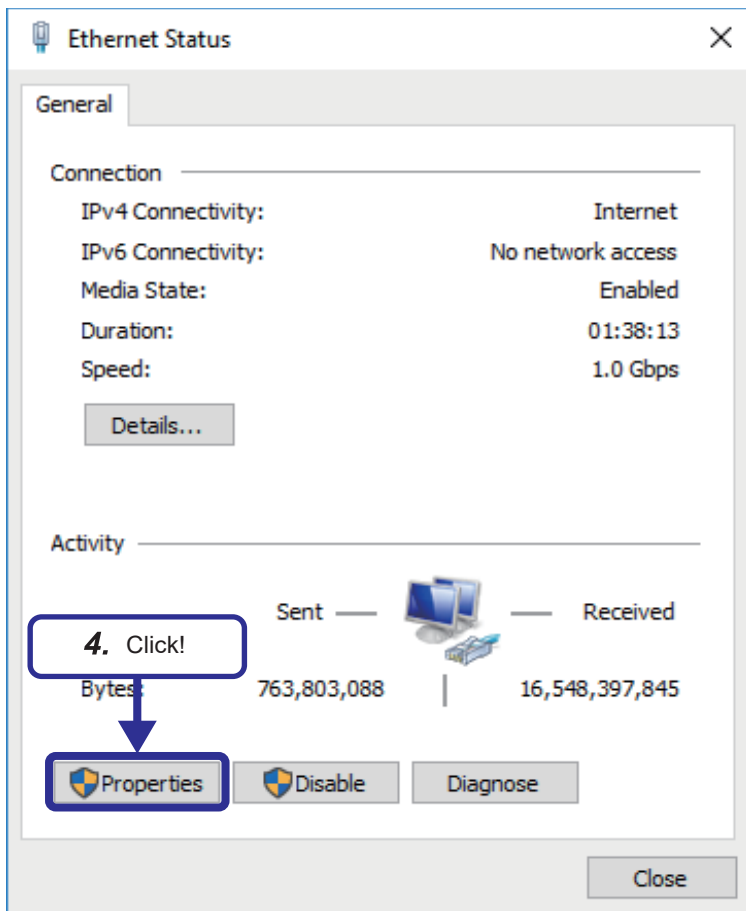


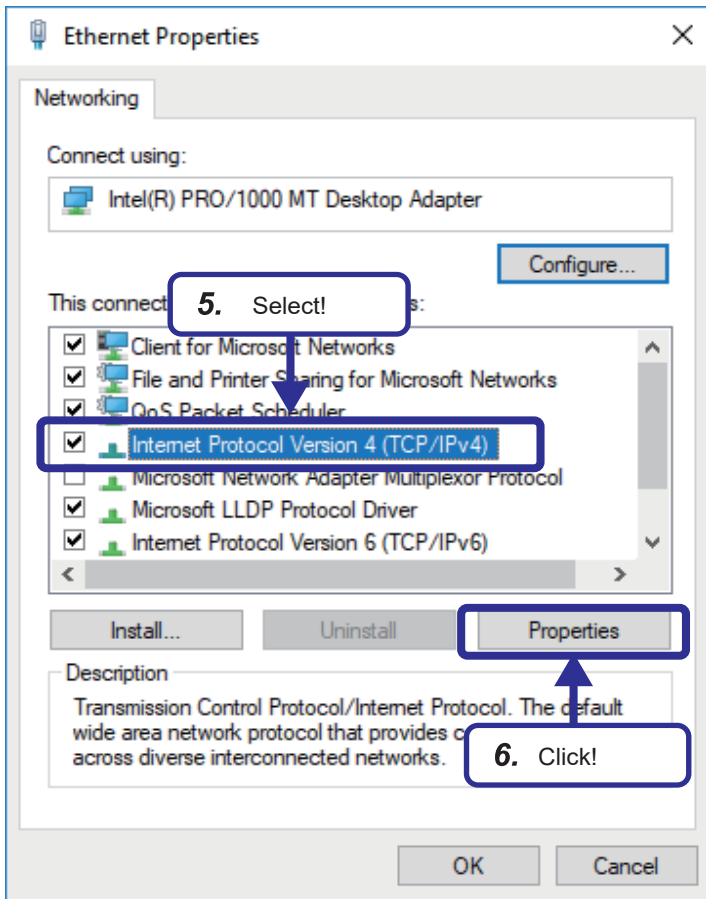
2. The Control Panel appears. Select "View network status and tasks".

3. Select "Ethernet".

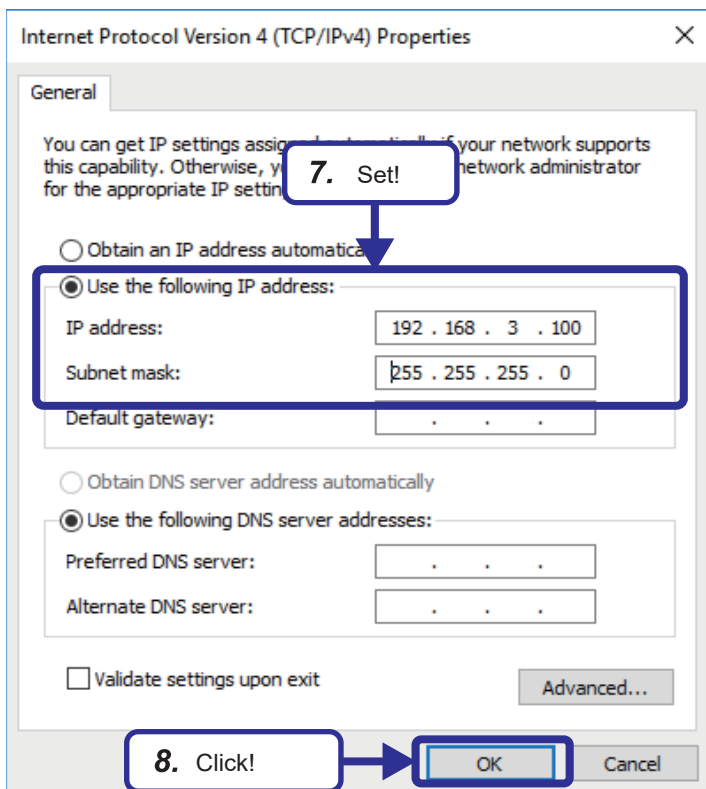


4. Click the [Properties] button.





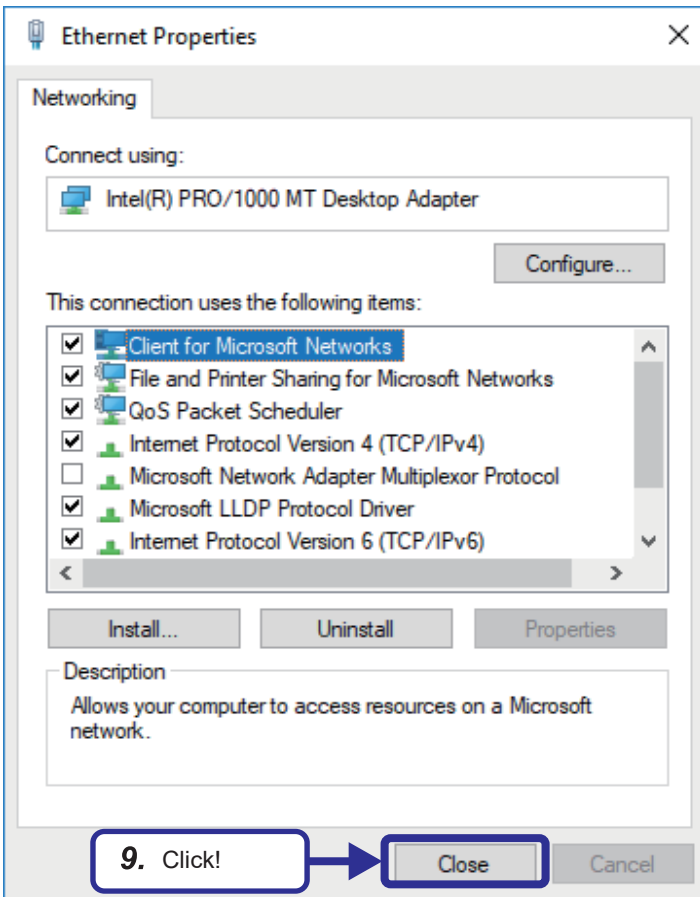
5. Select "Internet Protocol Version 4 (TCP/IPv4)".
6. Click the [Properties] button.



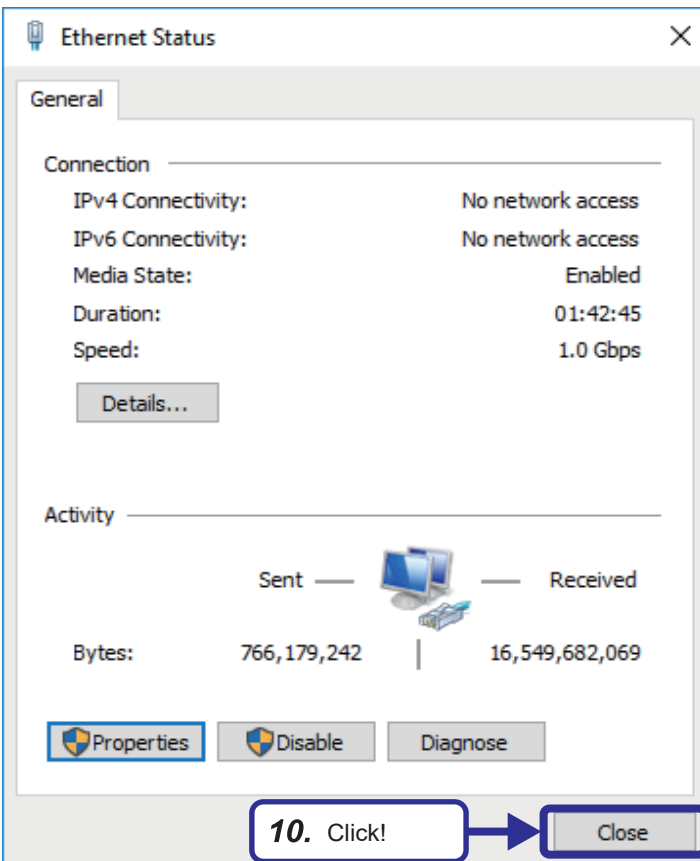
7. Select "Use the following IP address", and set the following:
[Settings]
IP address: 192.168.3.100
Subnet mask: 255.255.255.0
8. Click the [OK] button.



9. Click the [OK] button.



10. Click the [Close] button.



Appendix 2 Hyper Alarm

On Page 31 EXERCISE 1 CREATING AN OPERATION MONITORING SCREEN, we set threshold values and alarm messages to be displayed to the equipment properties using AssetWorX™.

Such data can also be set to the alarm tags on the Hyper Alarm Server.

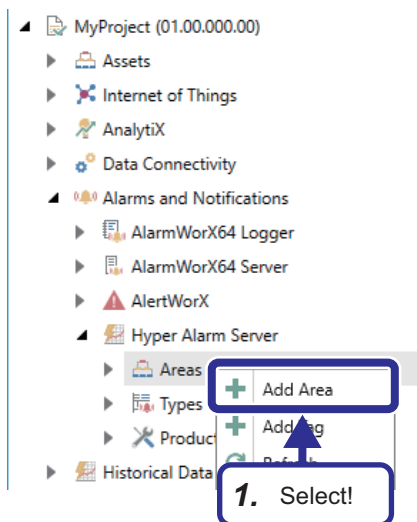
This section describes how to set alarm tags using the alarm type set on Page 87 Setting a real-time alarm.

Precautions

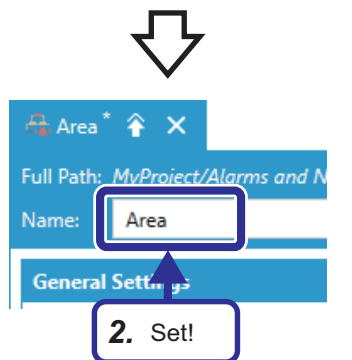
The alarm tags created on the Hyper Alarm Server cannot be migrated to the equipment properties in AssetWorX™.

Setting a real-time alarm

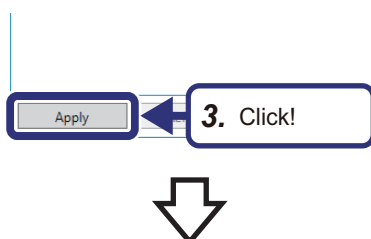
Operating procedure



1. Start the Workbench, and select [MyProject (01.00.000.00)] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [Areas] in the "Project Explorer" window. Right-click on [Areas], and select [Add Area].

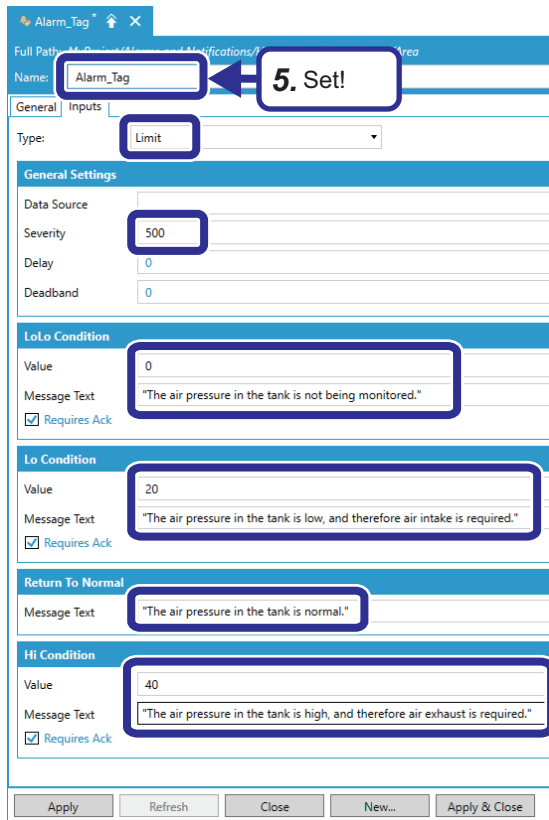
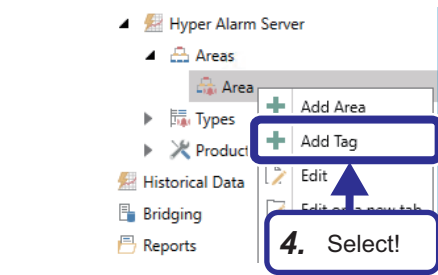


2. Set the following:
[Settings]
Name: Area



3. Click the [Apply] button.





4. Right-click on [Area], and select [Add Tag].

5. Set the following:
[Settings]
Name: Alarm_Tag

6. Set the following in the [Inputs] tab:

[Settings]

Type: Limit

"General Settings"

Severity: 500

"LoLo Condition"

Value: 0

Message Text: "The air pressure is not being monitored."

"Lo Condition"

Value: 20

Message Text: "The air pressure in the tank is low, and therefore air intake is required."

"Return to Normal"

Message Text: "The air pressure in the tank is normal."

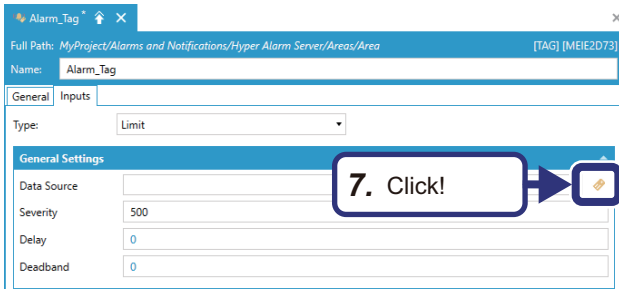
"Hi Condition"


Value: 40

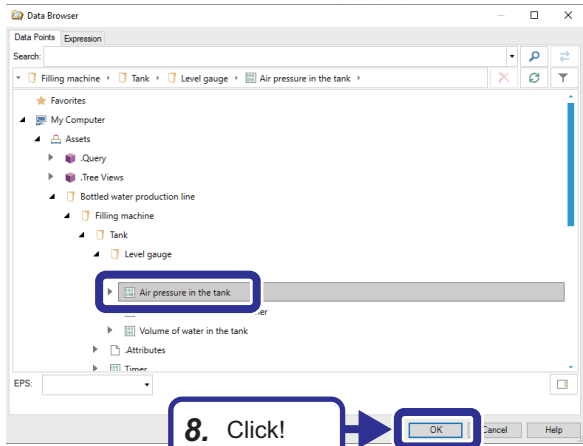
Message Text: "The air pressure in the tank is high, and therefore air exhaust is required."

Point

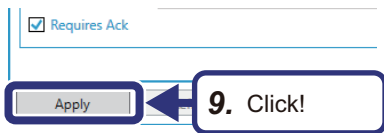
- The default values set to the alarm type are displayed in blue. When edited, the values are displayed in black.
- For the alarm type setting items that require input with a string, enclose the input string in double quotes.



7. Click  to open the "Data Source" browser.



8. Select [My Computer] ⇒ [Assets] ⇒ [Bottled water production line] ⇒ [Filling machine] ⇒ [Tank] ⇒ [Level gauge] ⇒ [Air pressure in the tank], and click the [OK] button.

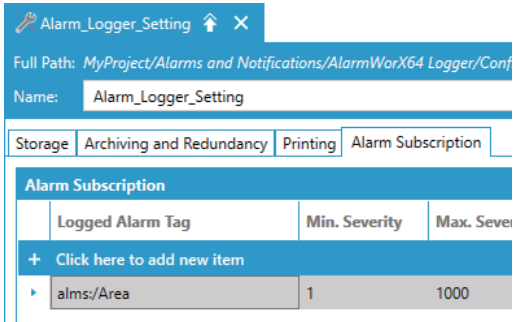
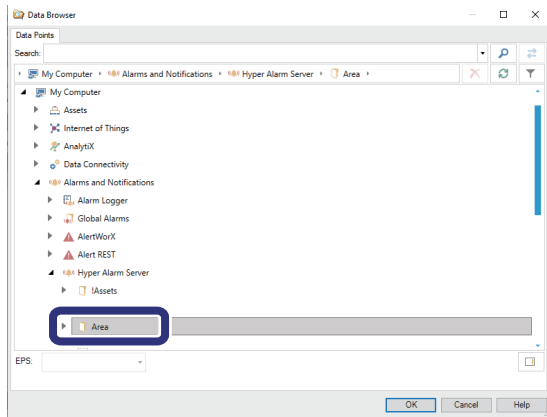


9. Click the [Apply] button.



Setting a historical alarm

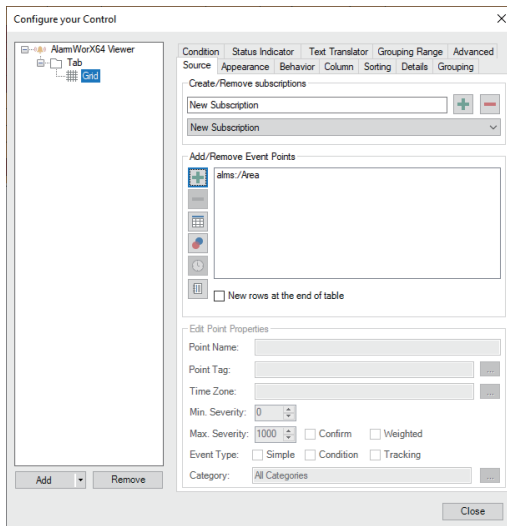
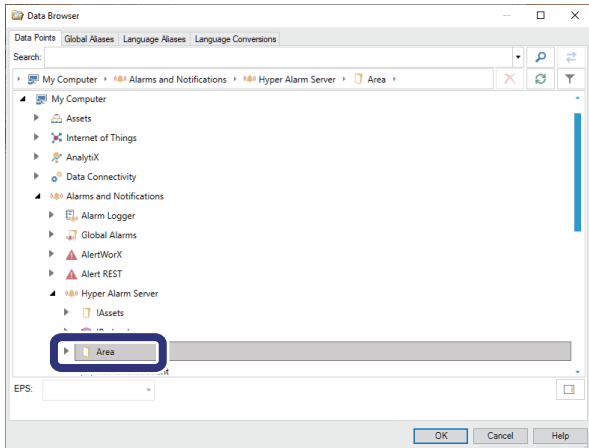
Operating procedure



1. Set a historical alarm referring to the procedure described on Page 103 Setting a historical alarm. In Step 4 of the procedure for setting an alarm configuration, set the following as an alarm subscription item:
[Settings]
[My Computer] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [Area]

Creating a real-time alarm viewer

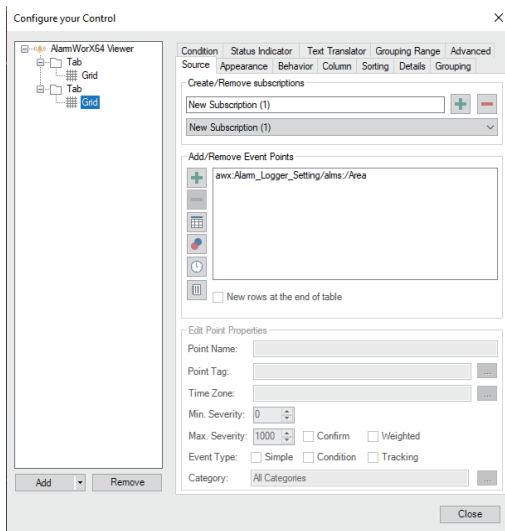
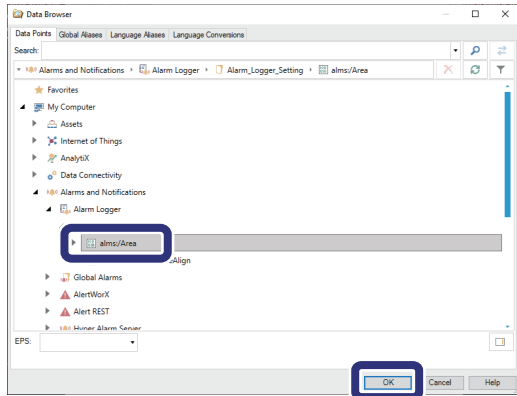
Operating procedure



1. Create a real-time alarm viewer referring to the procedure described on Page 107 Creating a real-time alarm viewer. In Step 5 of the procedure described on Page 113 Setting an alarm viewer (grid), set the following as an event point:
[Settings]
[My Computer] ⇒ [Alarms and Notifications] ⇒ [Hyper Alarm Server] ⇒ [Area]

Creating a historical alarm viewer

Operating procedure



1. Create a historical alarm viewer referring to the procedure described on Page 112 Creating a historical alarm viewer. In Step 5 of the procedure described on Page 113 Setting an alarm viewer (grid), set the following as an event point:
[Settings]
[My Computer] ⇒ [Alarms and Notifications] ⇒ [Alarm Logger] ⇒ [Alarm_Logger_Setting] ⇒ [alms:/Area]

Mitsubishi Programmable Controllers Training Manual

GENESIS64™ Basic Course

MODEL	SCHOOL-R MCWORKS-E
MODEL CODE	13JW58
SH(NA)-082347ENG-B(2303)MEE	

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