

**DeviceNet Safety
WS02-CFSC1-E**

NE1A Logic Simulator


OPERATION MANUAL


OMRON


Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

 **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

 **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

Notation in Operating Procedures

The following conventions are used in the manual in operating procedures.

Menu items are set in bold-italic text and menu levels are separated by hyphens.

Example: “***Debug - Input Pulse***” indicates selecting “Input Pulse” from the Debug Menu.

Tab, button, and key names are set in bold. Example: **OK** Button

Other on-screen text is set in bold when necessary for clarity.

Key combinations have been indicated with plus symbols.

Example: “Ctrl+M” indicates pressing the **M** Key while holding down the **Ctrl** Key.

Conditions for Software Application and Warranty

Application of and warranty for the NE1A Logic Simulator (hereafter “Software”) are bound by the following *Conditions for Application and Warranty*. After-sales service will be provided to the customer based on the enclosed software user registration and upgrade form.

Conditions for Application and Warranty

1. Copyright

The copyright to the Software, including the contents of all enclosed storage media and manuals, is the property of OMRON Corporation.

2. Copying and Modifying the Software

- a. The Software may not be copied in part or whole for any purpose other than as a backup or for modification as described in b, below.
- b. The user may modify the Software to implement changes or improvements provided that the user himself/herself makes these modifications and provided that the modifications are for application by the user himself/herself. OMRON, however, assumes no responsibility for the results of any modifications made by the user, including defects or damages of any nature.

3. Warranty and After-sales Service

- a. If the Software fails to function normally in a manner for which OMRON is responsible, OMRON will correct or replace the Software free of charge.
- b. The warranty in a, above, is valid for one year from the date of purchase.
- c. OMRON will provide to customers that return the user registration and upgrade form, information on any bugs in the program that become known to OMRON and information on software upgrades.
- d. OMRON assumes no responsibility for the results of the application of the Software and assumes no warranty other than that stated here.

4. Third-party Usage

Providing copies of the Software to any third party in any form or by any means is strictly prohibited.

Registered Trademarks

DeviceNet and DeviceNet Safety are registered trademarks of the ODVA. Windows is a registered trademark of the Microsoft Corporation.

© OMRON, 2007

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

TABLE OF CONTENTS

PRECAUTIONS	xv
1 Intended Audience	xvi
2 General Precautions	xvi
3 Safety Precautions	xvi
SECTION 1	
Overview	1
1-1 The NE1A Logic Simulator	2
1-2 Features	3
1-3 System Requirements	4
SECTION 2	
Basic Operation	5
2-1 Starting and Exiting the Logic Simulator	6
2-2 NE1A Logic Simulator Window Configuration	7
2-3 Menus	8
2-4 Pop-up Menus	10
2-5 Tool Bars	11
2-6 Status Bar	14
2-7 Simulation Procedure	15
2-8 Creating Logic Programs	16
2-9 Creating Simulation Files	17
2-10 Opening Simulation Files	18
2-11 Importing Programs	19
2-12 Debugging	21
2-13 Using the Watch Window	22
2-14 Saving Simulation Files	26
2-15 Versions	27
2-16 Help Display	28
SECTION 3	
Debugging with the Logic Window	29
3-1 Overview	30
3-2 Starting and Stopping the Logic Program	31
3-3 Modifying Input Tags	32
3-4 Setting Initial Values	34
3-5 Setting the Cycle Time Base Value	35
3-6 Feedback Settings	36
3-7 Monitoring a User-defined Function Block	38
3-8 Zooming In and Out of the Logic Window Display	39

TABLE OF CONTENTS

SECTION 4

Debugging with the Timing Chart Window	41
4-1 Overview	42
4-2 Timing Chart Window	43
4-3 Adding to the Timing Chart	44
4-4 Inputs to the Timing Chart	45
4-5 Starting and Stopping the Timing Chart	47
4-6 Importing/Exporting Timing Chart Data	48
4-7 Printing the Timing Chart	50
4-8 Timing Chart Options	51
4-9 Breakpoints	54
4-10 I/O Breakpoint	56
4-11 Zooming In and Out of the Timing Chart Display	58

SECTION 5

Troubleshooting	59
5-1 Operating Errors and Countermeasures	60

Appendix

A Shortcut Key List	63
---------------------------	----

Index	67
--------------------	-----------

Revision History	69
-------------------------------	-----------

About this Manual:

This manual describes the installation and operation of the Logic Simulator and includes the sections described below. The NE1A Logic Simulator is a software package that runs on Windows and is used to simulate and verify the operation of programs for NE1A Safety Network Controllers.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate the NE1A Logic Simulator. Please use this manual together with the *DeviceNet Safety System Configuration Manual* (Cat. No. Z905) and the *Network Configurator Operation Manual* (Cat. No. W382). Be sure to read the precautions provided in the following section.

Precautions provides general precautions for using the NE1A Logic Simulator.


Section 1 provides an overview of the NE1A Logic Simulator, including features and system requirements.

Section 2 describes the basic operation of the NE1A Logic Simulator.

Section 3 describes how to debug programs for the NE1A Logic Simulator using the Logic Window.

Section 4 describes how to debug programs for the NE1A Logic Simulator using the Timing Chart Window.

Section 5 describes troubleshooting problems that can occur based on error messages displayed by the NE1A Logic Simulator.

 **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PRECAUTIONS

This section provides general precautions for using the NE1A Logic Simulator.

The information contained in this section is important for the safe and reliable application of the NE1A Logic Simulator. You must read this section and understand the information contained before attempting to set up or operate the NE1A Logic Simulator.

1	Intended Audience	xvi
2	General Precautions	xvi
3	Safety Precautions.....	xvi

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems
- Personnel in charge of designing FA systems
- Personnel in charge of managing FA systems and facilities
- Personnel qualified, authorized, and responsible for maintaining safety in equipment design, installation, operation, maintenance, and disposal

2 General Precautions


The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for installing and operating the NE1A Logic Simulator. Be sure to read this manual before attempting to use the Simulator and keep this manual close at hand for reference during operation.

3 Safety Precautions

-  **WARNING** The NE1A Logic Simulator simulates the safety logic of an NE1A Controller. Operation and timing, however, vary somewhat from that of the NE1A Controller. After debugging safety logic on the NE1A Logic Controller, always debug the safety logic directly on the NE1A Controller to verify operation. Debugging only on the NE1A Logic Simulator may result in unexpected operation, possibly causing accidents.

SECTION 1

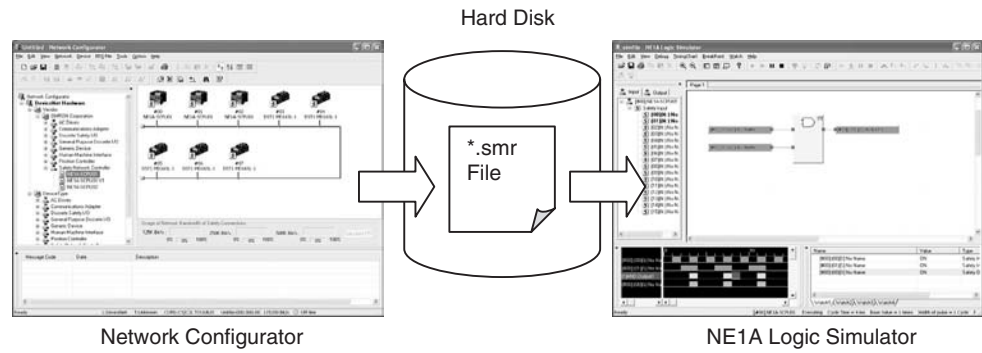
Overview

This section provides an overview of the NE1A Logic Simulator, including features and system requirements.

1-1	The NE1A Logic Simulator	2
1-2	Features	3
1-3	System Requirements	4

1-1 The NE1A Logic Simulator

The NE1A Logic Simulator provides an offline debugging environment on a computer by simulating the safety logic operation of an NE1A-series Safety Network Controller using only software. The NE1A Logic Simulator operates on Windows 2000 or XP. Logic programs created with the Network Configurator (WS02-CFSC1-E) are loaded as files, and then the virtual safety logic engine is started.

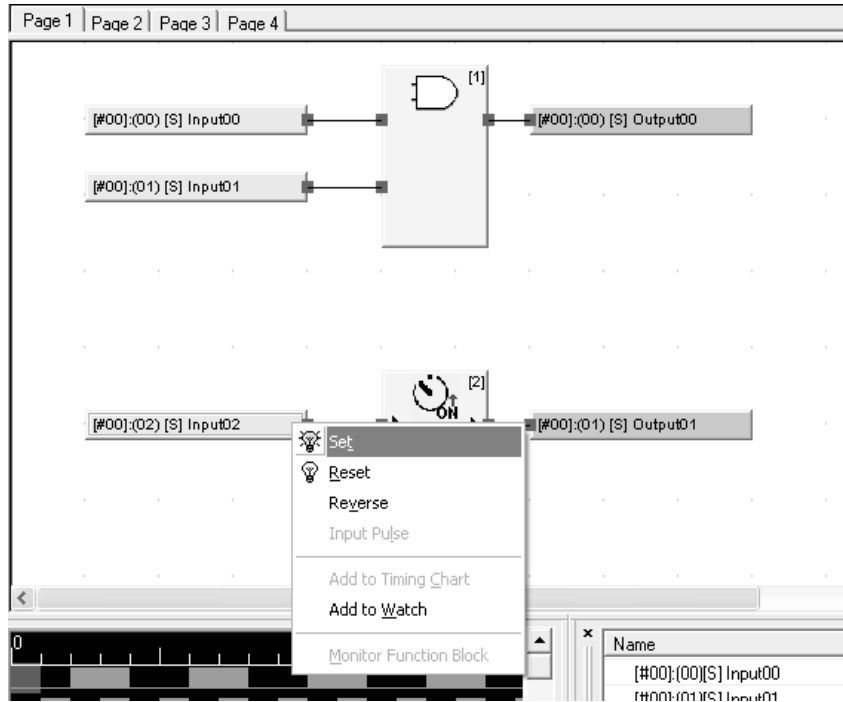


- Note**
- (1) When a logic program that has been created with the Network Configurator is exported from the Network Configurator, a simulation file (*.smr file) will be created. The simulation file will be loaded into the NE1A Logic Simulator and simulation will begin.
 - (2) Safety logic programs can be simulated only for one NE1A-series Controller at a time. Multiple Controllers connected to the same network cannot be linked for simulations.

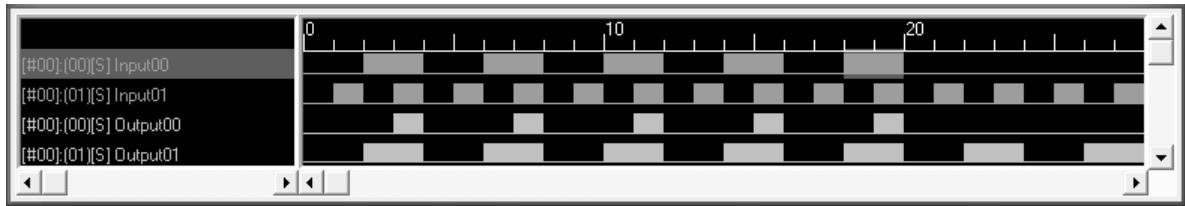
1-2 Features

When using the NE1A Logic Simulator, the following features can be used to reduce the debug work.

- Input tags can be modified on a screen similar to the logic editor on the Network Configurator. Corresponding outputs can be verified.



- The Timing Chart Window can be used to run simulations.



- There is a Watch Window, which can be used to monitor registered tags.

Name	Value	Type	Comment
[#00];(01)[S] Input01	OFF	Safety Input	
[#00];(02)[S] Input02	OFF	Safety Input	
[#00];(00)[S] Output00	OFF	Safety Output	
[#00];(01)[S] Output01	OFF	Safety Output	
[1]AND Output#1	OFF	Function Block	

Watch1 \ Watch2 \ Watch3 \ Watch4

1-3 System Requirements

The NE1A Logic Simulator is compatible with the NE1A-series Network Safety Controllers.

The following system requirements must be satisfied in order to use the NE1A Logic Simulator.

Item	Specification
Operating system	Microsoft Windows 2000 Microsoft Windows XP
Computer hardware	IBM PC/AT or compatible with Pentium 300 MHz or better
Memory (RAM)	256 MB min. (512 MB min. recommended)
Hard-disk space	40 MB available space
Display	High-definition display, S-VGA (800 × 600) or better
Disk drive	CD-ROM drive

Note The specified amount of RAM required relates to the capacity of the program created by the Network Configurator. If the computer does not contain sufficient RAM, it may slow the performance of the NE1A Logic Simulator.

SECTION 2

Basic Operation

This section describes the basic operation of the NE1A Logic Simulator.

2-1	Starting and Exiting the Logic Simulator	6
2-1-1	Starting the Logic Simulator	6
2-1-2	Exiting the Logic Simulator	6
2-2	NE1A Logic Simulator Window Configuration	7
2-3	Menus	8
2-4	Pop-up Menus	10
2-5	Tool Bars	11
2-5-1	General Tool Bar	11
2-5-2	Debug Tool Bar	11
2-5-3	Timing Chart Tool Bar	12
2-5-4	Watch Tool Bar	13
2-6	Status Bar	14
2-7	Simulation Procedure	15
2-8	Creating Logic Programs	16
2-9	Creating Simulation Files	17
2-10	Opening Simulation Files	18
2-11	Importing Programs	19
2-12	Debugging	21
2-12-1	Debugging with the Logic Window	21
2-12-2	Debugging with the Timing Chart Window	21
2-13	Using the Watch Window	22
2-13-1	What Is the Watch Window?	22
2-13-2	Displaying/Hiding the Watch Window	22
2-13-3	Adding Tags to the Watch Window	22
2-13-4	Deleting from the Watch Window	24
2-13-5	Modifying Tag Values	25
2-13-6	Moving Tags	25
2-14	Saving Simulation Files	26
2-15	Versions	27
2-16	Help Display	28

2-1 Starting and Exiting the Logic Simulator

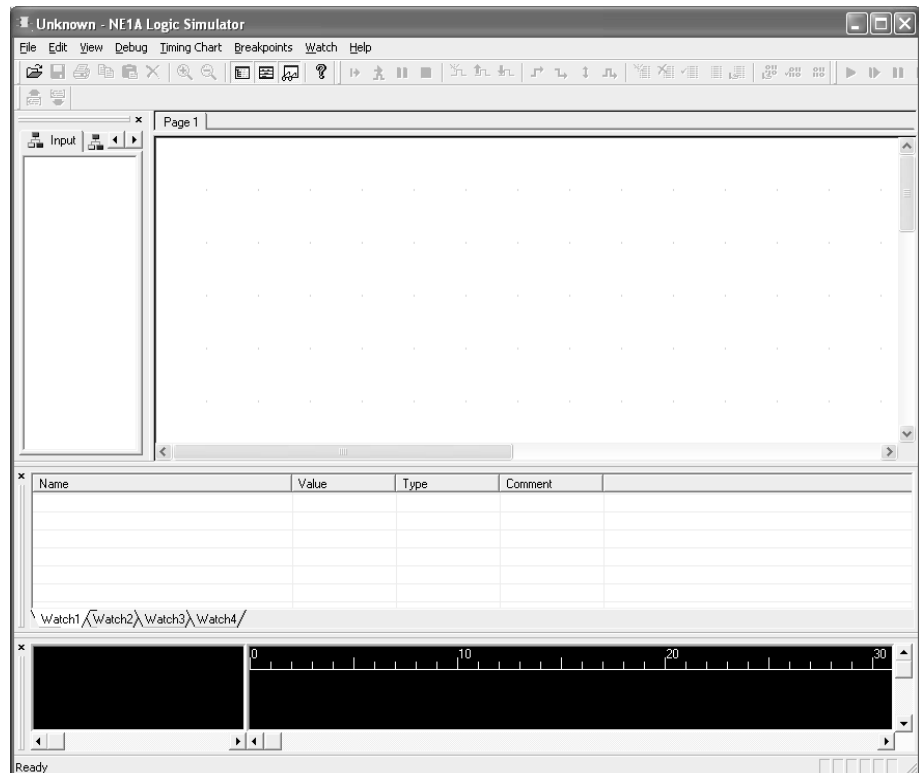
This section describes how to start and how to exit the NE1A Logic Simulator.

2-1-1 Starting the Logic Simulator

Use the following procedure to start the NE1A Logic Simulator.

- 1,2,3... 1. Select **Start - All Program - OMRON Network Configurator for DeviceNet Safety - NE1A Logic Simulator**.

The NE1A Logic Simulator will start and the following main window will be displayed.



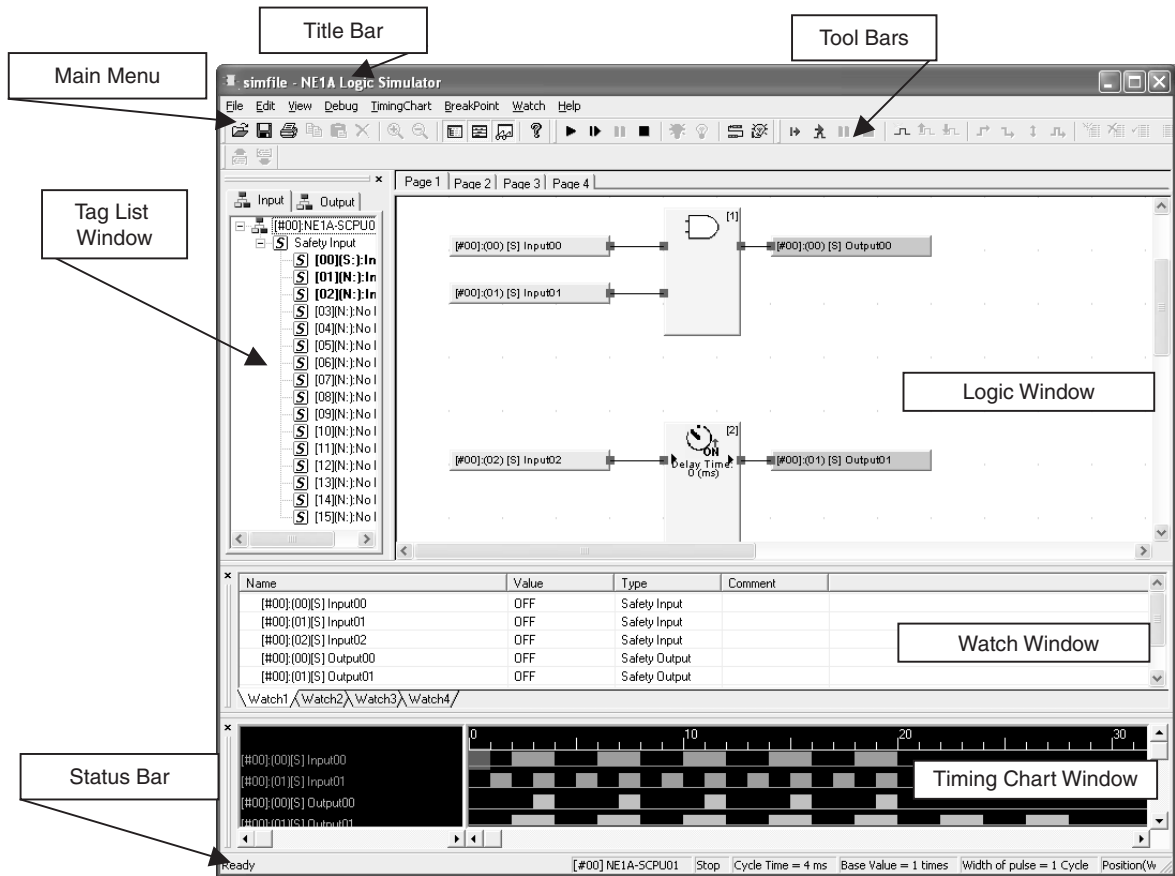
2-1-2 Exiting the Logic Simulator

Use the following procedure to exit the NE1A Logic Simulator.

- 1,2,3... 1. Select **File - Exit** from the main window.
The NE1A Logic Simulator will be closed.

2-2 NE1A Logic Simulator Window Configuration

This section describes the various parts of the NE1A Logic Simulator Window.



Item	Function
Title Bar	Displays the file name.
Main Menu	Used to select menu items.
Tool Bars	Used to select functions by clicking icons. The desired tool bars can be displayed by selecting View - Tool Bar . The position of a tool bar can be changed by dragging it as a group.
Logic Window	Displays the logic program.
Tag List Window	Displays the tag list. Tags can be set or reset. They can also be selected and added to the Timing Chart Window or to the Watch Window.
Timing Chart Window	Used to create timing charts and monitor debugging.
Watch Window	Used to monitor and set tags. Tags that have been added to the Watch Window can be monitored, and their values can be modified.
Status Bar	Displays information such as the device ID, device comment, debug status, and cycle time.

2-3 Menus

Menu items and shortcut keys for the NE1A Logic Simulator are listed in the following table.

Main menu	Item	Shortcut key	Function
File	Open	Ctrl+O	Opens an existing file.
	Save	Ctrl+S	Overwrites the current working file.
	Save As		Saves the current working file with a new name.
	Import Program		Reads in program data from a file.
	Import Timing Chart Data		Reads in timing chart data from a file.
	Export Timing Chart Data		Writes timing chart data to a file.
	Print Timing Chart	Ctrl+P	Prints the timing chart.
	Recent		Displays recently used files.
	Exit		Closes the application and saves the file.
Edit	Copy	Ctrl+C	Copies the selected area of the timing chart and saves it to the clipboard.
	Paste	Ctrl+V	Pastes the contents of the clipboard onto the timing chart.
	Delete	Del	Deletes the selected tags in the Timing Chart Window or Watch Window.
View	Tool Bars		Displays/Hides the tool bars.
	Windows		Displays/Hides windows.
	Status Bar		Displays/Hides the status bar.
	Next Pane	F6	Switches to the next pane.
	Previous Pane	Shift+F6	Switches to the previous pane.
	Zoom In		Enlarges the display in the Logic Window or the Timing Chart Window.
	Zoom Out		Reduces the display in the Logic Window or the Timing Chart Window.
Debug	Start	F5	Starts debugging in the Logic Window.
	Execute 1 Cycle	F10	Executes the logic program for one cycle.
	Pause	Ctrl+F5	Pauses the logic program.
	Stop	Shift+F5	Stops and resets the logic program.
	Set	Ctrl+J	Turns ON the selected tags.
	Reset	Ctrl+K	Turns OFF the selected tags.
	Reverse	Ctrl+R	Reverses the selected tags.
	Input Pulse		Applies a specified pulse input to the selected tag.
	Set Initial Values		Sets the initial values of tags.
	Feedback Settings		Makes feedback settings.
	Set Cycle Time Base Value		Sets the cycle time base value for executing the logic program.
	Monitor Function Block		Used to monitor user-defined function blocks.

Main menu	Item	Shortcut key	Function
Timing Chart	Execute	F7	Executes timing chart simulation.
	Execute 1 Pulse	F8	Executes timing chart simulation for one pulse.
	Pause	Ctrl+F7	Pauses timing chart simulation.
	Stop	Shift+F7	Stops and resets timing chart simulation.
	Add Tag	Insert	Adds tags from the tag list to the Timing Chart Window.
	ON	S	Turns ON the selected section of the waveform in the timing chart.
	OFF	R	Turns OFF the selected section of the waveform in the timing chart.
	Reverse	Space	Reverses the selected section of the waveform in the timing chart.
	Make Pulses		Applies the specified pulses to the selected section of the timing chart.
	Move Up		Moves the selected tags in the timing chart upwards.
	Move Down		Moves the selected tags in the timing chart downwards.
	Options		Sets the timing chart options.
	Breakpoints	Register/Unregister	F9
Delete All		Shift+F9	Deletes all breakpoints in the timing chart.
Enable			Enables the selected breakpoint.
Disable			Disables the selected breakpoint.
Display Breakpoint List			Displays a list of breakpoints.
I/O Breakpoint			Sets an I/O breakpoint.
Watch	Add Tag	Ctrl+Insert	Adds tags to the Watch Window.
	Move Up		Moves the selected tags upwards.
	Move Down		Moves the selected tags downwards.
Help	Topics	F1	Displays the help file.
	About		Displays NE1A Logic Simulator version information.

2-4 Pop-up Menu

Menu options that appear when you right-click on a window are listed.

Window	Menu item	Function
Logic Window	Set	Turns ON the selected tags.
	Reset	Turns OFF the selected tags.
	Reverse	Reverses the selected tags.
	Input Pulse	Applies a specified pulse input to the selected tag.
	Add to Timing Chart	Adds the selected tag, jump address, or function block to the Timing Chart Window.
	Add to Watch	Adds the selected tag, jump address, or function block to the Watch Window.
	Monitor Function Block	Monitors the internal functions of the selected user-defined function block.
Tag List Window	Set	Turns ON the selected tags.
	Reset	Turns OFF the selected tags.
	Reverse	Reverses the selected tags.
	Add to Timing Chart	Adds the selected tags to the Timing Chart Window.
	Add to Watch	Adds the selected tags to the Watch Window.
Timing Chart Window (Tag Part)	Add Tag	Adds tags from the tag list to the Timing Chart Window.
	Delete	Deletes the selected tags from the Timing Chart Window.
	Move Up	Moves the selected tags in the timing chart upwards.
	Move Down	Moves the selected tags in the timing chart downwards.
Timing Chart (Chart Part)	ON	Turns ON the selected section of the timing chart waveform.
	OFF	Turns OFF the selected section of the timing chart waveform.
	Reverse	Reverses the selected section of the waveform in the timing chart.
	Make Pulses	Applies the specified pulses to the selected section of the timing chart.
	Copy	Copies the selected area of the timing chart and saves it to the clipboard.
	Paste	Pastes the contents of the clipboard onto the timing chart.
	Breakpoints	Registers/Unregisters breakpoints.
	I/O Breakpoint	Sets, enables, or disables an I/O breakpoint.
	Import Timing Chart Data	Reads in the timing chart data from a file.
	Export Timing Chart Data	Writes the timing chart data to a file.
Watch Window	Set	Turns ON the selected tags.
	Reset	Turns OFF the selected tags.
	Reverse	Reverses the selected tags.
	Input Pulse	Applies a specified pulse input to the selected tag.
	Delete	Deletes the selected tags in the Watch Window.
	Move Up	Moves the selected tags upwards.
	Move Down	Moves the selected tags downwards.

2-5 Tool Bars

This section describes the functions of the tool bars in the NE1A Logic Simulator.

There are four tool bars in the NE1A Logic Simulator as described below. Each tool bar can be displayed or hidden by selecting **View - Tool Bars** followed by the name of the tool bar.

2-5-1 General Tool Bar





Icon	Function	Description
	Open File	Opens an existing file.
	Save File	Overwrites the current working file.
	Print Timing Chart	Prints the timing chart.
	Copy	Copies the selected area of the timing chart and saves it to the clipboard.
	Paste	Pastes the contents of the clipboard onto the timing chart.
	Delete Tag	Deletes tags in the Timing Chart Window or Watch Window.
	Zoom In	Enlarges the display on the Logic Window or the Timing Chart Window.
	Zoom Out	Reduces the display on the Logic Window or the Timing Chart Window.
	Tag List Window	Displays/Hides the Tag List Window.
	Timing Chart Window	Displays/Hides the Timing Chart Window.
	Watch Window	Displays/Hides the Watch Window.
	Topics	Displays the help file.

2-5-2 Debug Tool Bar






















Icon	Function	Description
	Start	Starts debugging in the Logic Window.
	Execute 1 Cycle	Executes the logic program for one cycle.
	Pause	Pauses the logic program.
	Stop	Stops and resets the logic program.
	Set	Turns ON the selected tags.
	Reset	Turns OFF the selected tags.

Icon	Function	Description
	Feedback Settings	Makes feedback settings.
	Set Initial Values	Sets the initial values of input tags.



2-5-3 Timing Chart Tool Bar



Icon	Function	Description
	Start	Executes timing chart simulation.
	Execute 1 Pulse	Executes timing chart simulation for one pulse
	Pause	Pauses timing chart simulation.
	Stop	Stops and resets timing chart simulation.
	Add Tag	Adds tags from the tag list to the Timing Chart Window.
	Move Up	Moves the selected tags in the timing chart upwards.
	Move Down	Moves the selected tags in the timing chart downwards.
	ON	Turns ON the selected section of the waveform in the timing chart.
	OFF	Turns OFF the selected section of the waveform in the timing chart.
	Reverse	Reverses the selected section of the waveform in the timing chart.
	Make Pulses	Applies the specified pulses to the selected section of the timing chart.
	Register/Unregister	Registers/Unregisters a breakpoint at a specified position in the timing chart.
	Delete All	Deletes all breakpoints in the timing chart.
	Enable	Enables the selected breakpoint.
	Disable	Disables the selected breakpoints.
	Display Breakpoint List	Displays a list of the breakpoints.
	I/O Breakpoint	Sets an I/O breakpoint.
	Enable	Enables the I/O breakpoint.
	Disable	Disables the I/O breakpoint.

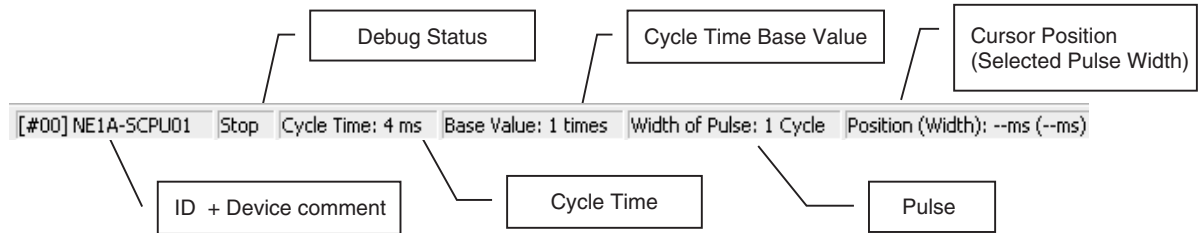
2-5-4 Watch Tool Bar



Icon	Function	Description
	Move Up	Moves the selected tags in the Watch Window upwards.
	Move Down	Moves the selected tags in the Watch Window downwards.

2-6 Status Bar

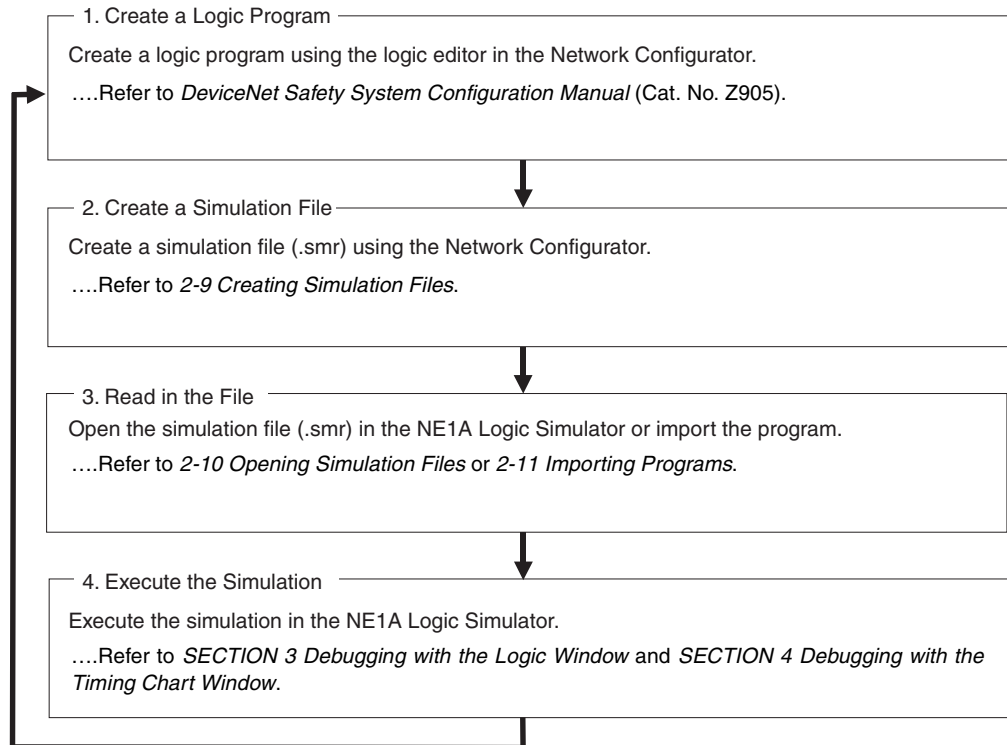
The following information is displayed in the Status Bar.



Item	Description
ID + Device comment	Displays the device ID and device comment that have been set by the Network Configurator.
Debug Status	Displays the debug status: Run, Pause, or Stop
Cycle Time	Displays the device cycle time.
Cycle Time Base Value	Displays the cycle time base value.
Pulse Width	Displays the multiplier of the time width of one pulse in the timing chart against the device cycle time.
Cursor Position	Displays the cursor position on the timing chart. The time of the selected section of the pulse is shown in the brackets. When a timing chart simulation is running, the current execution point will be displayed.

2-7 Simulation Procedure

Use the following procedure to simulate execution of a safety logic program.



2-8 Creating Logic Programs

Logic Programs must be created with the Network Configurator.

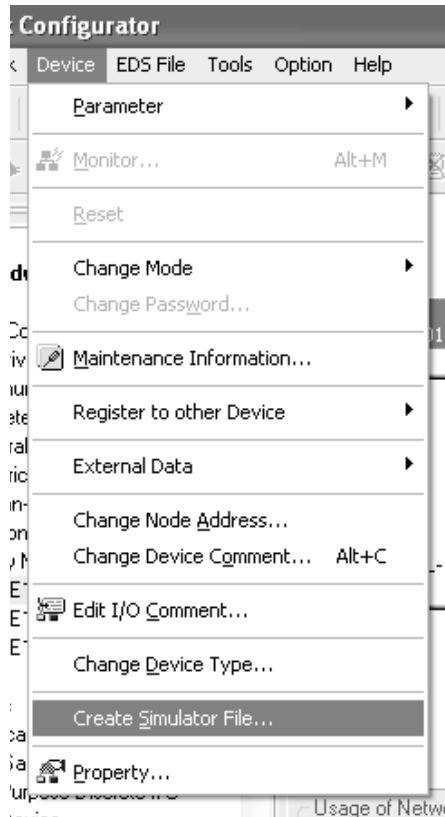
For information on creating logic programs using the Network Configurator, refer to *Section 6 Programming the Safety Network Controller* in the *DeviceNet Safety System Configuration Manual* (Cat. No. Z905).

2-9 Creating Simulation Files

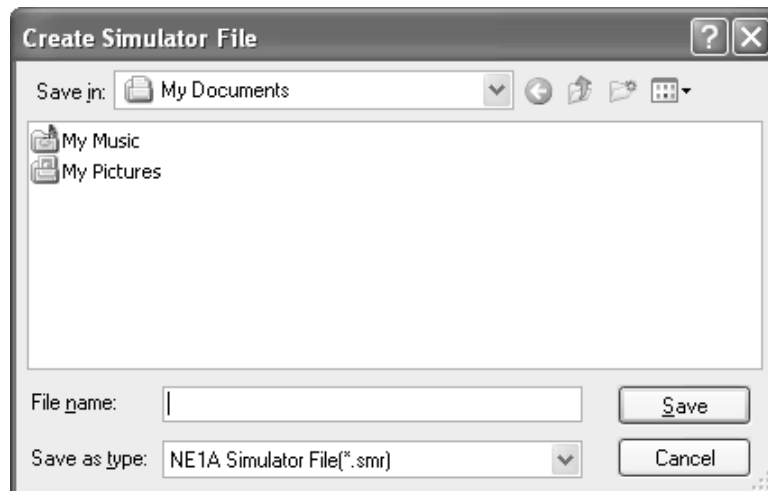
New simulation files (*.smr file) are created with the Network Configurator.

Use the following procedure to create a simulation file.

- 1,2,3... 1. Select the icon for the device which has the program that you want to simulate and select **Device - Create Simulator File**. Alternatively, right-click on the device icon and select **Create Simulator File** from the pop-up menu.



2. The Create Simulator File Dialog Box will be displayed as shown below. Specify the save location, enter the file name, and then click the **Save** Button to create a simulation file (*.smr File) in the specified location.



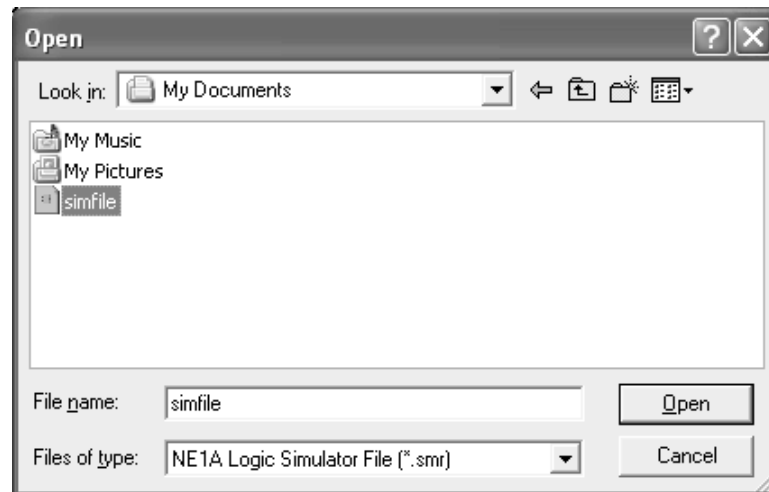
2-10 Opening Simulation Files

Use the following procedure to load the simulation file (*.smr file) to run a simulation.

1,2,3...

1. Select **File - Open**.

The following dialog box will be displayed.



2. Select the simulation file and click the **Open** Button.

If there is a password setting on the program in the opened simulation file, the following Confirm Password Dialog Box will be displayed.



3. Enter the password and click the **OK** Button.

Note If there is no password setting, the Confirm Password Dialog Box will not be displayed.

The simulation file (*.smr file) will be loaded and displayed on the screen.

Note To set the password, select the *Enable Password* Option on the Program Tab Page of the Edit Device Parameter Dialog Box in the Network Configurator.

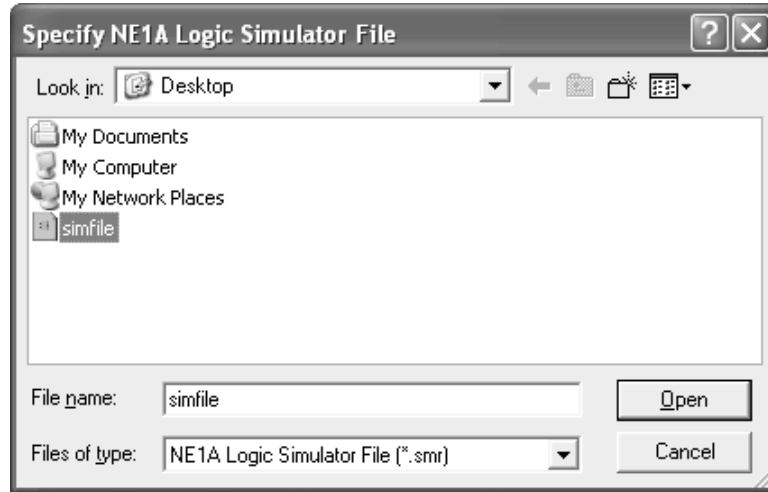
2-11 Importing Programs

To load programs from other simulation files, use the program import function. The program import function only loads the program part of the file; information in the Timing Chart Window and Watch Window will not be changed.

1,2,3...

1. Select **File - Import Program**.

The following dialog box will be displayed.



2. Select a Simulation File and click the **Open** Button.

If there is a password setting on the program in the imported simulation file, the following Confirm Password Dialog Box will be displayed.



3. Enter the Password and click the **OK** button.

Note If there is no password setting, the Confirm Password Dialog Box will not be displayed.

The program part of the simulation file will be loaded and the logic program will be displayed on the screen.

Note

- (1) After importing the program, if the tags and function blocks used in the Timing Chart Window and Watch Window are not used within the imported program, their names will appear as "???". Check these tags to see if they are required. If they are not required, delete them. The original names can be displayed again by importing the original program.
- (2) To correct a program from a file that is being used in a simulation, edit the program with the Network Configurator and then create a new simulation file. Save the new file with a different name to that of the file being used in the simulation, then import the program from that file. Files can be overwritten while the Logic Simulator is being used but any data other than the program (i.e., information on the Timing Chart Window and Watch Window) will all be deleted.

- (3) To set the password, select the Enable Password Option on the Program Tab Page of the Edit Device Parameter Dialog Box in the Network Configurator.

2-12 Debugging

There are the following two methods for debugging using the NE1A Logic Simulator.

2-12-1 Debugging with the Logic Window

The Logic Window displays the logic program. It is similar to the Online Monitor of the logic editor in the Network Configurator. Input tags can be modified using the Logic Window, Tag List Window, or Watch Window. The corresponding outputs can then be verified. A graphical interface allows for easy-to-understand verification, and is suited for verifying simple logic.

Refer to *SECTION 3 Debugging with the Logic Window* for details.

2-12-2 Debugging with the Timing Chart Window

The user can enter input tag values over time and execute a simulation for them. By executing the simulation, an output result timing chart can be obtained that is suited for debugging when the input values change in short periods of time.

Refer to *SECTION 4 Debugging with the Timing Chart Window* for details.

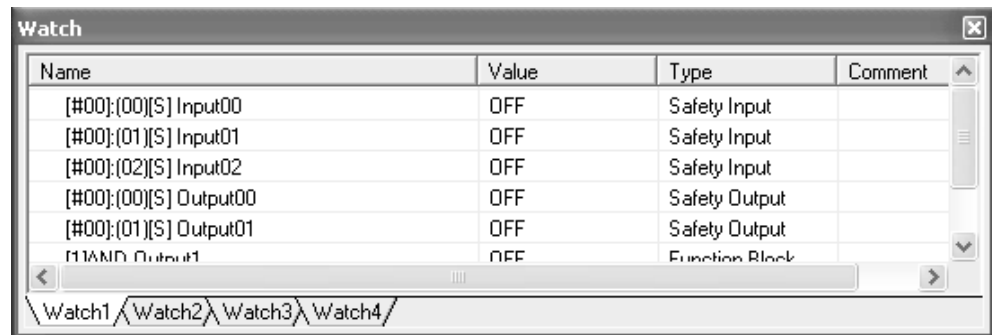
2-13 Using the Watch Window

This section describes how to use the Watch Window.

2-13-1 What Is the Watch Window?

The Watch Window can list in one window many tags and function block outputs that are located on different pages. Input tag values can be modified from this window when debugging with the Logic Window,

In the Watch Window there are four tab pages, from Watch 1 to Watch 4. You can group tags and function block outputs that you want to view together on a tab page for easy viewing.




The items that are displayed in the Watch Window are listed below.

Item	Content
Name	Displays tag name or function block output name.
Value	Displays tag value or function block output value as either ON or OFF.
Type	Displays tag or function block output type.
Comment	Displays the function block name for a function block output

2-13-2 Displaying/Hiding the Watch Window

To display the Watch Window, select **View - Windows - Watch** from the System Menus. Alternatively, click the  Icon on the General Tool Bar

To hide the Watch Window, follow the same steps as displaying the window. Select **View - Windows - Watch**. Alternatively, click the  Icon on the General Tool Bar or click the **Close** Button in the Watch Window.

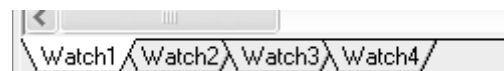
2-13-3 Adding Tags to the Watch Window

Tags can be added to the Watch Window in the following ways.

Note A maximum of 100 tags that can be added to one tab page of the Watch Window. The same tag can be added more than once.

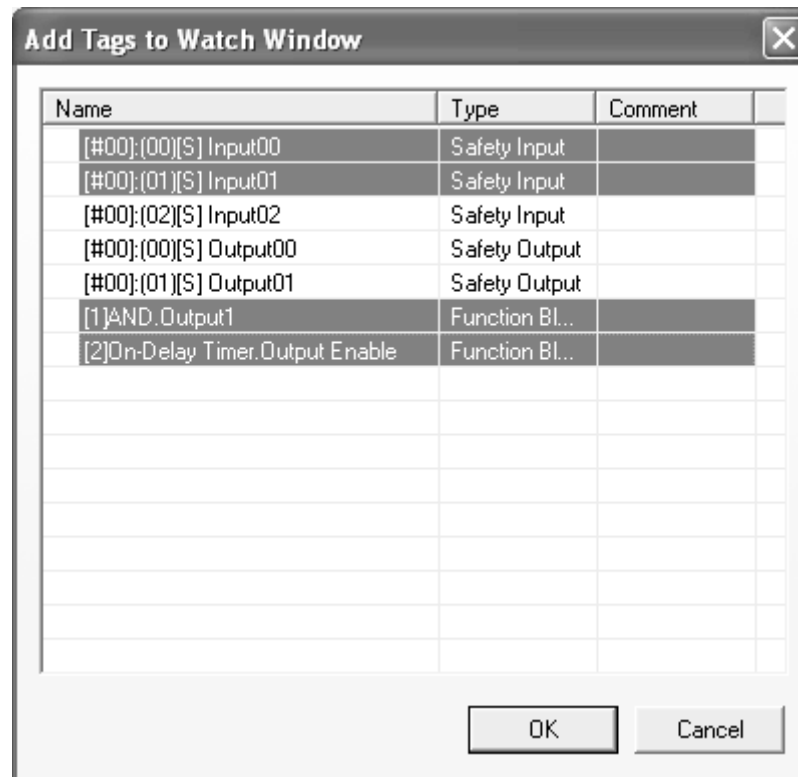
Adding from a Tag List

- 1,2,3... 1. Click a Watch Window Tab (Watch 1 to Watch 4) to select it.



2. Select **Watch - Add Tag**.

The Add Tags to Watch Window Dialog Box will be displayed.



3. Select the tag to be added to the Watch Window and click the **OK** Button. More than one tag can be added at the same time by holding down the **Ctrl** Key or **Shift** Key while selecting the tags.

The selected tags will be added to the Watch Window as shown below.

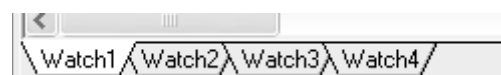
Name	Value	Type	Comment
[#00];(00)[S] Input00	OFF	Safety Input	
[#00];(01)[S] Input01	OFF	Safety Input	
[1]AND.Output1	OFF	Function Block	
[2]On-Delay Timer.Output Enable	OFF	Function Block	

Watch1 Watch2 Watch3 Watch4

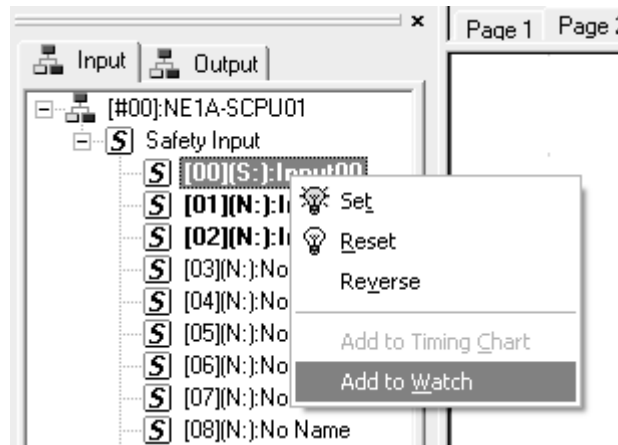
Note The names of the Watch Window tabs cannot be changed.

Adding from a Tag List Window

- 1,2,3... 1. Click a Watch Window Tab (Watch 1 to Watch 4) to select it.



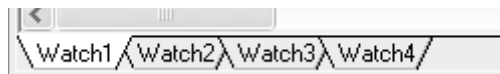
2. Right-click the tag in the Tag List Window to be added to the Watch Window and select **Add to Watch**.



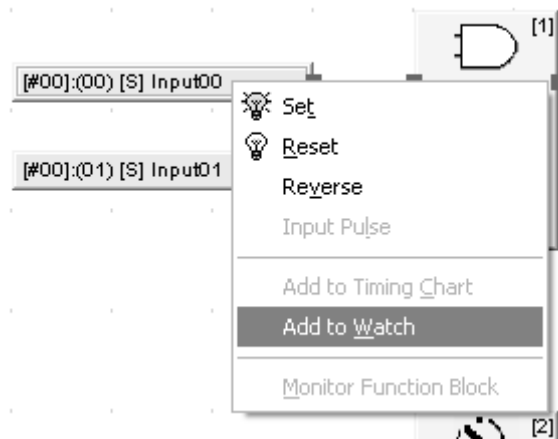
The selected tag will be added to the Watch Window.

Adding from the Logic Window

- 1,2,3... 1. Click a Watch Window Tab (Watch 1 to Watch 4) to select it.



2. In the Logic Window, select the tag or function block that you want to add to the Watch Window. To select more than one tag or function blocks, hold down the **Shift** Key while clicking on the tags.



3. Right-click and select **Add to Watch**.
The selected tags or function blocks will be added to the Watch Window.

2-13-4 Deleting from the Watch Window

Tags can be deleted from the Watch Window in using the following procedure.

- 1,2,3... 1. Select the tag to be deleted from the Watch Window.
2. Select **Edit - Delete**. Alternatively, right-click and select **Delete** from the pop-up menu.

2-13-5 Modifying Tag Values

When the Logic Window is used for debugging, input tags that have been added to the Watch Window can be set, reset, or reversed.

Note Output tag values or function block output values cannot be modified.

- 1,2,3...**
1. Select a tag from the Watch Window to modify its value. More than one tag can be selected by holding down the **Ctrl** Key or the **Shift** Key while selecting the tags.
 2. Select **Debug** and then **Set**, **Reset**, or **Reverse**. Alternatively, right-click and select **Set**, **Reset**, or **Reverse** from the pop-up menu.

2-13-6 Moving Tags

Tags that have been added to the Watch Window can be moved up or down.

- 1,2,3...**
1. Select a tag to be moved from the Watch Window. More than one tag can be selected by pressing the **Ctrl** Key or the **Shift** Key while selecting tags.
 2. Select **Watch - Move Up** (or **Move Down**). Alternatively, right-click and select **Move Up** (or **Move Down**) from the pop-up menu.

2-14 Saving Simulation Files

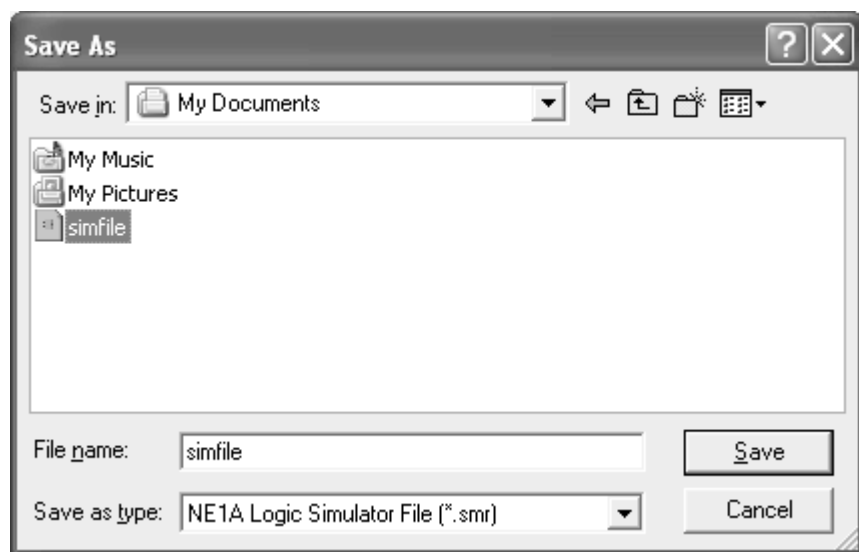
You can save a simulation file (*.smr) by overwriting an existing file or as a new file with a different name. Saving a file will save the logic program, timing chart data, and registered watch data in a single file.

Overwriting Simulation Files

- 1,2,3...**
1. Select **File - Save**.
The simulation file will be overwritten.

Saving the File with a Different Name

- 1,2,3...**
1. Select **File - Save As**.
The following dialog box will be displayed.



2. Change the file name and click the **Save** Button.
The simulation file will be saved with a different name.

2-15 Versions

You can check the version of the NE1A Logic Simulator using the following procedure.

1,2,3...

1. Select **Help - About**.

The NE1A Logic Simulator Dialog Box will be displayed.



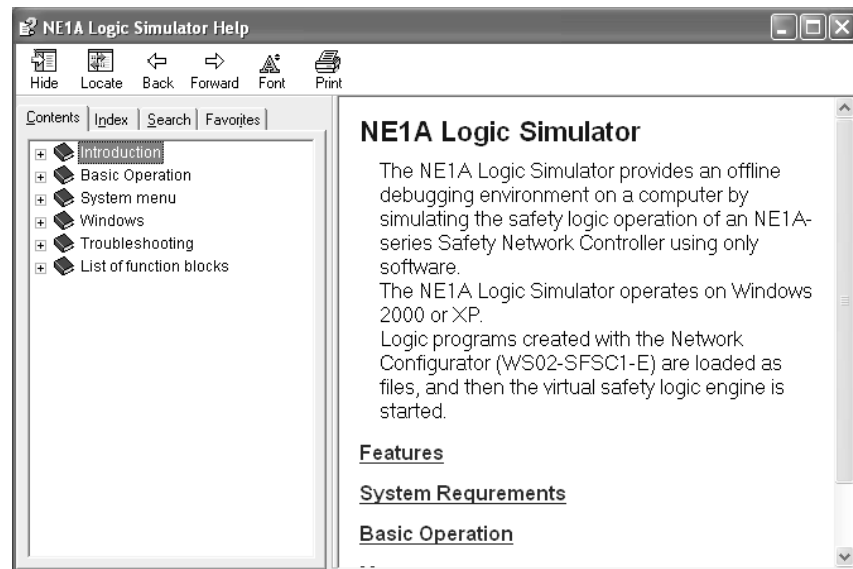
2-16 Help Display

This section describes how to display the NE1A Logic Simulator Help.

1,2,3...

1. Select **Help - Topics**.

The Help Menu will be displayed.



SECTION 3

Debugging with the Logic Window

This section describes how to debug programs for the NE1A Logic Simulator using the Logic Window.

3-1	Overview	30
3-2	Starting and Stopping the Logic Program	31
3-2-1	Starting	31
3-2-2	Stopping	31
3-2-3	Pausing	31
3-2-4	Executing One Cycle	31
3-3	Modifying Input Tags	32
3-3-1	Setting, Resetting, and Reversing	32
3-3-2	Inputting Pulses	32
3-4	Setting Initial Values	34
3-5	Setting the Cycle Time Base Value	35
3-6	Feedback Settings	36
3-7	Monitoring a User-defined Function Block	38
3-8	Zooming In and Out of the Logic Window Display	39

3-1 Overview

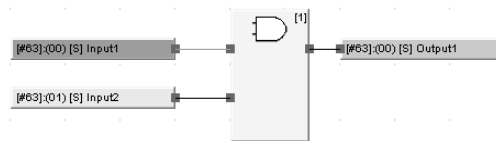
This section describes how to debug using the Logic Window.

The Logic Window displays the Logic Program. Input tags can be modified using the Logic Window, Tag List Window, or the Watch Window. The corresponding outputs can then be verified. Similar to the Online Monitor Screen for the Logic Editor of the Network Configurator, tags that are ON and lines that are connected are displayed in dark green.

Note The Timing Chart Window and the Logic Window cannot be used for debugging simultaneously.

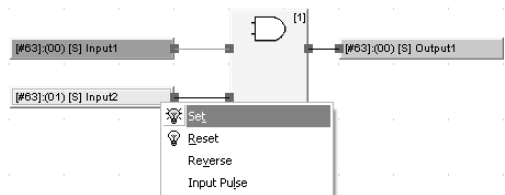
A program simulation using an AND function block is shown as an example below.

Input 1 is ON and input 2 is OFF. Therefore the output (output 1) of the AND function block is OFF.

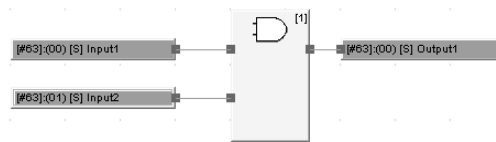


Note Tags that are ON and lines that are connected are displayed in dark green.

Now, input 2 is modified by right-clicking it and selecting **Set** from the pop-up menu.




As shown below, input 1 and input 2 turn ON and the AND function block output (output 1) turns ON.



3-2 Starting and Stopping the Logic Program


This section describes how to start and stop a logic program.

3-2-1 Starting

To start a logic program when it is stopped or paused, select **Debug - Start**. Alternatively, click the  icon on the tool bar.


The logic program will begin execution. Input tags can be modified and the corresponding outputs verified while in this state.

3-2-2 Stopping

To stop a logic program when it is being executed or when it is paused, select **Debug - Stop**. Alternatively, click the  icon on the tool bar.


The logic program will stop. When the program is stopped, it will be reset and all input and output tags will return to their initial values.

3-2-3 Pausing

To pause execution of a logic program while it is being executed, select **Debug - Pause**. Alternatively, click the  icon on the tool bar.

Execution of the logic program will pause.

3-2-4 Executing One Cycle

To execute one cycle of the logic program when it is stopped or paused, select **Debug - 1 Cycle Execute**. Alternatively, click the  icon on the tool bar.

The logic program will be executed for one cycle and then pause.

3-3 Modifying Input Tags

This section describes how to modify input tags.

3-3-1 Setting, Resetting, and Reversing

Set, reset, and reverse functions can be applied in the Logic Window, Tag List Window, or Watch Window. **Set** turns ON a value, **Reset** turns OFF a value, and **Reverse** turns OFF a value if it's ON and turns ON a value if it's OFF.

Modifying Tags from the Logic Window

Select an input tag in the Logic Window and select **Set**, **Reset**, or **Reverse** from the Debug Menu. These functions can be applied also by right-clicking and selecting menu items from the pop-up menu or selecting icons from the tool bar.

More than one tag can be selected and modified at once. To select more than one tag, hold down the **Shift** Key while selecting tags with the mouse in the Logic Window, or make a block selection by dragging the mouse.

Modifying Tags from the Tag List Window

Select an input tag in the Tag List Window and select **Set**, **Reset**, or **Reverse** from the Debug Menu. These functions can be applied also by right-clicking and selecting a menu item from the pop-up menu or selecting icons from the tool bar. More than one tag can be selected and applied at once. To select more than one tag, hold down the **Shift** Key while selecting tags with the mouse in the Tag List Window.

Modifying Tags from the Watch Window

Select an input tag in the Watch Window and select **Set**, **Reset**, or **Reverse** from the Debug Menu. These functions can be applied also by right-clicking and selecting a menu item from the pop-up menu or selecting icons from the tool bar. More than one tag can be selected and applied at once. To select more than one tag, hold down the **Ctrl** Key or **Shift** Key while selecting tags with the mouse from the Watch Window.

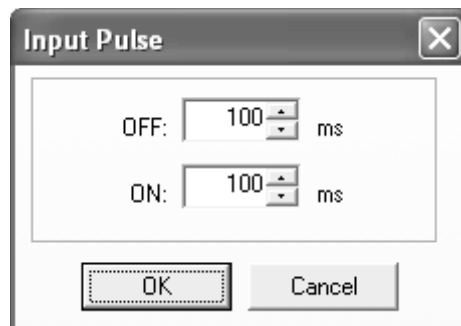
Note Tags that have been selected in a window can be set or reset by clicking the **Set** (💡) or **Reset** (💡) Icon in the Debug Tool Bar.

3-3-2 Inputting Pulses

A pulse input can be applied to an input tag. Use the following procedure to apply a pulse input.

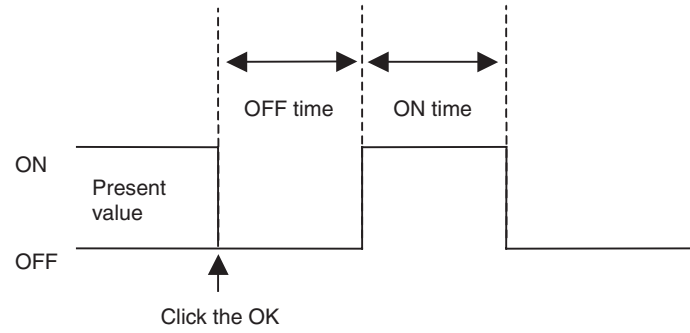
- 1,2,3...
1. Select an input tag in the Logic Window.
 2. Select **Debug - Input Pulse**. (Alternatively, right-click on the input tag and select **Input Pulse** from the pop-up menu.)

The following dialog box will be displayed.



3. Enter the OFF and ON times and click the **OK** Button. The time settings for both the OFF and ON times must be between 100 and 10,000 ms. The time setting specified here is the program time. Simulation with the Logic Simulator will be executed based on the time set here, multiplied by the cycle time base value.

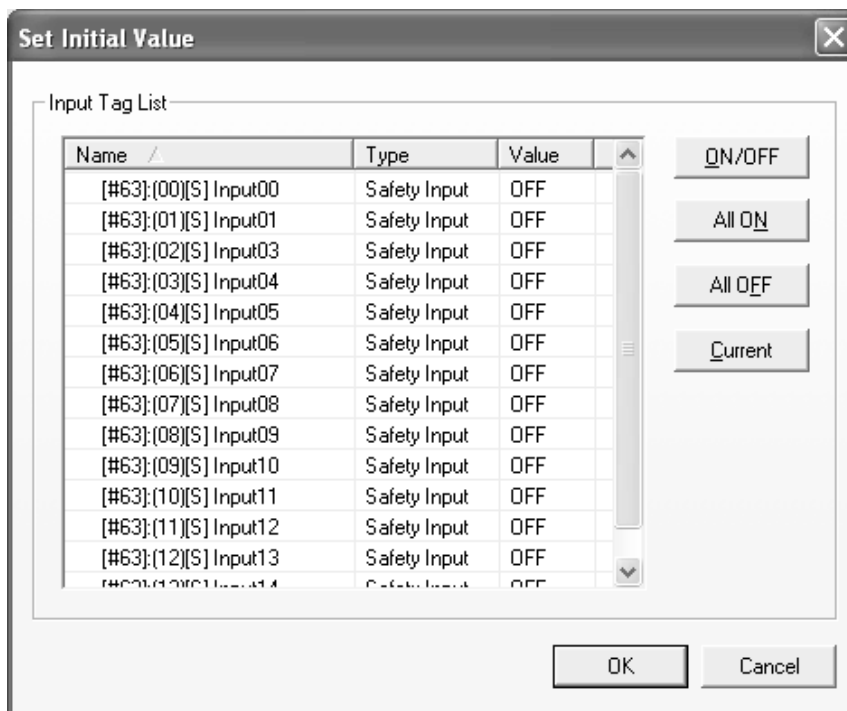
The shape of the input pulse is shown below.



3-4 Setting Initial Values

The initial values of input tags can be entered when debugging with the Logic Window. Use the following procedure to set the initial values of input tags.

- 1,2,3... 1. Select **Debug - Set Initial Value**.
The following dialog box will be displayed.



2. Select an input tag to set the initial value for debugging. To select more than one tag, hold down the **Shift** Key or the **Ctrl** Key while selecting tags with the mouse.
3. Click the buttons on the right of the Input Tag List to set the initial values and then click the **OK** Button.

Functions of the buttons are given below.

Button	Function
ON/OFF	Turns ON to OFF, and OFF to ON.
All ON	Turns ON all tags.
All OFF	Turns OFF all tags.
Current Value	Sets the tag to its present value.

When the **OK** Button is clicked and the dialog box is closed, the settings will be reflected in the program.

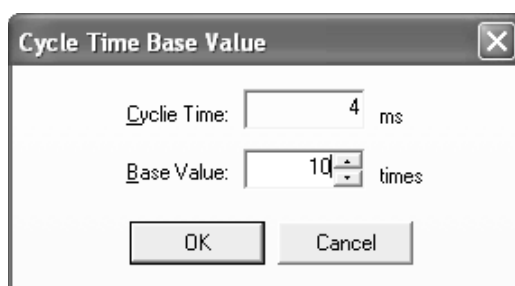
Note The tags in the Input Tag List can be set to ON or OFF by double-clicking them.

3-5 Setting the Cycle Time Base Value

The cycle time base value is a multiplier applied to the actual device cycle time. When the cycle time base value is 1, the simulator runs based on the same cycle time as the actual device. If the value is larger than 1, the simulation can be made slower than the actual device, so that delay times and discrepancy times can be checked. For example, if the delay function block is set to 300 ms and the cycle time base value is set to 10, the delay in the logic simulator will be 3 seconds.

Use the following procedure to set the cycle time base value. The setting cannot be changed if debug is being executed or paused.

- 1,2,3...
1. Select **Debug - Cycle Time Base Value**.
The following dialog box will be displayed.



2. Set the Cycle Time Base Value between 1 and 1,000, and then click the **OK** Button.

The product of the cycle time and the cycle base value (ms) will become one cycle of the debug process.

Note The cycle time is determined by the Network Configurator based on the program size and other factors. It is only displayed for reference in this window and cannot be modified.

- Note**
- (1) If the cycle time base value is set to a small value and the CPU performance of the computer is low, CPU utilization will become high. When this happens, it may create a time error in the input pulse or feedback settings. This may interfere with correct operation of the program. If this occurs, increase the cycle time base value to reduce the error.
 - (2) The cycle time base value set here does not affect debugging using the Timing Chart Window.

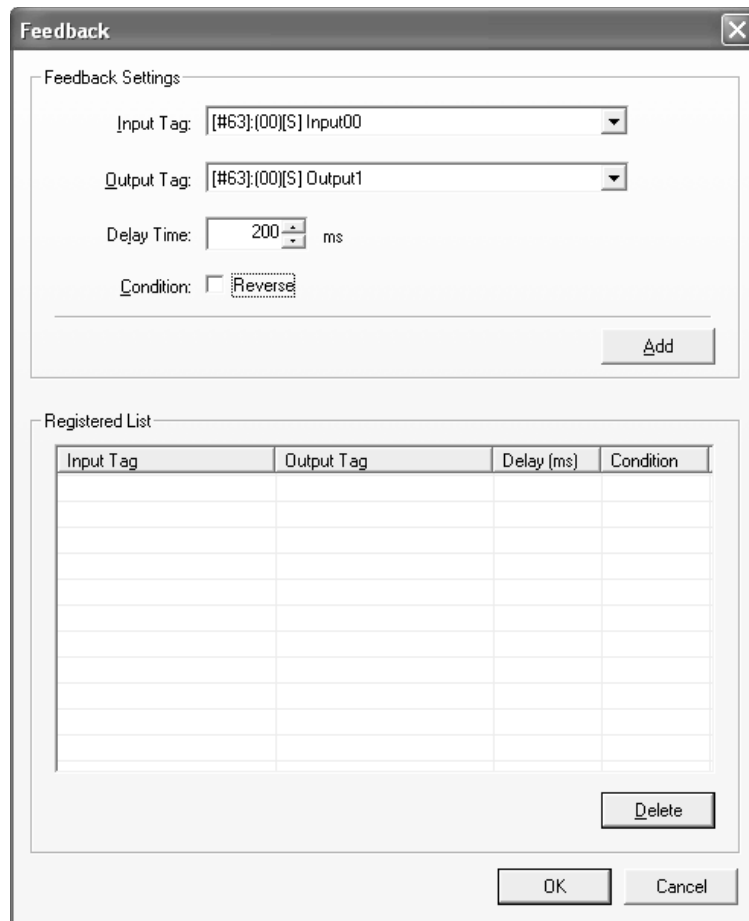
3-6 Feedback Settings

If the EDM input (monitored input) is changed while the program is being executed when using EDM function blocks, the EDM feedback signal will not change and will trigger a feedback error. Use the feedback settings to link the reverse output signal to the EDM feedback signal in the EDM function block to avoid feedback errors.

Note Feedback settings operate based on the Windows timer, which has error. The error becomes larger particularly when the load on Windows is high. If this happens, feedback error may occur even if feedback settings have been made. To avoid feedback errors, make the cycle time base setting larger than the current value.

Use the following procedure to set the feedback settings.

- 1,2,3... 1. Select **Debug - Feedback Settings**.
The Feedback Dialog Box will be displayed.



Item	Description
Input Tag	Specifies the input tag to be used in the feedback settings.
Output Tag	Specifies the output tag that is linked to the input tag.
Delay	Specifies the delay time between 50 and 1000 ms.
Condition	Sets whether the value is reversed or not. Select the cell when the reverse of the output tag is to be assigned to the input tag.

- Select or assign the input tag, output tag, delay time, and condition in the feedback settings, and then click the **Add** Button.

The feedback settings will be added to the registered list as shown below.

The screenshot shows a dialog box titled "Feedback" with a close button (X) in the top right corner. It is divided into two main sections: "Feedback Settings" and "Registered List".

Feedback Settings:

- Input Tag:** A dropdown menu showing "[#63]:(00)[S] Input00".
- Output Tag:** A dropdown menu showing "[#63]:(00)[S] Output1".
- Delay Time:** A numeric input field with "200" and a spinner, followed by "ms".
- Condition:** A checkbox labeled "Reverse" which is checked.

At the bottom right of the "Feedback Settings" section is an "Add" button.

Registered List:

A table with the following columns: Input Tag, Output Tag, Delay (ms), and Condition.

Input Tag	Output Tag	Delay (ms)	Condition
[#63]:(00)[S] Input00	[#63]:(00)[S] Output1	200	Reverse

At the bottom right of the "Registered List" section is a "Delete" button.

At the bottom of the dialog box are "OK" and "Cancel" buttons.

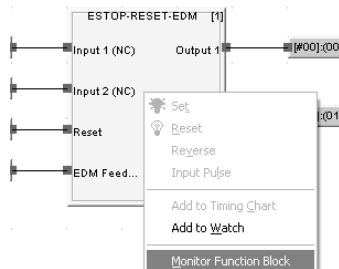
- To correct feedback settings that have already been registered, select the desired setting from the Registered List Area, change the contents, and then click the **Add** Button again.
- To delete registered feedback settings, select the desired setting from the Registered List Area and click the **Delete** Button.

Note A maximum of 200 feedback settings can be registered.

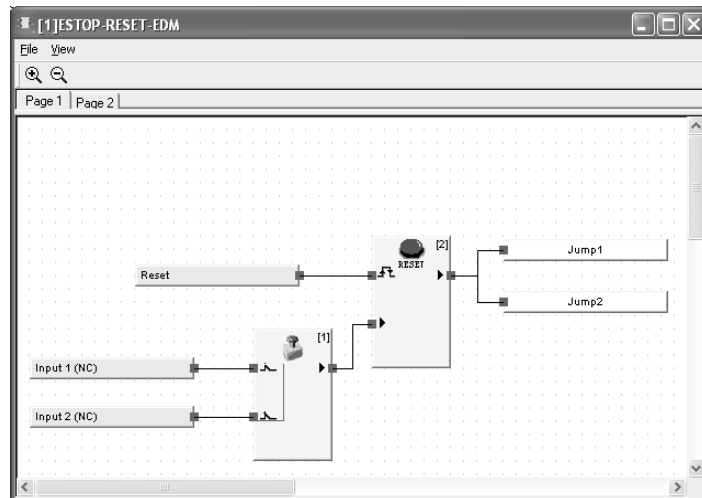
3-7 Monitoring a User-defined Function Block

This section describes how to monitor the contents of a user-defined function block.

- 1,2,3... 1. Right-click a user-defined function block in the Logic Window and select **Monitor Function Block** from the pop-up menu.



The User-defined Function Block Window will be opened as shown below. The contents of the selected user-defined function block will be displayed.



The User-defined Function Block Window has the following functions.

Main menu	Menu item	Function
File	Exit	Exits the user-defined function block monitor and closes the window.
View	Tool Bar	Displays/hides the tool bar.
	Zoom In	Enlarges the display.
	Zoom Out	Reduces the display.

- Note**
- (1) Input tags cannot be modified directly from the User-defined Function Block Window. Go to the Logic Window, Tag List Window, or the Watch Window to modify them.
 - (2) If the user-defined function block file does not exist, it cannot be monitored. Import the function block using the logic editor in the Network Configurator.

3-8 Zooming In and Out of the Logic Window Display

Use the following procedure to zoom in and out of the display in the Logic Window.

- 1,2,3...**
1. Click in the Logic Window (or press **F6/Shift + F6**) to move to the Logic Window.
 2. Select **View - Zoom In** or **View - Zoom Out**.
This will zoom in or out of the display in the Logic Window.

This function can only be used in the Logic Window.

Note Pressing the **Ctrl** Key while moving the mouse wheel up or down will also zoom in and out of the display in the Logic Window.

SECTION 4

Debugging with the Timing Chart Window

This section describes how to debug programs for the NE1A Logic Simulator using the Timing Chart Window.

4-1	Overview	42
4-2	Timing Chart Window	43
4-3	Adding to the Timing Chart	44
4-3-1	Adding from the Tag List	44
4-3-2	Adding from the Tag List Window	44
4-3-3	Adding from the Logic Window	44
4-4	Inputs to the Timing Chart	45
4-4-1	Basic Input	45
4-4-2	Pulse Setting	45
4-4-3	Copying and Pasting in the Timing Chart	45
4-4-4	Editing the Timing Chart with a Text Editor	46
4-5	Starting and Stopping the Timing Chart	47
4-6	Importing/Exporting Timing Chart Data	48
4-6-1	Importing Timing Chart Data	48
4-6-2	Exporting Timing Chart Data	48
4-7	Printing the Timing Chart	50
4-8	Timing Chart Options	51
4-8-1	Displaying the Timing Chart Options Dialog Box	51
4-8-2	Setting Tab Page	51
4-8-3	View Tab Page	52
4-8-4	Print Tab Page	53
4-9	Breakpoints	54
4-9-1	Adding Breakpoints	54
4-9-2	Deleting Breakpoints	54
4-9-3	Enabling/Disabling Breakpoints	54
4-9-4	Breakpoint List	55
4-10	I/O Breakpoint	56
4-10-1	I/O Breakpoint Settings	56
4-10-2	Enabling/Disabling the I/O Breakpoint	57
4-11	Zooming In and Out of the Timing Chart Display	58

4-1 Overview

This section describes how to debug a program using the Timing Chart Window.

The debugging process starts with assigning input values to tags in the timing chart, executing the logic program, then displaying the output results.

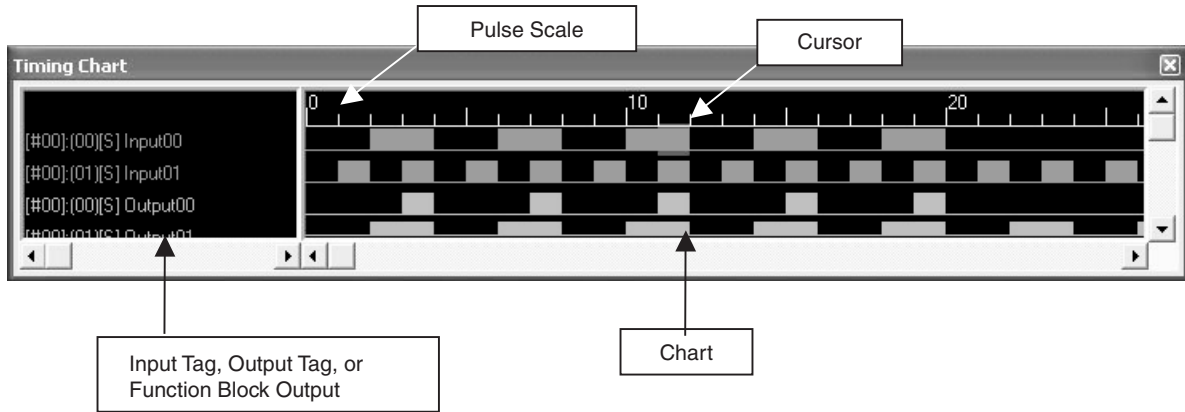
Pulses can be specified in terms of the device cycle time when using the Timing Chart Window. This makes it possible to run simulations for inputs that fluctuate quickly, which is not possible when debugging with the logic window.

Note Debugging cannot be performed simultaneously using both the Timing Chart Window and the Logic Window.

4-2 Timing Chart Window

This section describes the various parts of the Timing Chart Window.

The tags and function block outputs are displayed on the left of the window. The corresponding chart is displayed on the right.

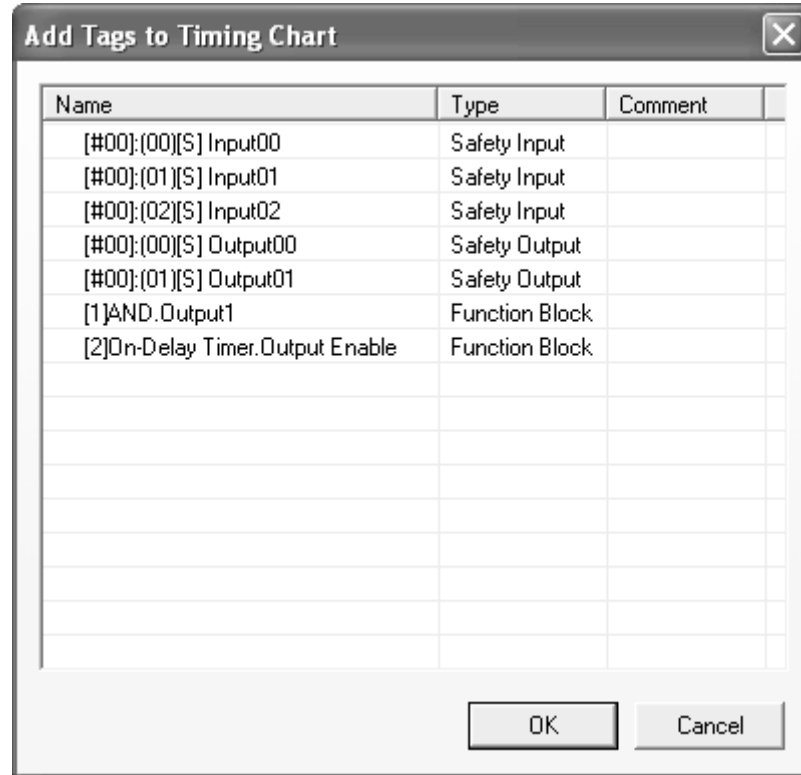


4-3 Adding to the Timing Chart

Use the following procedure to add a tag or a function block output to the timing chart. A maximum of 1,000 tags can be added to a timing chart.

4-3-1 Adding from the Tag List

- 1,2,3... 1. Select *Timing Chart - Add Tag*.



2. Select the tag to be added to the timing chart and click the **OK** Button. The tag will be added to the timing chart.

More than one tag can be added at the same time by holding down the **Ctrl** Key or **Shift** Key while selecting the tags.

4-3-2 Adding from the Tag List Window

- 1,2,3... 1. In the Tag List Window, select the tag to be added to the timing chart.
2. Right-click and select **Add to Timing Chart** from the pop-up menu.
The tag will be added to the timing chart.

4-3-3 Adding from the Logic Window

- 1,2,3... 1. Select an input tag, output tag, jump address, or function block from the logic window to be added to the timing chart. More than one item can be selected by holding down the **Shift** Key while selecting the items.
2. Right-click and select **Add to Timing Chart** from the pop-up menu.
The tags will be added to the timing chart.

4-4 Inputs to the Timing Chart

This section explains how to apply inputs to the tags that have been added to the timing chart. The output tags, jump address, and function blocks cannot be changed.

4-4-1 Basic Input

Use the following procedure to turn the input tags to ON or OFF or to reverse the tag status.

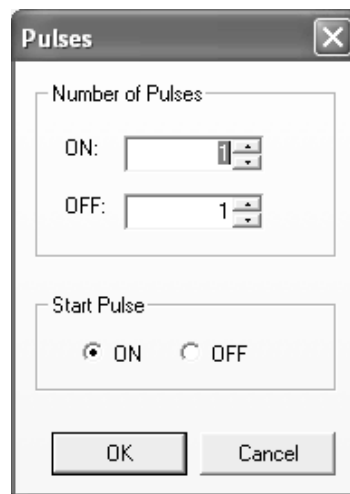
- 1,2,3...**
1. Move the cursor to the area where you want to apply an input to the timing chart. An area can be selected.
 2. Select **ON**, **OFF**, or **Reverse** from the Timing Chart Menu.

4-4-2 Pulse Setting

A specified pulse can be assigned using the following procedure.

- 1,2,3...**
1. Select the area on the timing chart where you want to apply the set pulses.
 2. Select **Timing Chart - Make Pulses**. Alternatively, right-click in the selected area and select **Make Pulses** from the pop-up menu.

The following dialog box will be displayed.



3. Set the number of pulses and the start pulse, and then click the **OK** Button. The specified pulses will be applied to the selected area.

4-4-3 Copying and Pasting in the Timing Chart

- 1,2,3...**
1. Select the area on the timing chart to be copied.
 2. Select **Edit - Copy**. Alternatively, right-click and select **Copy** from the pop-up menu.
 3. Move the cursor to where you want to paste and select **Edit - Paste**. Alternatively, right-click and select **Paste** from the pop-up menu.

4-4-4 Editing the Timing Chart with a Text Editor

The timing chart can be edited with a text editor by using the copy and paste functions.

1,2,3...

1. Select the area of the timing chart that you want to edit.

2. Select **Edit - Copy**.

The contents will be copied to the clipboard.

3. Start a text editor and paste the content of the clipboard in it. The data will be displayed in 0s and 1s as shown below.

```
NE1ASimulatorTimingChart
11100010010111011111000000000000
01111010000111011111000000000000
01111010110001011100000000000000
00000000000000000000000000000000
```

4. After the text has been edited, copy the text in the text editor to the clipboard.

5. Go to the timing chart and select **Edit - Paste**.

Note When using a text editor to edit the timing chart, do not delete the first line 'NE1ASimulatorTimingChart'. If this line is missing, or characters other than 0 and 1 are entered, the data cannot be pasted.

4-5 Starting and Stopping the Timing Chart


This section describes how to start and stop timing chart simulations.

To start timing chart simulations, the logic program must be stopped.


When the timing chart simulation is being executed, the input tags and output tags that are displayed in the logic window will not be updated. The display will be updated when the simulation is paused.

The display in the Watch Window will be updated regardless of whether the timing chart simulation is executing or has stopped.


Starting the Timing Chart

- 1,2,3...**
1. Select **Timing Chart - Execute 1 Pulse**, or click the  Icon on the Timing Chart Tool Bar.
The timing chart simulation will be started.


Pulse Execute on the Timing Chart

- 1,2,3...**
1. Select **Timing Chart - Execute 1 Pulse**, or click the  Icon on the Timing Chart Tool Bar.
The timing chart simulation will be executed for one pulse.
When it has finished, simulation will be paused.

Stopping the Timing Chart

- 1,2,3...**
1. Select **Timing Chart - Stop**, or click the  Icon on the Timing Chart Tool Bar.
The timing chart simulation will be stopped.
When the timing chart simulation is stopped, the input tags displayed in the Logic Window and Watch Window will be set to their initial values.

Pausing the Timing Chart

- 1,2,3...**
1. Select **Timing Chart - Pause**, or click the  Icon on the Timing Chart Tool Bar.
The timing chart simulation will be paused.

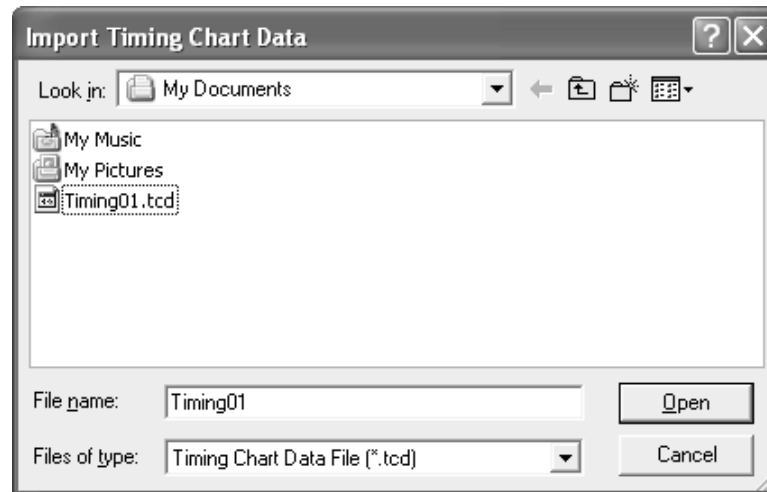
Note Breakpoints and an I/O breakpoint can be set in the timing chart. Refer to *4-9 Breakpoints* and *4-10 I/O Breakpoint* on for details on setting breakpoints.

4-6 Importing/Exporting Timing Chart Data

Data in the Timing Chart Window can be saved to a file or read in from a file. The file extension is *.tcd.

4-6-1 Importing Timing Chart Data

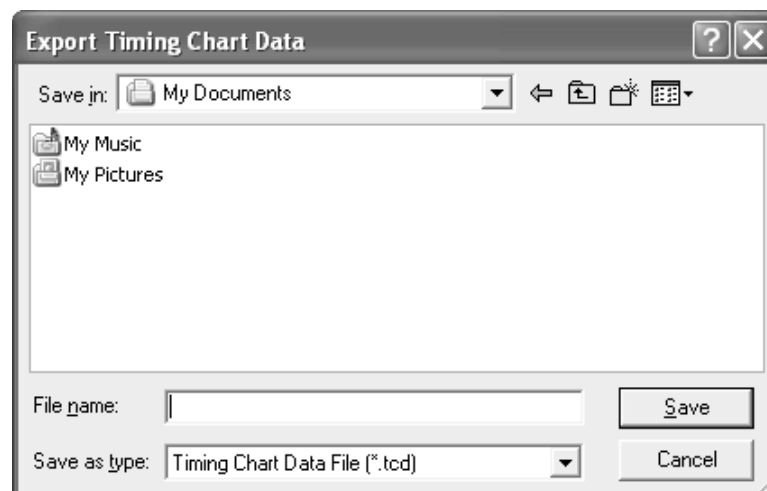
- 1,2,3... 1. Select **File - Import Timing Chart Data**.
The following dialog box will be displayed.



2. Select a timing chart data file (*.tcd) and click the **Open** Button.
The timing chart data will be read in and displayed on the timing chart.
Note Importing a file will overwrite the data that is currently being displayed on the timing chart. If you need to save the data currently in the timing chart, export it before importing a file.

4-6-2 Exporting Timing Chart Data

- 1,2,3... 1. Select **File - Export Timing Chart Data**.
The following dialog box will be displayed.



2. Specify the save location and the filename (*.tcd) of the timing chart data, and then click the **Save** Button.
The timing chart data file will be saved.

Note The breakpoint information described in *4-9 Breakpoints* and *4-10 I/O Breakpoint* will not be included in the timing chart data export file.

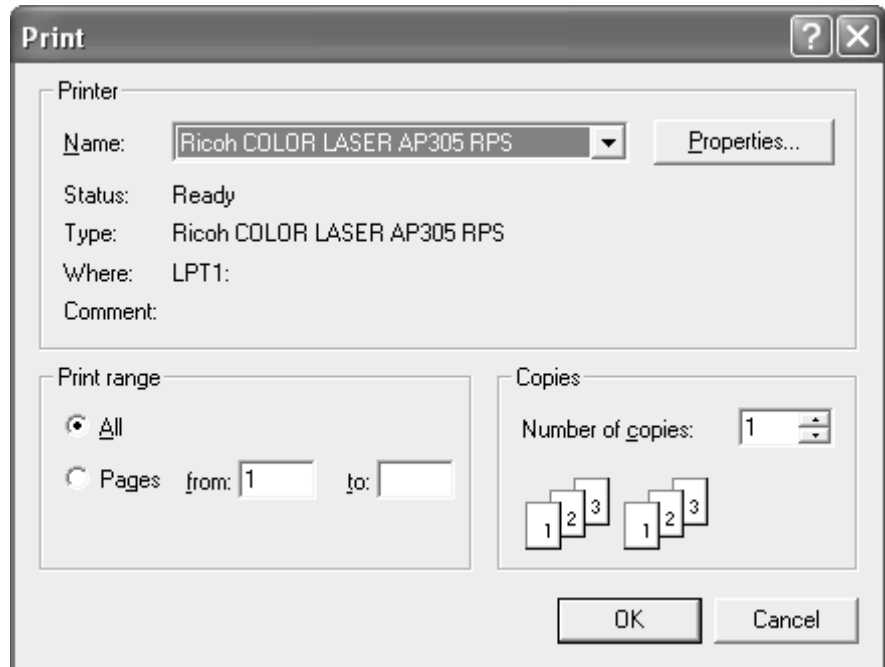
4-7 Printing the Timing Chart

The timing chart can be printed.

1,2,3...

1. Select **File - Print Timing Chart**.

The standard Windows Print Dialog Box will be displayed.



2. Set the printing properties as required, and click the **OK** Button.
The timing chart will be printed.

Note The contents that is printed can be specified on the Print Tab Page of the Timing Chart Option Dialog Box. Refer to *4-8-4 Print Tab Page* for details on settings.

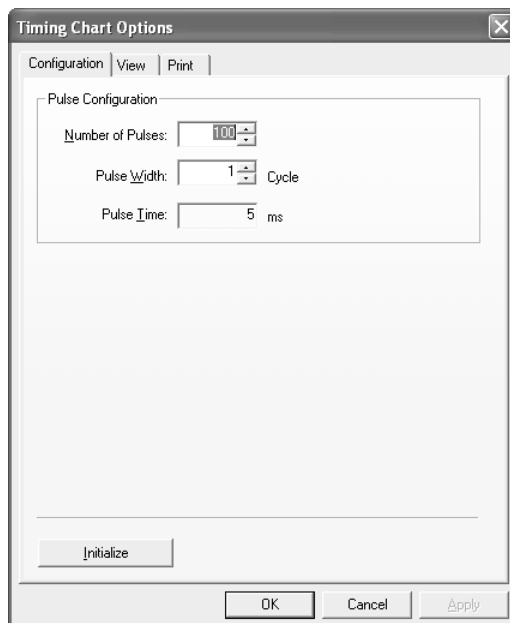
4-8 Timing Chart Options

This section describes the timing chart option settings. The timing chart option settings can be changed in the Timing Chart Options Dialog Box.

4-8-1 Displaying the Timing Chart Options Dialog Box

- 1,2,3... 1. Select **Timing Chart - Options**.

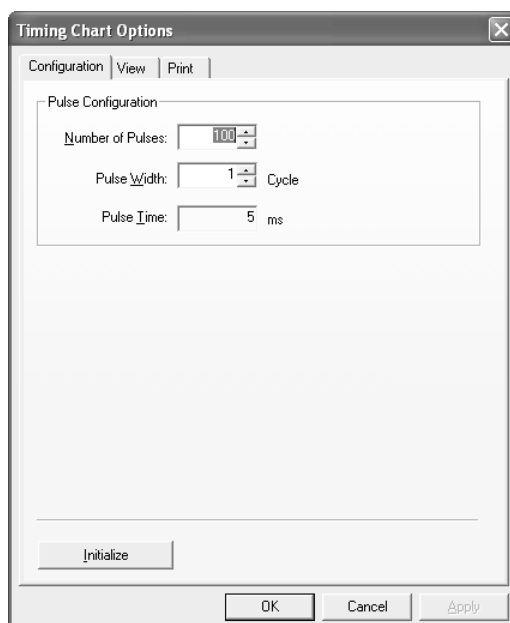
The Timing Chart Options Dialog Box will be displayed.



4-8-2 Setting Tab Page

The pulses used in the timing chart can be set up on the Configuration Tab Page.

- 1,2,3... 1. Click the **Configuration** Tab in the Timing Chart Options Dialog Box.

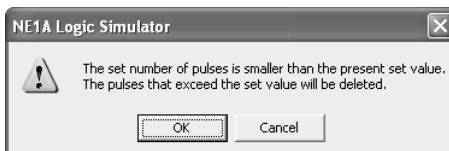


The pulse configuration consists of the following items.

Parameter/button	Description
Number of Pulses	Specifies the number of pulses that are used in the timing chart. The number of pulses can be set to between 10 and 1,000. (The initial value is 100.)
Pulse Width	Specifies the width of one pulse as a multiple of the device cycle time. The pulse width can set to between 1 and 100 cycles. (The initial value is 1 cycle.)
Pulse Time	Displays the time of one pulse. (Cycle time (ms) × Pulse width (cycles).)
Initialize Button	Returns the number of pulses and pulse width to their initial values.

2. Modify the pulse settings and click the **OK** Button.

Note If a value smaller than the current number of pulse is entered, the following dialog box will be displayed.

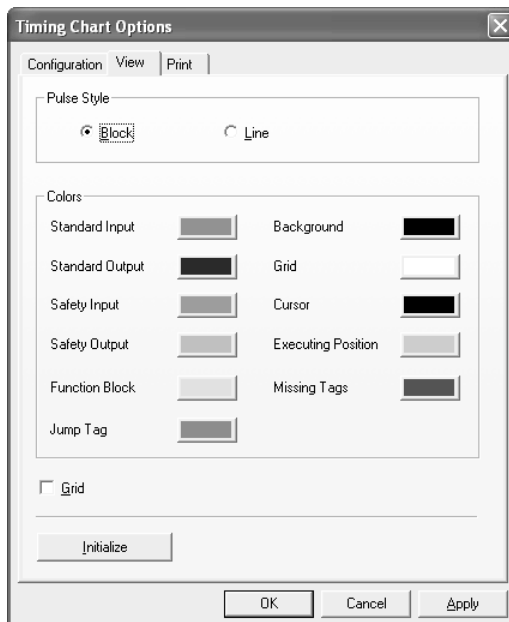


Clicking the **OK** Button will delete the pulses that exceed the set value.

4-8-3 View Tab Page

The display options can be set on the View Tab Page.

1,2,3... 1. Click the **Display** Tab in the Timing Chart Options Dialog Box.



The display options consist of the following items.

Parameter/button	Description
Pulse Style	Used to select block or line.
Color	Changes the chart color

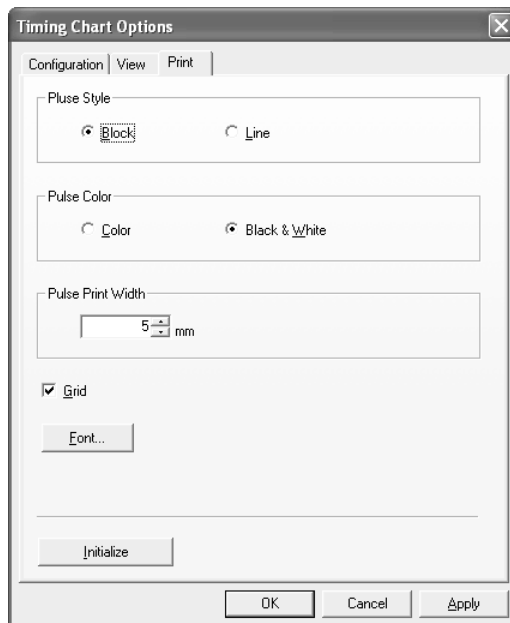
Parameter/button	Description
Grid	Displays/Hides the grid.
Initialize Button	Returns all settings on the Display Tab Page to their initial values.

2. Modify the timing chart view settings and click the **OK** Button.

4-8-4 Print Tab Page

The timing chart printing options can be set up on the Print Tab Page.

- 1,2,3... 1. Click the **Print** Tab in the Timing Chart Options Dialog Box.



The print options consist of the following items

Parameter/button	Description
Pulse Style	Used to select block or line.
Pulse Color	Changes the print color of the chart.
Pulse Print Width	Sets the printing width of one pulse (in mm).
Grid	Displays/Hides the grid.
Font Button	Sets the character font to be printed.
Initialize Button	Returns all settings on the Print Tab Page to their initial values.

2. Modify the timing chart print settings and click the **OK** Button.

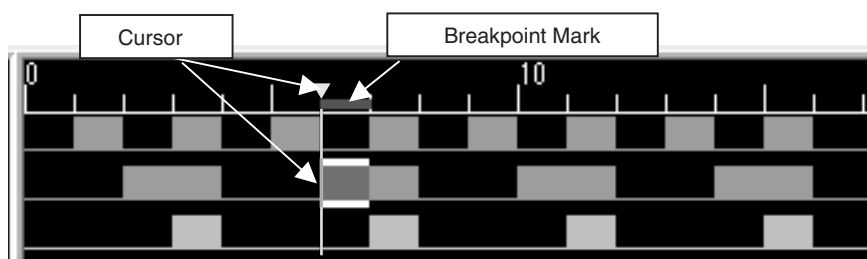
4-9 Breakpoints

When a timing chart with breakpoints is executed, it will pause after evaluating the row with the breakpoint, allowing you to check the status.

Breakpoints can be temporarily disabled.

4-9-1 Adding Breakpoints

- 1,2,3...**
1. Move the cursor on the timing chart where you want to add a breakpoint.
 2. Select **Breakpoints - Register/Unregister**.
A breakpoint mark will be added.



Note There is no limit to the number of breakpoints that can be added.

4-9-2 Deleting Breakpoints

- 1,2,3...**
1. Move the cursor on the timing chart to the breakpoint that you want to remove.
 2. Select **Breakpoints - Register/Unregister**.
The breakpoint will be deleted and the mark will disappear.

4-9-3 Enabling/Disabling Breakpoints

- 1,2,3...**
1. Move the cursor on the timing chart to the breakpoint that you want to enable or disable.
 2. Select **Enable** or **Disable** from the Breakpoints Menu.
The breakpoint will be enabled or disabled and the mark will change.

- Enabled Breakpoint



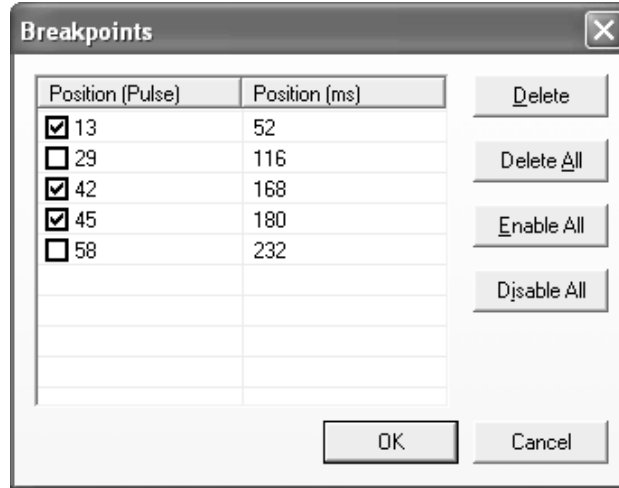
- Disabled Breakpoint



4-9-4 Breakpoint List

Breakpoints can be displayed in a list and be chosen to be removed, enabled, or disabled.

- 1,2,3... 1. Select **Breakpoints - Display Breakpoint List**.
The following dialog box will be displayed.



- Each breakpoint can be enabled or disabled using the check boxes on the left.

Button	Function
Delete	Deletes the selected breakpoint.
Delete All	Deletes all breakpoints.
Enable All	Enables all breakpoints.
Disable All	Disables all breakpoints.

2. When the required settings have been completed, click the **OK** Button.

4-10 I/O Breakpoint

An I/O breakpoint can be used to pause the timing chart depending on I/O status (ON or OFF).

4-10-1 I/O Breakpoint Settings

- 1,2,3... 1. Select **Breakpoints - I/O Breakpoint - Setting**.

The screenshot shows the 'I/O Breakpoint Settings' dialog box. It features a 'Register Break Conditions' section with a table listing various tags and their types. Below this is a 'Condition' section with radio buttons for 'ON' and 'OFF', and an 'Add' button. The 'Applied Conditions List' section contains an empty table with columns for Name, Value, and Type. At the bottom, there is a 'Logic between Conditions' section with radio buttons for 'AND' and 'OR', and a 'Delete' button. The dialog concludes with 'OK' and 'Cancel' buttons.

Name	Type
[#00];(00)[S] Input00	Safety Input
[#00];(01)[S] Input01	Safety Input
[#00];(02)[S] Input02	Safety Input
[#00];(00)[S] Output00	Safety Output
[#00];(01)[S] Output01	Safety Output
[1]AND. Output1	Function Block

Name	Value	Type

The setting screen consists of the following parameters.

Parameter	Description
Register Break Conditions	Select the tags that are used as conditions for the I/O breakpoint. Set the Condition Option to ON or OFF , and then click the Add Button. The tag will be added to the Applied Conditions List. Up to ten tags can be assigned to one I/O breakpoint as conditions.
Applied Conditions List	Displays a list of conditions for the I/O breakpoint. Select a condition from the list and click the Delete Button to delete the selected condition.
Logic between Conditions	If AND is selected, the timing chart will stop when all the applied conditions are met. If OR is selected, the timing chart will stop when at least one of the applied conditions is met.

2. Make the settings as required and click the **OK** Button.

- Note**
- Only one I/O breakpoint can be registered. Up to a maximum of ten conditions can be assigned for the I/O breakpoint.
 - Double-click a tag in the Applied Conditions List Area to turn it ON and OFF.

4-10-2 Enabling/Disabling the I/O Breakpoint

Enabling the I/O Breakpoint

- 1,2,3...**
1. Select ***Breakpoints - I/O Breakpoint - Enable***.
The I/O breakpoint will be enabled.

Disabling the I/O Breakpoint

- 1,2,3...**
1. Select ***Breakpoints - I/O Breakpoint - Disable***.
The I/O breakpoint will be disabled. Even if the I/O breakpoint conditions are satisfied, the timing chart will not be stopped.

4-11 Zooming In and Out of the Timing Chart Display

Use the following procedure to zoom in and out of the display in the Timing Chart Window.

- 1,2,3...**
1. Click on the timing chart (or press **F6 / Shift + F6**) to move to the Timing Chart Window.
 2. Select **View - Zoom In** or **View - Zoom Out**.
This will zoom in or out of the timing chart.

This function can only be used in the Timing Chart Window.

Note Pressing the **Ctrl** Key while moving the mouse wheel up or down will zoom in and out of the display in the Logic Window.

SECTION 5

Troubleshooting

This section describes troubleshooting problems that can occur based on error messages displayed by the NE1A Logic Simulator.

5-1	Operating Errors and Countermeasures	60
5-1-1	Overview.....	60
5-1-2	File Errors	60
5-1-3	Watch Window Errors.....	61
5-1-4	Debug Errors.....	61
5-1-5	Timing Chart Errors	61

5-1 Operating Errors and Countermeasures

5-1-1 Overview

If an error occurs while the NE1A Logic Simulator is running, a dialog box will appear with an error message. The errors can be cleared using the following countermeasures.

5-1-2 File Errors

Error message	Countermeasure
Failed to load EDS file.	The simulation file that you tried to open is not supported by the installed Network Configurator. Update the version of the Network Configurator.
Access to 'file name' was denied.	<ol style="list-style-type: none"> 1. The simulation file that you tried to save is being used elsewhere. Close the application that is using the file. 2. You do not have access rights to the simulation file that you are trying to open or save. Select a file that you have access rights to.
A sharing violation occurred while accessing 'file name'.	The simulation file that you tried to open is being used by another application. Close the application that is using the file.
Processing failed.	<ol style="list-style-type: none"> 1. The file you tried to import is not in timing chart format. Specify a valid timing chart file. 2. You do not have access rights to the timing chart file that you are trying to import or export. Select a file that you have access rights to.
The password was not correct. Please enter the correct password.	The entered password does not match the password that has been set in the logic program. Enter the correct password.
This program is not complete and cannot be executed. Please select an executable file.	The function block used in the logic program is missing a necessary input. This program cannot be simulated. Correct the program with the Network Configurator and create the simulation file again.
This program is not complete and cannot be download to the device. Continue anyway?	The function block used in the logic program is missing an input or an output. It cannot be downloaded to the actual device but a simulation can be run. To run a simulation, click the YES Button, otherwise click the Cancel Button and correct the program with the Network Configurator.
The current file will be overwritten with 'file name' from the disk. OK?	The file that you tried to open is already open. To overwrite the already opened file, click the YES Button. To leave it and continue using the already opened file, click the No Button.
The file is not valid. Please specify a valid file.	<ol style="list-style-type: none"> 1. The file that you tried to import is not in simulation file format. Specify a valid simulation file. 2. The file that you tried to import is not in timing chart file format. Specify a valid timing chart file.
Unexpected file format.	The file that you tried to open or import is not in simulation file format. Specify a valid simulation file.

5-1-3 Watch Window Errors

Error message	Countermeasure
Tags were registered up to the limit of 100 tags. Tags exceeding this limit were not registered.	You tried to add more than the limit of 100 tags in total on the Watch Window. Up to 100 tags will be registered but the remaining tags will not be registered. Add them to a different tab or delete unwanted tags before trying to add more.
The limit of 100 tags has already been registered.	You tried to add more tags when the limit of 100 tags has already been registered. Add them to a different tab page or delete unwanted tags before trying to add more.

5-1-4 Debug Errors

Error message	Countermeasure
Specify the delay in increments of 10 ms.	The delay value of the feedback setting has not been specified in increments of 10 ms. It must be entered in increments of 10 ms.
Specify the time in increments of 10 ms.	The pulse input ON time or OFF time has not been specified in increments of 10 ms. It must be entered in increments of 10 ms.
The feedback setting has already been made for this input tag. Overwrite it?	The input tag that you tried to use for feedback setting already has feedback setting. To overwrite the setting, click the Yes Button, otherwise click the No Button.
The limit of 200 conditional expressions has already been registered.	You tried to add more than the limit of 200 conditional expressions for the feedback setting. You cannot register more than 200 conditions. Delete conditions that are no longer required before adding new ones.
The pulse input operation is already being executed. OK to stop the operation?	You tried to use the input pulse operation while it is already being executed. To stop the pulse input operation and apply a new pulse input, click the Yes Button. To continue the previous pulse input, click the No Button.

5-1-5 Timing Chart Errors

Error message	Countermeasure
Tags were registered up to the limit of 1,000 tags. Tags exceeding this limit were not registered.	You tried to add more than the limit of 1,000 tags in total on the Timing Chart Window. Delete tags that are no longer required before trying to add more. You can also use the timing chart import/export function to switch between multiple timing chart files for debugging.
The I/O break condition registered for the tag that was deleted was removed from the timing chart.	A tag that was registered as an I/O break condition has been deleted from the timing chart. It will be deleted from the I/O break condition.
The I/O breakpoint is disabled. Do you want to enable it?	An I/O breakpoint is set but is not enabled. To enable the I/O breakpoint click the Yes Button, to leave it disabled click the No Button.
The limit of 10 conditional expressions has already been registered.	You tried to add a new condition when the number of conditions registered with the I/O breakpoint has already reached its limit of 10. Only up to 10 conditions can be added. Delete conditions that are no longer required before trying to add more.

Error message	Countermeasure
The limit of 1,000 tags has already been registered.	You tried to add more tags when the limit of 1,000 tags has already been registered. Delete tags that are no longer required before trying to add more. You can also use the timing chart import/export function to switch between multiple timing chart files for debugging.
The set number of pulses is smaller than the present set value. The pulses that exceed the set value will be deleted.	The set number of pulses is smaller than the present set value. If it is alright to delete the pulses that exceed the set value, click the OK Button. To stop the process without deleting the pulses, click the Cancel Button.
The tag registered in the I/O break condition will be added to the timing chart.	A tag registered in the I/O break condition has not been added to the timing chart. It will automatically be added to the timing chart.

Appendix A

Shortcut Key List

The shortcut keys for the NE1A Logic Simulator are listed in the following tables.

Common to All Windows

Function	Menu	Shortcut key
Starting debugging	Debug - Start	F5
Executing one cycle	Debug - Execute 1 Cycle	F10
Pausing debugging	Debug - Pause	Ctrl + F5
Stopping debugging	Debug - Stop	Shift + F5
Executing a timing chart	Timing Chart - Execute	F7
Pulsing execution of a timing chart	Timing Chart - Execute 1 Pulse	F8
Pausing a timing chart	Timing Chart - Pause	Ctrl + F7
Stopping a timing chart	Timing Chart - Stop	Shift + F7
Adding a tag to a timing chart	Timing Chart - Add Tag	Insert
Adding a tag to the Watch Window	Watch - Add Tag	Ctrl + Insert
Opening a file	File - Open	Ctrl + O
Saving a file	File - Save	Ctrl + S
Moving to the next pane	View - Next Pane	F6
Moving to the previous pane	View - Previous Pane	Shift + F6
Canceling a selected function or close	---	Esc
Selecting a menu item	---	Alt + Letter next to the menu item
Displaying help	Help - Topics	F1

Logic Window

Function	Menu	Shortcut key
Moving up a page		↑
Moving down a page		↓
Moving right in a page		→
Moving Left in a page		←
Moving to the next page		Page Up
Moving to the previous page		Page Down
Setting	Debug - Set	Ctrl + J (Only works when one or more tags are selected)
Resetting	Debug - Reset	Ctrl + K (Only works when one or more tags are selected)
Reversing	Debug - Reverse	Ctrl + R (Only works when one or more tags are selected)

Tag List Window

Function	Menu	Shortcut key
Setting	Debug - Set	Ctrl + J
Resetting	Debug - Reset	Ctrl + K
Reversing	Debug - Reverse	Ctrl + R

Timing Chart Window (Tag)

Function	Menu	Shortcut key
Moving up one line		↑
Moving down one line		↓
Moving right within a window		→
Moving left within a window		←
Selecting the tags on the previous page		Page Up
Selecting the tags on the next page		Page Down
Deleting tags	Edit - Delete	Del

Timing Chart Window (Chart)

Function	Menu	Shortcut key
Moving the cursor up		↑
Moving the cursor down		↓
Moving the cursor to the right		→
Moving the cursor to the left		←
Moving the cursor up one page		Page Up
Moving the cursor down one page		Page Down
Moving to home		Home
Moving to end		End
Copying	Edit - Copy	Ctrl + C
Pasting	Edit - Paste	Ctrl + V
Turning ON the chart display	Timing Chart - ON	S
Turning OFF the chart display	Timing Chart - OFF	R
Reversing the chart display	Timing Chart - Reverse	Space
Registering/Unregistering breakpoints	Breakpoints - Register/Unregister	F9
Deleting all breakpoints	Breakpoints- Delete All	Shift + F9

Watch Window

Function	Menu	Shortcut key
Deleting	Edit - Delete	Del
Moving up one line		↑
Moving down one line		↓
Moving right within page		→
Moving left within page		←
Moving one page up		Page Up
Moving one page down		Page Down
Setting	Debug - Set	Ctrl + J
Resetting	Debug - Reset	Ctrl + K
Reversing	Debug - Reserve	Ctrl + R

Index

Symbols

.smr file, 17

.tcd file, 48

A

adding tags to the Watch Window, 22

adding to the timing chart, 44

B

breakpoints, 54

C

current value, 34

cycle time base value, 35

D

Debug - Reset, 25, 32

Debug - Reverse, 25, 32

Debug - Set, 25, 32

E

executing 1 cycle, 31

exporting timing chart data, 48

F

feedback settings, 36

I

I/O breakpoint, 56

importing programs, 19

importing timing chart data, 48

importing/exporting timing chart data, 48

initial values of input tags, 34

inputting pulses, 32

L

logic program

 pausing, 31

 starting, 31

 stopping, 31

Logic Simulator

 starting, 6

Logic Window, 30

M

Make Pulses, 45

menus, 8

modifying input tags, 32

modifying tag values, 25

monitoring a user-defined function block, 38

O

options, 51

P

pop-up menus, 10

precautions, xv

 general, xvi

 safety, xvi

Print Tab, 53

printing the timing chart, 50

S

safety precautions, xvi

saving simulation files, 26

setting initial values, 34

shortcut key list, 63

simulation file, 17

status bar, 14

system requirements, 4

T

Timing Chart - Execute 1 Pulse, 47

Timing Chart - OFF, 45

Timing Chart - ON, 45

Timing Chart - Reverse, 45
timing chart options, 51
Timing Chart Window, 43
tool bars, 11

V

versions, 27

W

Watch Window, 22

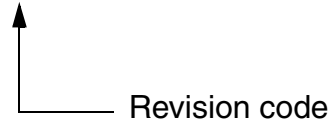
Z

zooming in, 58
zooming out, 58

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. Z910-E1-02



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	January 2007	Original production
02	June 2007	Changed descriptions.