DeviceNet Safety
NE1A Series:
NE1A-SCPU01(-V1)/-SCPU02

Safety Network Controller

OPERATION MANUAL

OMRON

NE1A Series Safety Network Controller:
NE1A-SCPU01(-V1)/-SCPU02
Operation Manual

Revised September 2006

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.

⚠ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may be significant property damage.

🚫	Indicates general prohibitions for which there is no specific symbol.

❗	Indicates general mandatory actions for which there is no specific symbol.

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 "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.

IMPORTANT Indicates important information on what to do or not to do to prevent failure to operation, malfunction, or undesirable effects on product performance.

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

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

Trademarks and Copyrights

DeviceNet and DeviceNet Safety are registered trademarks of the Open DeviceNet Vendors Association.

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About this Manual

This manual describes the installation and operation of the NE1A-series Safety Network Controllers.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate the NE1A-series Controller. Be sure to read the precautions provided in the following section.

● **Definition of NE1A-series Controllers**

In this manual, the term "NE1A-series Controllers" refers to the NE1A-SCPU01 and NE1A-SCPU02 Safety Network Controllers.

The following manuals provide information on the DeviceNet and DeviceNet Safety.

DeviceNet Safety NE1A Series Safety Network Controller Operation Manual (this manual) (Z906)

This manual describes the specifications, functions, and usage of the NE1A-SCPU01 and NE1A-SCPU02.

DeviceNet Safety System Configuration Manual (Z905)

This manual explains how to configure the DeviceNet Safety system using the Network Configurator.

DeviceNet Operation Manual (W267)

This manual describes the construction and connection of a DeviceNet network. It provides detailed information on the installation and specifications of cables, connectors, and other peripheral equipment used in the network, and on the supply of communications power. Obtain this manual and gain a firm understanding of its contents before using a DeviceNet system.

⚠ 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

1 Intended Audience

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

- Personnel in charge of introducing FA and safety systems into production facilities
- Personnel in charge of designing FA and safety systems
- Personnel in charge of managing FA facilities
- Personnel who have the qualifications, authority, and obligation to provide safety during each of the following product phases: mechanical 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 programming and operating the Unit. Be sure to read this manual before attempting to use the Unit and keep this manual close at hand for reference during operation.

⚠ WARNING
It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications

⚠ WARNING

This is the Operation Manual for the NE1A-series Safety Network Controllers. Heed the following items during system construction to ensure that safety-related components are configured in a manner that allows the system functions to sufficiently operate.

● **Risk Assessment**

The proper use of the safety device described in this Operation Manual as it relates to installation conditions and mechanical performance and functions is a prerequisite for its use. When selecting or using this safety device, risk assessment must be conducted with the aim of identifying potential danger factors in equipment or facilities in which the safety device is to be applied, during the development stage of the equipment or facilities. Suitable safety devices must be selected under the guidance of a sufficient risk assessment system. An insufficient risk assessment system may lead to the selection of unsuitable safety devices.

- Typical related international standards: ISO 14121, Safety of Machinery -- Principles of Risk Assessment

● **Safety Measures**

When using this safety device to build systems containing safety-related components for equipment or facilities, the system must be designed with the full understanding of and conformance to international standards, such as those listed below, and/or standards in related industries.

- Typical related international standards: ISO/DIS 12100, Safety of Machinery -- Basic Concepts and General Principles for Design
IEC 61508, Safety Standard for Safety Instrumented Systems (Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems)

● **Role of Safety Device**

This safety device is provided with safety functions and mechanisms as stipulated in relevant standards, but suitable designs must be used to allow these functions and mechanisms to operate properly inside system constructions containing safety-related components. Build systems that enable these functions and mechanisms to perform properly, based on a full understanding of their operation.

- Typical related international standards: ISO 14119, Safety of Machinery -- Interlocking Devices Associated with Guards -- Principles of Design and Selection

● **Installation of Safety Device**

The construction and installation of systems with safety-related components for equipment or facilities must be performed by technicians who have received suitable training.

- Typical related international standards: ISO/DIS 12100, Safety of Machinery -- Basic Concepts and General Principles for Design
IEC 61508, Safety Standard for Safety Instrumented Systems (Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems)

● **Complying with Laws and Regulations**

This safety device conforms to the relevant regulations and standards, but make sure that it is used in compliance with local regulations and standards for the equipment or facilities in which it is applied.

- Typical related international standards: IEC 60204, Safety of Machinery -- Electrical Equipment of Machines

● **Observing Precautions for Use**

When putting the selected safety device to actual use, heed the specifications and precautions in this Operation Manual and those in the Instruction Manual that comes with the product. Using the product in a manner that deviates from these specifications and precautions will lead to unexpected failures in equipment or devices, and to damages that result from such failures, due to insufficient operating functions in safety-related components.

● **Moving or Transferring Devices or Equipment**

When moving or transferring devices or equipment, be sure to include this Operation Manual to ensure that the person to whom the device or equipment is being moved or transferred will be able to operate it properly.

- Typical related international standards: ISO/DIS 12100 ISO, Safety of Machinery -- Basic Concepts and General Principles for Design IEC 61508, Safety Standard for Safety Instrumented Systems (Functional Safety of Electrical/ Electronic/ Programmable Electronic Safety-related Systems)

3   Safety Precautions

⚠ WARNING	
Serious injury may possibly occur due to loss of required safety functions. Do not use the NE1A-series Controller's test outputs as safety outputs.	⃠
Serious injury may possibly occur due to loss of required safety functions. Do not use DeviceNet standard I/O data or explicit message data as safety data.	⃠
Serious injury may possibly occur due to loss of required safety functions. Do not use indicators or 7-segment display on the NE1A-series Controller for safety operations.	⃠
Serious injury may possibly occur due to breakdown of safety outputs or test outputs. Do not connect loads beyond the rated value to the safety outputs and test outputs.	⃠
Serious injury may possibly occur due to loss of required safety functions. Wire the NE1A-series Controller properly so that the 24-VDC line does NOT touch the outputs accidentally or unintentionally.	❗
Serious injury may possibly occur due to loss of required safety functions. Ground the 0-V line of the power supply for external output devices so that the devices do NOT turn ON when the safety output line or the test output line is grounded.	❗
Serious injury may possibly occur due to loss of required safety functions. Clear previous configuration data before connecting the devices to the network.	❗
Serious injury may possibly occur due to loss of required safety functions. Set suitable node addresses and a suitable baud rate before connecting the devices to the network.	❗
Serious injury may possibly occur due to loss of required safety functions. Perform user testing and confirm that all of the device configuration data and operation is correct before starting system operation.	❗
Serious injury may possibly occur due to loss of required safety functions. When replacing a device, configure the replacement device suitably and confirm that it operate correctly.	❗
Serious injury may possibly occur due to loss of required safety functions. Use appropriate components or devices according to the requirements given in the following table.	❗

Controlling devices	Requirements
Emergency stop switch	Use approved devices with a direct opening mechanism compliant with IEC/EN 60947-5-1.
Door interlocking switch or limit switch	Use approved devices with a direct opening mechanism compliant with IEC/EN 60947-5-1 and capable of switching micro-loads of 4 mA at 24 VDC.
Safety sensor	Use approved devices compliant with the relevant product standards, regulations, and rules in the country where they are used.
Relay with forcibly guided contacts	Use approved devices with forcibly guided contacts compliant with EN 50205. For feedback signals, use devices with contacts capable of switching micro-loads of 4 mA at 24 VDC.
Contactor	Use contactors with a forcibly guided mechanism and monitor the auxiliary NC contact to detect contactor failures. For feedback signals, use devices with contacts capable of switching micro-loads of 4 mA at 24 VDC.
Other devices	Evaluate whether devices used are appropriate to satisfy the requirements of the safety category level.

4   Precautions for Safe Use

● **Handling with Care**
Do not drop the NE1A-series Controller or subject it to excessive vibration or mechanical shock. The NE1A-series Controller may be damaged and may not function properly.

● **Installation and Storage Environment**
Do not use or store the NE1A-series Controller in any of the following locations:

- Locations subject to direct sunlight
- Locations subject to temperatures or humidity outside the range specified in the specifications
- Locations subject to condensation as the result of severe changes in temperature
- Locations subject to corrosive or flammable gases
- Locations subject to dust (especially iron dust) or salts
- Locations subject to water, oil, or chemicals
- Locations subject to shock or vibration

Take appropriate and sufficient measures when installing systems in the following locations. Inappropriate and insufficient measures may result in malfunction.

- Locations subject to static electricity or other forms of noise
- Locations subject to strong electromagnetic fields
- Locations subject to possible exposure to radioactivity
- Locations close to power supplies

● **Installation and Mounting**

- Use the NE1A-series Controller within an enclosure with IP54 protection or higher according to IEC/EN 60529.
- Use DIN rail (TH35-7.5/TH35-15 according to IEC 60715) to install the NE1A-series Controller into the control panel. Mount the NE1A-Series Controller to the DIN rail using PFP-M End Plates (not included with the NE1A-series Controller) to prevent it falling off the DIN rail because of vibration.
- Space must be provided around the NE1A-series Controller, at least 5 mm from its side and at least 50 mm from its top and bottom surfaces, for ventilation and wiring.

● **Installation and Wiring**

- Use the following to wire external I/O devices to the NE1A-series Controller.

Solid wire	0.2 to 2.5 mm^2 (AWG 24 to AWG 12)
Stranded (flexible) wire	0.34 to 1.5 mm^2 (AWG 22 to AWG 16) Stranded wires should be prepared by attaching insulated bar terminals (DIN 46228-4 standard compatible) to the ends before connecting them.

- Disconnect the NE1A-series Controller from the power supply before starting wiring. Devices connected to the NE1A-series Controller may operate unexpectedly.
- Properly apply the specified voltage to the NE1A-series Controller inputs. Applying an inappropriate DC voltage or any AC voltage will cause the NE1A-series Controller to fail.
- Be sure to separate the communications cables and I/O cables from near high-voltage/high-current lines.
- Be cautious not to get your fingers caught when attaching connectors to the plugs on the NE1A-series Controller.
- Tighten the DeviceNet connector screws correctly (0.25 to 0.3 N·m).
- Incorrect wiring may lead to loss of safety functions. Wire conductors correctly and verify the operation of the NE1A-series Controller before using the system in which the NE1A-series Controller is incorporated.
- After wiring is completed, be sure to remove label for wire clipping prevention on the NE1A-series Controller to enable heat to escape or proper cooling.

- **Power Supply Selection**

  Use a DC power supply satisfying the following requirements.
  - The secondary circuits of the DC power supply must be isolated from the primary circuit by double insulation or reinforced insulation.
  - The DC power supply must satisfy the requirements for class 2 circuits or limited voltage/current circuits given in UL 508.
  - The output hold time must be 20 ms or longer.

- **Periodic Inspections and Maintenance**
  - Disconnect the NE1A-series Controller from the power supply before replacing the Controller. Devices connected to the NE1A-series Controller may operate unexpectedly.
  - Do not disassemble, repair, or modify the NE1A-series Controller. Doing so may lead to loss of safety functions.

- **Disposal**
  - Be cautions not to injure yourself when dismantling the NE1A-series Controller.

5 Additional Precautions According to UL 1604

The NE1A-series Controller is suitable for use in Class I, Div. 2, Group A, B, C, D or Non-Hazardous Location Only.

WARNING – Explosion Hazard – Substitution of Components May Impair Suitability For Class I, Div. 2.
WARNING – Explosion Hazard – Do Not Disconnect Equipment Unless Power Has Been Switched OFF or the Area Is Known To Be Non-Hazardous.
WARNING – Explosion Hazard – Do Not Disconnect USB Connector Unless Power Has Been Switched OFF or the Area Is Known To Be Non-Hazardous.

6 Regulations and Standards

The NE1A-SCPU01 has been certified as follows:

Certifying organization	Standards
TUV Rheinland	EN954-1:1996, EN60204-1:1997, EN61000-6-2:2001, EN61000-6-4:2001, EN418:1992, IEC61508 part1-7/12.98-05.00, IEC61131-2:2003, NFPA 79-2002, ANSI RIA15.06-1999, ANSI B11.19-2003
UL	UL1998, UL508, UL1604, NFPA79, IEC61508, CSA22.2 No142, CSA22.2 No213

As of July 2006, applications have been submitted for the following certifications for the NE1A-SCPU01-V1 and NE1A-SCPU02 and are still pending.

Certifying organization	Standards
TUV Rheinland	EN954-1:1996, EN60204-1:1997, EN61000-6-2:2001, EN61000-6-4:2001, EN418:1992, IEC61508 part1-7/12.98-05.00, IEC61131-2:2003,NFPA 79-2002, ANSI RIA15.06-1999, ANSI B11.19-2003
UL	UL1998, UL508, UL1604, NFPA79, IEC61508, CSA22.2 No142, CSA22.2 No213

7   Unit Versions of NE1A-series Controllers

Unit Versions

A "unit version" has been introduced to manage NEA1-series Safety Network Controllers according to differences in functionality accompanying Unit upgrades.

1) Notation of Unit Versions on Products
    The unit version (Ver. □.□) is listed near the lot number on the nameplate of the products for which unit versions are being managed, as shown below.

    - Controllers that do not have a unit version listed on the label are called Pre-Ver. 1.0 Controllers.

Product Nameplate
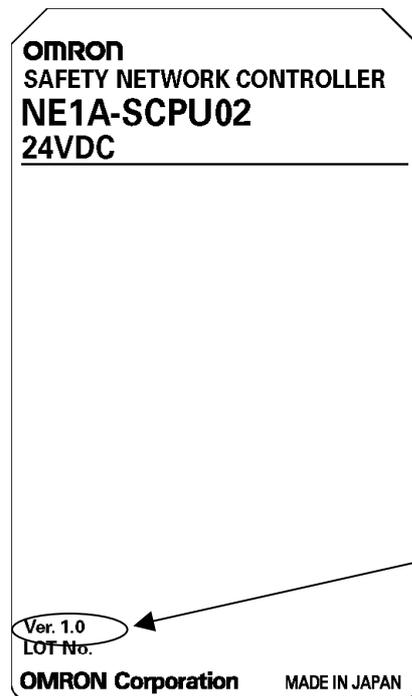
The unit version is listed here.
(Example: Ver. 1.0)

2) Checking the Unit Version with Support Software
The following procedure can be used to check the unit version from the Network Configurator version 1.6 or higher.

1. Upload the configuration information from the system. The device icons will be displayed, as shown in the following diagram.
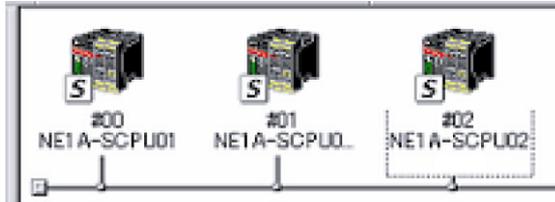
2. Right-click on the Controller's icon to display the popup menu shown below.
Select *Property* from the menu.
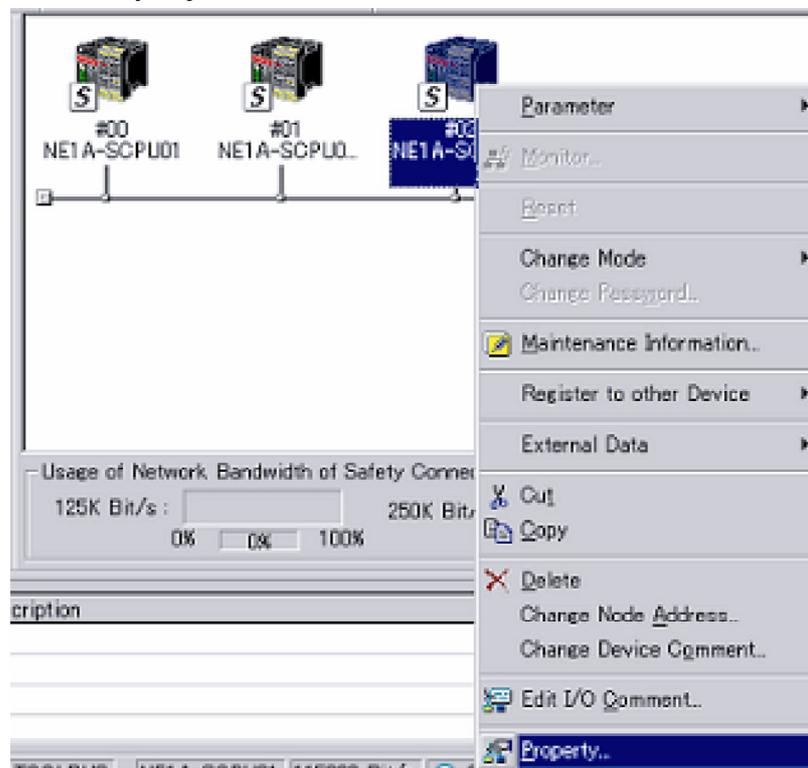
3. The Controller's Property Window will be displayed.
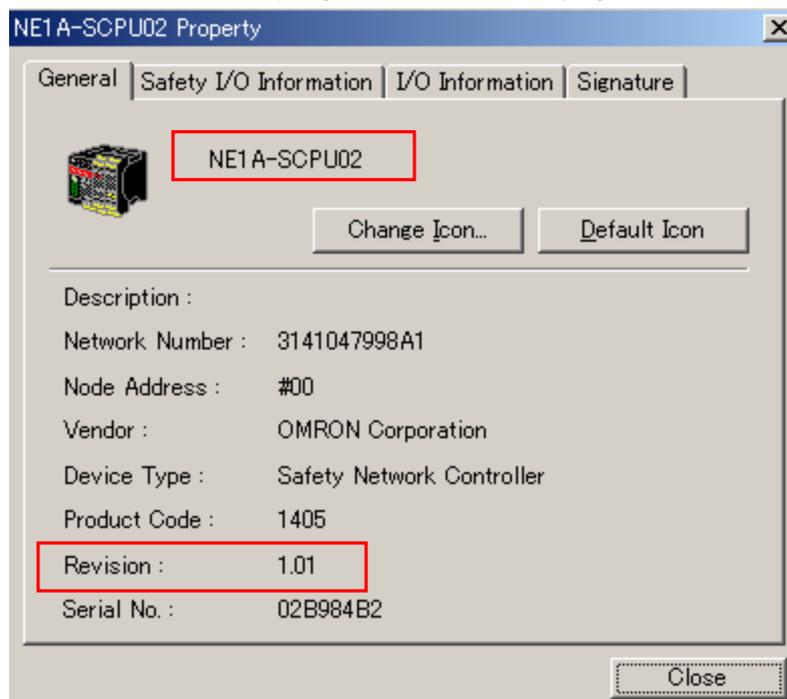
The device name and revision are given in the Property Window. The NE1A-series Controllers supported by version 1.6□ are listed in the following table.

Model	Device name	Revision	Unit version
NE1A-SCPU01	NE1A-SCPU01	1.01	Pre-Ver. 1.0
NE1A-SCPU01-V1	NE1A-SCPU01-V1	1.01	1.0
NE1A-SCPU02	NE1A-SCPU02	1.01	1.0

3) Checking the Unit Version with the Unit Version Label

The following unit version labels are provided with the Controller.

These labels can be affixed to the front of earlier Controllers to differentiate between Controllers with different unit versions.

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Function Support by Unit Version

Model	NE1A-SCPU01	NE1A-SCPU01-V1	NE1A-SCPU02
Unit version Function	Pre-Ver. 1.0	Ver. 1.0	Ver. 1.0
Logic operations			
Maximum program size (total number of function blocks)	128	254	254
Added function blocks • RS Flip-flop • Multi Connector • Muting • Enable Switch • Pulse Generator • Counter • Comparator	---	Supported	Supported
Selection of the rising edge of the reset condition for the Reset and Restart Function Blocks	---	Supported	Supported
Use local I/O status in logic programming.	---	Supported	Supported
Use the Unit's general status in logic programming.	---	Supported	Supported
I/O control functions			
Contact Operation Counter	---	Supported	Supported
Total ON Time Monitor	---	Supported	Supported
DeviceNet communications functions			
Number of safety I/O connections at the Safety Master	16	32	32
Selection of operation of safety I/O communications after a communications error	---	Supported	Supported
Add local output monitoring to send data during Slave operation.	---	Supported	Supported
Add local input monitoring to send data during Slave operation.	---	Supported	Supported
Functions supporting system startup and error recovery			
Saving non-fatal error history in non-volatile memory	---	Supported	Supported
Added function block errors to error history.	---	Supported	Supported

Unit Versions and Programming Devices

Network Configurator version 1.6 or higher must be used when using a Safety Logic Controller with unit version 1.0. The following table shows the relationship between unit versions and Network Configurator versions.

Model number	Network Configurator		
	Ver. 1.3☐	Ver. 1.5☐	Ver. 1.6☐
NE1A-SCPU01, Pre-Ver. 1.0	Can be used.	Can be used.	Can be used.
NE1A-SCPU01-V1 with unit version 1.0	Cannot be used.	Cannot be used.	Can be used.
NE1A-SCPU02 with unit version 1.0	Cannot be used.	Cannot be used.	Can be used.

NE1A-series Controller Upgrade Procedure

Functionality has been expanded in various ways for the NE1A-SCPU01-V1 and NE1A-SCPU02 in comparison to the NE1A-SCPU01. When changing from a NE1A-SCPU01 to a NE1A-SCPU01-V1 or NE1A-SCPU02 in a system that uses a NE1A-SCPU01, the previous configuration data can be used by converting it from configuration data for the NE1A-SCPU01 to configuration data for the NE1A-SCPU01-V1 or NE1A-SCPU02.

Use the following procedure to create configuration data for the NE1A-SCPU01-V1 or NE1A-SCPU02 from configuration data for the NE1A-SCPU01.

1) Reading Configuration Data
Use the following procedure to read the configuration data with the Network Configurator (version 1.6).
- Read the saved configuration data.
- Use network uploading to read configuration data from devices on the network.

The following screen will be displayed when reading has been completed.
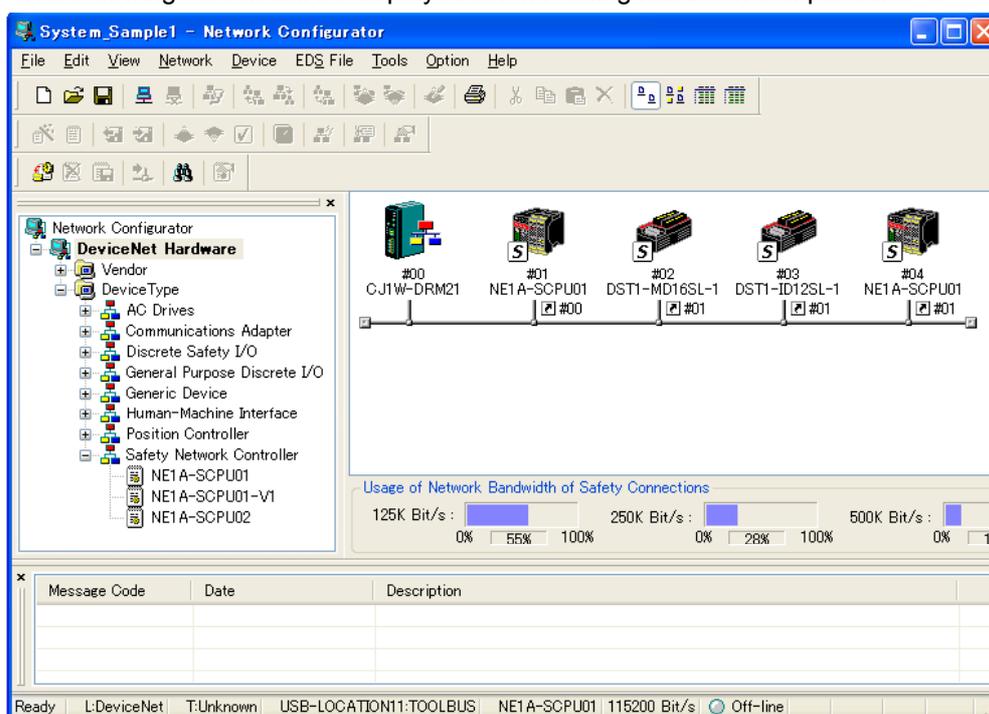
2) Converting Configuration Data
In the data read with the Network Configurator, right-click the NE1A-SCPU01 that is to be changed to the NE1A-SCPU01-V1 or NE1A-SCPU02 and select **Change Device Type** from the pop-up menu.
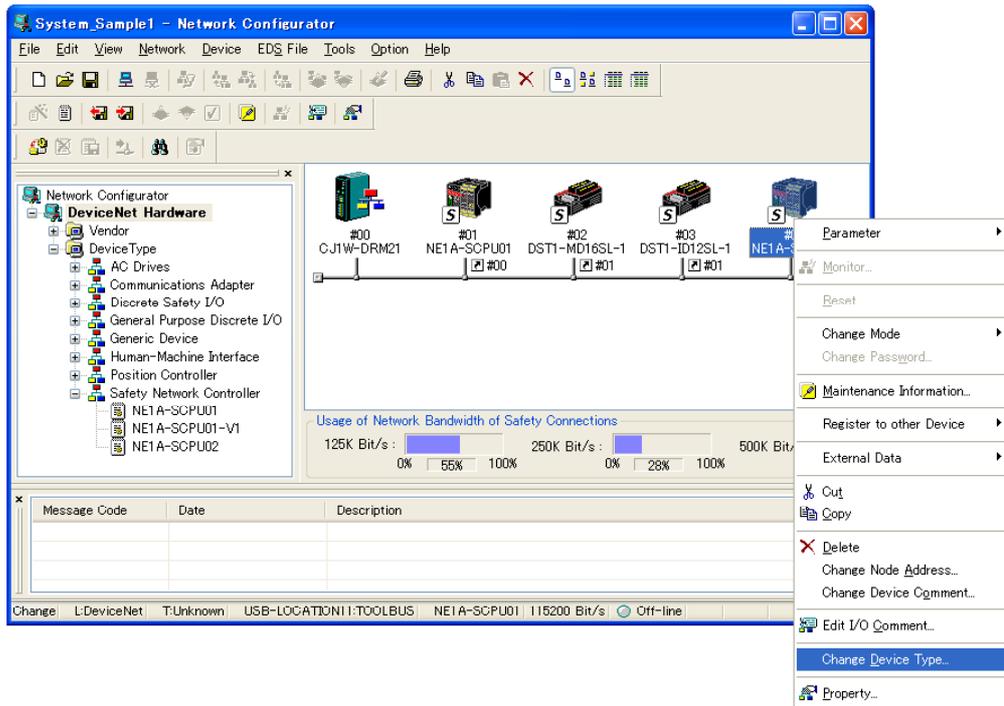
Next, select the new device in the *New Device* and press the **OK** Button.

After a moment, the model number will change and the configuration data for the new device will be completed.
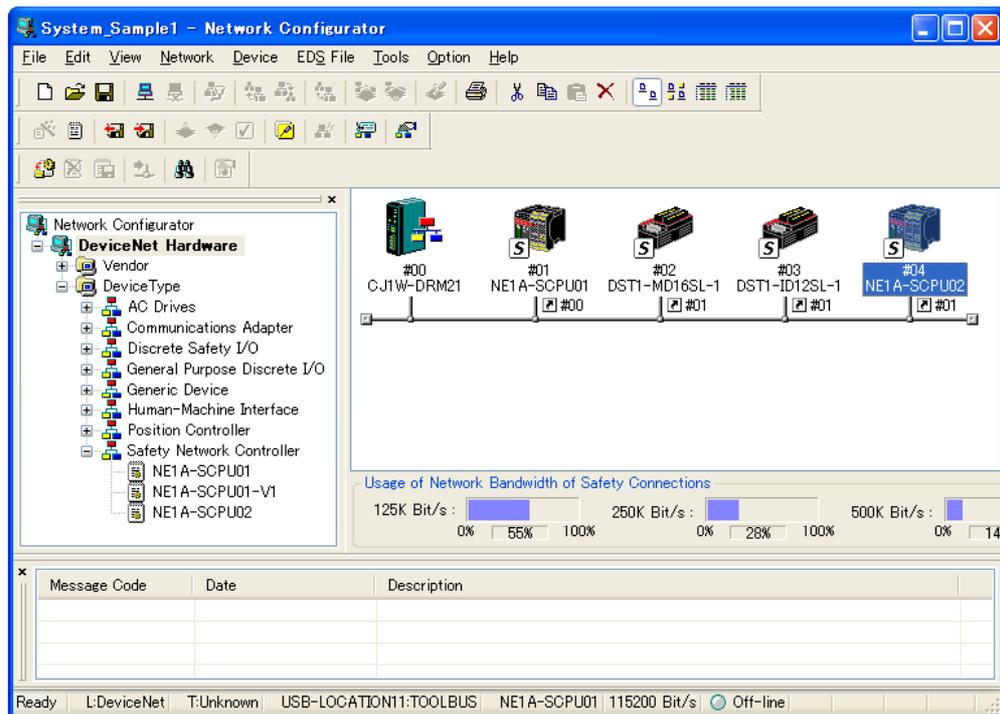
3) Expansion Configuration

When the data configuration is converted, all expanded functionality will be set to the default values. Set the configuration for all expanded functionality to be used.

4) Re-registering Safety Slaves in the Safety Master
If the device for which configuration data has been converted is a Safety Slave, it must be re-registered in the Safety Master. First, select the Slave in the Safety Connections Tab Page of the Safety Master and unregister it.
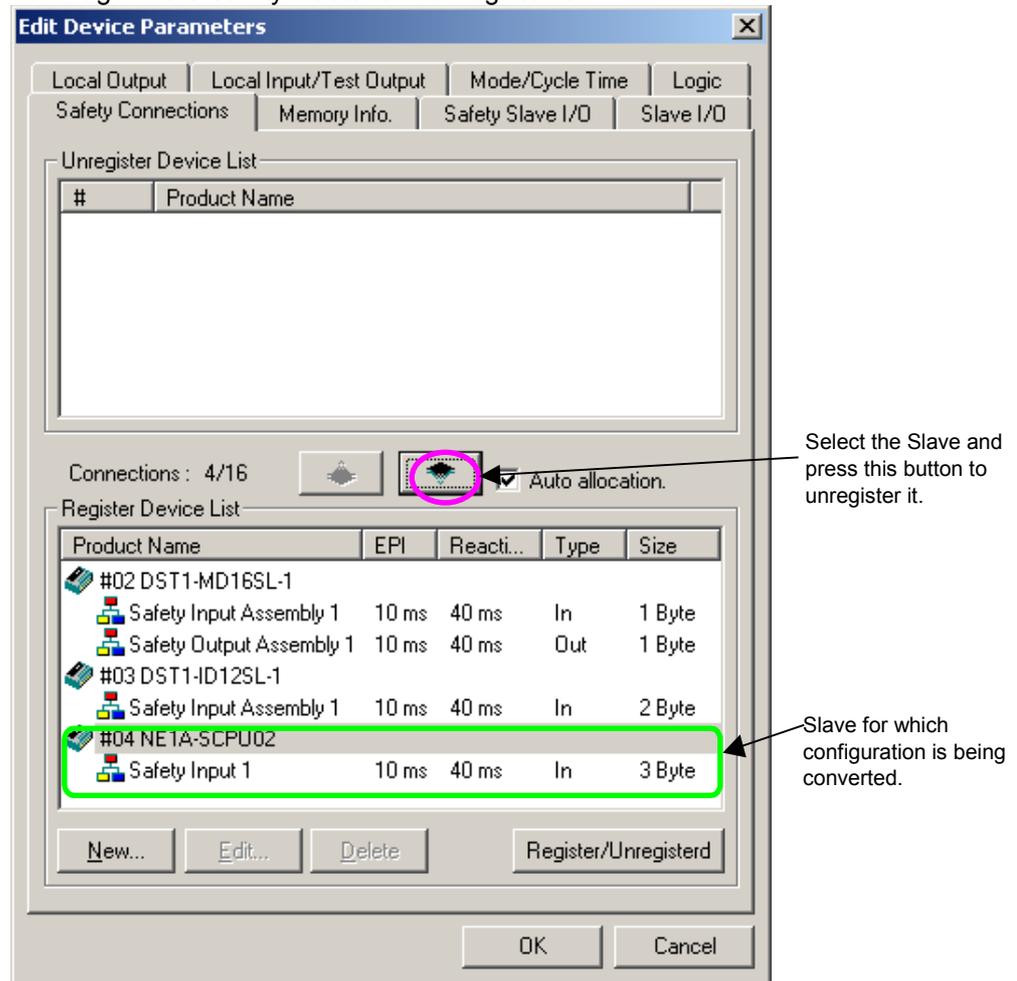
The following message will be displayed when the button to unregister the Slave is pressed.

Click the **Yes** Button.

The following window will be displayed when the Slave has been unregistered.
Click the registration button to register the Slave again.
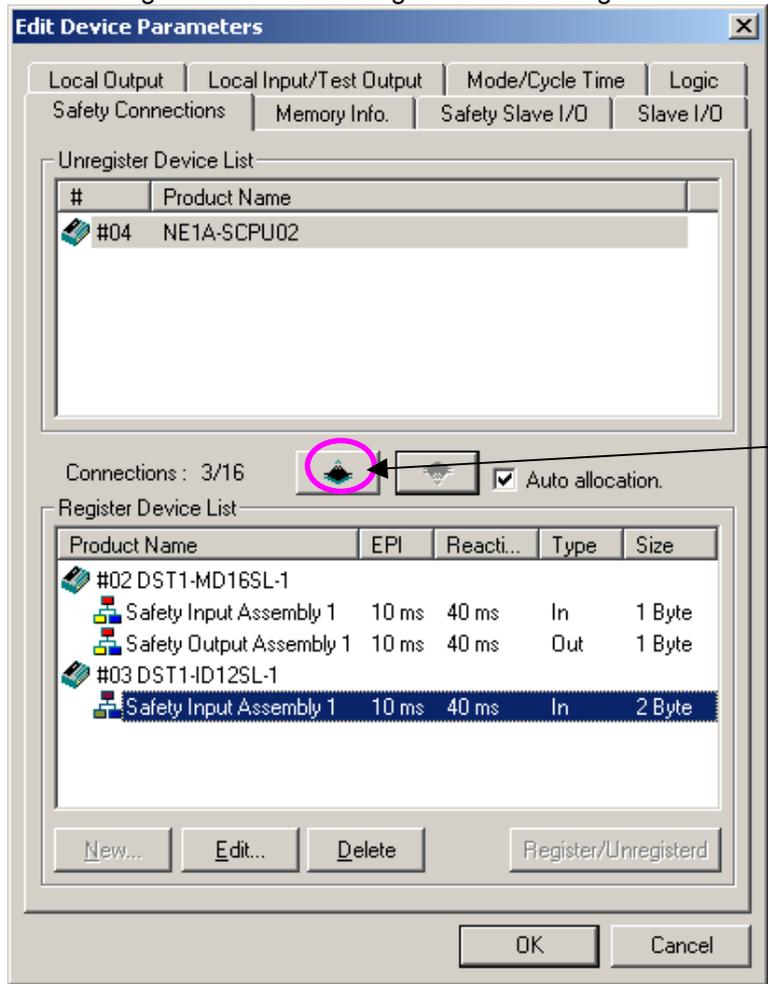
Select the Slave and click this button to register the Slave again.

The following window will appear when the Slave has been registered.

Edit Device Parameters

Tabs: Local Output | Local Input/Test Output | Mode/Cycle Time | Logic
Safety Connections | Memory Info. | Safety Slave I/O | Slave I/O

Unregister Device List

#	Product Name	

Connections : 4/16   ☑ Auto allocation.

Register Device List

Product Name	EPI	Reacti...	Type	Size
#02 DST1-MD16SL-1				
Safety Input Assembly 1	10 ms	40 ms	In	1 Byte
Safety Output Assembly 1	10 ms	40 ms	Out	1 Byte
#03 DST1-ID12SL-1				
Safety Input Assembly 1	10 ms	40 ms	In	2 Byte
#04 NE1A-SCPU02				
Safety Input 1	10 ms	40 ms	In	3 Byte

New... | Edit... | Delete | Register/Unregisterd

OK | Cancel

Click the **OK** Button. This completes the procedure.

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5) Re-registering Standard Slaves to Standard Masters
If the devices for which the configuration data is being converted is set as a Standard
Slave and the device product code is selected in the Standard Master, the settings in
the Standard Master must be changed.
Select the device from the device list on the General Tab Page of the Edit Device
Parameters Window for the Standard Master.
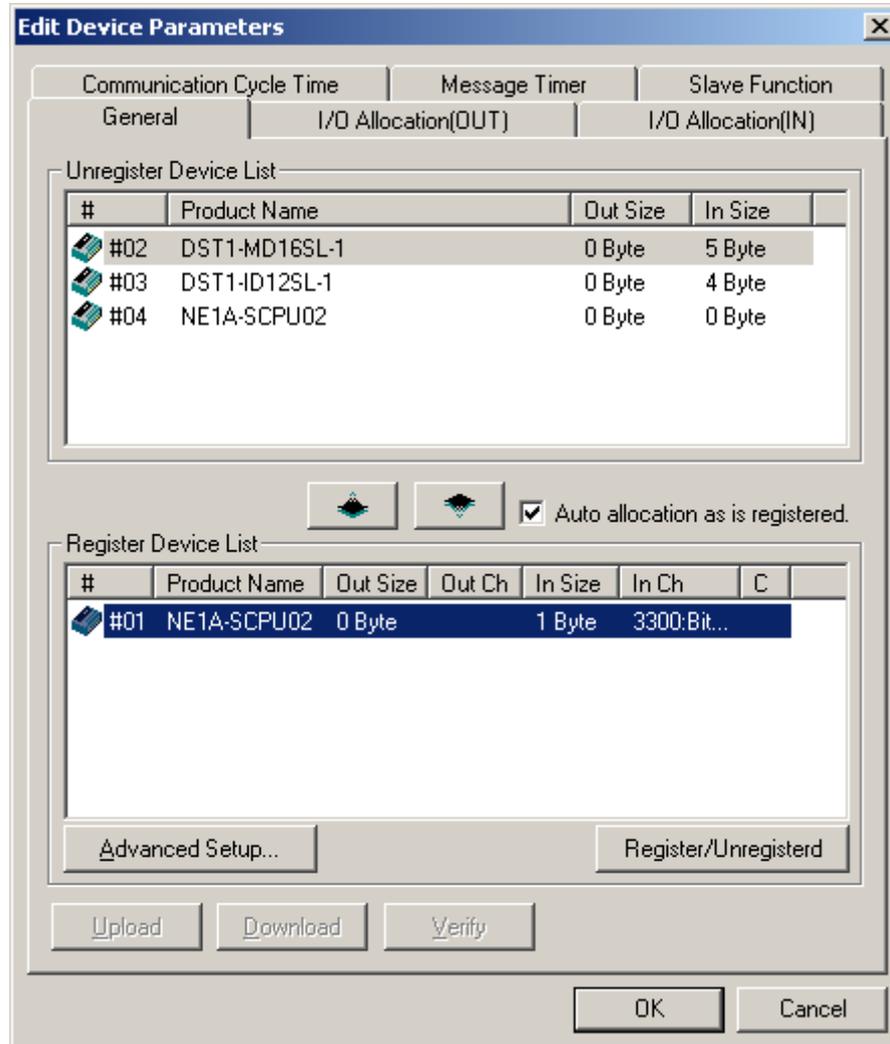
Then, click the **Advanced Setup** Button.
If the *Check Product Code* Option is selected on the Device Information Tab Page of the Advanced Setting Window, change the product code according to the device being used. Product codes are as follows:
NE1A-SCPU01: 1403
NE1A-SCPU01-V1: 1404
NE1A-SCPU02: 1405

Click the **OK** Button after completing the setting. This completes the procedure.

Section 1
Overview of the NE1A-series
Safety Network Controllers

1-1   About NE1A-series Safety Network Controllers

1-1-1   Introduction to the NE1A-series Safety Network Controllers

The NE1A-series Safety Network Controllers provide various functions, such as safety logic operations, safety I/O control, and a DeviceNet Safety protocol. The NE1A-series Controller allows the user to construct a safety control/network system that meets the requirements for Safety Integrity Level (SIL) 3 according to IEC 61508 (Functional Safety of Electrical/Electronic/ Programmable Electronic Safety-related Systems) and the requirements for Safety Category 4 according to EN 954-1.

In the example system shown below, the safety control system implemented with an NE1A-series Controller and the monitoring system implemented with a Standard PLC are realized on the same network.

- As a Safety Logic Controller, the NE1A-series Controller executes safety logic operations and controls local I/O.
- As a DeviceNet Safety Master, the NE1A-series Controller controls the remote I/O of DeviceNet Safety Slaves.
- As a DeviceNet Standard Slave, the NE1A-series Controller communicates with the DeviceNet Standard Master.
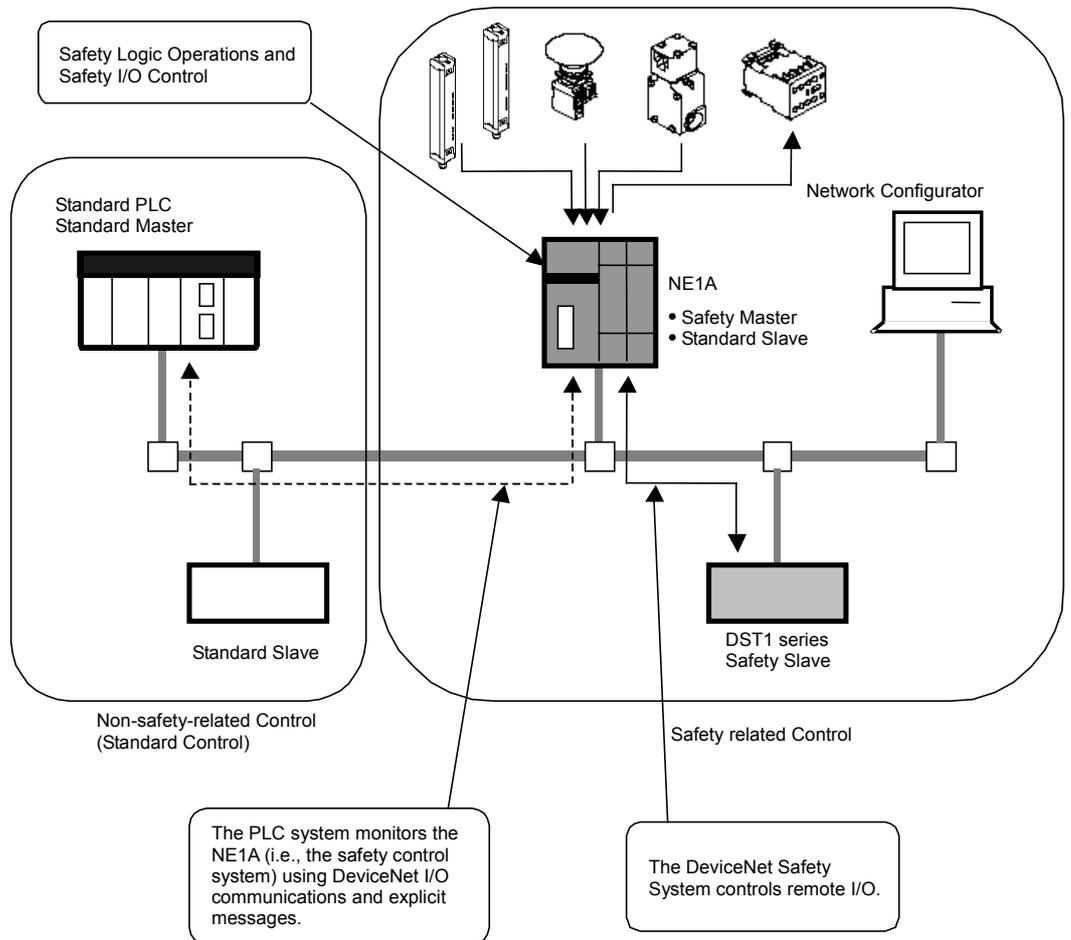
1-1-2   Features of the NE1A-series Controllers

Safety Logic Operations

In addition to basic logic functions, such as AND and OR, function blocks such as Emergency Stop or Safety Gate Monitoring that enable various safety applications are supported.

Local Safety I/O

- In the NE1A-SCPU01(-V1), a total of 24 local safety I/O points are supported: 16 inputs and 8 outputs.
- In the NE1A-SCPU02, a total of 48 local safety I/O points are supported: 40 inputs and 8 outputs.
- Faults in external wiring can be detected.
- Dual Channel Mode can be set for pairs of related local input terminals.
  When Dual Channel Mode is set, an NE1A-series Controller can evaluate the input data patterns and the time discrepancy between input signals.
- Dual Channel Mode can be set for pairs of related local output terminals. When Dual Channel Mode is set, an NE1A-series Controller can evaluate the output data patterns.

DeviceNet Safety Communications

- As a Safety Master, Pre-Ver. 1.0 Controllers can perform safety I/O communications with up to 16 connections using up to 16 bytes per connection.
- The NE1A-series Controllers with unit version 1.0 can perform safety I/O communications with up to 32 connections using up to 16 bytes per connection.
- As a Safety Slave, the NE1A-series Controllers can perform safety I/O communications with a maximum of four connections using up to 16 bytes per connection.

DeviceNet Standard Communications

As a Standard Slave, the NE1A-series Controllers can perform standard I/O communications with one Standard Master for up to two connections using up to 16 bytes per connection.

Standalone Controller Mode

An NE1A-series Controller can be used as a Standalone Controller by disabling its DeviceNet communications.

Configuration with a Graphical Tool

- A graphical tool is provided for both network configuration and logic programming. It enables easy configuration and programming.
- A Logic Editor can be activated from the Network Configurator.
- Configuration data can be downloaded and uploaded, and devices can be monitored online via DeviceNet, USB, or the peripheral interface of an OMRON PLC.

System Startup and Error Recovery Support

- The error information can be checked by using the Network Configurator or the indicators on the front of the NE1A-series Controller.
- The NE1A-series Controller's internal status information can be monitored from a Standard PLC by allocating the information in the Standard Master. In the same way, monitoring with a Safety PLC is possible by allocating information in the Safety Master.

Access Control with a Password

- The NE1A-series Controller's configuration data is protected by a password set in the Controller.
- The Network Configurator controls access to each project file with a password.

1-1-3   Functional Overview

Function		Overview	Details
Logic Operations			
Logic operations		Basic logic operations, such as AND and OR, and function blocks, such as Emergency Stop (ESTOP) and Safety Gate Monitoring (SGATE), are supported. In the Pre-Ver. 1.0 Controllers, up to 128 logic functions and function blocks can be used in programming. In the Controllers with unit version 1 or later, up to 254 logic functions and function blocks can be used in programming.	6
Safety I/O			
I/O comments		The user can store any name for each I/O terminal using a maximum of 32 characters (ASCII).	5-1-1
I/O power monitoring		The NE1A-series Controllers can detect whether I/O power is supplied within the normal voltage range.	5-1-2
Safety inputs		The NE1A-SCPU01(-V1) supports a 16 safety inputs. The NE1A-SCPU02 supports a 40 safety inputs.	5-2
	Input circuit diagnosis	Test pulses are used to check the NE1A-series Controller's internal circuits, external devices, and external wiring.	
	Input ON/OFF delays	Input time constants between 0 and 126 ms in multiples of the Controller's cycle time can be set for Controller's inputs. Setting input ON/OFF delays helps reduce influence from chattering or external noise.	
	Dual Channel Mode	Time discrepancies in changes in data or input signals between two paired local inputs can be evaluated.	
Test pulse outputs		The NE1A-SCPU01(-V1) supports four independent test outputs. The NE1A-SCPU02 supports eight independent test outputs. These are normally used in combination with safety inputs. They can also be set for use as signal output terminals.	5-3
	Current monitoring for muting lamp (T3, T7 terminal only)	The NE1A-SCPU01(-V1) can detect a disconnection at the T3 terminal. The NE1A-SCPU02 can detect disconnections at the T3 and T7 terminals.	
	Overcurrent detection/protection	An output is blocked when an overcurrent is detected to protect the circuit.	
Safety outputs		The NE1A-SCPU01(-V1) and NE1A-SCPU02 both support eight safety outputs.	5-4
	Output circuit diagnosis	Test pulses are used to check the NE1A-series Controller's internal circuits, external devices, and external wiring.	
	Overcurrent detection/protection	To protect the circuit, the output is cut off when an overcurrent is detected.	
	Dual Channel Mode	Both of two paired outputs can be set into a safety state when an error occurs in either of the two paired local outputs without depending on the user program.	
DeviceNet Communications			
Safety Master		A master-slave relationship is established for each connection on the DeviceNet Safety Network separate from the Master-Slave communications on the DeviceNet Standard Network. This enables the NE1A-series Controller to be the safety master to control the connections.	4-4
Safety Slave		An NE1A-series Controller can also operate as a DeviceNet Safety Slave, and the Controller's internal status information as well as a specified area of I/O can be allocated in the Safety Master.	4-5
Standard Slave		An NE1A-series Controller can also operate as a Standard Slave, and the Controller's internal status information as well as a specified area of I/O can be allocated in the Standard Master.	4-6
Explicit messages		Explicit messages can be used to read an NE1A-series Controller's status information. In addition, explicit messages set from the Network Configurator can be sent from the user program.	4-7
Automatic baud rate detection		The NE1A-series Controller's baud rate can be set automatically to match the baud rate of the network master.	4-1-1
Standalone Controller Mode			
Standalone Controller mode		An NE1A-series Controller can be used as a Standalone Controller by disabling the Controller's DeviceNet communications.	4-1-2
System Startup/Error Recovery Functions			
Error history		Errors detected by the NE1A-series Controller are recorded along with the Controller's total operating time at the point that the error was detected.	10-4

Function	Overview	Details
Online monitoring	The NE1A-series Controller's internal status information and I/O data can be monitored online from the Network Configurator.	System Configuration Manual, Section 7
Other Functions		
Configuration lock	The configuration data stored in the NE1A-series Controller can be locked to protect the data after it has been downloaded and verified.	7-1
Reset	The NE1A-series Controller can be reset from the Network Configurator.	7-2
Password	A password can be set to prevent unintended or unauthorized access to the NE1A-series Controller.	7-3

1-1-4   Comparison of the I/O Capacity of the NE1A-SCPU01(-V1) and NE1A-SCPU02

Item	NE1A-SCPU01	NE1A-SCPU02	Reference
Number of I/O points			
Safety inputs	16	40	2-1
Test outputs	4	8	2-1
Safety outputs	8	8	2-1

1-1-5   Functions Improved in the Unit Version 1.0 Upgrade

The following table outlines the changes made in the unit version 1.0 upgrade.

Function	Summary	Reference
Logic operations		
Logic operations	Up to 254 logic functions and function blocks can be used in programming.	Section 6
Function blocks	The following additional function blocks can be used: Logic functions • RS Flip-flop • Comparator Function blocks • Muting • Enable Switch • Pulse Generator • Counter • Multi Connector	Section 6
Specifying the reset conditions for the Reset and Restart function blocks	The following reset conditions can be selected: • Low - High - Low ON pulse (Earlier version's reset condition) • Low - High rising edge	Section 6
I/O control functions		
Data usable in I/O tags	The following additional I/O tags can be used: • Local I/O status • General Unit status	6-1-2
Contact Operation Counter	The number of ON/OFF operations at an input or output can be counted and stored internally.	5-1-3
Total ON Time Monitor	The ON time of an input or output can be timed and stored internally.	5-1-4
DeviceNet communications functions		
Safety Master function	Up to 32 connections can be used.	4-4
Specifying the safety I/O communications status after a communications error occurs	The user can specify one of the following conditions for safety I/O communications after a communications error occurs. • Automatic reset (earlier version's function) • Stop only the connection where the error occurred. • Stop all connections	4-4
Restarting I/O communications that were stopped due to a communications error	When safety I/O communications have been stopped due to a communications error, the I/O communications can be restarted from the Network Configurator or the logic program.	4-4
Remote I/O allocation	When the Controller is operating as a Safety Slave or Standard Slave with inputs, the following data can be attached to the send data. • Local input monitor • Local output monitor	4-3
Functions supporting system startup and error recovery		
Saving the error history	The non-fatal error history is stored in non-volatile memory.	10-3
Added error history items	Errors occurring in function blocks are recorded in the error history.	10-4

1-2   System Configuration

1-2-1   DeviceNet Safety System Overview

DeviceNet is an open-field, multi-vendor, multi-bit network, which combines the controls in the machine and line control levels with information. The DeviceNet Safety network adds safety functions to the conventional DeviceNet standard communications protocol. The DeviceNet Safety concept has been approved by a third-party organization (TUV Rhineland).

Just as with DeviceNet, DeviceNet Safety-compliant devices from third-party vendors can be connected to a DeviceNet Safety network. Also, DeviceNet-compliant devices and DeviceNet Safety-compliant devices can be combined and connected on the same network.

By combining DeviceNet Safety-compliant products, a user can construct a safety control/network system that meets the requirements for Safety Integrity Level (SIL) 3 according to IEC 61508 (Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems) and the requirements for Safety Category 4 according to EN 954-1.

Safety Control as a Safety Network Controller
- **Safety I/O Communications**

Network Configurator

Standard Control and Monitoring as a Standard PLC
- **Standard I/O communications**
- **Explicit message communications**

Safety Network Controller
- *Safety Master*
- *Standard Slave*

Standard PLC/Standard Master

Safety configuration   **Standard configuration**

Safety communications   **Standard communications**

Safety Terminal
- *Safety Slave*
- *Standard Slave*

Safety Network Controller
- *Safety Slave*
- *Standard Slave*

Standard Slave

43
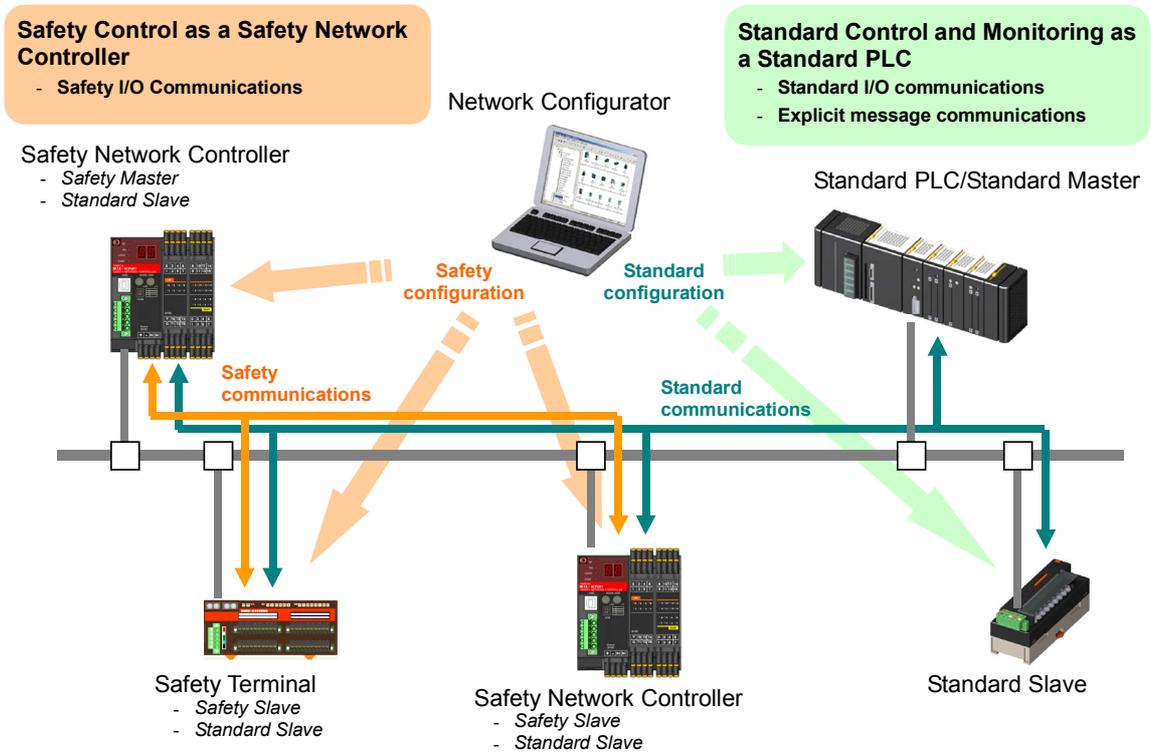
1-2-2   Example System Configurations

The following examples illustrate safety control systems using NE1A-series Controllers.

- Safety Control System with an NE1A-series Safety Master
- System Combining an NE1A- series Safety Control System and a Standard PLC Monitoring Control System
- System Combining a Distributed Safety Control System with Multiple NE1A-series Controllers and a Centralized Monitoring System Using Standard PLCs
- Standalone NE1A-series Controller System
- Connection with a Network Configurator

Safety Control System with an NE1A-series Safety Master

This system uses the NE1A-series Controller as a Safety Master and establishes a Safety Remote I/O System with Safety Slaves.

The Pre-Ver. 1.0 Controllers can perform safety I/O communications as a Safety Master for a maximum of 16 connections (16 Slaves) with up to 16 bytes per connection.

Controllers with unit version 1.0 or later can perform safety I/O communications as a Safety Master for a maximum of 32 connections (32 Slaves) with up to 16 bytes per connection.
The NE1A-series Controllers support two protocols, single cast and multicast (broadcast), for safety I/O connections.

NE1A
• Safety Master

Safety connections (logic communications paths)
• Either singlecast or multicast
• 16 connections maximum
• 32 connections maximum (unit version 1.0 or later)

DST1 Safety Slave

Safety Slave by other manufacturer

Safety Slave by other manufacturer
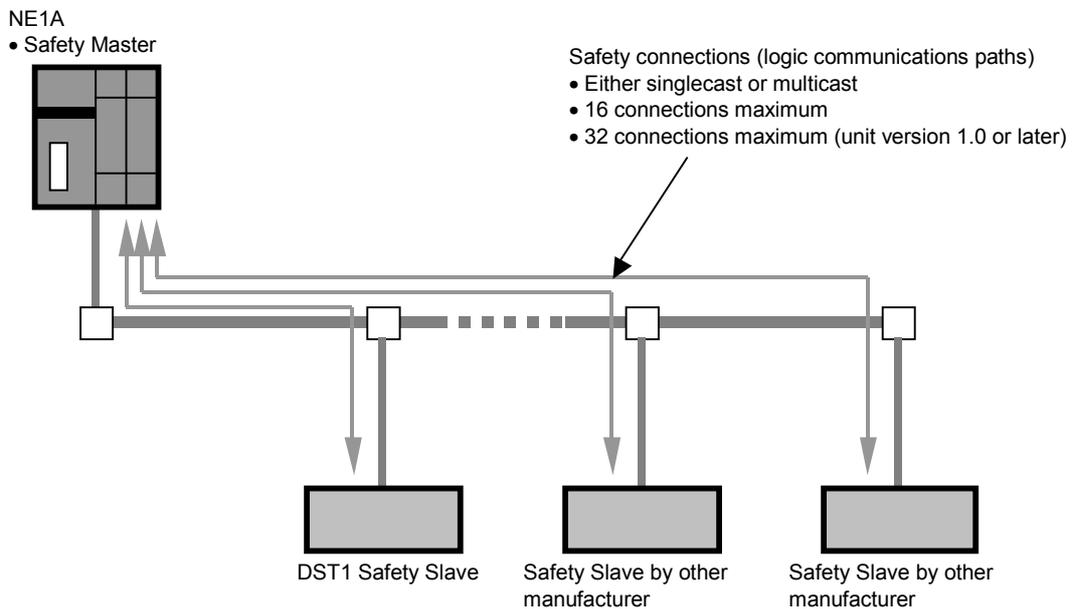
System Combining a Safety Control System and a PLC Monitoring Control System

This system uses the NE1A-series Controller as a Safety Master and establishes a Safety Remote I/O System with Safety Slaves.

The NE1A-series Controller is used as a Standard Slave and standard I/O communications are performed with the Standard Master. The NE1A-series Controller simultaneously functions as the Safety Master and a Standard Slave.

As a Standard Slave, the NE1A-series Controller enables standard I/O communications for a maximum of two connections with up to 16 bytes per connection. Four protocols (i.e., Poll, Bitstrobe, COS and Cyclic) are supported for I/O connections. The NE1A-series Controller cannot operate as a Standard Master.

The Safety Control System can be monitored using a Standard PLC by allocating the NE1A-series Controller's status information (general status, local I/O error status, or other information) or logic operation results in the Standard PLC for standard I/O communications.

A Safety System and a Monitoring System can be combined and established on the same network by using standard devices and safety devices.
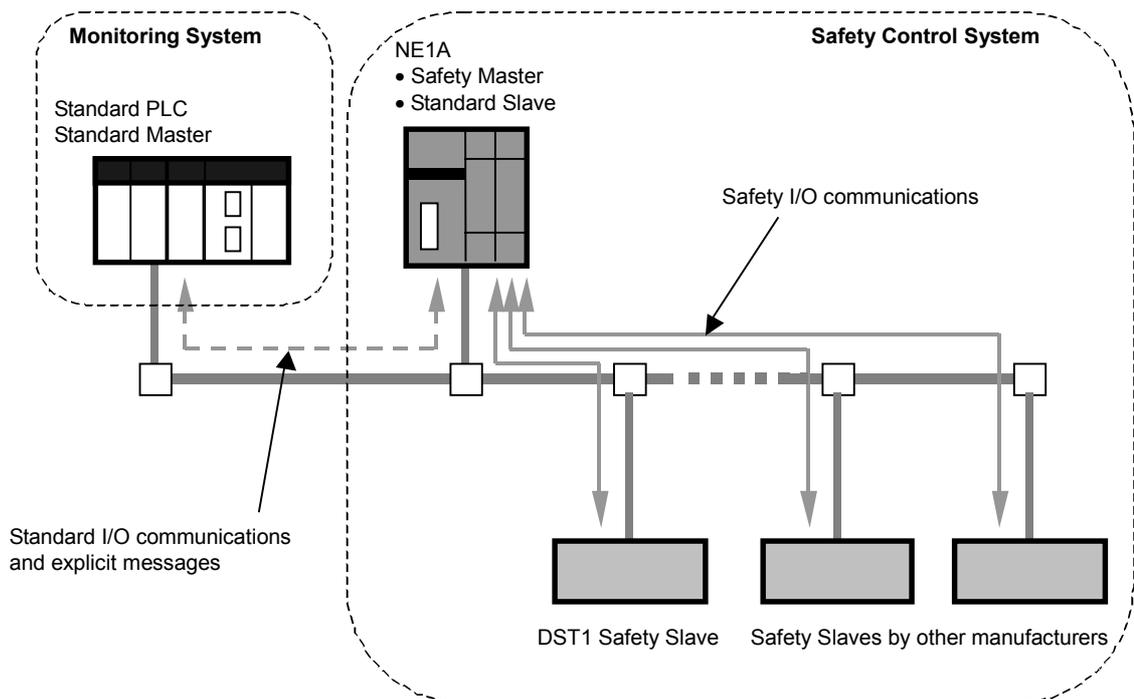
IMPORTANT: A maximum total of 64 standard nodes and safety nodes can be connected on the same network.
The data attributes handled by standard I/O communications and explicit message communications are non-safety data. The necessary measures for safety data are not taken for this data during data generation. Therefore, do not use this data to configure the Safety Control System.

System Combining a Distributed Safety Control System with Multiple NE1A-series Controllers and a Centralized Monitoring System

This system uses each NE1A-series Controller as a Safety Master and establishes a Safety Remote I/O System with Safety Slaves.

Each NE1A-series Controller also simultaneously functions as a Standard Slave and standard I/O communications are performed with the Standard Master.

The Safety Control System can be monitored using a Standard PLC by allocating the NE1A-series Controller's status information (general status, local I/O error status, or other information) or logic operation results in the Standard PLC.

In the DeviceNet Safety System, multiple Safety Masters can be connected on the same network. Therefore, the distributed safety control blocks can be monitored centrally on the same network.
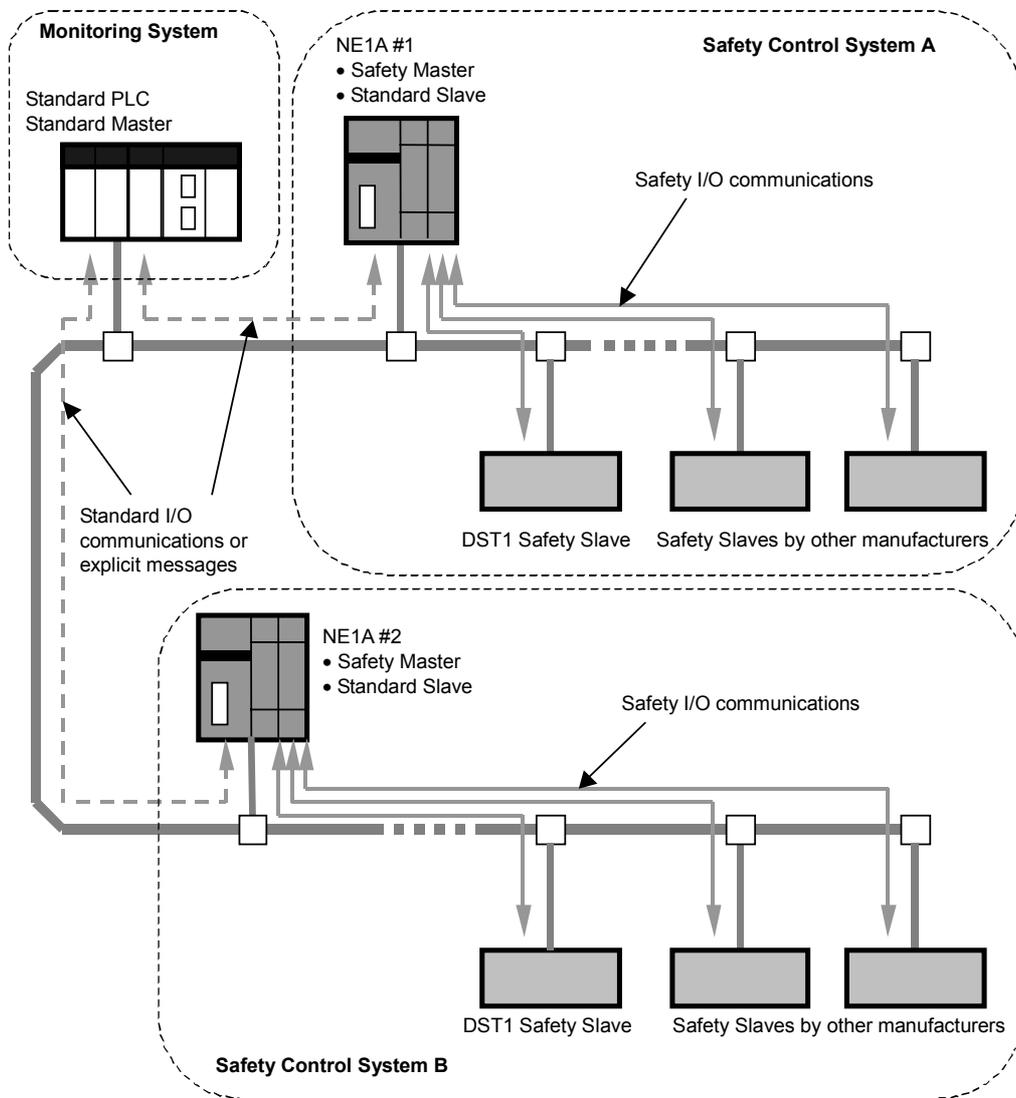
Also, safety I/O communications between NE1A-series Controllers can be performed as illustrated in the following diagram. In the diagram, NE1A #2 is set as the slave of NE1A #1 safety connections to perform safety I/O communications.

The NE1A-series Controller functions as a Safety Master, Safety Slave, and Standard Slave simultaneously. As a Safety Slave, the NE1A-series Controller enables safety I/O communications for a maximum of four connections with up to 16 bytes per connection.

Monitoring System

Standard PLC
Standard Master

NE1A #1
• Safety Master
• Standard Slave

Safety Control System A

NE1A #1 functions as the Safety Master for NE1A #2.

DST1 Safety Slave   Safety Slaves by other manufacturers

NE1A #2
• Safety Master
• Safety Slave
• Standard Slave

Safety I/O communications

Safety Control System B

DST1 Safety Slave   Safety Slaves by other manufacturers

NE1A #2 functions as a Safety Slave under NE1A #1.

IMPORTANT: The data attributes handled by DeviceNet standard I/O communications and explicit message communications are non-safety data. The necessary measures for safety data are not taken for this data during data generation. Therefore, do not use this data to configure the Safety Control System.

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NE1A Standalone System

If there are only a few I/O points, the NE1A-series Controller can be used as Stand-alone Controller.

The Controller's DeviceNet communications can be disabled through settings made from the Network Configurator to enable the NE1A-series Controller to operate as Standalone Controller.
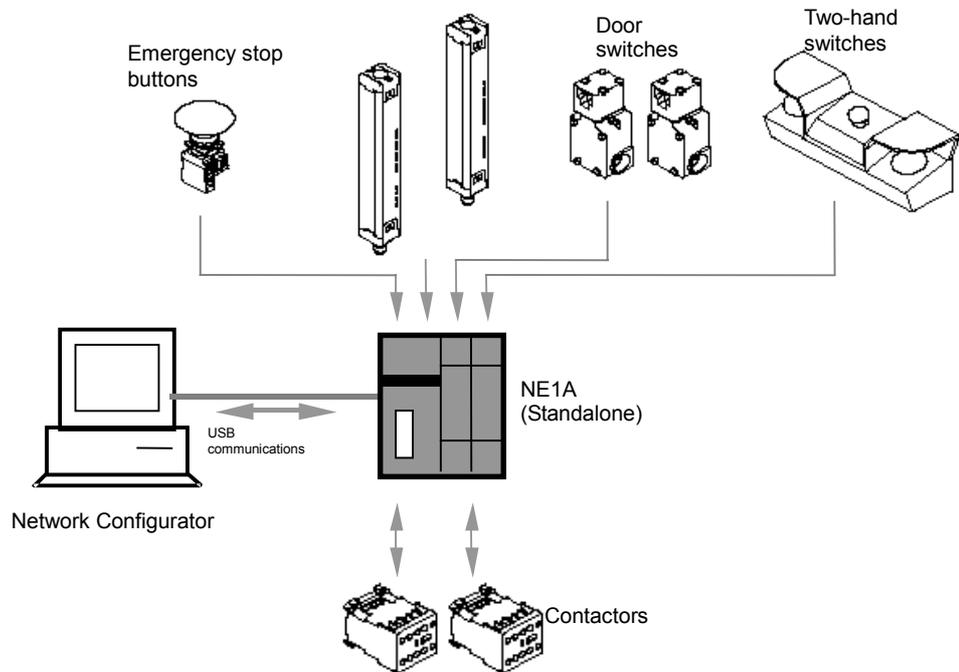
IMPORTANT: Use a USB port connection to set Standalone Mode. DeviceNet communications are stopped when Standalone Mode is set, and so setting is not possible from the DeviceNet port.

Connection with Network Configurator

The NE1A-series Controller is set and programmed using a Network Configurator. The Network Configurator also enables uploading configuration data, online monitoring of program execution status, error history checks, etc.

The Network Configurator can be used in the following three ways:
- Direct connection to DeviceNet
- USB connection to the NE1A-series Controller
- Serial connection to an OMRON PLC

Direct Connection to DeviceNet

A DeviceNet Board/Card enables the Network Configurator to connect directly to the network. Remote configuration and monitoring are supported for standard nodes and safety nodes on the network. When connected directly to DeviceNet, the Network Configurator forms one node on the network.

Network Configurator   NE1A   Standard PLC
                                                                        Standard Master

Explicit message communications

PCI Board
PCMCIA Card

Downloading/uploading configuration
data and monitoring are supported from
the Network Configurator for devices on
the network via DeviceNet.

Safety Slave   Standard Slave
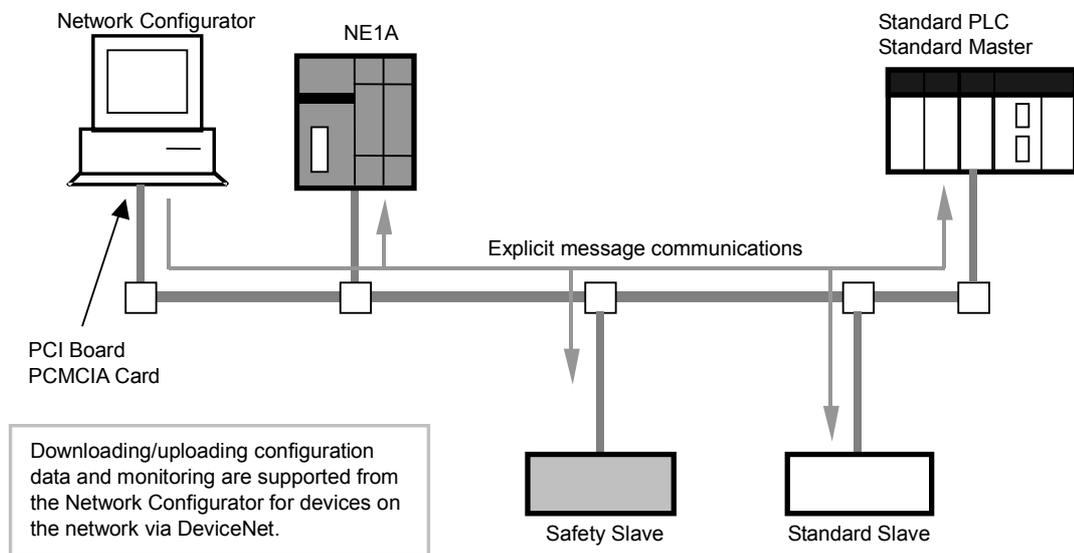
USB Connection to an NE1A-series Controller

The Network Configurator can be used by connecting to the USB port on the NE1A-series Controller. Remote configuration and monitoring are supported for not only the Controller connected to the USB port but also for other devices on the network. For a USB connection, the Network Configurator does not use a node address on the network.
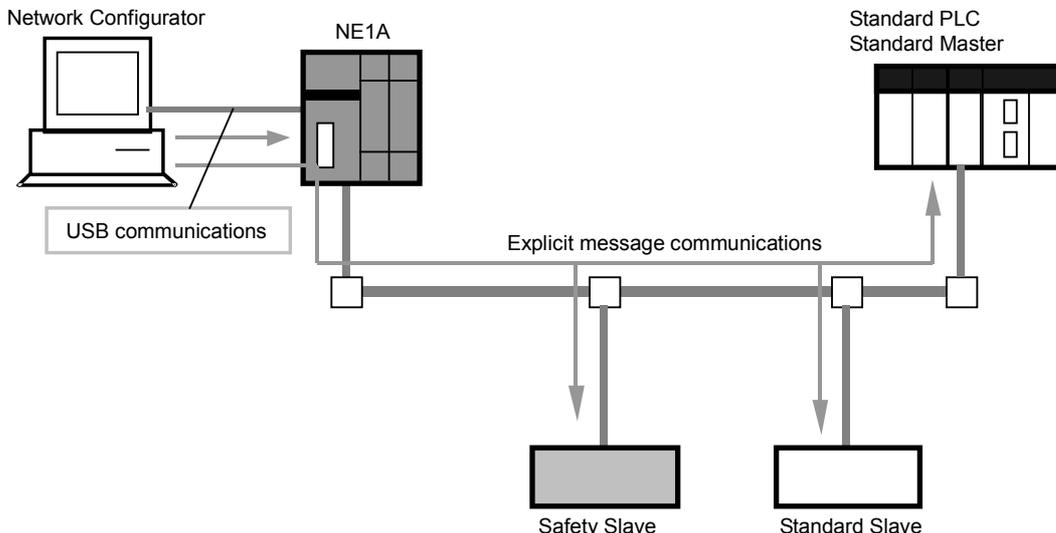
Serial Connection to an OMRON PLC

The Network Configurator can be used by connecting to a serial port on an OMRON PLC. Remote configuration and monitoring are supported for standard nodes and safety nodes on the network. For a PLC connection, the Network Configurator does not use a node address on the network.
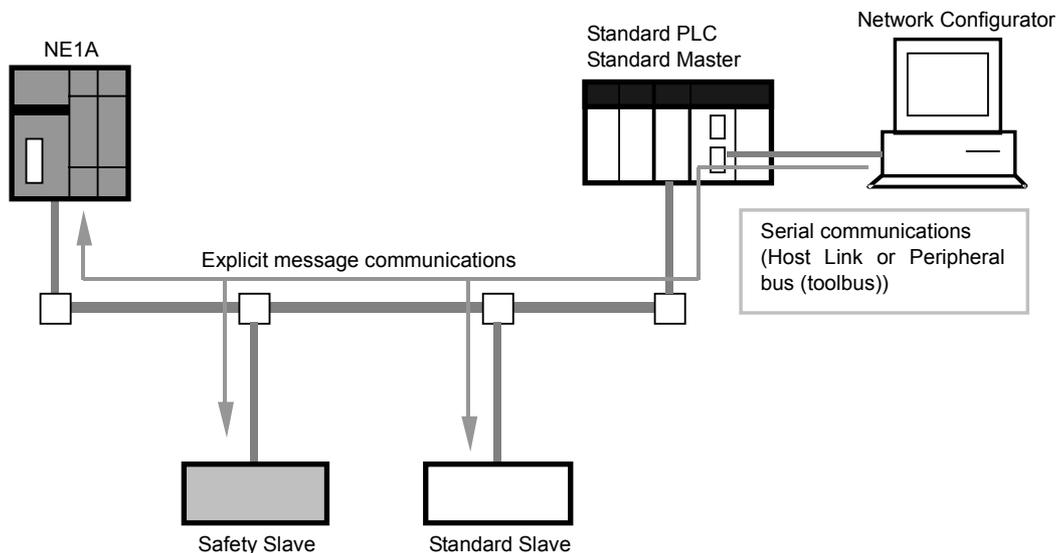
Note: Check the following when downloading from a Standard Master to the NE1A.
- The timeout monitor time for the Standard Master must be at least 15 seconds.
- Remote I/O communications from the Standard Master to the NE1A must be stopped (disconnected).

1-3   System Setup Procedure

The general working phases until the Safety System is operational are shown below.

```
           ┌──────────────────────┐
           │   1. System Design   │
           └──────────────────────┘
            │                    │
            ▼                    ▼
┌───────────────────────┐  ┌──────────────────────┐
│3. Installation and Wiring│ │   2. Programming     │
└───────────────────────┘  └──────────────────────┘
            │                    │
            └─────────┬──────────┘
                      ▼
           ┌──────────────────────┐
           │   4. Configuration   │
           └──────────────────────┘
                      │
                      ▼
           ┌──────────────────────┐
           │   5. User Testing    │
           └──────────────────────┘
                      │
                      ▼
           ┌──────────────────────┐
           │  6. System Operation │
           └──────────────────────┘
```
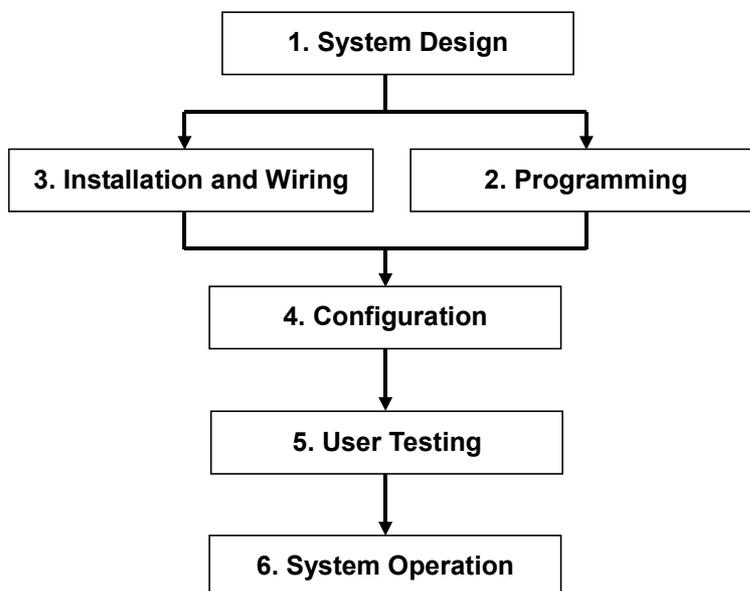
The NE1A-series Controller information required in each phase is described in the following sections.

Working phase	Required information	Details
System design	■ System overview and example configurations ■ Specifications and functions ■ Performance	Section 1 Section 2, Section 4 to 8 Section 9
Programming	■ Programming guidelines ■ Function block specifications	Section 6

Installation and wiring	■ Node address and baud rate settings
	■ Installation location
	■ Device connections
	  • Power supply wiring
	  • Connection with I/O devices
	  • Wiring for DeviceNet
		Section 4-1
		Section 3

Configuration	■ Configuration method	Section 7
User test	■ Error classification and error history	Section 10
System operation	■ Maintenance and inspection	Section 11

Refer to the following manuals for information on DeviceNet installation, DeviceNet Safety System construction, Network Configurator operation, Programming Device operation, and other devices used in the safety system.

Item	Manual name	Cat. No.
Installation of DeviceNet	DeviceNet User's Manual	W379
Construction of a DeviceNet Safety System	DeviceNet Safety System Configuration Manual	Z905
Network Configurator Operation		
Programming Device Operation		
Installation of Safety I/O Terminals	DeviceNet Safety I/O Terminal Operation Manual	Z904

Section 2
Specifications and Nomenclature

2-1   Nomenclature and Functions

This section describes the part names and functions of the NE1A-series Controllers.

2-1-1   Nomenclature

NE1A-SCPU01 (Pre-Ver. 1.0)
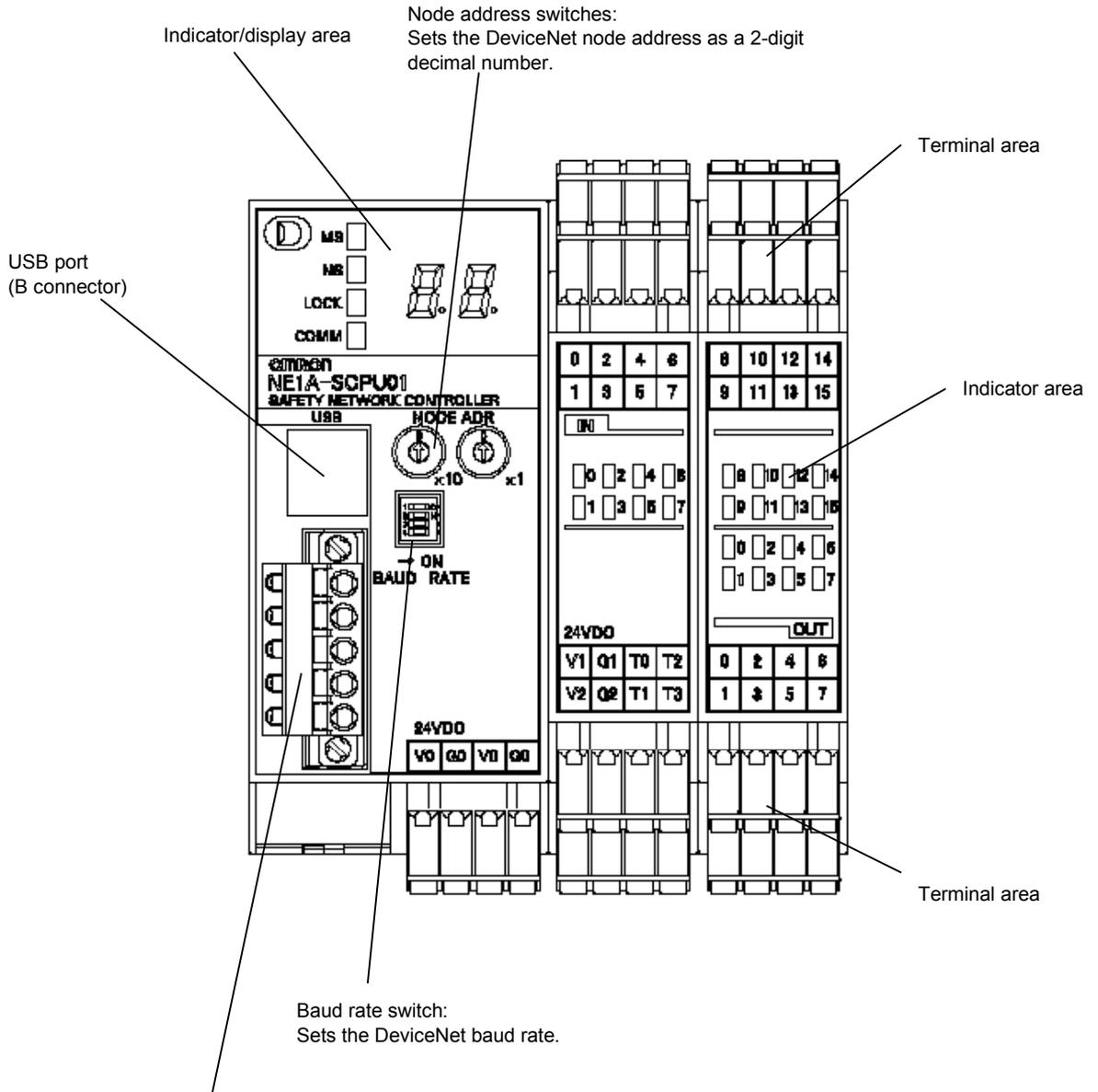
Indicator/display area

Node address switches:
Sets the DeviceNet node address as a 2-digit decimal number.

Terminal area

USB port
(B connector)

Indicator area

Terminal area

Baud rate switch:
Sets the DeviceNet baud rate.

DeviceNet communications connector:
Connects to the network communications cable.
The power for communications is also supplied from this connector.
The XW4G-05C1-H1-D is provided for node connections.

NE1A-SCPU01 (Unit Version 1.0 or Later)

Indicator/display area

Node address switches:
Sets the DeviceNet node address as a
2-digit decimal number.

Terminal area

USB port
(B connector)

Indicator area

Terminal area

Baud rate switch:
    Sets the DeviceNet baud rate.

DeviceNet communications connector:
    Connects to the network communications cable.
    The power for communications is also supplied from this connector.
    The XW4G-05C1-H1-D Connector is provided for node connections.

NE1A-SCPU02

Indicator/display area

Node address switches:
Sets the DeviceNet node address as a
2-digit decimal number.

Terminal area

USB port
(B connector)

Indicator area

Baud rate switch:
Sets the DeviceNet baud rate.

Terminal area

DeviceNet communications connector:
Connects to the network communications cable.
The power for communications is also supplied from this connector.
The XW4G-05C1-H1-D Connector is provided for node connections.

2-1-2   Indicator/Display Areas

Status Indicators

The following LED indicators show the status of the NE1A-series Controller, network, and I/O circuits.

- MS (module status)
- NS (network status)
- LOCK (configuration lock status)
- COMM (USB communications status)
- IN 0 to 15 (local input status, NE1A-SCPU01(-V1))
- IN 0 to 39 (local input status, NE1A-SCPU02)
- OUT 0 to 7 (local output status)

Indicator name	Color	Status	Meaning
MS (module status)	Green	ON	Operation status
		Flashing	Idle status
	Red	ON	Critical error status
		Flashing	Abort status
	Green/red	Flashing	Waiting for TUNID setting during self-diagnosis or waiting for configuration.
	-	OFF	Power is not supplied.
NS (network status)	Green	ON	Online connection has been established.
		Flashing	Online connection has not been established.
	Red	ON	Unable to communicate.
		Flashing	I/O communications error
	Green/red	Flashing	Waiting for TUNID setting.
	-	OFF	Not online or DeviceNet communications disabled (Standalone Mode).
LOCK (configuration lock)	Yellow	ON	Lock has been completed with a valid configuration.
		Flashing	Lock has not been completed with a valid configuration.
		OFF	No valid configuration data
COMM (USB)	Yellow	Flashing	Data transmission/reception in progress.
		OFF	No data transmission/reception in progress.
NE1A-SCPU01 IN 0, 1, 2, …15 OUT 0, 1, 2, …7 (local I/O status) NE1A-SCPU02 IN 0, 1, 2 …39 OUT 0, 1, 2 …7 (local I/O status)	Yellow	ON	I/O signal is ON.
	Red	ON	Error detected in I/O circuits. Discrepancy error has occurred in an input set for Dual Channel Mode. Dual channel violation has occurred in an output set for Dual Channel Mode.
		Flashing	Error detected in the other I/O circuit set for Dual Channel Mode (no error in this I/O circuit).
	-	OFF	I/O signal is OFF.

⊐□⊏ : ON   ⊐▰⊏ : Flashing   ■ : OFF

Seven-segment Display

The 7-segment display indicates the NE1A-series Controller's node address during normal conditions, and the error code and the node address of the error during error conditions. Also, "nd" is displayed during normal conditions if DeviceNet communications are disabled (i.e., Standalone Mode).

Status		Display	
Normal conditions with DeviceNet enabled	Operating mode: RUN mode Safety I/O communications: Operating or not set.	Shows the NE1A-series Controller's node address (00 to 63).	Lit
	Operating mode: RUN mode Safety I/O communications: Not operating		Flashing
	Operating mode: Self-testing, configuring, or idle		Flashing
Normal conditions with DeviceNet disabled	Operating mode: RUN mode	"nd"	Lit
	Operating mode: Self-testing, configuring, or idle		Flashing
Error conditions	Critical error	Indefinite	
		Only error code	Lit
	Abort	Only error code	Lit
	Nonfatal error	Alternates between displaying the error code and the node address where the error occurred.	

⚠ WARNING
Serious injury may possibly occur due to loss of required safety functions. Do not use the NE1A-series Controller's indicators for safety operations.

Note: The errors are indicated by the combination of the MS indicator, NS indicator, and the 7-segment display. For further details on specific meanings, refer to *Section 10 Trouble-shooting.*

2-1-3   Switch Settings

Node Address Switches

Set the DeviceNet node address using the rotary switches on the front of the NE1A-series Controller.

Method	Two-digit decimal number
Range	0 to 63

Note: The node address is set to 63 at the factory.

Any node address in the setting range can be used as long as the same address is not used by another node. If a value between 64 and 99 is set on the rotary switches, the node address can be set using a software setting on the Network Configurator.

IMPORTANT:
- Turn OFF power to the NE1A-series Controller before setting the rotary switches.
- Do not change the rotary switches while the power is ON. The Controller will detect this as a change in the configuration and will switch to ABORT State.
- A node address duplication error will occur if the same address is set for more than one node. Communications will not start if this error occurs.

Note:
- Use a small flat-blade screwdriver to set the rotary switches, being careful not to scratch them.
- Refer to *4-1 Initial Setting* for software setting procedures.

Baud Rate Switch

The DeviceNet baud rate is set using the DIP switch on the front of the NE1A-series Controller. The baud rate settings are shown in the following table:

Pin				Baud rate
1	**2**	**3**	**4**	
OFF	OFF	OFF	OFF	125 kbit/s
ON	OFF	OFF	OFF	250 kbit/s
OFF	ON	OFF	OFF	500 kbit/s
ON	ON	OFF	OFF	
ON or OFF	ON or OFF	ON	OFF	Software setting
ON or OFF	ON or OFF	ON or OFF	ON	Automatic baud rate detection

Note: The baud rate is set to 125 kbit/s at the factory.

Note: Refer to *4-1 Initial Setting* for software setting procedures.

2-1-4   DeviceNet Communications Connector

Stickers are placed on the communication connectors based on the color of each communications wire. By matching the communications wire colors with the unit sticker colors, you can check to see if wires are in the correct locations. The colors of the wires are as follows:

Color	Description
Red	V+
White	Signal (CAN H)
-	Drain
Blue	Signal (CAN L)
Black	V–

Refer to the *DeviceNet User's Manual* (W379) for details on communications specifications and wiring.

IMPORTANT: Turn OFF the power supply to the NE1A-series Controller and all nodes on the network before starting any wiring operations.

2-1-5   USB Communications Connector

Connect the USB communications connector with a computer when a Network Configurator is to be used. The NE1A-series Controllers support the USB version 1.1 standard. Use a commercially available USB-A to USB-B Male/Male cable for the connection.

2-1-6   Input/Output Terminals and Internal Connections

NE1A-SCPU01(-V1)

Terminal name	Description
V0	Power supply terminal for internal circuits The two V0 terminals are connected internally.
G0	Power supply terminal for internal circuits The two G0 terminals are connected internally.
V1	Power supply terminal for external input devices and test outputs
G1	Power supply terminal for external input devices and test outputs
V2	Power supply terminal for external output devices
G2	Power supply terminal for external output devices
IN0 to IN15	Safety input terminals
T0 to T3	Test output terminals used to connect with safety inputs IN0 to IN15. Each test output terminal outputs a different test pulse pattern. Terminal T3 also supports a current monitoring function for the output signal, for example, for a muting lamp.
OUT0 to OUT7	Safety output terminals

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NE1A-SCPU02-V1

Terminal name	Description
V0	Power supply terminal for internal circuits The two V0 terminals are connected internally.
G0	Power supply terminal for internal circuits The two G0 terminals are connected internally.
V1	Power supply terminal for external input devices and test outputs
G	Power supply terminal for external input devices and test outputs
V2	Power supply terminal for external output devices
G	Power supply terminal for external output devices
IN0 to IN39	Safety input terminals
T0 to T3	Test output terminals used to connect with safety inputs IN0 to IN19. Each test output terminal outputs a different test pulse pattern. Terminal T3 also supports a current monitoring function for the output signal, for example, for a muting lamp.
T4 to T7	Test output terminals used to connect with safety inputs IN20 to IN39. Each test output terminal outputs a different test pulse pattern. Terminal T7 also supports a current monitoring function for the output signal, for example, for a muting lamp.
OUT0 to OUT7	Safety output terminals

2-2   Specifications

This section provides the NE1A-series Controller's specifications.

2-2-1   General Specifications

NE1A-SCPU01(-V1)

Item		Specifications
DeviceNet supply voltage		11 to 25 VDC (Supplied from communications connector.)
Device supply voltage V0 (See note.)		20.4 to 26.4 VDC (24 VDC, −15% to 10%)
I/O supply voltages V1 and V2 (See note.)		20.4 to 26.4 VDC (24 VDC, −15% to 10%)
Current con-sumption	DeviceNet	15 mA at 24 VDC
	Internal logic circuits	230 mA at 24 VDC
Overvoltage category		II (according to IEC 61131-2: 4.4.2)
EMC		Compliant with IEC 61131-2.
Vibration resistance		0.35 mm at 10 to 57 Hz, 50 m/s^2 at 57 to 150 Hz
Shock resistance		150 m/s^2 for 11 ms
Mounting		DIN Track (TH35-7.5/TH35-15 according to IEC 60715)
Operating temperature		−10 to 55°C
Humidity		10% to 95% (with no condensation)
Storage temperature		−40 to 70°C
Degree of protection		IP20
Serial interface		USB Ver. 1.1
Weight		460 g

Note: V0 to G0: For internal logic circuits, V1 to G1: For external input devices and test outputs, V2 to G2: For external output devices.

NE1A-SCPU02

Item		Specifications
DeviceNet supply voltage		11 to 25 VDC (Supplied from communications connector.)
Device supply voltage V0 (See note.)		20.4 to 26.4 VDC (24 VDC, −15% to 10%)
I/O supply voltages V1 and V2 (See note.)		20.4 to 26.4 VDC (24 VDC, −15% to 10%)
Current con-sumption	DeviceNet	15 mA at 24 VDC
	Internal logic circuits	280 mA at 24 VDC
Overvoltage category		II (according to IEC 61131-2: 4.4.2)
EMC		Compliant with IEC 61131-2.
Vibration resistance		0.35 mm at 10 to 57 Hz, 50 m/s^2 at 57 to 150 Hz
Shock resistance		150 m/s^2 for 11 ms
Mounting		DIN Track (TH35-7.5/TH35-15 according to IEC 60715)
Operating temperature		−10 to 55°C
Humidity		10% to 95% (with no condensation)
Storage temperature		−40 to 70°C
Degree of protection		IP20
Serial interface		USB Ver. 1.1
Weight		690 g

Note: V0 to G0: For internal logic circuits, V1 to G: For external input devices and test outputs, V2 to G: For external output devices.
G or V1 and G of V2 are connected internally.

2-2-2   DeviceNet Communications Specifications

Item	Specifications			
Communications protocol	Conforms to DeviceNet.			
Connection method	The multidrop and T-branch connections can be combined (for main line and branch lines).			
Baud rate	500 kbits/s, 250 kbits/s, 125 kbits/s			
Communications medium	Special cable with 5 lines (2 communications lines, 2 power lines, 1 shield line)			
Communications distance	Baud rate	Maximum network length	Branch length	Total length
	500 kbits/s	100 m max. (100 m max.)	6 m max.	39 m max.
	250 kbits/s	250 m max. (100 m max.)	6 m max.	78 m max.
	125 kbits/s	500 m max. (100 m max.)	6 m max.	156 m max.
	The numbers in parentheses are the lengths when Thin Cable is used.			
Communications power supply	11 to 25 VDC			
Connected nodes	63 nodes max.			
Safety I/O communications (Pre-Ver. 1.0 Controllers)	Safety Master Function: • Maximum number of connections: 16 • Maximum data size: 16 bytes input or 16 bytes output (per connector) • Connection type: Single-Cast, Multi-Cast Safety Slave Function: • Maximum number of connections: 4 • Maximum data size: 16 bytes input or 16 bytes output (per connector) • Connection type: Single-Cast, Multi-Cast			
Safety I/O communications (Controllers with unit version 1.0 or later)	Safety Master Function: • Maximum number of connections: 32 • Maximum data size: 16 bytes input or 16 bytes output (per connector) • Connection type: Single-Cast, Multi-Cast Safety Slave Function: • Maximum number of connections: 4 • Maximum data size: 16 bytes input or 16 bytes output (per connector) • Connection type: Single-Cast, Multi-Cast			
Standard I/O communications	Standard Slave Function • Maximum number of connections: 2 • Maximum data size: 16 bytes input and/or 16 bytes output (per connector) • Connection type: Poll, Bit-strobe, COS, Cyclic			
Message communications	Maximum message length: 552 bytes			

2-2-3   I/O Specifications

Safety Inputs

Item	Specifications
Input type	Current sinking (PNP)
ON voltage	11 VDC min. between each input terminal and G
OFF voltage	5 VDC max. between each input terminal and G
OFF current	1 mA max.
Input current	4.5 mA

Safety Outputs

Item	Specifications
Output type	Current sourcing (PNP)
Rated output current	0.5 A per output
Residual voltage	1.2 V max. between each output terminal and V2
Leakage current	0.1 mA max.

IMPORTANT: If a safety output is set as a *safety pulse output*, an OFF pulse signal (pulse width: 580 μs) will be output to diagnose the output circuit when the safety output turns ON. Check the input response time of the control device connected to the NE1A-series Controller to be sure that this output pulse will not cause malfunctions.

Test Outputs

Item	Specifications
Output type	Current sourcing (PNP)
Rated output current	0.7 A max. per output (See notes 1 and 2.)
Residual voltage	1.2 V max. between each output terminal and V1
Leakage current	0.1 mA max.

Note 1:   Total simultaneous current: 1.4 A max.
(T0 to T3: NE1A-SPCPU01(-V1), T0 to T7: NE1A-SCPU02)

   2:   Connectable external indicator (T3, T7): 24 VDC, 15 to 400 mA

3-1   Installation

3-1-1   Requirements for Installation and Wiring

Consider the following for installation and wiring to improve the reliability of the NE1A-series Safety Network Controller System and to fully exploit the system's capabilities.

Installation and Storage Environment

Do not use or store the NE1A-series Controller in any of the following locations.

- Locations subject to direct sunlight
- Locations subject to temperatures or humidity outside the ranges specified in the specifications
- Locations subject to condensation as the result of severe changes in temperature
- Locations subject to corrosive or flammable gases
- Locations subject to dust (especially iron dust) or salts
- Locations subject to water, oil, or chemicals
- Locations subject to shock or vibration

Take appropriate and sufficient measures when installing systems in the following locations. Inappropriate and insufficient measures may result in malfunction.

- Locations subject to static electricity or other forms of noise
- Locations subject to strong electromagnetic fields
- Locations subject to possible exposure to radioactivity
- Locations close to power supplies

3-1-2   Mounting to the Control Panel

- Use the NE1A-series Controller in an enclosure with IP54 protection or higher according to IEC/EN 60529.
- Use DIN Track (TH35-7.5/TH35-15 according to IEC 60715) to mount the NE1A-series Controller in the control panel. Mount the Controller to the DIN Track using PFP-M End Plates (not included with the NE1A-series Controller) to prevent it from falling off the DIN Track because of vibration.
- Provide sufficient space around the NE1A-series Controller, at least 5 mm at the sides and at least 50 mm at the top and bottom, for ventilation and wiring.
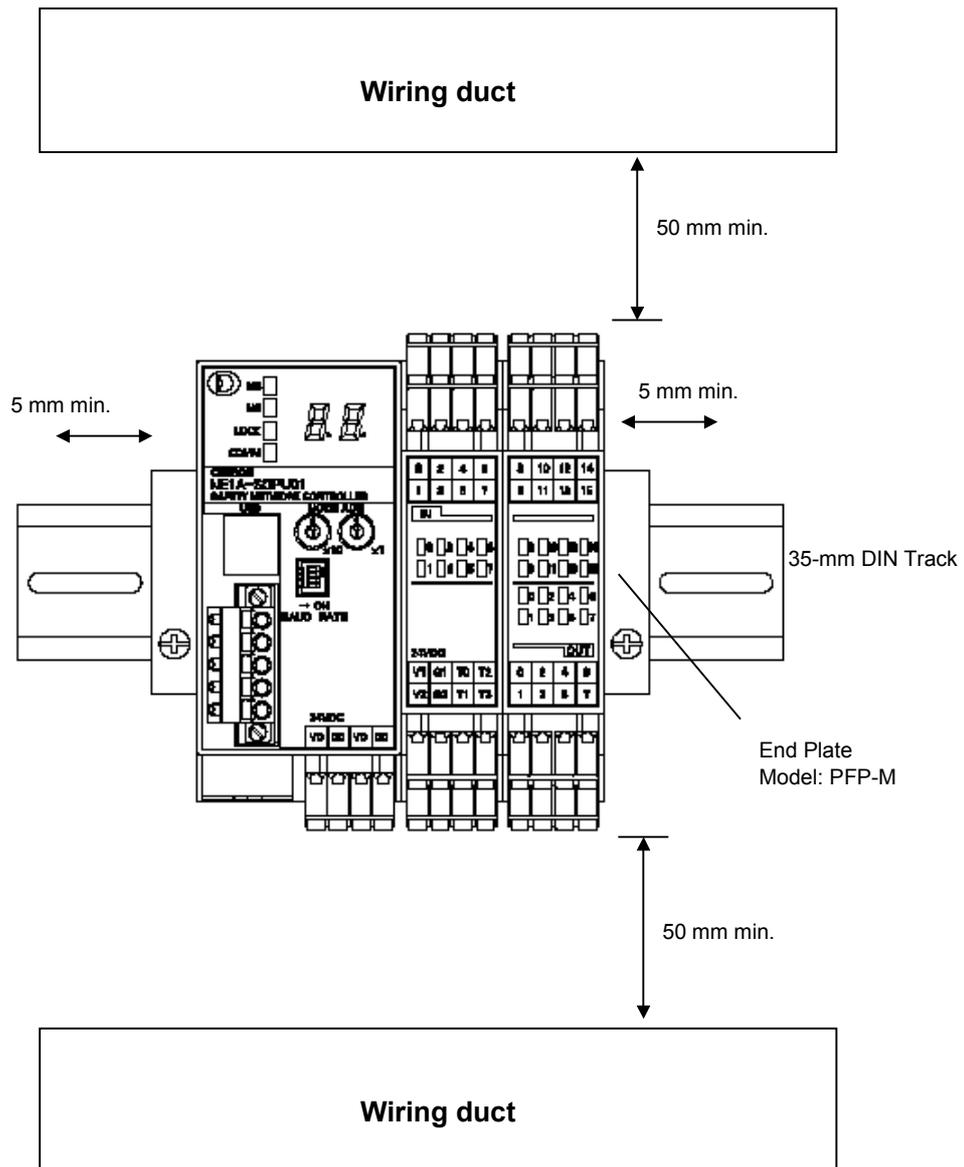
Note: The NE1A-series Controller can be mounted only to DIN Track. Do not screw the Controller to the control panel.

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Mounting

To ensure proper ventilation, mount the NE1A-series Controller as shown in the following diagram.
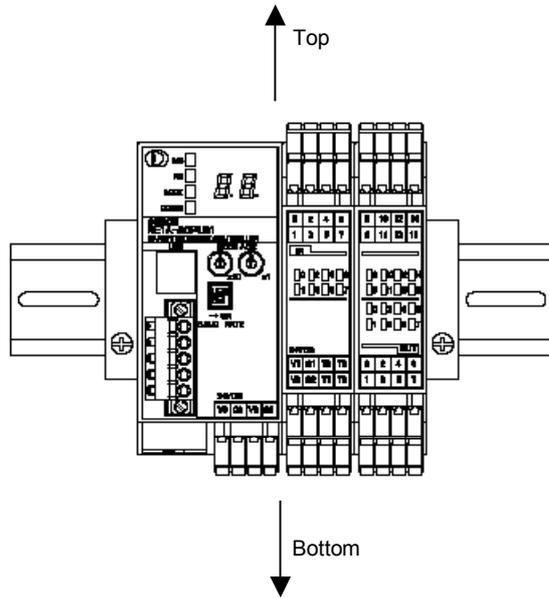
Do not mount the NE1A-series Controller as in the following diagrams.

Top

Bottom

Top

Bottom

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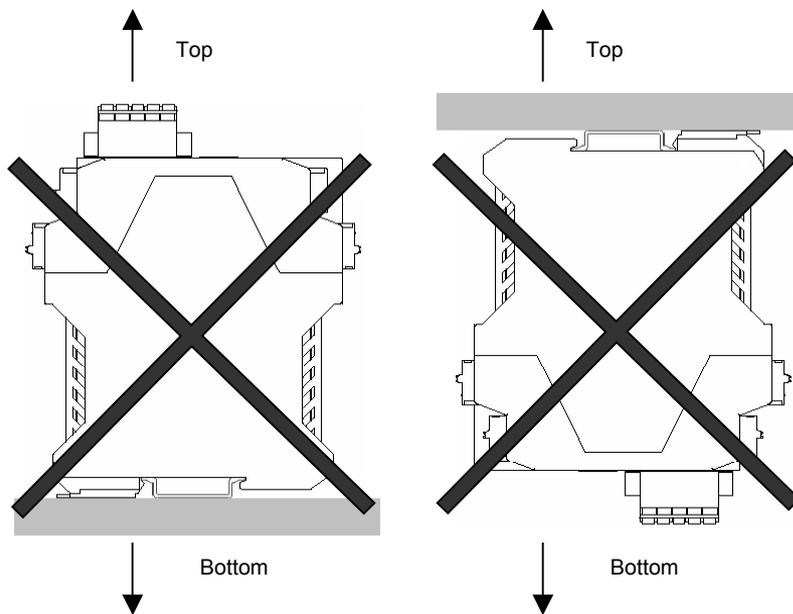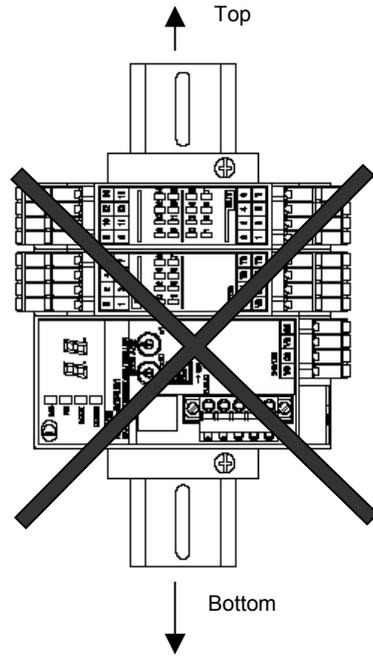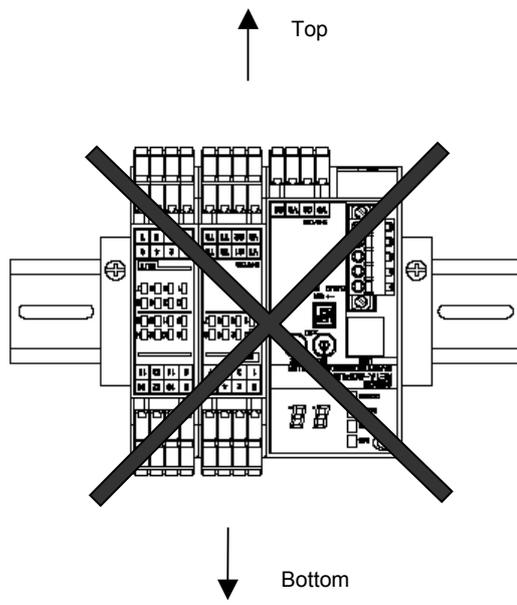
Position of the NE1A-SCPU01(-V1) Controller's DIN Track Mounting Bracket
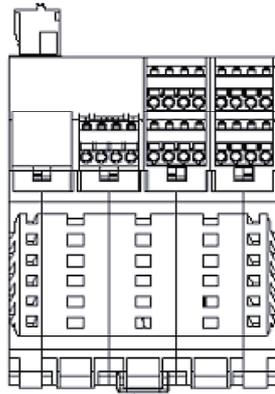
DIN Track Mounting Bracket

Position of the NE1A-SCPU02 Controller's DIN Track Mounting Brackets
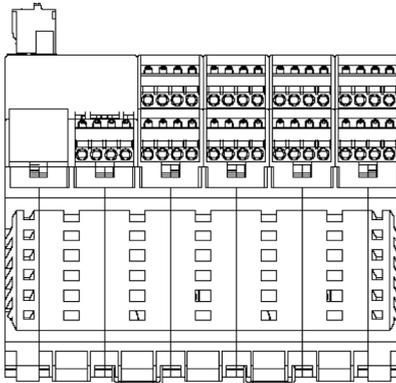
DIN Track Mounting Brackets

3-1-3   Dimensions and Weight

Dimensions

NE1A-SCPU01(-V1)
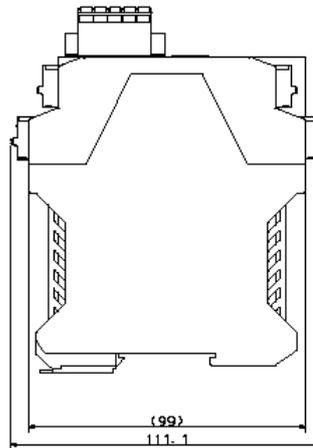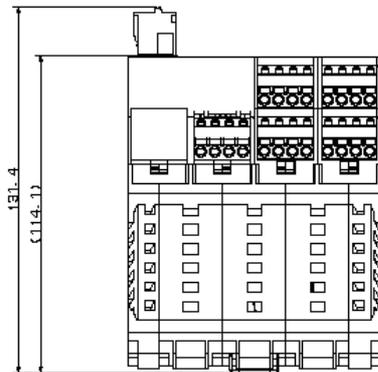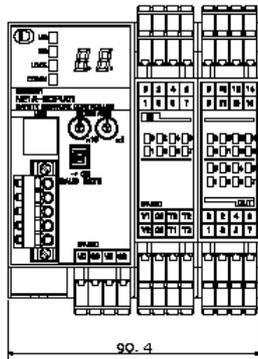
NE1A-SCPU02
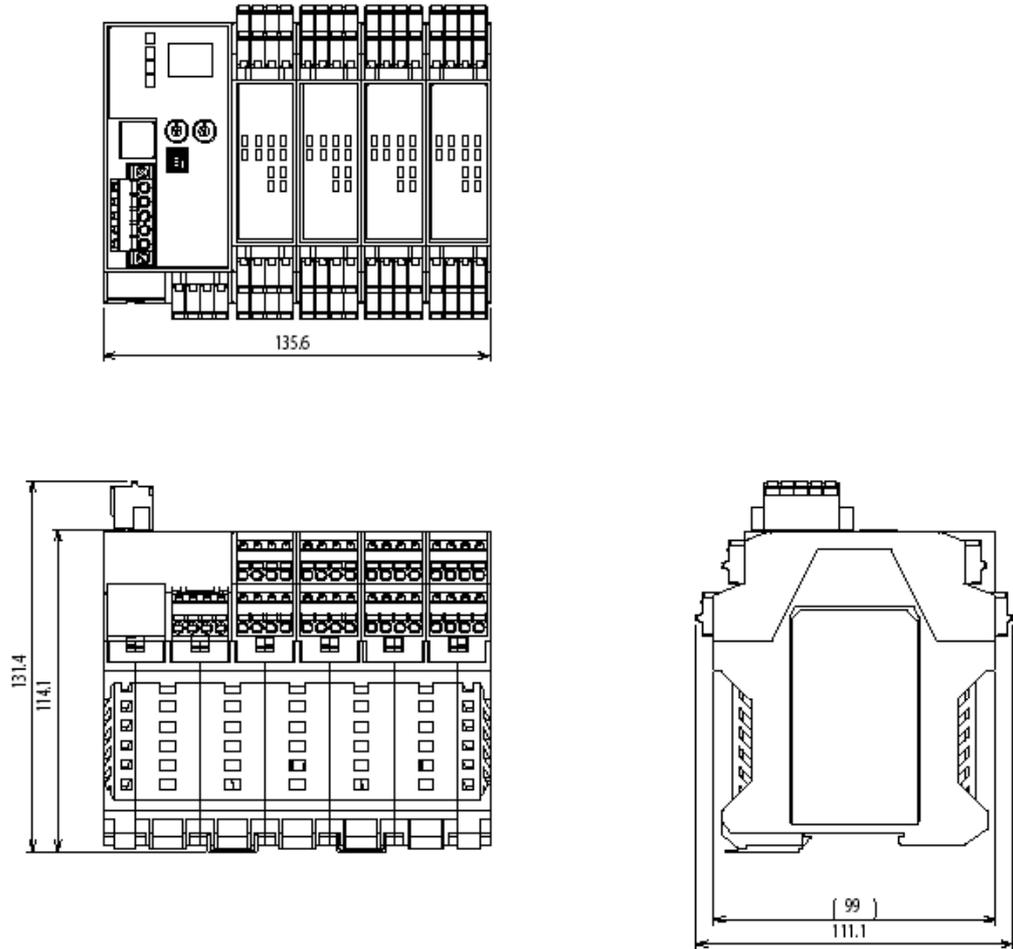
Weight

Model	Weight
NE1A-SCPU01(-V1)	460 g max.
NE1A-SCPU02	690 g max.

3-2   Wiring

3-2-1   General Instructions on Wiring

Precaution:
- To prevent wire clippings from getting into the NE1A-series Controller, do not re-move the label on the Controller before wiring has been completed.
- After wiring has been completed, be sure to remove the label from the Controller to enable heat dissipation for proper cooling.
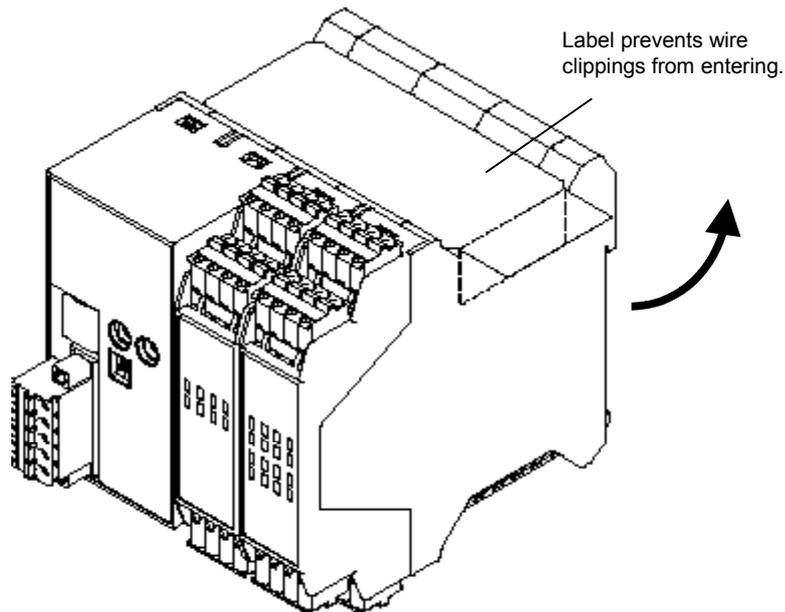
Label prevents wire clippings from entering.

- Disconnect the NE1A-series Controller from the power supply before starting any wiring operations. Devices connected to the Controller may operate unexpectedly if wiring is performed with the power supply connected.
- Be careful not to get your fingers caught when attaching connectors to the plugs on the NE1A-series Controller.

⚠ **WARNING**	
Serious injury may possibly occur due to loss of required safety functions. Wire the conductors correctly and verify the operation of the NE1A-series Controller before using the Controller system in actual operation.	❗

3-2-2   Wiring the Power Supply and I/O Lines

Wire Sizes

Use the following wires to connect external I/O devices to the NE1A-series Controller.

Solid wire	0.2 to 2.5 mm^2 (AWG 24 to AWG 12)
Stranded (flexible) wire	0.34 to 1.5 mm^2 (AWG 22 to AWG 16) Stranded wires should be prepared by attaching ferrules with plastic insulation collars (DIN 46228-4 standard compatible) before connecting them.

Recommended Materials and Tools

Insulated Pin Terminals

Use a pin terminal with an insulated cover compliant with the DIN 46228-4 standard. Pin terminals similar in appearance but not compliant with the standard may not match the terminal block on the NE1A-series Controller. (The wiring dimensions are rough standards. Confirm the dimensions beforehand.) Use wires of the same diameter if two-wire pin terminals are used.

Note: • When wiring with pin terminals, be sure to insert pin terminals all the way into the terminal block.

• When using two-wire pin terminals, use wires of the same diameter.

• When using two-wire pin terminals, insert the pin terminal so that metal portion of the pin terminal is inserted straight into the terminal block, i.e., so that the long sides of the insulating cover are vertical.

Reference Specifications (Product Specifications for Phoenix Contact)

Model of pin terminal		Wire dimensions		Pin terminal specifications					Dimensions
		Cross-sectional area of conductor (mm^2)	AWG	Stripped length of insulation (mm)	Overall length L1 (mm)	Length of metal part L2 (mm)	Inner diameter of conductor D1 (mm)	Inner diameter of insulative cover D2 (mm)	
One-wire pin terminals	AI 0,34-8TQ	0.34	22	10	12.5	8	0.8	2.0	*1
	AI 0,5-10WH	0.5	20	10	16	10	1.1	2.5	
	AI 0,75-10GY	0.75	18	10	16	10	1.3	2.8	
	AI 1-10RD	1.0	18	10	16	10	1.5	3.0	
	AI 1,5-10BK	1.5	16	10	18	10	1.8	3.4	
Two-wire pin terminals	AI-TWIN 2 x 0,75-10GY	2 x 0.75	–	10	17	10	1.8	2.8/5.0	*2
	AI-TWIN 2 x 1-10RD	2 x 1	–	10	17	10	2.05	3.4/5.4	
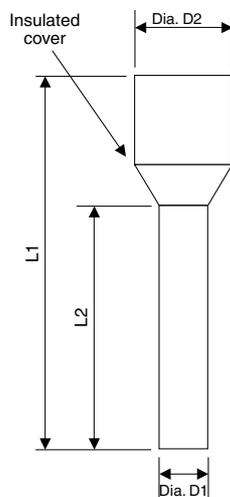
*1: One-wire Pin Terminal   ***2: Two-wire Pin Terminal**
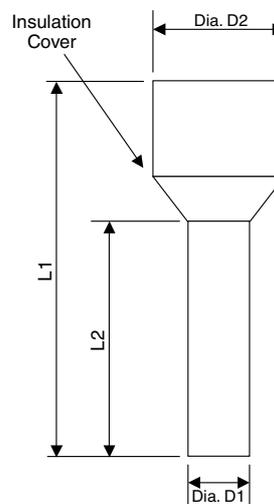
Terminal Crimping Tool

Manufacturer	Model
Phoenix Contact	CRIMPFOX UD6

Power Supply Selection

Use a DC power supply satisfying the following requirements.
- The secondary circuits of the DC power supply must be isolated from the primary circuit by double insulation or reinforced insulation.
- The DC power supply must satisfy the requirements for class 2 circuits or limited voltage/current circuits defined in UL 508.
- The output hold time must be 20 ms or longer.

3-2-3   Wiring I/O Devices

Wiring Input Devices

Refer to the following information for input device selection and wiring.

Devices with Mechanical Contact Outputs

Examples: Emergency stop buttons and safety limit switches

These devices use both a safety input terminal and test output terminal. A safety input terminal inputs the test output signal (pulse output) of the NE1A-series Controller via a contact output device.
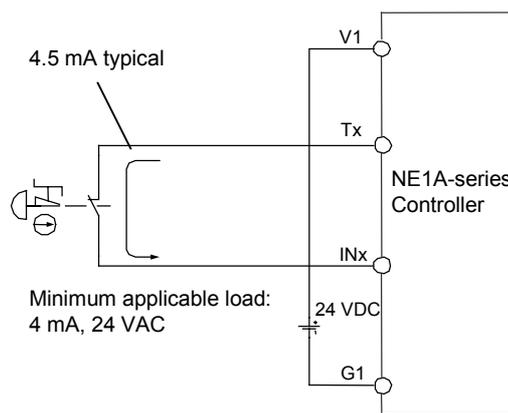
Devices with PNP Semiconductor Outputs (Current Sourcing)

Example: Light curtains

A PNP semiconductor output signal from this type of device is input to the NE1A-series Controller's safety input terminal.

⚠ WARNING
Serious injury may possibly occur due to loss of required safety functions. Use appropriate components or devices according to the requirements given in the following table.

Controlling devices	Requirements
Emergency stop switch	Use approved devices with a direct opening mechanism compliant with IEC/EN 60947-5-1.
Door interlocking switch or limit switch	Use approved devices with a direct opening mechanism compliant with IEC/EN 60947-5-1 and capable of switching micro-loads of 4 mA at 24 VDC.
Safety sensor	Use approved devices compliant with the relevant product standards, regulations, and rules in the country where they are used.
Relay with forcibly guided contacts	Use approved devices with forcibly guided contacts compliant with EN 50205. For feedback, use devices with contacts capable of switching micro-loads of 4 mA at 24 VDC.
Contactor	Use contactors with a forcibly guided mechanism and monitor the auxiliary NC contact to detect contactor failures. For feedback, use devices with contacts capable of switching micro-loads of 4 mA at 24 VDC.
Other devices	Evaluate whether devices used are appropriate to satisfy the requirements of the safety category level.

IMPORTANT:
- Properly apply the specified voltage to the NE1A-series Controller's inputs. Applying an inappropriate DC voltage or any AC voltage may cause reduced safety functions, damage to the NE1A-series Controller, or a fire.
- Be sure to separate I/O cables from high-voltage/current lines.
- Use I/O cables of 30 m or less.
- Do not apply the power supply to the test output terminals. Doing so may result in product damage or burning.

Wiring Output Devices

Refer to the following diagram for selection and wiring of output devices.

⚠ WARNING
Serious injury may possibly occur due to breakdown of outputs. Do not connect loads beyond the rated value to the safety outputs and the test outputs.
Serious injury may possibly occur due to loss of required safety functions. Wire the NE1A-series Controller properly so that 24-VDC lines do NOT touch the safety outputs and the test outputs accidentally or unintentionally.
Serious injury may possibly occur due to loss of required safety functions. Ground the 0-V line of the power supply for external output devices so that the devices do NOT turn ON when the safety output line or the test output line is grounded.
Serious injury may possibly occur due to loss of required safety functions. Use appropriate components or devices according to the requirements given in the following table.

Controlling Devices	Requirements
Contactor	Use contactors with a forcibly guided mechanism and monitor the auxiliary NC contact to detect contactor failures. For feedback, use devices with contacts capable of switching micro-loads of 4 mA at 24 VDC.
Other devices	Evaluate whether devices used are appropriate to satisfy the requirements of safety category level.

IMPORTANT:
- Be sure to separate I/O cables from high-voltage/current lines.
- Use I/O cables of 30 m or less.
- Do not apply the power supply to the test output terminals. Doing so may result in product damage or burning.

Examples of I/O Device Connections

Example of Connecting an Emergency Stop Button
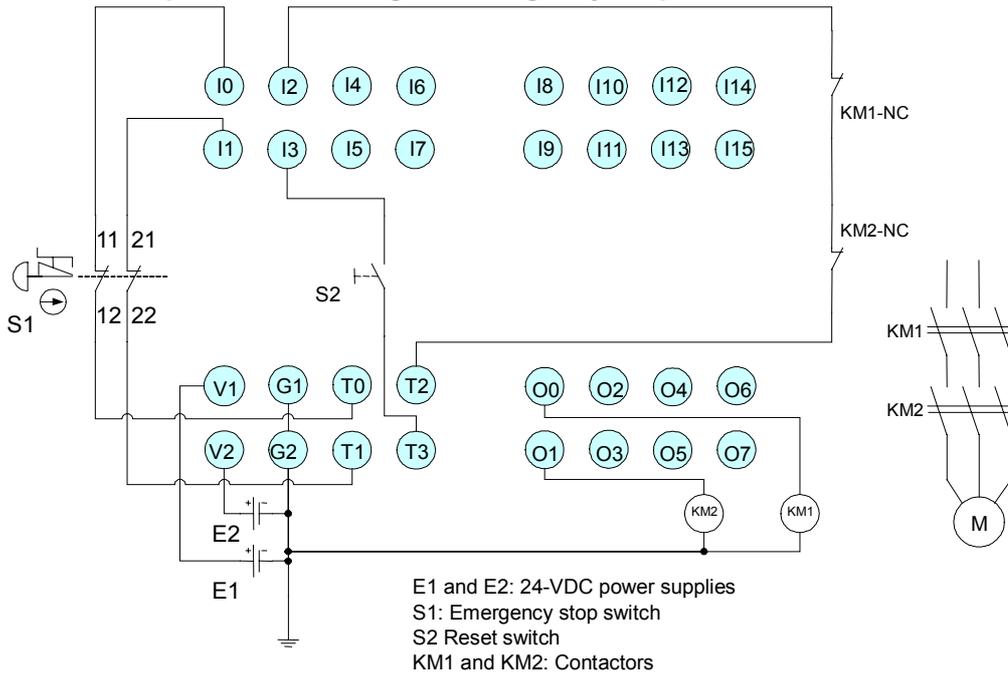
E1 and E2: 24-VDC power supplies
S1: Emergency stop switch
S2 Reset switch
KM1 and KM2: Contactors

Note: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).

Note: This example shows an NE1A-SCPU01(-V1) Controller's terminal layout.

Example of Connecting Limit Switches (for a Safety Gate)
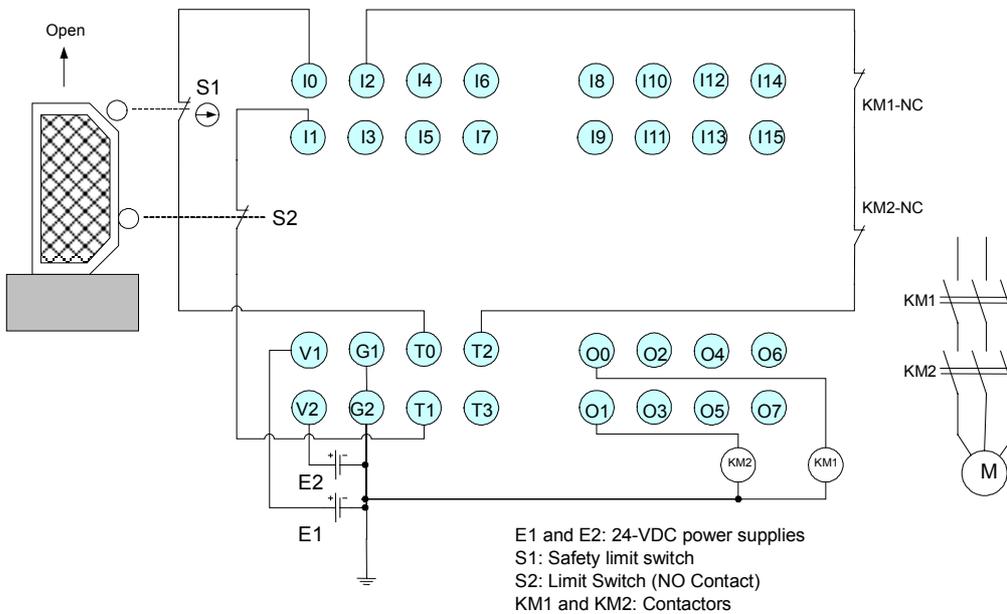
E1 and E2: 24-VDC power supplies
S1: Safety limit switch
S2: Limit Switch (NO Contact)
KM1 and KM2: Contactors

Note: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).

Note: This example shows an NE1A-SCPU01(-V1) Controller's terminal layout.

Example of Connecting Two-hand Switches
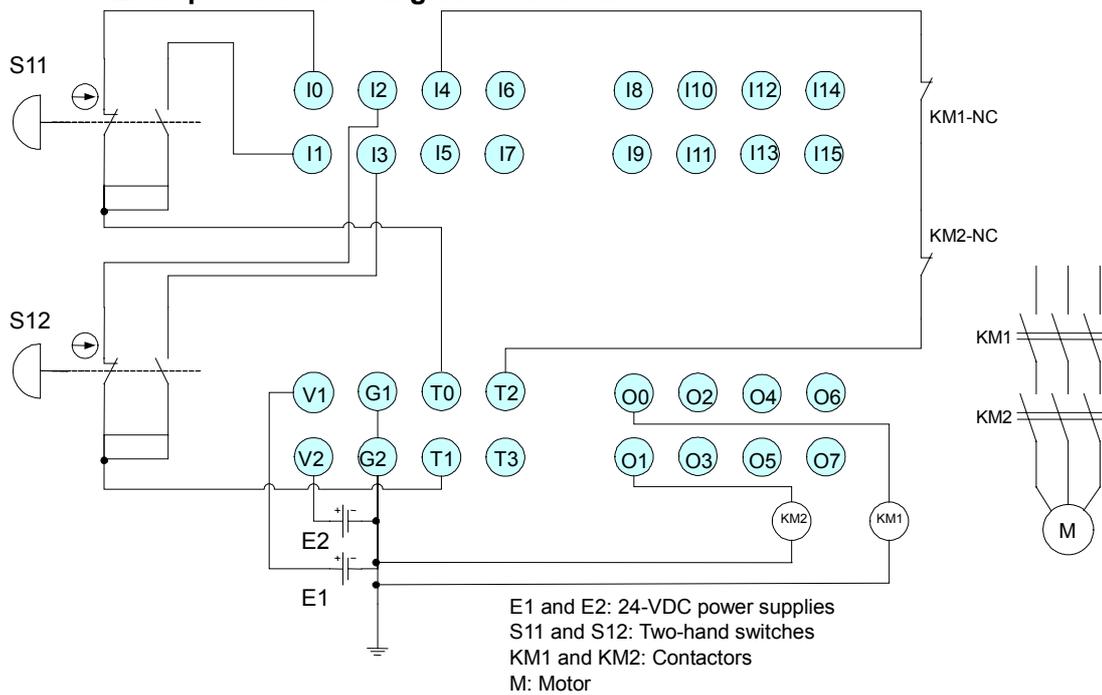
E1 and E2: 24-VDC power supplies
S11 and S12: Two-hand switches
KM1 and KM2: Contactors
M: Motor

Note: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).

Note: This example shows an NE1A-SCPU01(-V1) Controller's terminal layout.

Example of Connecting a Light Curtain
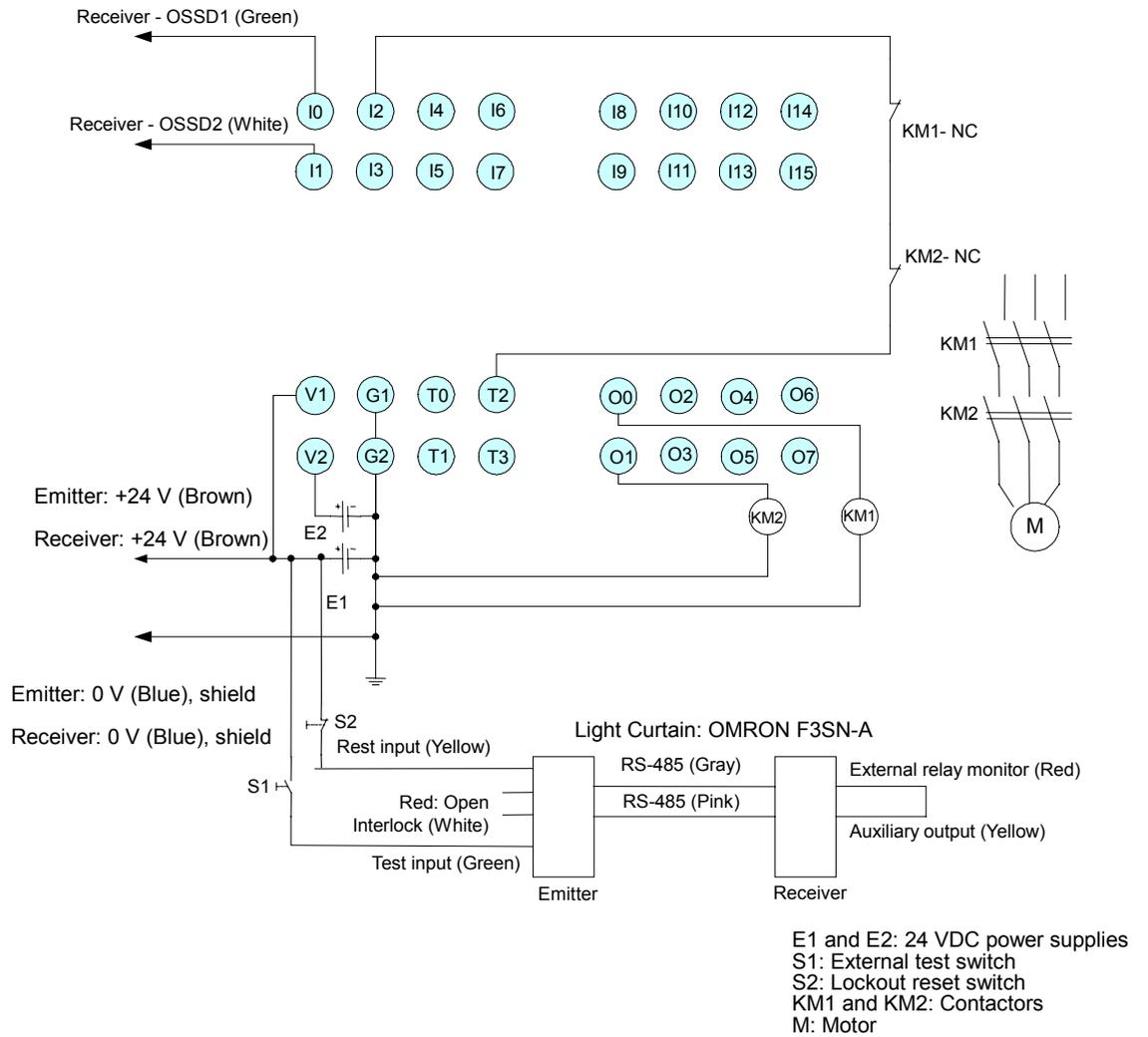
Note: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for the internal circuits).

Note: This example shows an NE1A-SCPU01(-V1) Controller's terminal layout.

Example of Connecting a User Mode Switch
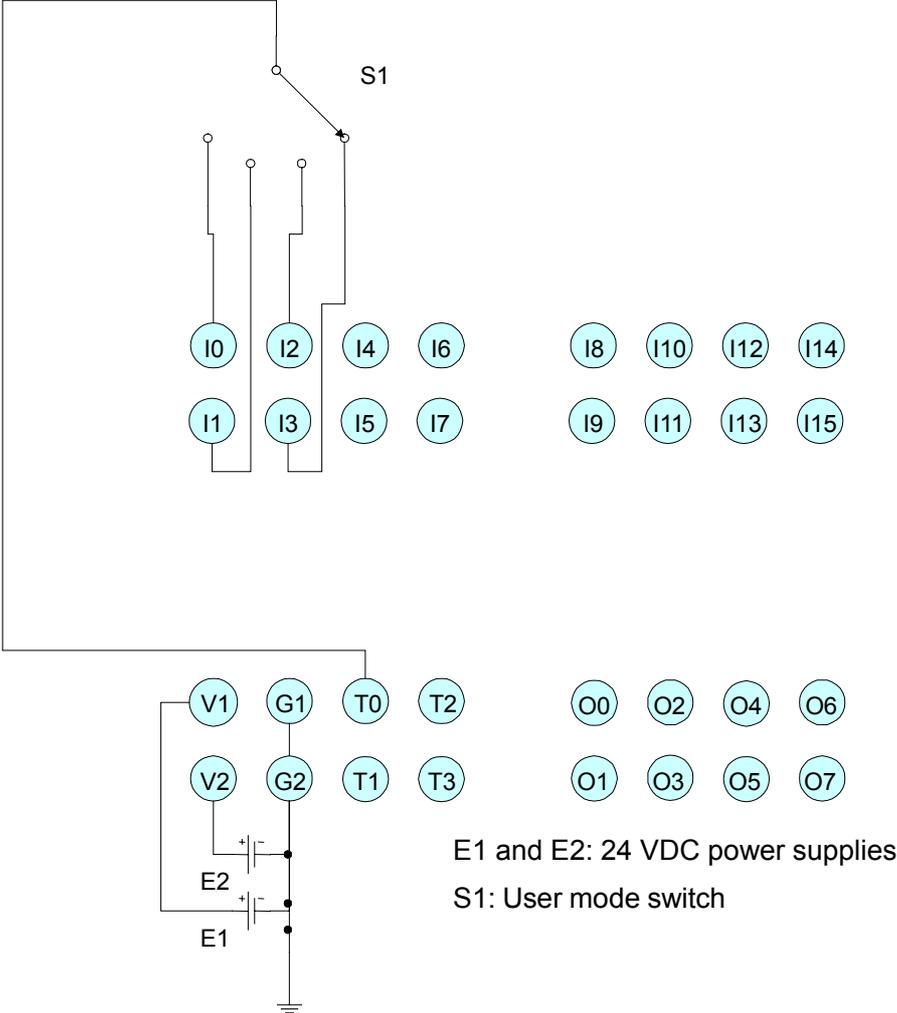
E1 and E2: 24 VDC power supplies

S1: User mode switch

Note: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).
Note: This example shows an NE1A-SCPU01(-V1) Controller's terminal layout.

3-2-4   DeviceNet Wiring

Wire the DeviceNet communications cable as shown in the following diagram.
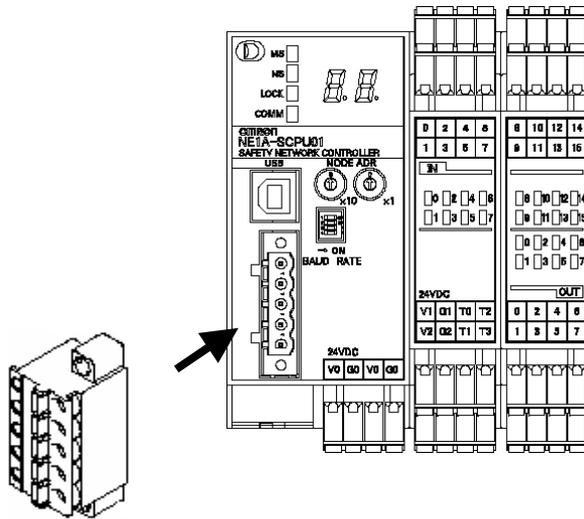
Stickers are placed on the communication connectors based on the color of each communications wire. By matching the communications wire colors with the connector sticker colors, you can check to see if wires are in the correct locations. The colors of the wires are as follows:
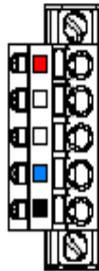
Color	Description
Red	V+
White	Signal (CAN H)
-	Drain
Blue	Signal (CAN L)
Black	V−

IMPORTANT:
- Turn OFF the power supply to the NE1A-series Controller, to all nodes on the network, and to communications lines before starting any wiring operations.
- Tighten the DeviceNet connector to the appropriate torque (0.25 to 0.3 N·m).
- Separate the DeviceNet communications cables from high-voltage/current lines.

Note: Refer to the *DeviceNet Operation Manual* (W267) for further information on wiring.

3-2-5   Wiring the USB Connector

A computer is connected to use the Network Configurator.
Use a commercially available USB-A to USB-B Male/Male cable to make the connection.

Note: Use a USB cable of 3 meters max.

Section 4
DeviceNet Communications Functions

4-1   Initial Setting

4-1-1   Hardware Setup

Node Address Setting

Set the DeviceNet node address using the rotary switches on the front of the NE1A-series Controller.

Method	Two-digit decimal number
Range	0 to 63

Note: The node address is set to 63 at the factory.

Any node address in the setting range can be used as long as the same address is not used by another node. If a value between 64 and 99 is set on the rotary switches, the node address can be set using a software setting on the Network Configurator.

Software Setting

Use the following procedure to set the node address using the Network Configurator.

1   Turn OFF the power and then set the rotary switches to a number between 64 and 99 (software setting).

2   Turn ON the power. The NE1A-series Controller will operate using the previous node address (factory set to 63).

3   Reset to the default settings using the Network Configurator's RESET command. The configuration information held in the device will be initialized.

4   Set the node address from the Network Configurator.

From here on, the NE1A-series Controller will operate with the node address set in the software setting.

IMPORTANT:
- Turn OFF power to the NE1A-series Controller before setting the node addresses.
- Do not change the rotary switches while the power is ON. The NE1A-series Controller will detect this as a change in the configuration and will switch to Abort State.
- A node address duplication error will occur if the same address is set for more than one node. Communications will not start if this error occurs.

Note: Use a small flat-blade screwdriver to set the rotary switches, being careful not to scratch them.

Baud Rate Setting

The DeviceNet baud rate is set using the DIP switch on the front of the NE1A-series Controller. The baud rates settings are shown in the following table:

Pin				Baud rate
1	2	3	4	
OFF	OFF	OFF	OFF	125 kbit/s
ON	OFF	OFF	OFF	250 kbit/s
OFF	ON	OFF	OFF	500 kbit/s
ON	ON	OFF	OFF	Software setting
ON or OFF	ON or OFF	ON	OFF	Software setting
ON or OFF	ON or OFF	ON or OFF	ON	Automatic baud rate detection

Note: The baud rate is set to 125 kbit/s at the factory.

Software Setting

The Network Configurator can be used to set the baud rate. The procedure is as follows:

1. Turn OFF the power and change the DIP switch to the "software setting."

2. Turn ON the power. When power is turned ON, the NE1A-series Controller will operate at the previous baud rate (default setting: 125 kbit/s).

3. Reset to the default settings using the Network Configurator's RESET command. The configuration information held in the device will be initialized.

4. Set the baud rate from the Network Configurator.

5. Reset the NE1A-series Controller by cycling the power or using the NE1A-series Controller RESET command from the Network Configurator. The NE1A-series Controller will then operate with the baud rate set from the Network Configurator, i.e., the software setting.

Automatic Baud Rate Detection

The NE1A-series Controller's baud rate can be set automatically to match the baud rate of the master on the network. The baud rate must be set in at least one Safety Master or Standard Master on the network. After turning ON the power, the baud rate is set when establishing communications, and the baud rate setting is stored until the next time power is turned ON.

IMPORTANT:

- Turn OFF power to the NE1A-series Controller before setting the DIP switch.
- Do not change the DIP switch setting while the power supply is ON. The NE1A-series Controller will detect this as a change in the configuration and will switch to ABORT State.
- The baud rate must be the same for all nodes (masters and slaves) on the network.

4-1-2   Software Settings

DeviceNet Communications Disable (Standalone) Setting

When DeviceNet Communications are disabled, the NE1A-series Controller stops all DeviceNet communications and operates as a Standalone Controller. The default is to have DeviceNet communications enabled (normal mode).
Make the setting from the Network Configurator. After the setting has been made, a reset command will be sent from the Network Configurator to the NE1A-series Controller to enable the setting.

Setting	Description
Enabled (Normal Mode)	DeviceNet communications enabled.
Disabled (Standalone Mode)	DeviceNet communications disabled. The SNC will operate as a Standalone Controller. "nd" will be displayed on the 7-segment display.

IMPORTANT:

- When DeviceNet communications are disabled, connect the NE1A-series Controller to the Network Configurator via the USB connection.
- When DeviceNet communications are disabled, operation using the Network Configurator can be performed via a USB connection.

4-2   Network Status Indication

Network status is indicated using the NS (network status) indicator on the NE1A-series Controller.

The 7-segment display shows the NE1A-series Controller's node address during normal conditions, and the error code and the node address of the error during error conditions. Also, when DeviceNet communications are disabled (Standalone Mode), "nd" is displayed during normal conditions.
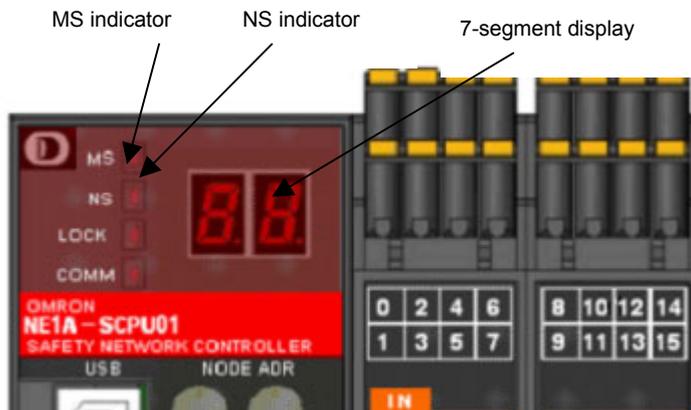
MS/NS Indicators

Indicator name	Color	Status	Meaning
MS (module status)	Green	ON	Operation status
		Flashing	Idle status
	Red	ON	Critical error status
		Flashing	Abort status
	Green/red	Flashing	Waiting for TUNID setting during self-diagnosis or waiting for configuration.
	-	OFF	Power is not supplied.
NS (network status)	Green	ON	Online connection has been established.
		Flashing	Online connection has not been established.
	Red	ON	Unable to communicate.
		Flashing	I/O communications error
	Green/red	Flashing	Waiting for TUNID setting.
	-	OFF	Not online (including Standalone Mode).

⊐⊏ : ON ⊐◀ : Flashing ■ : OFF

Seven-segment Display

The 7-segment display indicates the NE1A-series Controller's node address during normal conditions, and the error code and the node address of the error during error conditions. Also, "nd" is displayed during normal conditions if DeviceNet communications are disabled (i.e., Standalone Mode).

Status		Display	
Normal condition with DeviceNet enabled	Operating mode: RUN mode Safety I/O communications: Operating or not set	Shows the Controller's node address (00 to 63).	Lit
	Operating mode: RUN mode Safety I/O communications: Not operating		Flashing
	Operating mode: Self-testing, configuring, or idle		Flashing
Normal condition with DeviceNet disabled	Operating mode: RUN mode	"nd"	Lit
	Operating mode: Self-testing, configuring, or idle		Flashing
Error conditions	Critical error	Indefinite	
		Only error code	Lit
	Abort	Only error code	Lit
	Nonfatal error	Alternates between displaying the error code and the node address where the error occurred.	

Note: The errors are indicated by the combination of the MS indicator, NS indicator, and the 7-segment display. For further details on specific meanings, refer to *Section 10 Troubleshooting.*

4-3   Remote I/O Allocations

4-3-1   Remote I/O Area Allocation Overview

The remote I/O areas used in Safety Masters/Slaves and Standard Masters/Slaves are automatically allocated in the NE1A-series Controller's I/O memory according to settings made from the Network Configurator. I/O of the destination communications slave and the I/O area for an NE1A-series slave are displayed as I/O tags. Using I/O tags allows a user to program without being conscious of the NE1A-series Controller's memory addresses.

I/O of the registered slave is displayed as I/O tags.

Programming with I/O tags
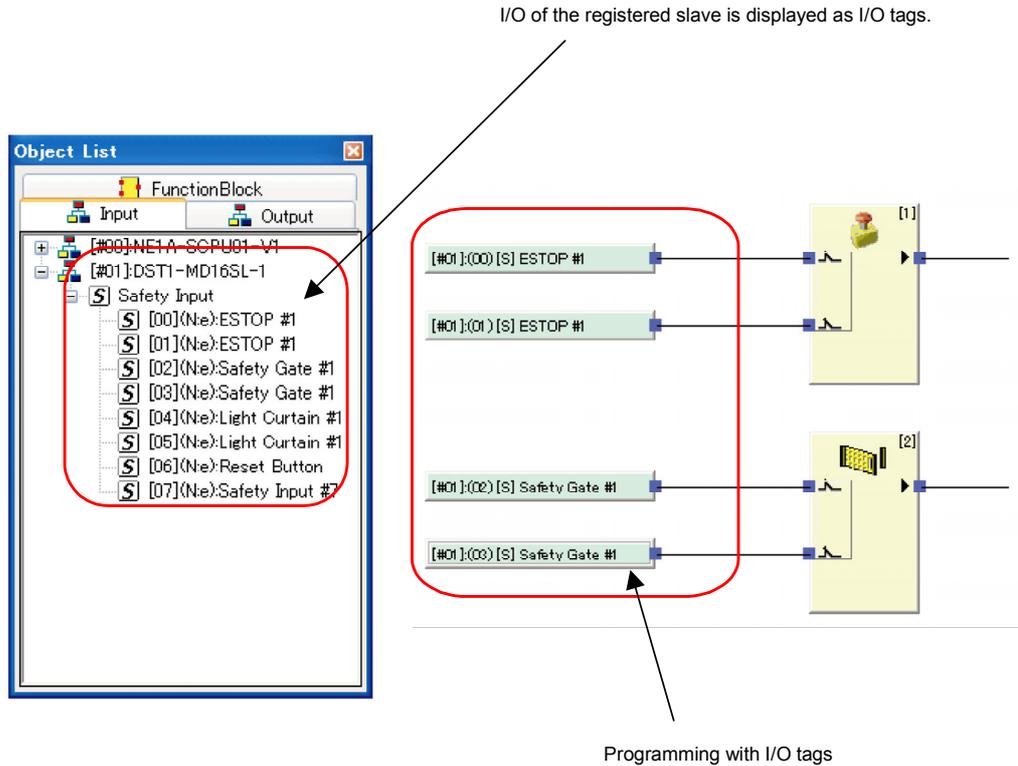
4-3-2   Remote I/O Area Attributes

Remote I/O Area Attributes

The NE1A-series Controller's remote I/O area has the following attributes.
All values in the safety remote I/O area will be cleared if the operating mode is changed. If a communications error occurs, all data for the connection for which the error occurred will be cleared.

	Mode change		Communications error	Power ON
	RUN to Idle	RUN or Idle to Configuration		
Safety remote I/O area (DeviceNet Safety)	Cleared (safety state)	Cleared (safety state)	Cleared for connection (safety state)	Cleared (safety state)
Standard remote I/O area (DeviceNet)	Depends on Slave I/O area hold setting.	Cleared	Depends on Slave I/O area hold setting.	Cleared

Note: Refer to *Section 8 Operating Modes and Power Supply Interruptions* for details on each operating mode.

Slave I/O Area Hold Setting

This setting specifies whether to clear or hold the data in a slave I/O area when the operating mode is changed or when a communications error occurs.

Setting	Description	Default	Validity
Clear	The slave output area (inputs to a user application program) is cleared when a communications (connection) error occurs. The slave input area (outputs to a Standard Master) is cleared when the operating mode is changed to IDLE Mode.	Clear	When power supply is cycled
Hold	The last data in the slave output area (inputs to a user application program) is held when a communications (connection) error occurs. The last data in the slave input area (outputs to a Standard Master) is held when the operating mode is changed to IDLE Mode. Values are cleared, however, when a critical error or abort occurs or when the power supply is turned ON again.		

4-3-3   Remote I/O Area Data Configuration

The Network Configurator can be used to specify the data transferred by the NE1A-series Controller as Safety Slave or Standard Slave input data. This section describes the data that can be set, the setting method, and the data configuration.

Configuration of Data to Be Transferred

The Pre-Ver. 1.0 NE1A-series Controllers can combine status data and I/O data and transfer them as remote I/O data.

NE1A-series Controllers with unit version 1.0 or later can combine status data, local I/O monitor data, and I/O data and transfer them as remote I/O data.

The data that is transferred is determined by the configuration. The data is normally configured of status data, local I/O monitor data, and I/O data, in that order. The status data can be collected in the PLC to create a monitoring system. The data can also be configured of only status data, only local I/O monitor data, or only I/O data.

Sample 1: Transmitting both Status Data and I/O Tags as Safety Slave Inputs
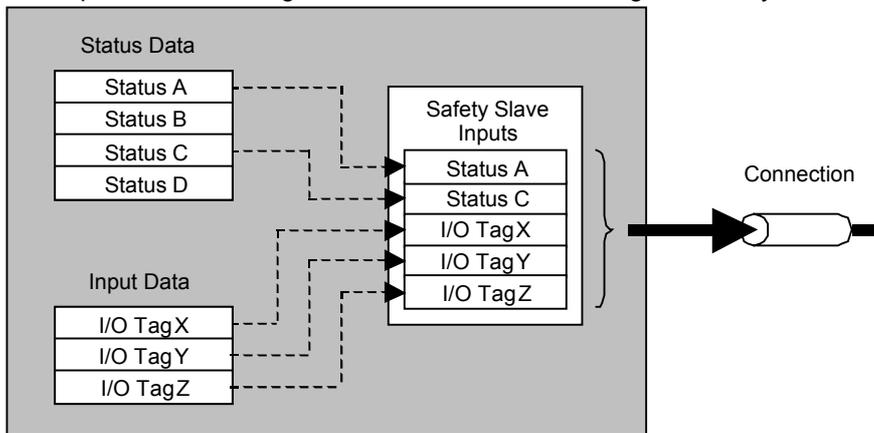
Sample 2: Transmitting Only I/O Tags as Safety Slave Inputs
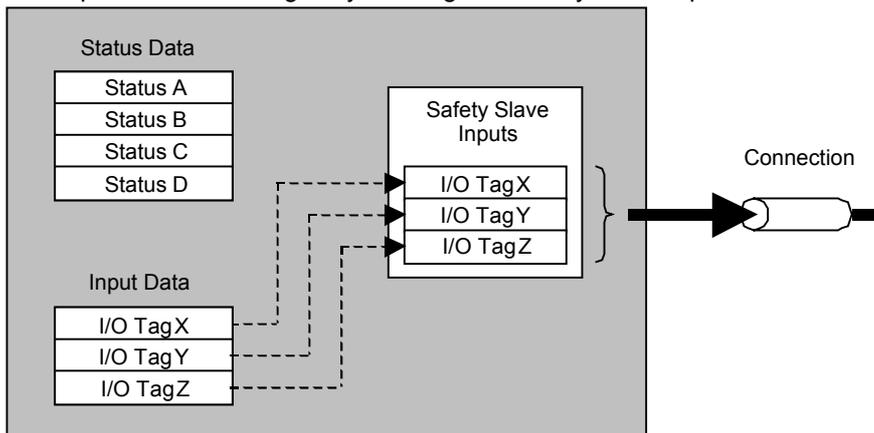
Sample 3: Transmitting Only Status Data as Standard Slave Inputs
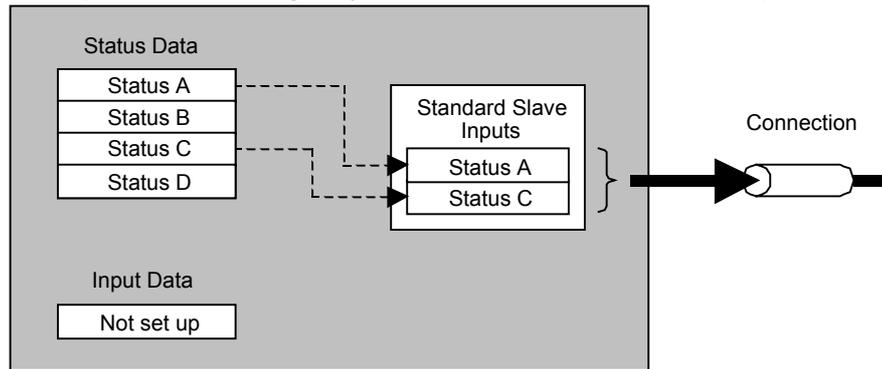
Data That Can Be Set and Example Arrangements

The following table shows the data that can be set.

· Pre-Ver. 1.0 NE1A-series Controllers

Data type	Name/format	Data size	Setting method using Network Configurator	Attribute
Status	General Status	Byte	Set using checkbox.	Non-safety
	Local Input Status	Word	Set using checkbox.	Safety
	Local Output Status	Byte	Set using checkbox.	Safety
	Test Output/Muting Lamp Status	Byte	Set using checkbox.	Non-safety
I/O tags	BOOL I/O Tags	Byte	User registered.	Safety
	BYTE I/O Tags	Byte	User registered.	Safety
	WORD I/O Tags	Word	User registered.	Safety
	DWORD (Double Word) I/O Tags	Double word	User registered.	Safety

· NE1A-series Controllers with Unit Version 1.0 or Later

Data type	Name/format	Data size	Setting method using Network Configurator	Attribute
Status	General Status	Byte	Set using checkbox.	Non-safety
	Local I/O Status 1 to N (See note 1.)	Byte	Set using checkbox.	Safety
	Local Output Status	Byte	Set using checkbox.	Safety
	Test Output/Muting Lamp Status 1 to M (See note 1.)	Byte	Set using checkbox.	Non-safety
Local I/O monitor	Local Input Monitor 1 to N (See note 1.)	Byte	Set using checkbox.	Safety
	Local Output Monitor	Byte	Set using checkbox.	Safety
I/O tags	BOOL I/O Tags	Byte	User registered.	Safety
	BYTE I/O Tags	Byte	User registered.	Safety
	WORD I/O Tags	Word	User registered.	Safety
	DWORD (Double Word) I/O Tags	Double word	User registered.	Safety

Note 1: For the NE1A-SCPU01-V1, N = 2 and M = 1. For the NE1A-SCPU02, N = 5 and M = 2. The sizes of the local input status, test output/muting lamp status, and local input monitor status data can be specified in bytes.

2: The measures required for handling data as safety data in the data generation process will not be executed for status and I/O tag data items with a non-safety attribute. Therefore do not use those items to configure a safety system.

Moreover, even if the attribute for an item is "safety," it will become "non-safety" for data input using standard I/O communications or for I/O tags connected with standard devices. Therefore, those items must also not be used to configure a safety system.

If the above data is combined, the I/O data will be configured as follows:

(1) When status data is set, the status is allocated at the beginning of the remote I/O area in the order shown below. (Status areas that are not set are not reserved, i.e., no unassigned areas are left.)

General Status
↓
Local Input Status
↓
Local Output Status
↓
Test Output/Muting Lamp Status

(2) When the local I/O monitor data is set (Controllers with unit version 1.0 or later only), the local I/O monitor data is attached after the other status data in the following order. (When local I/O monitor data is not set, the data will be shifted forward and that local I/O monitor area will not be reserved. This area does not exist in Pre-Ver. 1.0 Controllers.)

Local Input Monitor
↓
Local Output Monitor

(3) After the status data and local I/O monitor data, user-registered I/O tags are allocated in the remote I/O area in the order of registration. At this time, free areas are not reserved and all valid data is allocated with no unassigned areas.

Examples of settings from the Network Configurator are shown below, along with the remote I/O area arrangements.

Setting Example 1: Settings from Network Configurator (Unit Version 1.0 or Later)
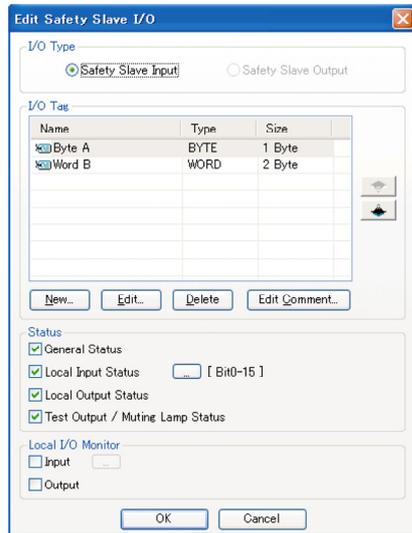
The following table shows the remote I/O area arrangement when the above settings are made.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	General Status (1 byte)							
1	Local Input Status 1 (1 byte)							
2	Local Input Status 2 (1 byte)							
3	Local Output Status (1 byte)							
4	Test Output/Muting Lamp Status (1 byte)							
5	Byte A (1 byte)							
6	Word B (2 bytes)							
7								

Setting Example 2: Settings from Network Configurator (Unit Version 1.0 or Later)
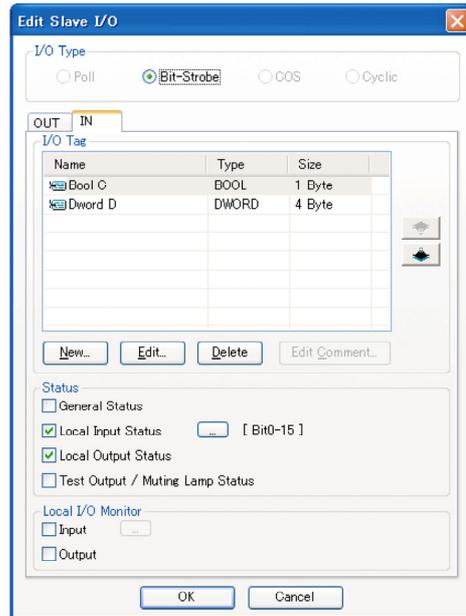
The following table shows the remote I/O area arrangement when the above settings are made.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Local Input Status 1 (1 byte)							
1	Local Input Status 2 (1 byte)							
2	Local Output Status (1 byte)							
3	Bool C (1 byte)							
4	Dword D (4 bytes)							
5								
6								
7								

Setting Example 3: Settings from Network Configurator (Controllers with Unit Version 1.0 or Later)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Local Input Status 1 (1 byte)							
1	Local Input Status 3 (1 byte)							
2	Local Input Status 5 (1 byte)							
3	Local Output Status (1 byte)							
4	Local Input Monitor 1 (1 byte)							
5	Local Input Monitor 3 (1 byte)							
6	Local Input Monitor 5 (1 byte)							
7	Local Output Monitor (1 byte)							
8	Bool E (1 byte)							
9	Byte F (1 byte)							

Bit Arrangements for Each Type of Data

The bit arrangements for status data and I/O tag settings are shown below.

Status Details

The following tables show the status details.

General Status (1 Byte)   **Attribute: Non-safety Data**

Bit	Content	Description
0	Input Power Supply Voltage Status Flag OFF: Normal power supply is ON. ON: Power supply voltage error or power supply is OFF.	Indicates the status of the power supply voltage for inputs.
1	Output Power Supply Voltage Status Flag OFF: Normal power supply is ON. ON: Power supply voltage error or power supply is OFF.	Indicates the status of the power supply voltage for outputs.
2	Standard I/O Communications Error Flag OFF: No error ON: Error	Indicates if there is any error in standard I/O communications. "Error" indicates that an error has been detected in one or more connections.
3	Standard I/O Communications Status Flag OFF: I/O communications stopped or error ON: I/O communications in progress	Indicates whether standard I/O communications are in progress. ON if normal communications are in progress for all connections.
4	Safety I/O Communications Error Flag OFF: No error ON: Error	Indicates if there is any error in Safety I/O communications. "Error" indicates that an error has been detected in one or more connections.
5	Safety I/O Communications Status Flag OFF: I/O communications stopped or error ON: I/O communications in progress	Indicates whether Safety I/O communications are in progress. ON if normal communications are in progress for all connections.
6	Operating Mode Flag OFF: Not RUN Mode ON: RUN Mode	Indicates the operating mode of the NE1A-series Controller.
7	NE1A Status Flag OFF: Error ON: Normal	Indicates the status of the NE1A-series Controller. This flag will indicate an error when an error indicated in the error details (*10-4-2 Error Information Details*) occurs.

Local Input Status (2 Bytes, Pre-Ver. 1.0 Controllers)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 7 status	Safety input terminal 6 status	Safety input terminal 5 status	Safety input terminal 4 status	Safety input terminal 3 status	Safety input terminal 2 status	Safety input terminal 1 status	Safety input terminal 0 status
1	Safety input terminal 15 status	Safety input terminal 14 status	Safety input terminal 13 status	Safety input terminal 12 status	Safety input terminal 11 status	Safety input terminal 10 status	Safety input terminal 9 status	Safety input terminal 8 status

ON: Normal, OFF: Error

Local Input Status 1 (1 Byte, Controllers with Unit Version 1.0 or Later)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 7 status	Safety input terminal 6 status	Safety input terminal 5 status	Safety input terminal 4 status	Safety input terminal 3 status	Safety input terminal 2 status	Safety input terminal 1 status	Safety input terminal 0 status

ON: Normal, OFF: Error

Local Input Status 2 (1 Byte, Controllers with Unit Version 1.0 or Later)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 15 status	Safety input terminal 14 status	Safety input terminal 13 status	Safety input terminal 12 status	Safety input terminal 11 status	Safety input terminal 10 status	Safety input terminal 9 status	Safety input terminal 8 status

ON: Normal, OFF: Error

Local Input Status 3 (1 Byte, NE1A-SCPU02)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 23 status	Safety input terminal 22 status	Safety input terminal 21 status	Safety input terminal 20 status	Safety input terminal 19 status	Safety input terminal 18 status	Safety input terminal 17 status	Safety input terminal 16 status

ON: Normal, OFF: Error

Local Input Status 4 (1 Byte, NE1A-SCPU02)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 31 status	Safety input terminal 30 status	Safety input terminal 29 status	Safety input terminal 28 status	Safety input terminal 27 status	Safety input terminal 26 status	Safety input terminal 25 status	Safety input terminal 24 status

ON: Normal, OFF: Error

Local Input Status 5 (1 Byte, NE1A-SCPU02)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 39 status	Safety input terminal 38 status	Safety input terminal 37 status	Safety input terminal 36 status	Safety input terminal 35 status	Safety input terminal 34 status	Safety input terminal 33 status	Safety input terminal 32 status

ON: Normal, OFF: Error

Local Output Status (1 Byte)   Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety output terminal 7 status	Safety output terminal 6 status	Safety output terminal 5 status	Safety output terminal 4 status	Safety output terminal 3 status	Safety output terminal 2 status	Safety output terminal 1 status	Safety output terminal 0 status

ON: Normal, OFF: Error

Test Output/Muting Lamp Status (1 Byte) (Pre-Ver. 1.0) Attribute: Non-safety

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Test output terminal 3 disconnection detected status	Reserved			Test output terminal 3 status	Test output terminal 2 status	Test output terminal 1 status	Test output terminal 0 status

ON: Normal, OFF: Error

Test Output/Muting Lamp Status 1 (1 Byte) (Unit Version 1.0 or Later) Attribute: Non-safety

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Test output terminal 3 disconnection detected status	Reserved			Test output terminal 3 status	Test output terminal 2 status	Test output terminal 1 status	Test output terminal 0 status

ON: Normal, OFF: Error

Test Output/Muting Lamp Status 2 (1 Byte) (NE1A-SCPU02) Attribute: Non-safety

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Test output terminal 7 discon- nection detected status	Reserved			Test output terminal 7 status	Test output terminal 6 status	Test output terminal 5 status	Test output terminal 4 status

ON: Normal, OFF: Error

Local Input Monitor 1 (1 Byte, Controllers with Unit Version 1.0 or Later) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 7 monitor	Safety input terminal 6 monitor	Safety input terminal 5 monitor	Safety input terminal 4 monitor	Safety input terminal 3 monitor	Safety input terminal 2 monitor	Safety input terminal 1 monitor	Safety input terminal 0 monitor

ON: Normal, OFF: Error

Local Input Monitor 2 (1 Byte, Controllers with Unit Version 1.0 or Later) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 15 monitor	Safety input terminal 14 monitor	Safety input terminal 13 monitor	Safety input terminal 12 monitor	Safety input terminal 11 monitor	Safety input terminal 10 monitor	Safety input terminal 9 monitor	Safety input terminal 8 monitor

ON: Normal, OFF: Error

Local Input Monitor 3 (1 Byte, NE1A-SCPU02) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 23 monitor	Safety input terminal 22 monitor	Safety input terminal 21 monitor	Safety input terminal 20 monitor	Safety input terminal 19 monitor	Safety input terminal 18 monitor	Safety input terminal 17 monitor	Safety input terminal 16 monitor

ON: Normal, OFF: Error

Local Input Monitor 4 (1 Byte, NE1A-SCPU02) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 31 monitor	Safety input terminal 30 monitor	Safety input terminal 29 monitor	Safety input terminal 28 monitor	Safety input terminal 27 monitor	Safety input terminal 26 monitor	Safety input terminal 25 monitor	Safety input terminal 24 monitor

ON: Normal, OFF: Error

Local Input Monitor 5 (1 Byte, NE1A-SCPU02) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal 39 monitor	Safety input terminal 38 monitor	Safety input terminal 37 monitor	Safety input terminal 36 monitor	Safety input terminal 35 monitor	Safety input terminal 34 monitor	Safety input terminal 33 monitor	Safety input terminal 32 monitor

ON: Normal, OFF: Error

Local Output Monitor (1 Byte) Attribute: Safety Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety output terminal 7 monitor	Safety output terminal 6 monitor	Safety output terminal 5 monitor	Safety output terminal 4 monitor	Safety output terminal 3 monitor	Safety output terminal 2 monitor	Safety output terminal 1 monitor	Safety output terminal 0 monitor

ON: Normal, OFF: Error

I/O Tag Details

The following tables show the I/O tag details.

BOOL

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Open (=0)							User data Bit 0

BYTE

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	User data Bit 7	User data Bit 6	User data Bit 5	User data Bit 4	User data Bit 3	User data Bit 2	User data Bit 1	User data Bit 0

WORD

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	User data Bit 7	User data Bit 6	User data Bit 5	User data Bit 4	User data Bit 3	User data Bit 2	User data Bit 1	User data Bit 0
1	User data Bit 15	User data Bit 14	User data Bit 13	User data Bit 12	User data Bit 11	User data Bit 10	User data Bit 9	User data Bit 8

DWORD

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	User data Bit 7	User data Bit 6	User data Bit 5	User data Bit 4	User data Bit 3	User data Bit 2	User data Bit 1	User data Bit 0
1	User data Bit 15	User data Bit 14	User data Bit 13	User data Bit 12	User data Bit 11	User data Bit 10	User data Bit 9	User data Bit 8
2	User data Bit 23	User data Bit 22	User data Bit 21	User data Bit 20	User data Bit 19	User data Bit 18	User data Bit 17	User data Bit 16
3	User data Bit 31	User data Bit 30	User data Bit 29	User data Bit 28	User data Bit 27	User data Bit 26	User data Bit 25	User data Bit 24

Unused bits among the above user-registered I/O tags will be fixed at 0.

4-4　Safety Master Function

4-4-1　Safety I/O Communications as Safety Master

Safety I/O communications are used to exchange data automatically with Safety Slaves without user programming.

To perform safety I/O communications with other slaves, the following items are required:
1. Registration of slave devices in the NE1A-series Controller.
2. Safety I/O connection settings.
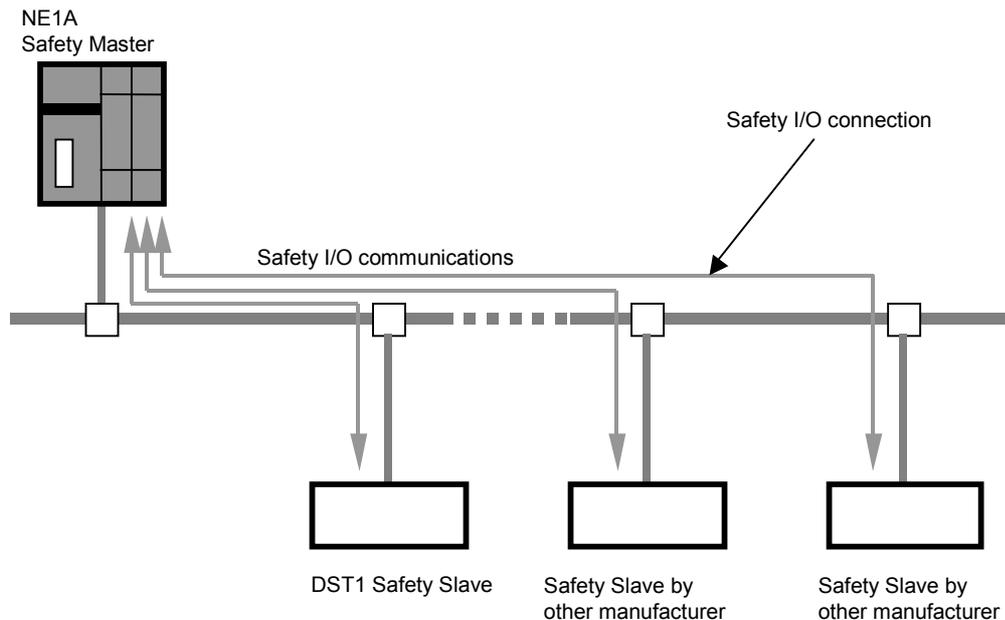
Safety Master Specifications

Safety I/O Connections	
Number of connections	Pre-Ver. 1.0 Controllers: 16 max. Controllers with unit version 1.0 or later: 32 max.
Maximum data size	16 bytes of input or 16 bytes of output (per connection)
Connection type	Single cast or multicast

Safety Slave Allocations

Safety Slaves that communicate with the NE1A-series Controller are allocated automatically in the Controller's I/O memory based on the settings made from the Network Configurator. In the Logic Editor, slave I/O is displayed as I/O tags. Using these I/O tags allows a user to program without being aware of specific memory addresses in the NE1A-series Controller.

4-4-2   Safety I/O Connection Settings

Safety connections must be set in order to perform safety I/O communications between the NE1A-series Controller and the Safety Slaves. A "connection" is a logical communications path for a master and slave to communicate with each other.

Safety I/O connection settings include the following settings:

1. I/O connection settings (Selecting I/O data used in the slave.)
2. Open type setting
3. Connection type setting
4. EPI (data expected packet interval) setting

(1) Select I/O data for each slave.

Safety Input Slave

Data A
Data B
Data C

NE1A (Safety Master)
I/O memory (inputs)
Data B
Data D
I/O memory (outputs)
Data F

Safety Output Slave
Data F

Safety Input Slave
Data D
Data E

(2) Network Configurator automatically allocates Safety Slaves.

(3) Select safety connection and set network parameters for each connection
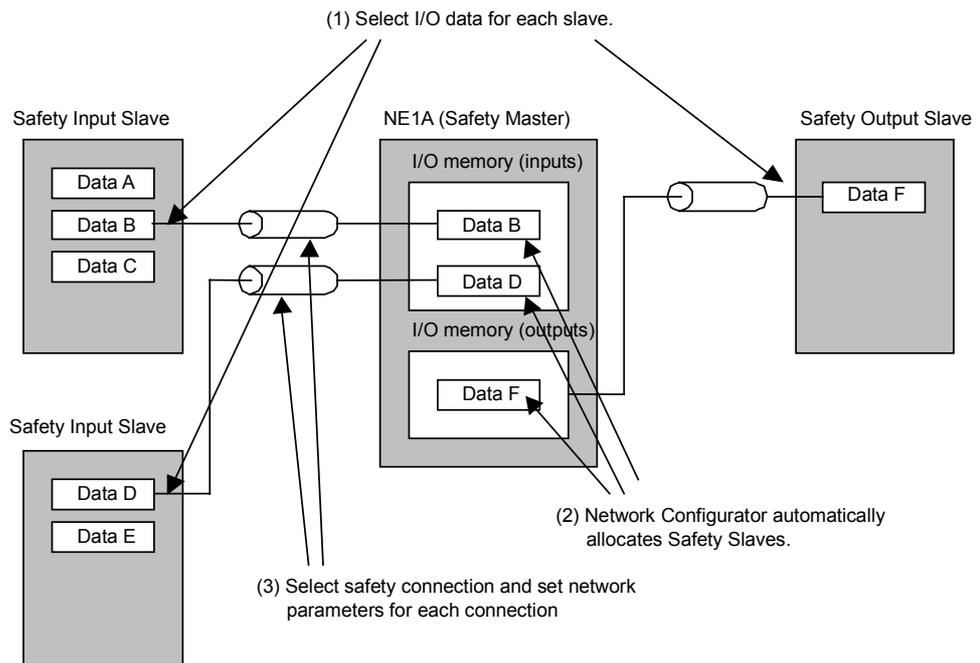
I/O Connection Settings

Some slaves have multiple I/O data (I/O assembly data) internally and the data to be communicated from them can be selected. Here, the data to allocated in the NE1A-series Controller can be specified from the data in the registered Safety Slave.
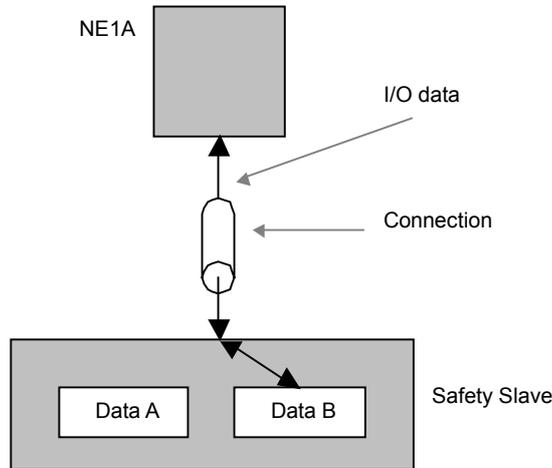
Open Type Setting

Select the open type that the NE1A-series Controller uses when establishing a connection.

Open type	Description
Configure the Safety Slave	Configures the Safety Slave when establishing the connection.
Check the Safety Signature	Checks that the configuration of the Safety Slave is correct by checking the safety signature when establishing the connection.
Open Only	Does not check that the configuration of Safety Slave is correct when establishing the connection.

⚠ WARNING

Serious injury may possibly occur due to loss of required safety functions. Serious injury may possibly occur due to loss of required safety functions. Always be sure that the Safety Master or Safety Slave has the correct configuration before setting the open type to *Open Only*.

Connection Type Setting

Select the safety connection type to use with Safety Slaves.
Either of the following two safety connections can be selected.

Connection type	Description
Multi-cast Connection	Multicast connections can be selected only for Safety Input Slaves. When a multicast connection is selected, the Safety Input Slave can transmit the input data to a maximum of 15 NE1A-series Safety Masters in multicast mode. NE1A-series Safety Masters that have the same I/O data type specified for I/O connections and the same EPI value are handled as the same multicast group. It is possible to select this connection even for just one NE1A-series Safety Master.
Single-cast Connection	With a Single cast connected, the Safety Master and Safety Slave perform 1:1 Safety I/O communications.

EPI (Data Expected Packet Interval) Setting

Set the interval to communicate safety data between the NE1A-series Safety Master and Safety Slaves. Devices that transmit data to network are monitored to confirm they can transmit the data within the set time interval and devices that receive data are monitored to confirm they can receive normal data within the data transmission interval using timers. If the data is not received, the connection is disconnected and a switch is made to the safety state.

Note:

- The time set here affects the network reaction time.
  Refer to *Section 9 Remote I/O Communications Performance and Local I/O Response Time* and to *Section 3 Constructing a Safety Network* in the *DeviceNet Safety System Configuration Manual* (Cat. No. Z905) for information on the network reaction time.
- The minimum set for the EPI is either the cycle time of the Safety Network Controller or the cycle time of the Safety Slaves (always 6 ms), whichever is greater. The minimum setting for the EPI will therefore be affected if the cycle time of the Safety Network Controller is longer then 6 ms.

4-4-3   Stopping/Resetting Communications after an Error

With Controllers with unit version 1.0 or later, the user can specify whether to stop or continue I/O communications after the connection times out during safety I/O communications with the safety slave. If I/O communications are stopped because of a timeout error, the communications can be restarted from the logic program or a Programming Device.
With Pre-Ver. 1.0 Controllers, I/O communications are continued (automatic recovery).

Setting the Operating Mode after a Communications Error

One of the following modes can be selected to specify the Controller's operation when there is a connection timeout during safety I/O communications with the safety slave.

Mode after communications error	Description
Automatic recovery	Specify this mode to re-establish the safety I/O connection for a connection in which a safety I/O communications error has occurred. If the cause of the communications error is eliminated, safety I/O communications will restart automatically.
Stop only the connection where the error occurred.	Specify this mode to keep safety I/O communications stopped on a connection in which a safety I/O communications error has occurred. I/O communications will continue for normal connections. To restart safety I/O communications for connections in which I/O communications have been stopped, use the Network Configurator to send a command to restart communications. It is also possible to write a logic routine in the logic program in advance to turn ON the specified Safety I/O Communications Restart Flag and restart communications with a specified trigger bit.
Stop all connections	Specify this mode to stop safety I/O communications with all safety slaves stopped after a safety I/O communications error has occurred. To restart safety I/O communications with the safety slaves after I/O communications have been stopped, use the Network Configurator to send a command to restart communications. It is also possible to write a logic routine in the logic program in advance to turn ON all of the Safety I/O Communications Restart Flags and restart communications with a specified trigger bit.

Resetting a Connection Stopped due to a Communications Error

When I/O communications have stopped in a connection due to a connection timeout, I/O communications can be restarted in the stopped connection by turning ON the Communications Reset Flag from the logic program or sending a Communications Restart command from the Network Configurator. If the Controller communications mode is set to stop all connections after a communications error, communications cannot be restarted in a specified stopped connection. In this case, restart communications in all connections.

(1) Restarting I/O Communications from the Network Configurator
After connecting online with the Network Configurator, select the Safety Master, right-click to display the popup menu, and select *Monitor* to display the Device Monitor Window. The following window will appear when the safety connection is selected.
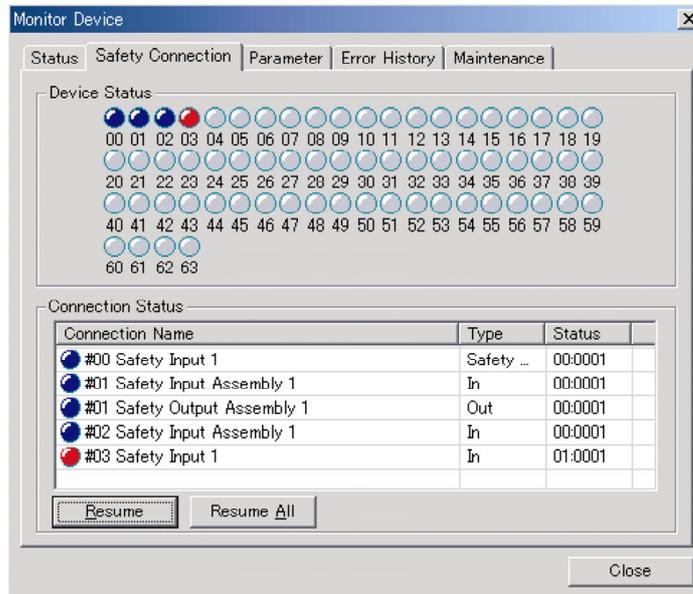
Communications can be restarted in a connection where an error occurred (evident from the connection status) by selecting that connection and clicking the **Resume** Button. If the **Resume All** Button is clicked, I/O communications will restart in all Slaves with which communications were stopped.

(2) Restarting I/O Communications from the Logic Program
When the safety connection is set, the following logic program output tags will be displayed for the connection.

Communications restart tags for specific connections

Communications restart tag for all connections
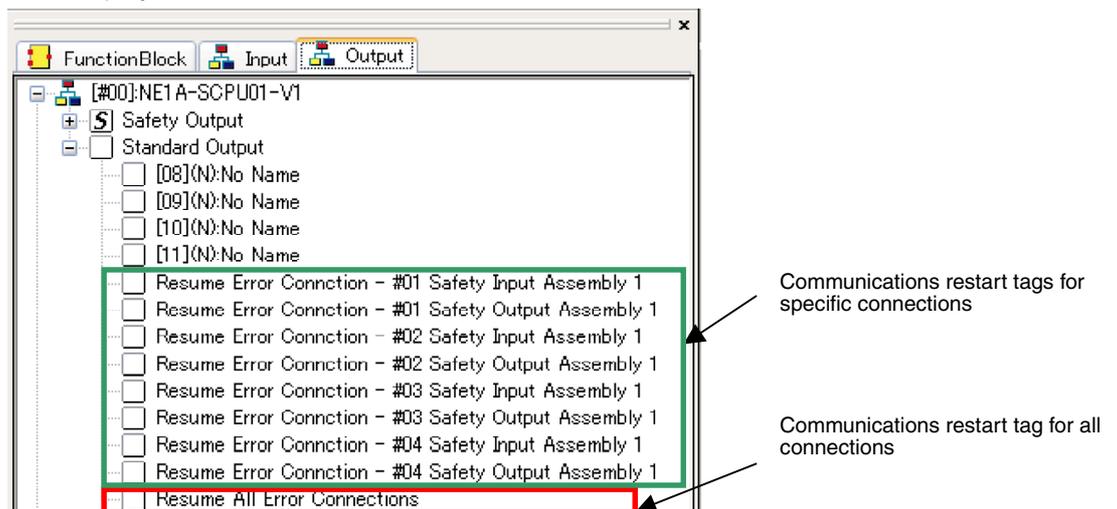
When these tags have been set in the logic program in advance as I/O communications restart conditions, I/O communications can be restarted with these tags by turning ON (OFF → ON) the specified condition.

4-5   Safety Slave Function

4-5-1   Safety I/O Communications as Safety Slave

An NE1A-series Controller can function as a Safety Slave.
One NE1A-series Controller can function simultaneously as a Safety Master, Safety Slave, and Standard Slave.

The following steps are required in order for the NE1A-series Controller to perform safety I/O communications as a Safety Slave.
1. Creation of I/O data (safety slave I/O) to use as a Safety Slave
2. Registration in the Safety Master
3. Safety I/O connections settings in the Safety Master
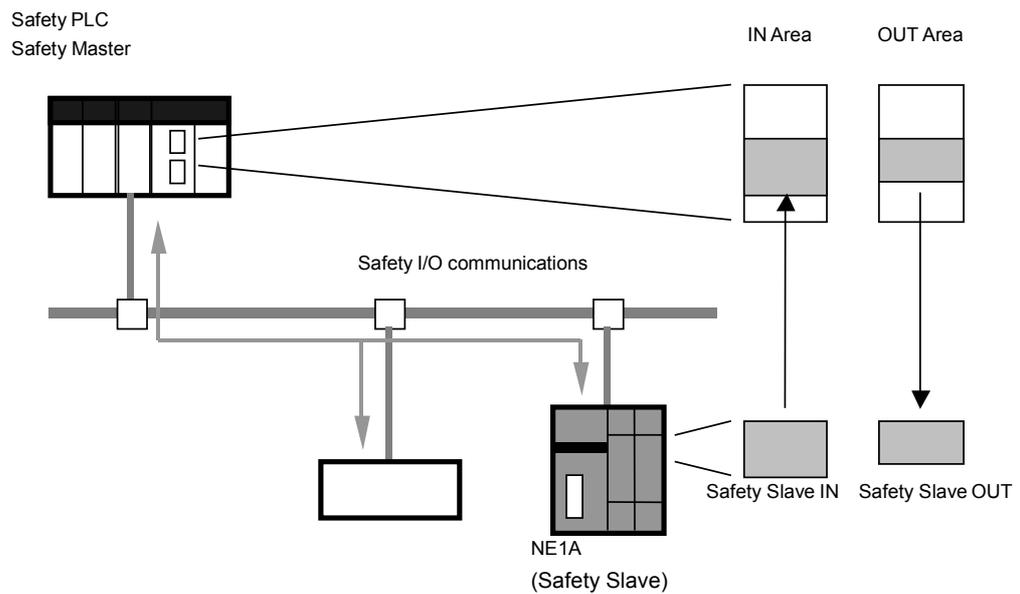
Safety Slave Specifications

Safety I/O Connections	
Number of connections	4 max.
Maximum data size	16 bytes of input or 16 bytes of output (per connection)
Connection type	Single cast or multicast (See note.)

Note: Up to 15 masters total can be communicated with for one multicast connection.

4-5-2   Creating I/O Data (Safety Slave I/O) to Use as Safety Slave

The I/O data to be used by the Safety Slave must be created in order for the NE1A-series Controller to perform safety I/O communications as a Safety Slave. The memory block for this I/O data is called Safety Slave I/O.

- Up to four types of Safety Slave I/O can be created.
- The maximum data size for Safety Slave I/O is 16 bytes.
- The following status information can be included in I/O data if the I/O type of the Safety Slave I/O is Slave IN.
  - General Status
  - Local Input Status
  - Local Output Status
  - Test Output/Muting Lamp Status
- If the I/O type of the Safety Slave I/O is set to Slave IN for a NE1A-series Controller with unit version 1.0 or later, the following local I/O monitor data can also be included in the I/O data.
  - Local Input Monitor
  - Local Output Monitor
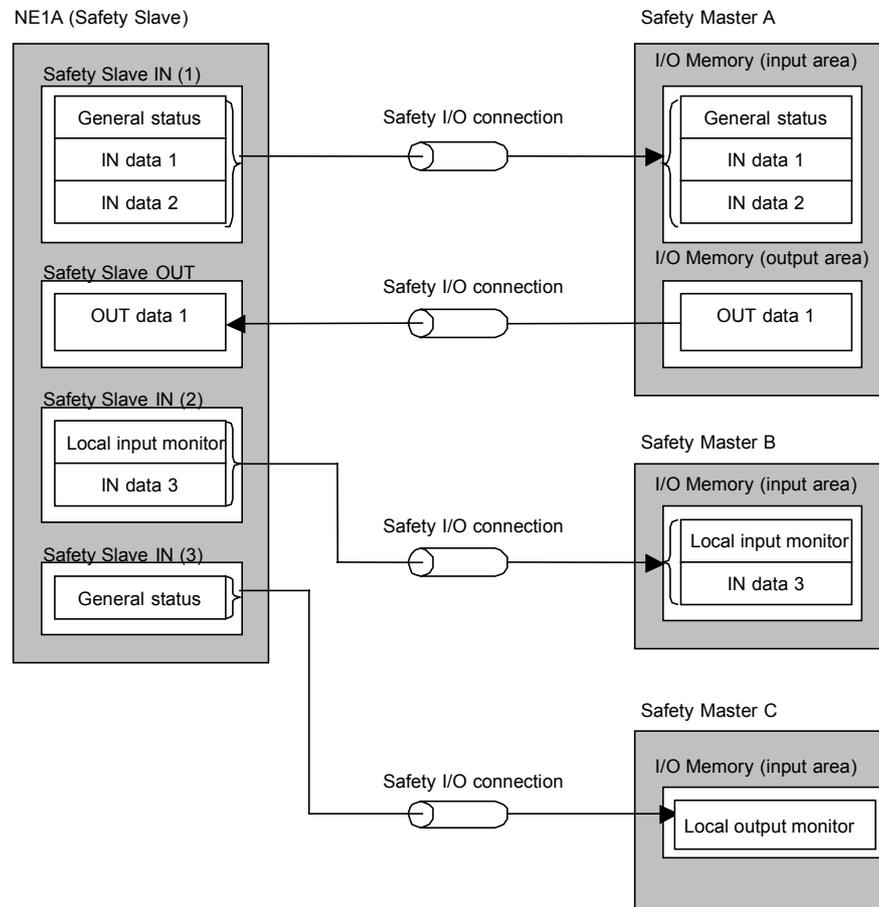
Safety Slave I/O Setting

Set the Safety Slave I/O as follows:
1. Select the I/O type.
2. Set the I/O tags.
3. Set additional status.
4. Set additional local I/O monitor data.
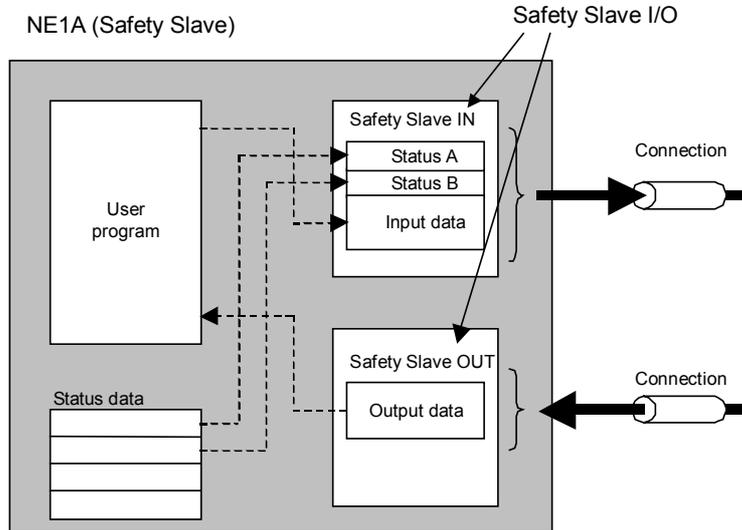
Selecting the I/O Type

I/O type	Description
Safety Slave IN	Data input from the network to the Safety Master.
Safety Slave OUT	Data output to the network from the Safety Master.

Setting I/O Tags

Set the input data blocks and output data blocks to use in the program for the Safety Slave I/O. Multiple data blocks can be set for Safety Slave I/O. The size of the data block can be selected from BOOL (1 byte), BYTE (1 byte), WORD (2 bytes), or DWORD (4 bytes). A maximum of 16 bytes, however, can be set for Safety Slave I/O. I/O tags defined for data blocks can be used in the Logic Editor. Using I/O tags enables the user to program without being aware of the NE1A-series Controller's specific memory addresses.

Setting Additional Status

When the I/O type of the Safety Slave I/O is Slave IN, the following status information can be added to the first line of the transmission data. Refer to *4-3-3 Remote I/O Area Data Configuration* for details on each status.

Pre-Ver. 1.0 Controllers

Tag name	Data size	Attribute
General Status	Byte	Non-safety
Local Input Status	Word	Safety
Local Output Status	Byte	Safety
Test Output/Muting Lamp Status	Byte	Non-safety

Controllers with Unit Version 1.0 or Later

Tag name	Data size	Attribute
General Status	Byte	Non-safety
Local Input Status 1 to N (See note.)	Byte	Safety
Local Output Status	Byte	Safety
Test Output/Muting Lamp Status 1 to M (See note.)	Byte	Non-safety

Note: For the NE1A-SCPU01-V1, N = 2 and M = 1. For the NE1A-SCPU02, N = 5 and M = 2.
The sizes of the local input status and test output/muting lamp status data can be specified in bytes.

Setting Local I/O Monitor Data

If the I/O type of the Safety Slave I/O is set to Slave IN for a NE1A-series Controller with unit version 1.0 or later, the following local I/O monitor information can be added to the transmission data after the status information. Refer to *4-3-3 Remote I/O Area Data Configuration* for details on the local I/O monitor information.

Local I/O Monitor	Data size	Attribute
Local Input Monitor 1 to N (See note.)	Byte	Safety
Local Output Monitor	Byte	Safety

Note: For the NE1A-SCPU01-V1, N = 2. For the NE1A-SCPU02, N = 5. The size of the local input monitor data can be specified in bytes.

⚠ **WARNING**
Serious injury may possibly occur due to loss of required safety functions. The necessary measures for safety data are not taken for data with the non-safety data attribute from NE1A-series Controller's internal status information allocated to the Safety Master. Therefore, do not use this data to configure the Safety Control System.

4-6   Standard Slave Function

4-6-1   Standard I/O Communications as Standard Slave

An NE1A-series Controller can function as a Standard Slave. One NE1A-series Controller can function simultaneously as a Safety Master, Safety Slave, and Standard Slave.

The NE1A-series Controller's internal status information is also included in the data allocated to the Standard Master, and so a monitoring system using a PLC can be established.

The following steps are required in order for an NE1A-series Controller to perform standard I/O communications as a Standard Slave.
1. Creation of I/O data (slave I/O) to use as a Standard Slave
2. Registration in the Standard Master
3. Connection settings in the Standard Master
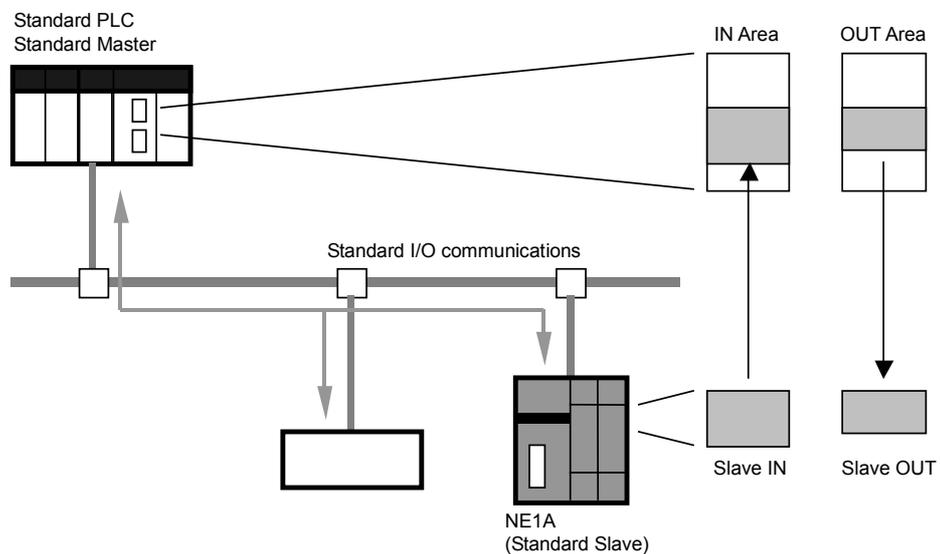
Standard Slave Specifications

Standard I/O Connections	
Number of connections	2 max.
Maximum data size	16 input bytes or 16 output bytes (per connection) (See note 1.)
Connection type	Poll, Bitstrobe, COS, or Cyclic

Note 1: The maximum data size is eight input bytes or zero outputs bytes when a Bitstrobe connection is selected.

2: COS and cyclic connections cannot be used at the same time.

3: When two Poll/COS or Poll/Cyclic connections are selected, the same output destination is used, so the maximum output data size is 16 bytes. For inputs, up to 32 bytes of data can be set for 2 connections.

4-6-2   Creating I/O Data (Slave I/O) to Use as Standard Slave

The I/O data to be used for the DeviceNet Slave must be created in order for an NE1A-series Controller to perform standard I/O communications as a Standard Slave. The memory blocks for this I/O data are called Slave I/O.

- Slave I/O blocks can be created for a maximum of 2 connections.
- The maximum data size for Slave I/O is 16 bytes.
- The following status information can be included in I/O data when the I/O type of the Slave I/O is slave input.
    - General Status
    - Local Input Status
    - Local Output Status
    - Test Output/Muting Lamp Status
- If the I/O type of the Safety Slave I/O is set to Slave IN for a NE1A-series Controller with unit version 1.0 or later, the following local I/O monitor data can also be included in the I/O data.
    - Local Input Monitor
    - Local Output Monitor

Setting Slave I/O

Set the Slave I/O as follows:
1. Select the connection type.
2. Set the I/O tags.
3. Set additional status.
4. Set additional local I/O monitor data.
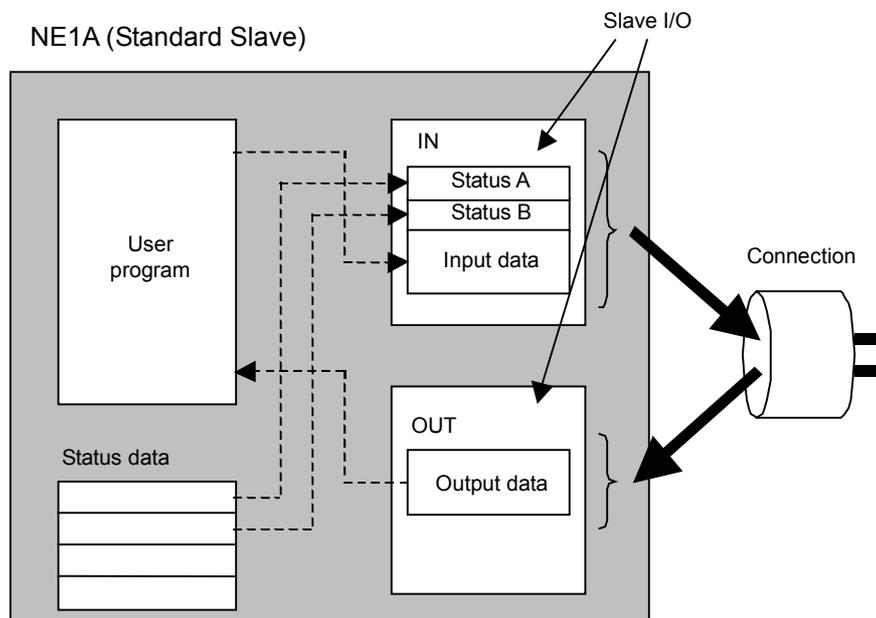
Selecting Connection Type

Any of the following 4 connection types can be selected. Output data cannot be set for Bitstrobe data because Bitstrobe data cannot be output from the Standard Master. Also, the maximum data size for Bitstrobe data input to Standard Master is 8 bytes. COS and cyclic connections cannot be used at the same time.

- Poll
- Bitstrobe
- COS
- Cyclic

Setting I/O Tags

Set the input data blocks and outputs data block to use for the selected connection. Multiple data blocks can be set for Slave I/O. The data block size can be selected from BOOL (1 byte), BYTE (1 byte), WORD (2 bytes), or DWORD (4 bytes). A maximum of 16 bytes, however, can be set for Slave I/O.

I/O tags defined for data blocks can be used in the Logic Editor. Using I/O tags enables the user to program without being aware of the specific memory addresses in the NE1A-series Controller.

Setting Additional Status

When the I/O type of a Slave I/O is Slave IN, the following status information can be added to the first line of the transmission data. Refer to *4-3-3 Remote I/O Area Data Configuration* for details on each status.

Pre-Ver. 1.0 Controllers

Tag Name	Data Size
General Status	Byte
Local Input Status	Word
Local Output Status	Byte
Test Output/Muting Lamp Status	Byte

Controllers with Unit Version 1.0 or Later

Tag Name	Data Size
General Status	Byte
Local Input Status 1 to N (See note.)	Byte
Local Output Status	Byte
Test Output/Muting Lamp Status 1 to N (See note.)	Byte

Note: For the NE1A-SCPU01-V1, N = 2 and M = 1. For the NE1A-SCPU02, N = 5 and M = 2. The sizes of the local input status and test output/muting lamp status data can be specified in bytes.

Setting Local I/O Monitor Data

If the I/O type of the Safety Slave I/O is set to Slave IN for a NE1A-series Controller with unit version 1.0 or later, the following local I/O monitor information can be added to the transmission data after the status information. Refer to *4-3-3 Remote I/O Area Data Configuration* for details on the local I/O monitor information.

Local I/O Monitor	Data size
Local Input Monitor 1 to N (See note.)	Byte
Local Output Monitor	Byte

Note: For the NE1A-SCPU01-V1, N = 2. For the NE1A-SCPU02, N = 5. The sizes of the local input status and local input monitor status data can both be specified in bytes.

⚠ WARNING

Serious injury may possibly occur due to loss of required safety functions. The data attributes handled by standard I/O communications are non-safety data. The necessary measures for safety data are not taken for this data during data generation. Therefore, do not use this data to configure the Safety Control System.

4-7   Explicit Message Communications

4-7-1   Receiving Explicit Messages

Sending explicit messages from the Standard Master to the NE1A-series Controller enables reading or writing any specified data or parameters of the Controller. The Controller operates according to the command sent from the master and returns a response.

The following example describes the I/O area read service provided by the Controller. Refer to *Appendix 3 DeviceNet Explicit Messages* for details on the services that are available.

NE1A-series Controller I/O Area Read
Reads the NE1A-series Controller's local I/O or the Safety Slave I/O area allocated to the Controller from the master.

Command Format
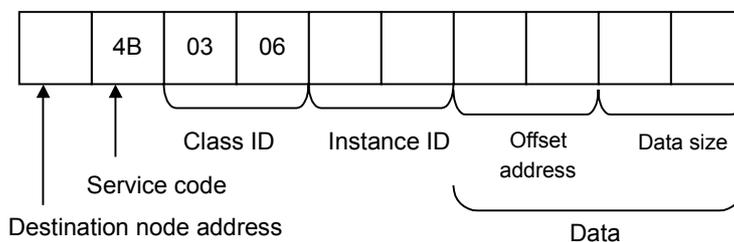
Response Format
- Normal Response to Explicit Message
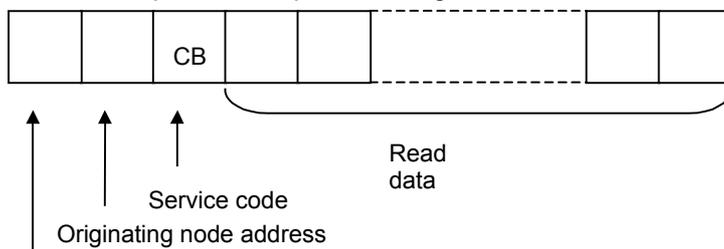
- Error Response to Explicit Message
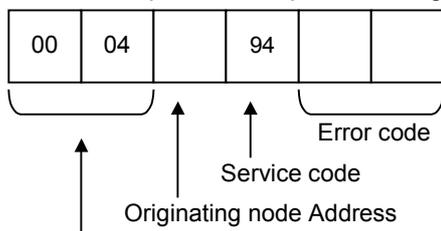
Destination Node Address (Command)
> Specifies in 1-byte hexadecimal the NE1A-series Controller's address of the data to be read.

Service Code (Command/Response)
> For commands, 4B hex is specified. For responses, the upper bit is turned ON, and CB hex is returned.

113

Class ID (Command)
   0306 hex.
Instance ID (Command)

Explicit message	Service	Instance ID
Read Local Input Area	Read	0001 hex
Read Local Output Area	Read	0002 hex
Read Safety Remote Input Area	Read	0005 hex
Read Safety Remote Output Area	Read	0006 hex

Data (Command)

Offset size	Specifies the address from which to start reading. This is an offset in bytes from the first line of the area.
Data size	Specifies in number of bytes to read (1 to 256 bytes)
Range	Local Input Area: 0 or 1 (Pre-Ver. 1.0 Controllers)
	0 or 1 (NE1A-SCPU01-V1)
	0 to 4 (NE1A-SCPU02)
	Local Output/Test Output Area: 0 or 1
	Safety Remote Input Area: 0 to 511
	Safety Remote Output Area: 0 to 511

The I/O addresses of memory information that has been read can be checked on the Memory Info. Tab Page of the Edit Device Parameters Dialog Box for the NE1A-series Controller.

I/O name
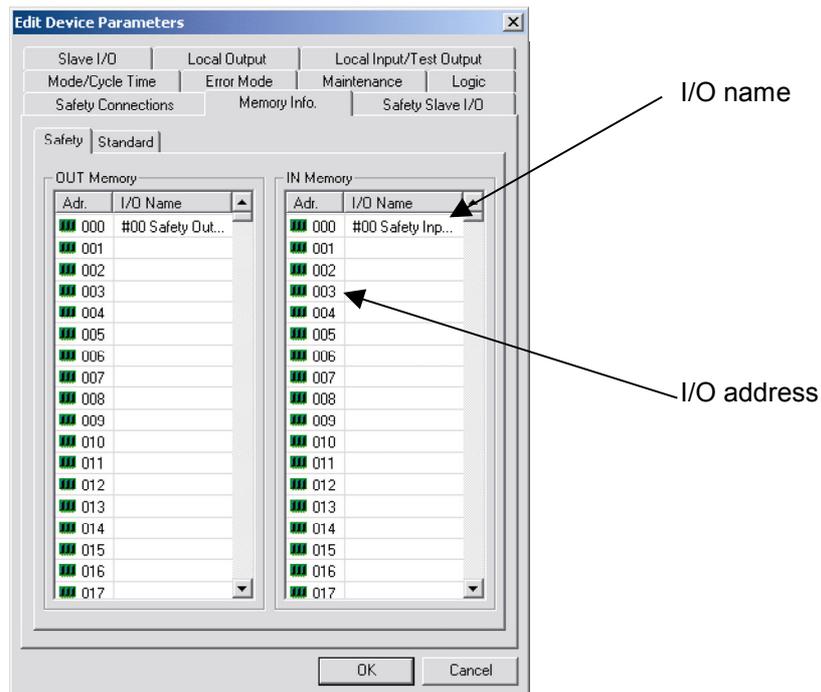
I/O address

Number of Receive Bytes (Response)
> The number of bytes of receive data from the Originating Node Address to the end of the response is returned in hexadecimal.

Originating Node Address (Response)
> The node address of the responding NE1A-series Controller is returned in 1-byte hexadecimal.

Read Data (Response)
> The I/O data from the specified area is returned.
> The address offsets and bit assignments for reading the local inputs, local outputs, and test outputs are given in the following tables.

• Local Inputs (5 Bytes)

Offset (bytes)	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety input terminal No.7	Safety input terminal No.6	Safety input terminal No.5	Safety input terminal No.4	Safety input terminal No.3	Safety input terminal No.2	Safety input terminal No.1	Safety input terminal No.0
1	Safety input terminal No.15	Safety input terminal No.14	Safety input terminal No.13	Safety input terminal No.12	Safety input terminal No.11	Safety input terminal No.10	Safety input terminal No.9	Safety input terminal No.8
2	Safety input terminal No.23	Safety input terminal No.22	Safety input terminal No.21	Safety input terminal No.20	Safety input terminal No.19	Safety input terminal No.18	Safety input terminal No.17	Safety input terminal No.16
3	Safety input terminal No.31	Safety input terminal No.30	Safety input terminal No.29	Safety input terminal No.28	Safety input terminal No.27	Safety input terminal No.26	Safety input terminal No.25	Safety input terminal No.24
4	Safety input terminal No.39	Safety input terminal No.38	Safety input terminal No.37	Safety input terminal No.36	Safety input terminal No.35	Safety input terminal No.34	Safety input terminal No.33	Safety input terminal No.32

Note: For the NE1A-SCPU01 or NE1A-SCPU01-V1, status can be read for 16 terminals, i.e., safety input terminals No. 0 to 15. For the NE1A-SCPU02, status can be read for 40 terminals, safety input terminals No. 0 to 39.

• Local Outputs and Test Outputs (2 Bytes)

Offset (bytes)	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Safety output terminal No.7	Safety output terminal No.6	Safety output terminal No.5	Safety output terminal No.4	Safety output terminal No.3	Safety output terminal No.2	Safety output terminal No.1	Safety output terminal No.0
1	Test output terminal No.7	Test output terminal No.6	Test output terminal No.5	Test output terminal No.4	Test output terminal No.3	Test output terminal No.2	Test output terminal No.1	Test output terminal No.0

Note: For the NE1A-SCPU01 or NE1A-SCPU01-V1, test output status can be read for 4 terminals, i.e., test output terminals No. 0 to 3. For the NE1A-SCPU02, test output status can be read for 8 terminals, i.e., test output terminals No. 0 to 7.

Error Code (Response)
> The following error codes defined in DeviceNet may be returned.

Response code	Error name	Cause
08FF	Service not supported	Error in the service code.
13FF	Not enough data	The data is shorter than the specified size.
15FF	Too much data	The data is longer than the specified size.
16FF	Object does not exist	The specified class ID or instance ID is not supported.
20FF	Invalid parameter	The specified operation command data is not supported.

4-7-2   Sending Explicit Messages

An NE1A-series Controller can send explicit messages from a user program. User-registered messages are sent over the network when user-specified trigger conditions are met. This can be used to notify monitoring and control devices or as a method for specifying outputs to display devices.

When sending an explicit message, set the send conditions in the Logic Editor. With an NE1A-series Controller, up to 32 bytes of explicit message data can be sent, as shown below.

● Explicit Message Data Format

Parameter name	Data size
MACID	1 byte
Service code	1 byte
Class ID	2 bytes
Instance ID	2 bytes
Service data	0 to 26 bytes

For information on service codes, class IDs, instance IDs, and service data, refer to the manual for the destination device of the message.

Procedure

Set the conditions using the following procedure.

1. Trigger Address Setting
   Set the condition for sending the explicit message. The explicit message will be sent when the set address turns ON.

2. Send Condition Setting
   Set the send conditions for the explicit message. The number of retries can also be set.

3. Creating a Send Message
   Check the object specifications at the destination node and create a send message based on the explicit message format.

Restrictions

- One address can be set in the user program for the trigger address.
- The NE1A-series Controller's internal I/O memory is sent as a response to an explicit message. Explicit messages can be sent from a user program in the Controller, but internal information in the Controller cannot be used as send message data.
- Response data to explicit messages cannot be used in an NE1A-series Controller's user programs.

⚠ WARNING
Serious injury may possibly occur due to loss of required safety functions. Do not use explicit message data as safety data. The necessary measures for safety communications are not taken for explicit message communications.

Note: Refer to DeviceNet specifications for details on explicit message parameters.

Section 5
I/O Control

5-1   Common Functions

5-1-1   I/O Comment Function

An optional name consisting of up to 32 characters can be registered in the NE1A-series Controller for each I/O terminal using the Network Configurator. These I/O comments can be used in the Function List of the Logic Editor as I/O tags, enabling easy conceptualization of what is actually being controlled and simplifying programming.
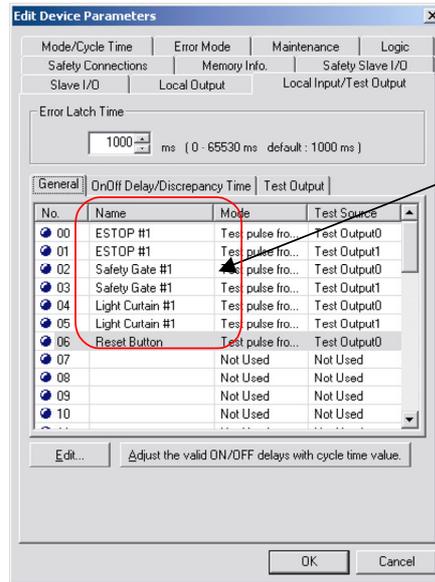
Set the I/O comments.

The set comments are registered as I/O tags in the Function List of the Logic Editor.

Programming is possible using I/O tags.
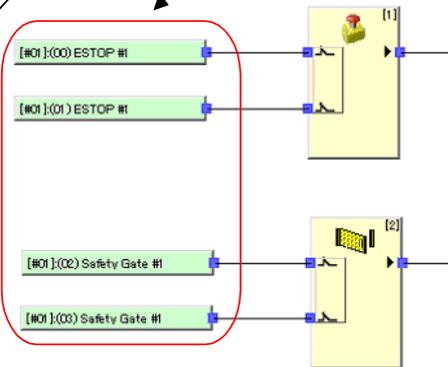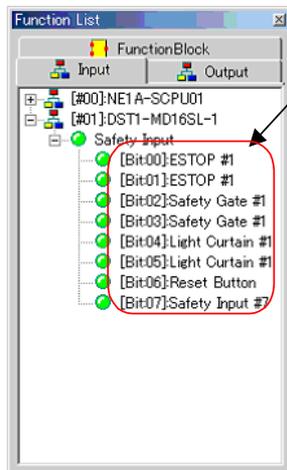
5-1-2   I/O Power Monitor

The I/O power supply input can be monitored to confirm if it is normal. If an I/O terminal on the NE1A-series Controller is set to any setting other than *Not Used* and the normal power supply voltage is not input, the following items will be displayed on the 7-segment display:
- Power supply for input not input normally: P4
- Power supply for output not input normally: P5

I/O power supply status can also be monitored in the General Status in DeviceNet I/O communications.

5-1-3   Contact Operation Counter

Overview

In NE1A-series Controllers with unit version 1.0 or later, this function counts the number of OFF → ON operations at a local input, test output, or local output and stores the count internally in non-volatile memory.
- Count range: 0 to 4,294,967,295 operations (stored as 00000000 to FFFFFFFF Hex)
- Count units: Operations
- Resolution: Depends on the cycle time.
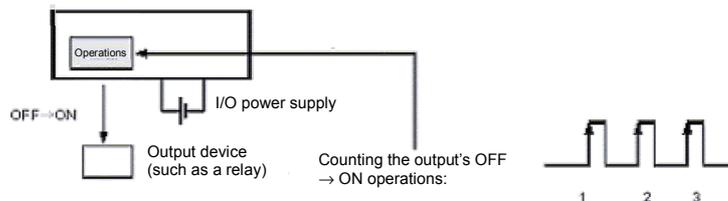
This information can be monitored using the Network Configurator or explicit messaging.

Note 1: The Contact Operation Counter function (Count) and Total ON Time Monitor function (Time) cannot be used simultaneously on one bit. Select one of these functions with the Maintenance Counter Mode Choice setting.

2: When the Maintenance Counter Mode Choice setting is changed, the collected data (operations count or total ON time) will be cleared.

3: These functions do not operate when the I/O power supply is OFF.

Setting the Contact Operations Alarm Threshold with the Network Configurator

The maintenance mode (Maintenance Counter Mode Choice) and alarm threshold (Threshold Maintenance Counter) can be set for each local input, test output, and local output terminal.

Edit Device Parameters

Slave I/O	Local Output	Local Input/Test Output
Safety Connections	Memory Info.	Safety Slave I/O
Mode/Cycle Time	Error Mode	Maintenance	Logic

Local Input | Local Output | Test Output

No.	Name	Detection M...	Threshold Va...
00		Time	0
01		Time	0
02		Time	0

Edit Maintenance Config

Detection Mode

○ Time   ⦿ Count

Value :   0   (0 - 4294967295 Times)
(0 - 4294967295 Seconds)

OK   Cancel

12		Time	0
13		Time	0
14		Time	0

Edit...

OK   Cancel
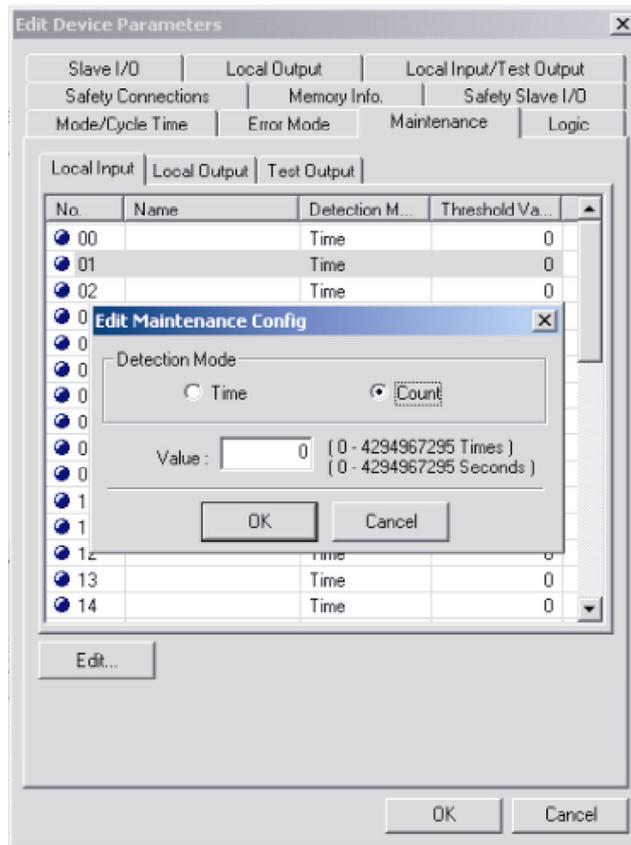
If the alarm threshold (Threshold Maintenance Counter) is set to 0, the Controller will
not compare the count or time PV to the alarm threshold SV.

Monitoring Operations from the Network Configurator

Any of the following methods can be used to monitor the number of contact operations
in the local input status, test output status, or local output status.

(1) Select the device and select *Device – Maintenance information* from the
menu bar.
(2) Select the device and click the toolbar's **Maintenance** Button.
(3) Select the device, right-click that device, and select *Maintenance infor-
mation* from the popup menu.
(4) Select the device, select *Device – Monitor* from the menu bar, and click
the **Maintenance** Tab in the displayed window.
(5) Select the device, click the toolbar's **Device Monitor** Button, and click the
Maintenance Tab in the displayed window.
(6) Select the device, right-click that device, select *Monitor* from the popup
menu, and click the **Maintenance** Tab in the displayed window.

Each I/O point's accumulated contact operations count can be cleared. To clear the count, select the contact operations count to be cleared and click the **Clear Value** Button.

5-1-4   Total ON Time Monitor Function

Overview

In NE1A-series Controllers with unit version 1.0 or later, this function times how long a local input, test output, or local output is ON and stores that total ON time internally in non-volatile memory.

- Count range: 0 to 4,294,967,295 s (stored as 00000000 to FFFFFFFF Hex)
- Count units: Seconds
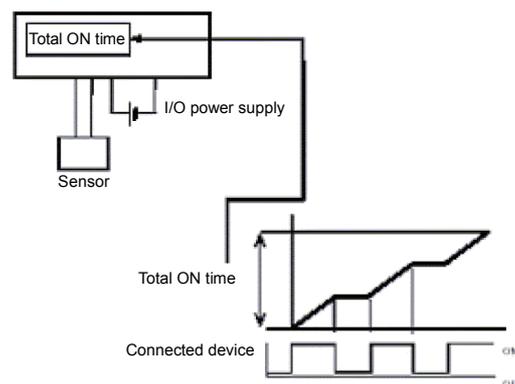
This information can be monitored using the Network Configurator or explicit messaging.

Note 1: The Total ON Time Monitor function (Time) and Contact Operation Counter function (Count) cannot be used simultaneously on one bit. Select one of these functions with the Maintenance Counter Mode Choice setting.

2: When the Maintenance Counter Mode Choice setting is changed, the collected data (operations count or total ON time) will be cleared.

3: These functions do not operate when the I/O power supply is OFF.

4: The Total ON Time Monitor function checks whether the connected device is ON at

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about 1-s intervals. This function may not count the total ON time precisely if the device is ON for intervals of less than 1 second.

Calculating the Total ON Time with 0.5-s ON Pulses

In figure A, the bit is actually ON for 0.5 s $\times$ 3 = 1.5 s, but the bit is ON just once when the status is checked, so the total ON time is measured as 1 s.

Measured about 1 time/second
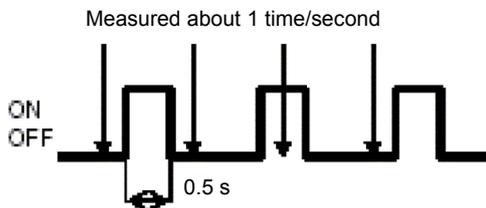
Figure A

In figure B, the bit is actually ON for 0.5 s $\times$ 3 = 1.5 s, but the bit is ON twice when the status is checked, so the total ON time is measured as 2 s.

Measured about 1 time/second
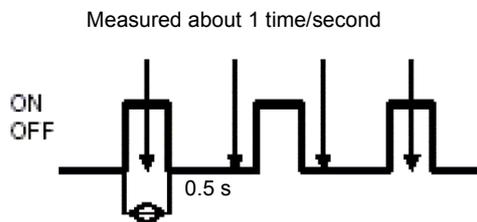
Figure B

Calculating the Total ON Time with 1.5-s ON Pulses

In figure C, the bit is actually ON for 1.5 s $\times$ 2 = 3 s, but the bit is ON four times when the status is checked, so the total ON time is measured as 4 s.

Measured about 1 time/second
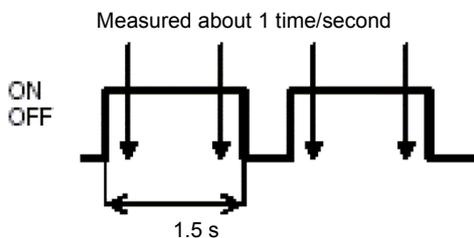
Figure C

Setting the Total ON Time Alarm Threshold with the Network Configurator

The maintenance mode (Maintenance Counter Mode Choice) and alarm threshold (Threshold Maintenance Counter) can be set for each local input, test output, and local output terminal.

If the alarm threshold (Threshold Maintenance Counter) is set to 0, the Controller will not compare the count or time PV to the alarm threshold SV.

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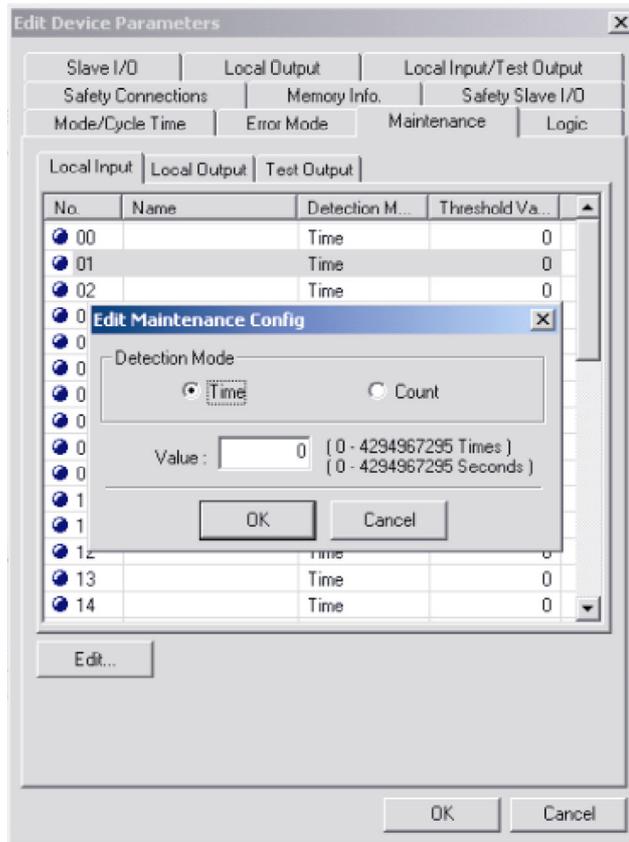
Monitoring the Total ON Time from the Network Configurator

Any of the following methods can be used to monitor the total ON time in the local input status, test output status, or local output status.

(1) Select the device and select **Device – Maintenance information** from the menubar.

(2) Select the device and click the toolbar's **Maintenance** Button.

(3) Select the device, right-click that device, and select **Maintenance information** from the popup menu.

(4) Select the device, select **Device – Monitor** from the menu bar, and click the **Maintenance** Tab in the displayed window.

(5) Select the device, click the toolbar's **Device Monitor** Button, and click the **Maintenance** Tab in the displayed window.

(6) Select the device, right-click that device, select **Monitor** from the popup menu, and click the **Maintenance** Tab in the displayed window.

Each I/O point's accumulated total ON time can be cleared. To clear the time, select the total ON time to be cleared and click the **Clear Value** Button.

5-2   Safety Inputs

5-2-1   Overview

The NE1A-SCPU01(-V1) is equipped with 16 safety input terminals.
The NE1A-SCPU02 is equipped with 40 safety input terminals.
By selecting the setup and wiring based on the types of input devices to be connected or the safety level to be achieved, the NE1A-series Controller can flexibly handle various applications. For example, an NE1A-series Controller's safety inputs can be used as described below.

Connecting to Contact Output Safety Devices

The NE1A-series Controller's test output signal (a pulse output) is input by connecting to a contact output device. Input signal line errors can then be detected by inputting the test output signal.

- Short circuits to the power supply line (positive side)
- Earth faults
- Short circuits between input signals
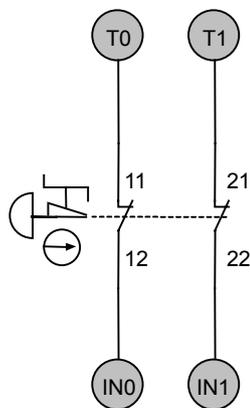
Connecting Semiconductor Output Safety Devices

The output from a 24-VDC semiconductor, such as the OSSD output from a Light Curtain, is input. Errors in the OSSD output signal line (i.e., the NE1A-series Controller's input signal line) is detected at the external connection device.
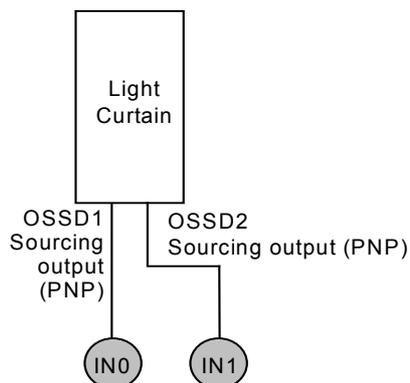
5-2-2   Input Channel Mode Setting

The input channel mode of local safety inputs is set based on the type of external device to be connected.

Channel Mode	Description
Not used	Input not connected to an external device.
Test pulse from test output	Connects a contact output safety device with a test output. When this mode is selected, select the test output terminal to use as the test source and set the test output mode to *Pulse Test Output.* This enables detection of short circuits with the power supply line (positive side), earth faults, and short circuits with other input signal lines.
Used as a safety input	Used when connecting to safety devices with a semiconductor output, such as a Light Curtain.
Used as a standard input	Input connected to a standard (non-safety) device.

5-2-3   Test Source Setting

Select the test output terminal to use as the test source for the safety input when the input channel mode is set to *Test pulse from test output.* If short circuit detection between input wiring lines is necessary, specify a different test output terminal.

Examples:
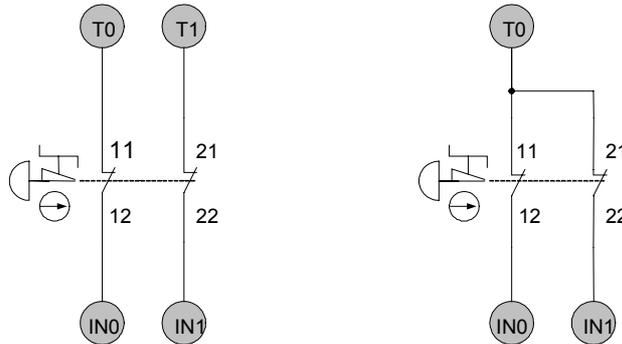
Circuit in Which Short Circuit Detection between Input Signals Is Required.

Circuit in Which Short Circuit Detection between Input Signals Is Not Required.

Note: With the NE1A-SCPU02, terminals T0 to T3 can be selected as the test sources for IN0 to IN19. Terminals T4 to T7 can be selected as the test sources for IN20 to IN39.

5-2-4   Input ON/OFF Delays

For the NE1A-series Controller's local safety inputs, input ON/OFF delays can be set in increments of multiples of the Controller's cycle time between 0 and 126 ms. Setting a larger value helps to reduce influence from external device chattering.
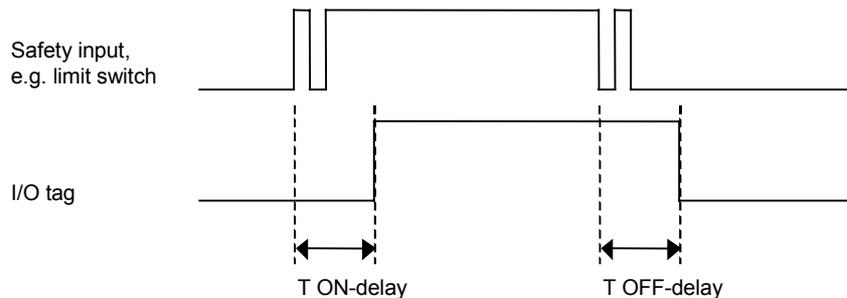
IMPORTANT: Both input ON delays and OFF delays must be added to the I/O response performance. This will affect the safety distance calculation.
For further details, refer to *Section 9 Remote I/O Communications Performance and Local I/O Response Time*.

5-2-5   Dual Channel Mode Setting

An NE1A-series Controller's local safety input terminals can be set to Dual Channel Mode. Setting Dual Channel Mode enables the following.
- The status of the two inputs can be evaluated and reflected in I/O tags.
- The discrepancy time between changes in the status of the two inputs can be evaluated.

Channel mode	Description
Single Channel	Used as an independent safety input terminal.
Dual Channel Equivalent	Used as a Dual Channel Equivalent Input with the paired safety input.
Dual Channel Comple-mentary	Used as a Dual Channel Complementary Input with the paired safety input.

Reflecting Input Status in Input I/O Tags

The status input to the safety input terminals is reflected in the I/O tags according to the channel mode as shown in the following tables.

Channel mode	Input to safety input terminal	Input Tag	Meaning of status
	IN (x)	IN (x)	
Single Channel	0	0	Inactive (OFF)
	1	1	Active (ON)

X = 0 to 15 (NE1A-SCPU01(-V1))
X = 0 to 39 (NE1A-SCPU02)

Channel Mode	Input to safety input terminal		Input Tag		Meaning of status
	IN (n)	IN (n+1)	IN (n)	IN (n+1)	
Dual Channel Equivalent	0	0	0	0	Inactive (OFF)
	0	1	0	0	Discrepant
	1	0	0	0	Discrepant
	1	1	1	1	Active (ON)
Dual Channel Complementary	0	0	0	1	Discrepant
	0	1	0	1	Inactive (OFF)
	1	0	1	0	Active (ON)
	1	1	0	1	Discrepant

n = Even number

Input Discrepancy Time Evaluation

For two inputs set in Dual Channel Mode, the time is monitored from a change in the value of one input to a change in the value of the other input (discrepancy time). When the value of the other input does not change within the set discrepancy, it is regarded as an error. The set discrepancy time can be set in increments of 10 ms between 0 (invalid) and 65,530 ms.
The discrepancy time cannot be set in Single Channel Mode.

Normal Operation for Dual Channel Equivalent Inputs
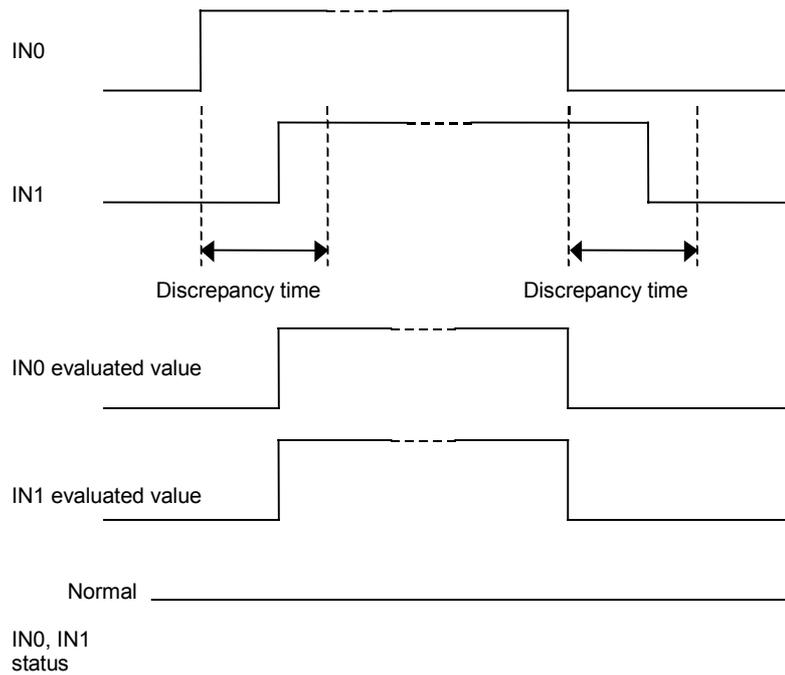
Error Operation for Dual Channel Equivalent Inputs (Discrepancy error)
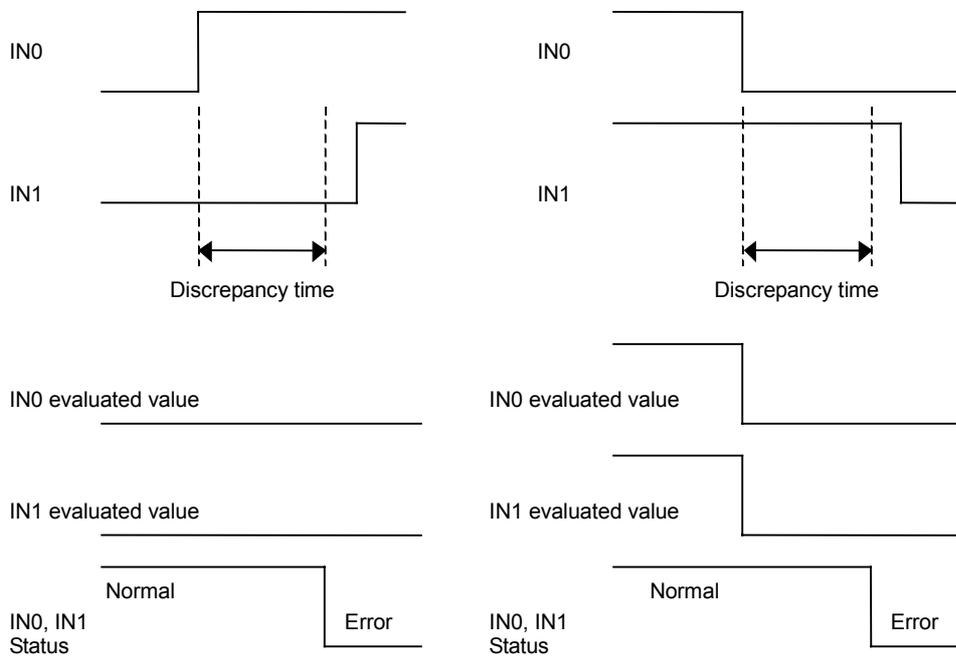
Note: The NE1A-series Controllers supports function blocks with functionality equivalent to Dual Channel Mode. If Dual Channel Mode is set in a function block, then the safety input terminal can be set to Single Channel Mode.

5-2-6   Error Handling

Behavior on Error Detection

Behavior in Single Channel Mode
The following operations are performed if an error is detected during self-diagnosis.
- I/O tags corresponding to safety input terminals for which errors have been detected are made inactive.
- The LED indicator of the safety input terminal with the error lights red.
- The error appears in the error history.
- The NE1A-series Controller continues to operate.

Behavior in Dual Channel Mode
The following operations are performed if a discrepancy error is detected.
- I/O tags corresponding to safety input terminal pairs for which errors have been detected are made inactive.
- Both LED indicators of the safety input terminals with the error light red.
- The errors appear in the error history.
- The NE1A-series Controller continues to operate.

The following operations are performed if an error is detected in one of the two inputs.
- I/O tags corresponding to safety input terminal pairs for which errors have been detected are made inactive.
- The LED indicator of the safety input with the error lights red, and the LED indicator of the other input flashes red.
- The errors appear in the error history.
- The NE1A-series Controller continues to operate.

Error Latch Time Setting

The time to latch the error state when an error occurs in a safety input circuit can be set. The error state will continue until the error latch time passes even if the cause of the error is momentarily removed. When monitoring errors from a monitoring system, take the monitoring interval into account when setting the error latch time.
The error latch time can be set in increments of 10 ms between 0 and 65,530 ms. The default is 1,000 ms.

Resetting Errors

All conditions below are necessary to recover from an error that has occurred in a safety input.
- The cause of the error must be removed.
- The error latch time must have passed.
- The input signal must return to an inactive state and there must be no error condition detected. (e.g., by pressing the emergency stop button or opening a door).

5-3   Test Outputs

5-3-1   Test Output Mode Setting

The NE1A-SCPU01(-V1) is equipped with four test output terminals.
The NE1A-SCPU02 is equipped with eight test output terminals.
The following settings are supported for the test outputs.

Channel mode	Description
Not used	The corresponding test output terminal is not used.
Standard output	Connected to the input for indicator light or a PLC. Used as a monitor output.
Pulse test output	Connected in combination with a safety input terminal and contact output device. The test output terminal outputs a pulse for circuit diagnosis. Pulses are output to each test output terminal at a different time.
Muting lamp output	Can be set as the output for a muting lamp. When the output is ON, disconnection of the muting lamp can be detected. With the NE1A-SCPU01, only the T3 terminal can be set to this mode. With the NE1A-SCPU02, the T3 or T7 terminal can be set to this mode.

5-3-2   Error Handling

Behavior on Error Detection

The following operations are performed if an error is detected during self-diagnosis:

- The output terminals for which errors have been detected will be made inactive without intervention from the user program.
- The error will be recorded in the error history.
- The NE1A-series Controller will continue to operate.

Error Latch Time Setting

The time to latch the error state when an error occurs in a safety input terminal or test output terminal can be set. The error state will continue until the error latch time passes even if the cause of the error is momentarily removed. When monitoring errors from a monitoring system, take the monitoring interval into account when setting the error latch time. The error latch time can be set in increments of 10 ms between 0 and 65,530 ms. The default is 1,000 ms.

Resetting Errors

Errors detected at test output terminals will be automatically reset after the error latch time. Leaving the short-circuit state as is may result in failure due to increased temperatures. If an external load short circuit occurs, remove the cause immediately.

5-4   Safety Outputs

5-4-1   Overview

The NE1A-SCPU01(-V1) and NE1A-SCPU02 Controllers are equipped with eight safety output terminals.

By selecting the setup and wiring based on the types of external devices to be connected or the safety level to be achieved, the NE1A-series Controller can flexibly handle various applications.

The following output signal line errors can be detected for the NE1A-series Controllers.

- Contact with the power supply line (positive side, only when the output is OFF)
- Ground faults

If the diagnostic pulse output is enabled, the following errors can be detected.

- Contact with the power supply line (positive side, when the output is ON or OFF)
- Ground faults
- Short circuits between output lines

5-4-2   Output Channel Mode Setting

Set the output channel mode based on the type of external device to be connected.

Channel mode	Description
Not used	Output not connect to an output device.
Safety	A test pulse is not output when the output is ON. Short circuits with the power supply line (when the output is OFF) and ground faults can be detected.
Safety pulse output	A test pulse is output when the output is ON. This enables detecting short circuits with the power supply line (positive side) (when the output is ON or OFF), ground faults, and short circuits between output signals.

IMPORTANT: If a safety pulse output is set, an OFF pulse signal (pulse width: 580 μs) will be output to diagnose the output circuit when the safety output turns ON. Check the input response time of the control device connected to the NE1A-series Controller to be sure that this output pulse will not cause malfunctions.

5-4-3   Dual Channel Mode Setting

The NE1A-series Controller's Local safety output terminals can be set to Dual Channel Mode. Setting Dual Channel Mode enables the following.

- An error will be detected if the two outputs from a user program are not equivalent.
- If an error is detected in one of the two output circuits, both outputs to the external device will become inactive.

Channel mode	Description
Single Channel	Used as an independent safety output.
Dual Channel	Used as a Dual Channel Output with the paired safety output terminal. The output can be turned on when both the output and the paired safety output are normal.

Reflecting Output Data from Output I/O Tags to Safety Output Terminals

Output I/O tag data is reflected in the safety output terminals according to the channel mode, as shown in the following tables.

Channel Mode	Output tag	Safety output terminal	The meaning of status
	OUT (x)	OUT (x)	
Single Channel	0	0	Inactive (OFF)
	1	1	Active (ON)

X = 0-7

Channel Mode	Output tag		Safety output terminal		The meaning of status
	IN (n)	IN (n+1)	OUT (n)	OUT (n+1)	
Dual Channel	0	0	0 (OFF)	0 (OFF)	Inactive (OFF)
	0	1	0 (OFF)	0 (OFF)	Violation at Safety Output (OFF)
	1	0	0 (OFF)	0 (OFF)	Violation at Safety Output (OFF)
	1	1	1 (ON)	1 (ON)	Active (ON)

n = even numbers

5-4-4   Error Handling

Behavior on Error Detection

Behavior in Single Channel Mode
The following operations are performed if an error is detected during self-diagnosis.
- The safety output which the error was detected becomes inactive without depending on the user program.
- The LED indicator of the safety output terminal with the error lights red.
- The error appears in the error history.
- The NE1A-series Controller continues to operate.

Behavior in Dual Channel Mode
The following operations are performed if an error is detected in one of the two outputs.
- Both outputs to the external device become inactive without depending on a user program.
- The LED indicator of the safety output terminal with the error lights red, and LED indicator of the other output flashes red.
- The error appears in the error history.
- The NE1A-series Controller continues to operate.

The following operations are performed if the two outputs from the user program to output I/O tags are equivalent.
- Both outputs to the external device become inactive without depending on a user program.
- The LED indicators of the paired safety output terminals light red.
- The error appears in the error history.
- The NE1A-series Controller continues to operate.

Error Latch Time Setting

The time to latch the error state when an error occurs in a safety output circuit can be set. The error state will continue until the error latch time passes even if the cause of the error is momentarily removed. When monitoring errors from a monitoring system, take the monitoring interval into account when setting the error latch time.
The error latch time can be set in increments of 10 ms between 0 and 65,530 ms.
The default is 1,000 ms.

Resetting Errors

All conditions below are necessary to recover from an error that has occurred in a safety output.
- The cause of the error must be removed.
- Error latch time must have passed.
- The output signals to the output I/O tags from the user application that correspond to the safety output terminals must go inactive.

Note: If the Dual Channel Mode is set for two outputs to implement redundant circuits and an error is detected for one of the outputs, the other output can be made to go inactive without relying on the user program. If the redundant circuits are implemented using two outputs in Single Channel Mode, the user program must be used to detect the error (using the External Device Monitoring function block).

6-1   Outline of Programming

6-1-1   Outline

The NE1A-series Safety Network Controller is programmed by starting a Logic Editor from the Network Configurator. As shown below, the Logic Editor consists of a Function List where function blocks, I/O tags, and other programming elements are registered and a workspace where programming is actually performed.

Programming is achieved using the function blocks, I/O tags, and other programming elements are registered in the function list.
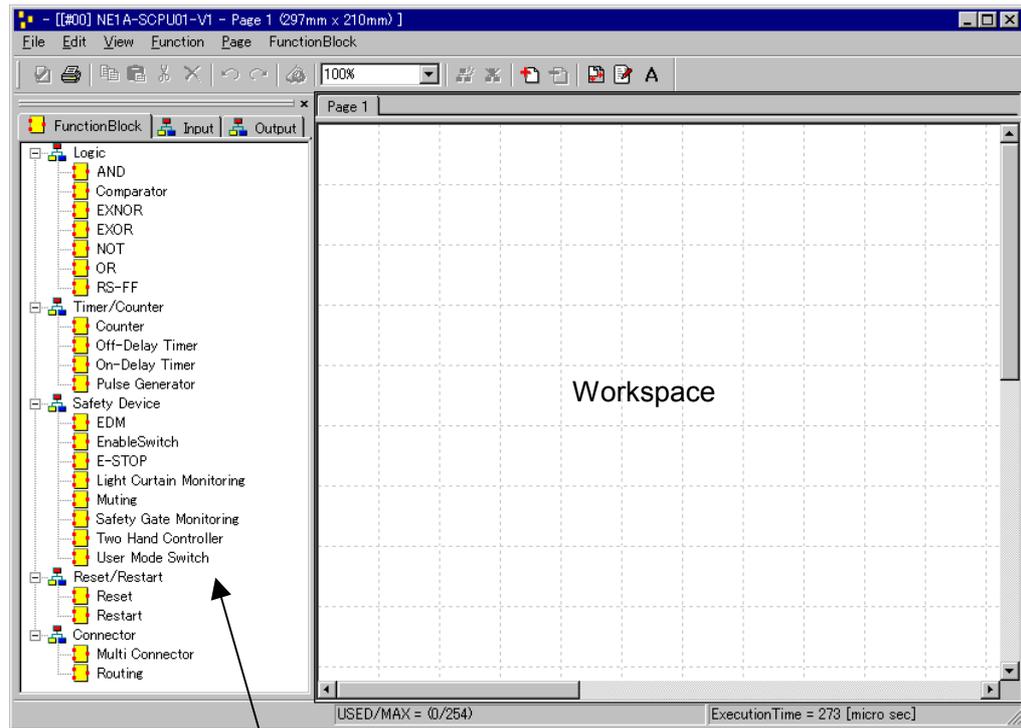
Function List

6-1-2   Programming Basics

Programs are created from logic functions and function blocks, which indicate commands, input tags, which indicate data input sources, and output tags, which indicate data output destinations. The I/O are connected with connection lines.
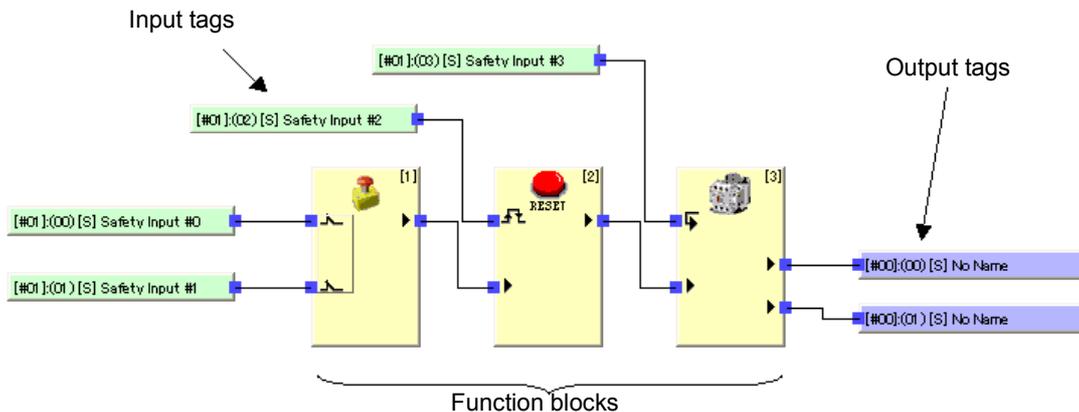
Input Tags

Input tags reflect the status of inputs in the following I/O areas.
- Input area from the NE1A-series Controller's local terminals
- Input area from safety slaves registered as communications partners
- I/O area reflected from Safety Master data
- I/O area reflected from Standard Master data

Input tags used in the Logic Editor include the following information.

Node address   Bit address   Attribute ("[S]" for safety I/O)

Registered I/O comment

[#01]:(00) [S] Safety Input #0

[#01]:(01) [S] Safety Input #1

[1]
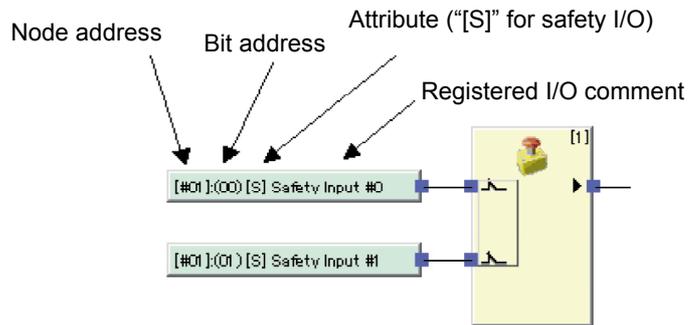
In Controllers with unit version 1.0 or later, data are reflected in the following I/O areas.
- Local input status
- Local output status
- General Unit status
- Test output status
- Muting lamp status

Output Tags

Output tags reflect the status of inputs in the following I/O areas.
- Output area from the NE1A-series Controller's local terminals
- Output area from safety slaves registered as communications partners
- I/O area reflected from Safety Master data
- I/O area reflected from Standard Master data

Output tags used in the Logic Editor include the following information.
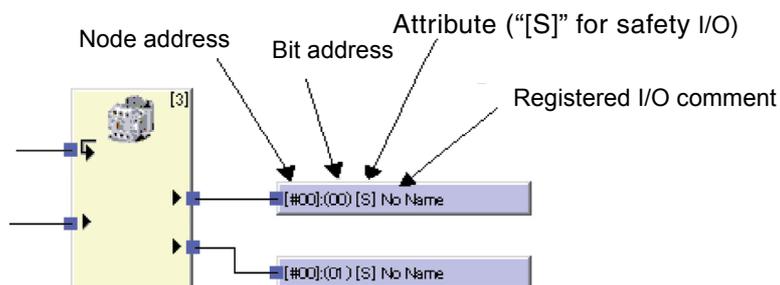
Node address   Bit address   Attribute ("[S]" for safety I/O)

Registered I/O comment

[3]

[#00]:(00) [S] No Name

[#00]:(01) [S] No Name

⚠ **WARNING**	
Serious injury may possibly occur due to loss of required safety functions. Always verify that the safety-related signals used in safety-related logic meet applicable standards and regulations. Input only safety input signals to function blocks. It is the user's responsibility to verify that the proper sources for signals used in conjunction with these function blocks and the overall safety logic implementation adhere to relevant safety standards and regulations.	❗
Serious injury may possibly occur due to loss of required safety functions. When implementing safety-related functions, you must verify that the control strategy and risk reduction techniques you are using adhere to local, regional, and national regulations. Consult these regulations and industry standards to determine the requirements that may apply to your application.	❗

6-1-3   Program Capacity

The following table shows the maximum size of user program that can be used in the NE1A-series Controllers.

Model	Total number of logic functions and function blocks
NE1A-SCPU01	128
NE1A-SCPU01-V1	254
NE1A-SCPU02	254

6-2   Function Block Overview

Logic programming for the NE1A-series Controller is accomplished using function blocks. Various safety applications can be achieved by using the function blocks described in this section to program operation to be compliant with safety standards.

6-2-1   Supported Function Blocks

The following tables show which logic functions and function blocks are supported in each NE1A-series Controller, based on each Controller's unit version.

Logic Functions

Name	Notation in function list	Compatible unit versions
NOT	NOT	All
AND	AND	All
OR	OR	All
Exclusive OR	EXOR	All
Exclusive NOR	EXNOR	All
RS Flip-flop	RS-FF	Unit version 1.0 or later
Comparator	Comparator	Unit version 1.0 or later

Function Blocks

Name	Notation in function list	Compatible unit versions
Reset	Reset	All
Restart	Restart	All
Emergency Stop Pushbutton Monitoring	E-STOP	All
Light Curtain Monitoring	Light Curtain Monitoring	All
Safety Gate Monitoring	Safety Gate Monitoring	All
Two-hand Controller	Two Hand Controller	All
OFF-Delay Timer	Off-Delay Timer	All
ON-Delay Timer	On-Delay Timer	All
User Mode Switch	User Mode Switch	All
External Device Monitoring	EDM	All
Routing	Routing	All
Muting	Muting	Unit version 1.0 or later
Enable Switch	Enable Switch	Unit version 1.0 or later
Pulse Generator	Pulse Generator	Unit version 1.0 or later
Counter	Counter	Unit version 1.0 or later
Multi Connector	Multi Connector	Unit version 1.0 or later

6-3   Function Block Editing

Editing of function blocks can be used to set parameters, add optional I/O, and add comments according to the application.
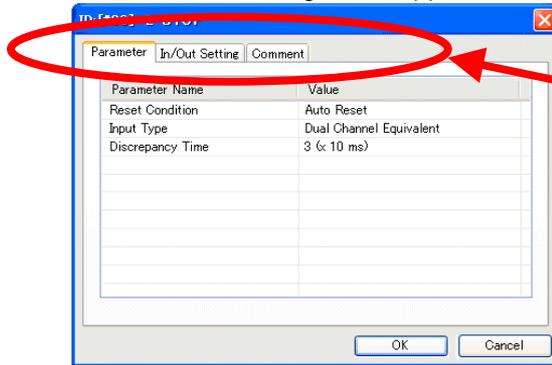
Tabs:
- Function block parameters
- Out point Setting, In/Out Settings
- Comments

6-3-1   Function Block Parameter Settings

The following parameters can be set for function blocks depending on the user application. The parameters that can be set will vary from function block to function block.

- Input type
- Discrepancy time
- Synchronization time
- Function test

Input Type Settings

- Single Channel
- Dual Channel Equivalent
- Dual Channel Complementary
- Dual Channel Equivalent (2 Pairs)
- Dual Channel Complementary (2 Pairs)

The following truth tables outline the internal evaluations performed by the NE1A-series Controller for each type of input signal. In the tables, 0 indicates OFF and 1 indicates ON.

Setting: Single Channel

Input 1 (NC)	Output Enable
0	0
1	1

Setting: Dual Channel Equivalent

Input 1 (NC)	Input 2 (NC)	Output Enable
0	0	0
0	1	0
1	0	0
1	1	1

Setting: Dual Channel Complementary

Input 1 (NC)	Input 2 (NO)	Output Enable
0	0	0
0	1	0
1	0	1
1	1	0

Setting: Dual Channel Equivalent (2 Pairs)

Input 1 (NC)	Input 2 (NC)	Input 3 (NC)	Input 4 (NC)	Output Enable
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

Setting: Dual Channel Complementary (2 Pairs)

Input 1 (NC)	Input 2 (NO)	Input 3 (NC)	Input 4 (NO)	Output Enable
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Discrepancy Time

If the function block input type is set to Dual Channel Equivalent or Dual Channel Complementary, the discrepancy time (i.e., the time between changes in the inputs) can be evaluated.

The time between when one of the dual-channel inputs changes until the other one changes is monitored. If the second dual-channel input does not change before the discrepancy time expires, an error will occur and the Output Enable output from the function block will not turn ON.

Dual channel mode	Input signals		Input signal status
	Input 1	Input 2	
Dual Channel Equivalent • Input 1: NC • Input 2: NC	0	0	Inactive
	0	1	Discrepant
	1	0	Discrepant
	1	1	Active
Dual Channel Complementary • Input 1: NC • Input 2: NO	0	0	Discrepant
	0	1	Inactive
	1	0	Active
	1	1	Discrepant

The dual channel modes can be used to detect faults in safety devices and safety device wiring monitored by the function block.

The time between changes in the inputs will not be monitored if the discrepancy time is set to 0.

The discrepancy time is evaluated both when the input signals go from active to inactive and from inactive to active.

Normal Operation Example for Dual Channel Equivalent Setting
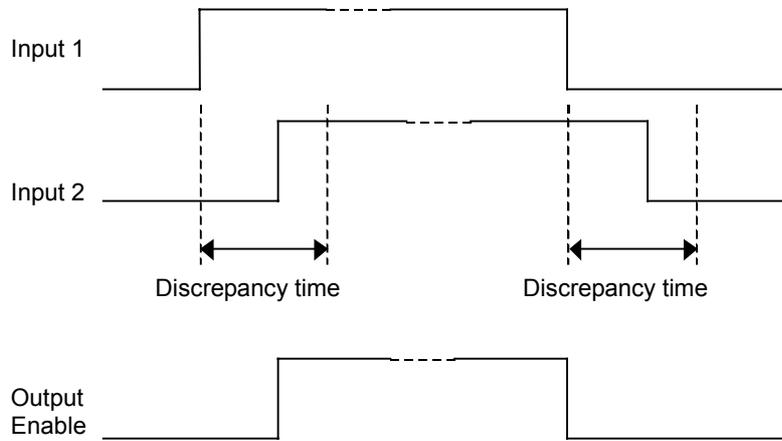
Discrepancy Error Operation Example for Dual Channel Equivalent Setting
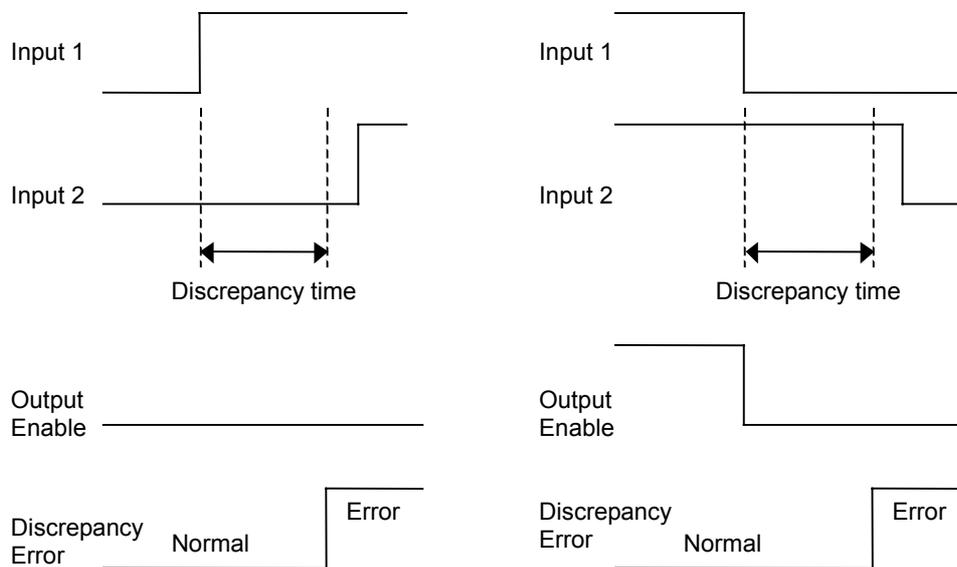
Synchronization Time Setting

If the function block input type is set to Dual Channel Equivalent (2 Pairs) or Dual Channel Complementary (2 Pairs) for the Safety Gate Monitoring function block, the synchronization time (i.e., the time between changes in the input pairs) can be evaluated.

The time between when one of the input pairs changes until the other one changes is monitored. If the second input pair does not change before the synchronization time expires, an error will occur and the Output Enable output from the function block will not turn ON. The time between changes in the input pairs will not be monitored if the synchronization time is set to 0.

Function Tests

Function tests are supported when using the Safety Gate Monitoring function block.

If the function test is enabled when the NE1A-series Controller is started, a safety gate test must be performed when the function test request signal is input from the machine.

6-3-2   I/O Settings

Input and Output Size Settings

The number of inputs and outputs for logic functions can be increased.

Output Points Setting

Optional outputs from function blocks can be enabled.

Fault Present Setting

Fault Present is a diagnostic status bit supported in some function blocks by selecting the checkbox located on the In/Out Setting or Out Point Tab Page of the function block properties. If the *Fault Present* checkbox is selected, an additional Fault Present output will be displayed on the function block.

Example: Safety Gate Monitoring Function Block (SGATE)
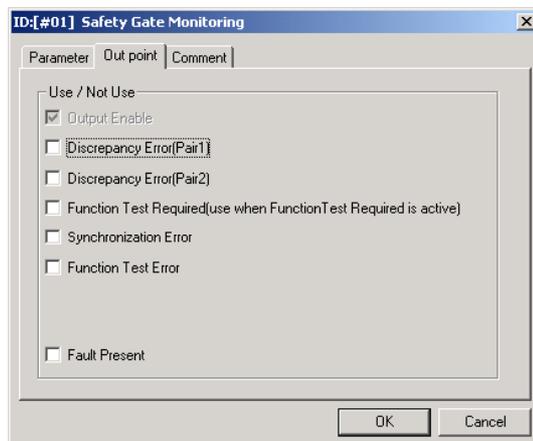
Out Point Tab Page in the Safety Gate Monitoring Function Block Editing Dialog Box
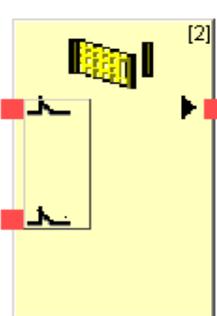
Safety Gate Monitoring Function Block with Default Settings
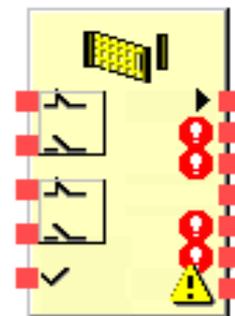
Safety Gate Monitoring Function Block with Maximum Inputs and Outputs Enabled

6-4   Command Reference: Logic Functions

6-4-1   Logic Function: NOT

Diagram
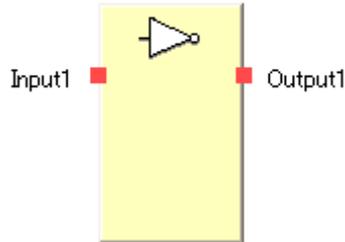
General Description

The output will be the inverse of the input.

Truth Table

Input 1	Output 1
0	1
1	0

0: OFF, 1: ON

6-4-2   Logic Function: AND

Diagram
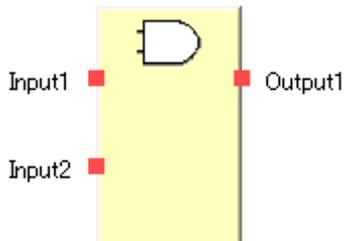
Default Connections

General Description

An AND of the input conditions will be output. Up to eight input conditions can be evaluated.

Optional Input Settings

The number of inputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	1 to 8	2
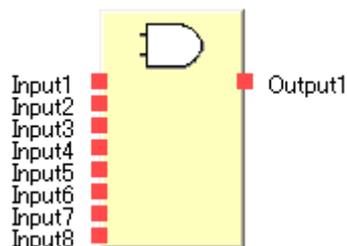
Maximum Number of Inputs for an AND Logic Function

Truth Tables

Truth Table for One-input AND Evaluation

Input 1	Output 1
0	0
1	1

0: OFF, 1: ON

Truth Table for Two-input AND Evaluation

Input 1	Input 2	Output 1
0	x	0
x	0	0
1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Three-input AND Evaluation

Input 1	Input 2	Input 3	Output 1
0	x	x	0
x	0	x	0
x	x	0	0
1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Four-input AND Evaluation

Input 1	Input 2	Input 3	Input 4	Output 1
0	x	x	x	0
x	0	x	x	0
x	x	0	x	0
x	x	x	0	0
1	1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Five-input AND Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Output 1
0	x	x	x	x	0
x	0	x	x	x	0
x	x	0	x	x	0
x	x	x	0	x	0
x	x	x	x	0	0
1	1	1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Six-input AND Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Output 1
0	x	x	x	x	x	0
x	0	x	x	x	x	0
x	x	0	x	x	x	0
x	x	x	0	x	x	0
x	x	x	x	0	x	0
x	x	x	x	x	0	0
1	1	1	1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Seven-input AND Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Output 1
0	x	x	x	x	x	x	0
x	0	x	x	x	x	x	0
x	x	0	x	x	x	x	0
x	x	x	0	x	x	x	0
x	x	x	x	0	x	x	0
x	x	x	x	x	0	x	0
x	x	x	x	x	x	0	0
1	1	1	1	1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Eight-input AND Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input 8	Output 1
0	x	x	x	x	x	x	x	0
x	0	x	x	x	x	x	x	0
x	x	0	x	x	x	x	x	0
x	x	x	0	x	x	x	x	0
x	x	x	x	0	x	x	x	0
x	x	x	x	x	0	x	x	0
x	x	x	x	x	x	0	x	0
x	x	x	x	x	x	x	0	0
1	1	1	1	1	1	1	1	1

0: OFF, 1: ON, x: Either ON or OFF

6-4-3   Logic Function: OR

<u>Diagram</u>
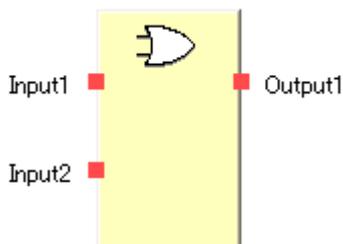
Default Connections

<u>General Description</u>

An OR of the input conditions will be output. Up to eight input conditions can be evaluated.

<u>Optional Input Setting</u>

The number of inputs can be increased on In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	1 to 8	2
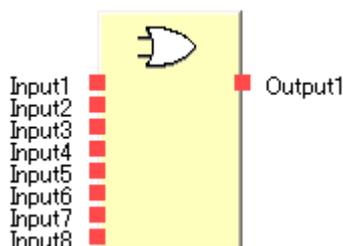
Maximum Number of Inputs for an OR Logic Function

<u>Truth Table</u>

Truth Table for One-input OR Evaluation

Input 1	Output 1
0	0
1	1

0: OFF, 1: ON

Truth Table for Two-input OR Evaluation

Input 1	Input 2	Output 1
0	0	0
1	x	1
x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Three-input OR Evaluation

Input 1	Input 2	Input 3	Output 1
0	0	0	0
1	x	x	1
x	1	x	1
x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Four-input OR Evaluation

Input 1	Input 2	Input 3	Input 4	Output 1
0	0	0	0	0
1	x	x	x	1
x	1	x	x	1
x	x	1	x	1
x	x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Five-input OR Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Output 1
0	0	0	0	0	0
1	x	x	x	x	1
x	1	x	x	x	1
x	x	1	x	x	1
x	x	x	1	x	1
x	x	x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Six-input OR Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Output 1
0	0	0	0	0	0	0
1	x	x	x	x	x	1
x	1	x	x	x	x	1
x	x	1	x	x	x	1
x	x	x	1	x	x	1
x	x	x	x	1	x	1
x	x	x	x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Seven-input OR Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Output 1
0	0	0	0	0	0	0	0
1	x	x	x	x	x	x	1
x	1	x	x	x	x	x	1
x	x	1	x	x	x	x	1
x	x	x	1	x	x	x	1
x	x	x	x	1	x	x	1
x	x	x	x	x	1	x	1
x	x	x	x	x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

Truth Table for Eight-input OR Evaluation

Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input 8	Output 1
0	0	0	0	0	0	0	0	0
1	x	x	x	x	x	x	x	1
x	1	x	x	x	x	x	x	1
x	x	1	x	x	x	x	x	1
x	x	x	1	x	x	x	x	1
x	x	x	x	1	x	x	x	1
x	x	x	x	x	1	x	x	1
x	x	x	x	x	x	1	x	1
x	x	x	x	x	x	x	1	1

0: OFF, 1: ON, x: Either ON or OFF

6-4-4   Logic Function: Exclusive OR

Diagram
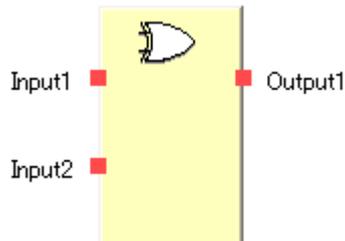
General Description

An exclusive OR of the input conditions will be output.

Truth Table

Truth Table for Exclusive OR Evaluation

Input 1	Input 2	Output 1
0	0	0
0	1	1
1	0	1
1	1	0

0: OFF, 1: ON

6-4-5   Logic Function: Exclusive NOR

Diagram
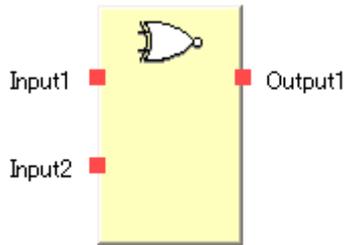
General Description

An exclusive NOR of the input conditions will be output.

Truth Table

Truth Table for Exclusive NOR Evaluation

Input 1	Input 2	Output 1
0	0	1
0	1	0
1	0	0
1	1	1

0: OFF, 1: ON

6-4-6   Logic Function: RS-FF (Reset Set Flip-Flop)

Diagram
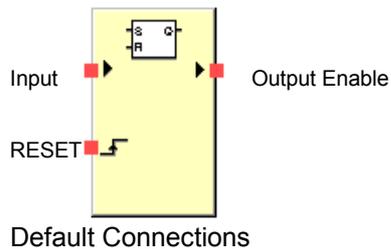
Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.
When the input condition to the RS-FF function block is turned ON, that ON status is maintained (latched) in the function block and the ON output is maintained at the Output Enable signal.
The ON status is maintained in the function block, so the Output Enable signal stays ON even if the input condition goes from ON to OFF.
The signal maintained in the function block is turned OFF when the function block's RESET condition is turned ON.

Fault Present Output Setting

A Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.

Input ▶

RESET

Output Enable
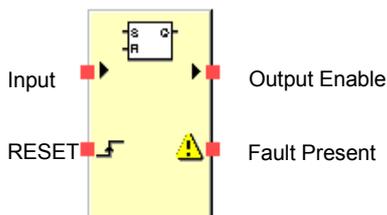
Fault Present

Maximum Number of I/O points for an RS-FF Function Block

Error Handling and Error Resetting

Error condition	Behavior for error detection		Resetting the error condition
	Output Enable	Fault Present	
Input and RESET are active simultaneously.	OFF (safety state)	ON	Make one of the signals inactive.

Timing Table

Input

RESET

Output Enable

FaultPresent
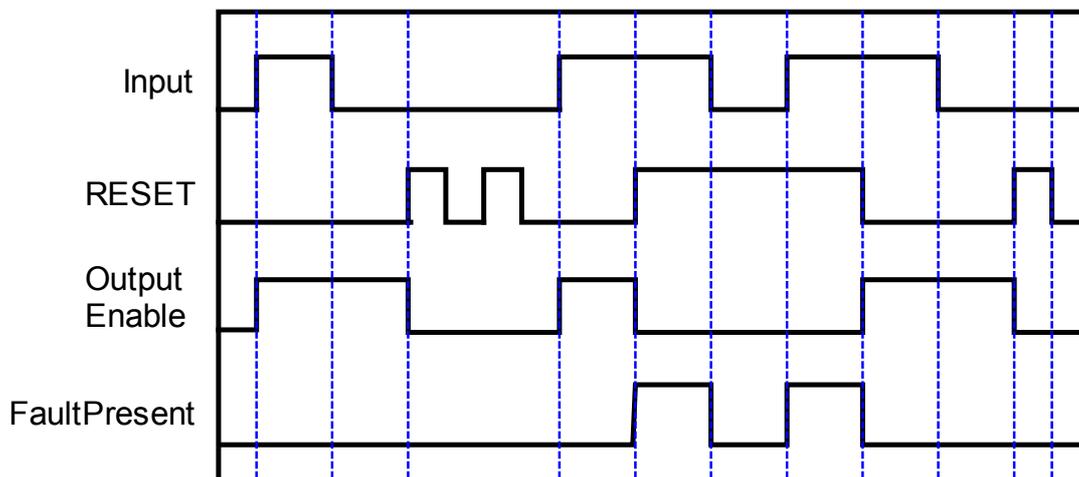
6-4-7   Logic Function: Comparator

Diagram
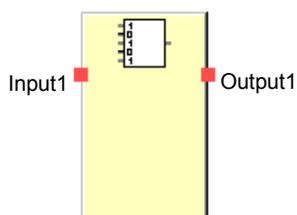
Input1

Output1

Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.

The Comparator compares the specified input signals (up to 8 inputs) with the comparison value set in the configuration, and turns ON the Output 1 signal when all of the input signals match the comparison value.
The Output 1 signal will be turned OFF when the input signals no longer match the comparison value.
From 1 to 8 inputs can be set for the input signals.

Set Parameters

Parameter	Setting range	Default setting
Comparison Value	00000000 to 11111111 (bit 0 to bit 7)	00000001

Optional Input Settings

The number of inputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	1 to 8	1

Input1
Input2
Input3
Input4
Input5
Input6
Input7
Input8
Output1
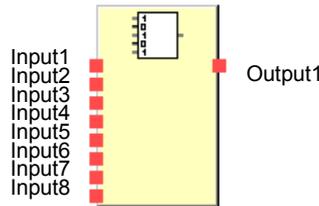
Maximum Number of Inputs for the Comparator Logic Function

Truth Table

Truth Table for Comparator Evaluation (CV = Comparison Value):

Input1	Input2	Input3	Input4	Input5	Input6	Input7	Input8	Output1
≠ CV for Bit 0	×	×	×	×	×	×	×	0
×	≠ CV for Bit 1	×	×	×	×	×	×	0
×	×	≠ CV for Bit 2	×	×	×	×	×	0
×	×	×	≠ CV for Bit 3	×	×	×	×	0
×	×	×	×	≠ CV for Bit 4	×	×	×	0
×	×	×	×	×	≠ CV for Bit 5	×	×	0
×	×	×	×	×	×	≠ CV for Bit 6	×	0
×	×	×	×	×	×	×	≠ CV for Bit 7	0
= CV for Bit 0	= CV for Bit 1	= CV for Bit 2	= CV for Bit 3	= CV for Bit 4	= CV for Bit 5	= CV for Bit 6	= CV for Bit 7	1

0: OFF; 1: ON, ×: Either ON or OFF

Note: "= CV for Bit n" indicates that the bit matches the comparison value.

"≠ CV for Bit n" indicates that the bit does not match the comparison value.

"×" indicates the status is not applicable (may match or not match).

Timing Chart
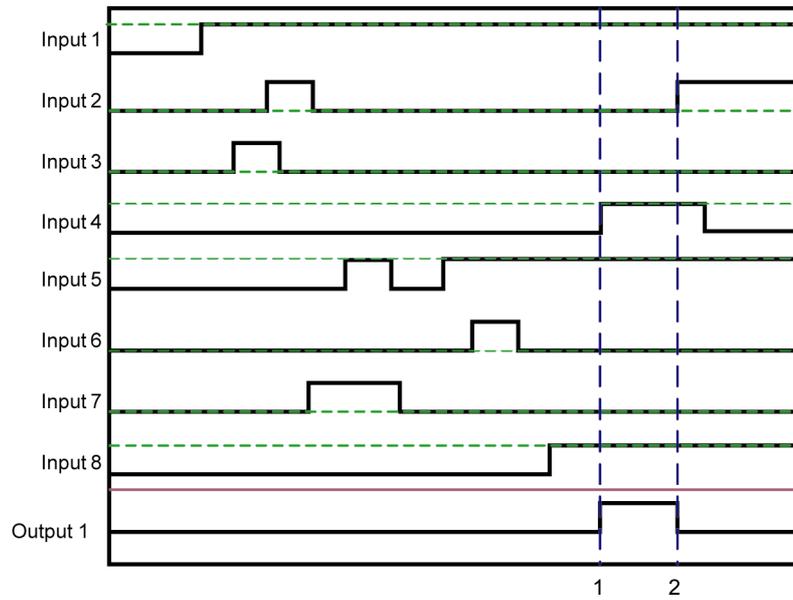
The horizontal broken lines in the above diagram represent the comparison values for each input.

1: Output1 turns ON when all of the input signals match the comparison value.

2: Output 1 turns OFF when any of the input signals does not match the comparison value.

6-5   Command Reference: Function Blocks

6-5-1   Function Block: Reset

Diagram
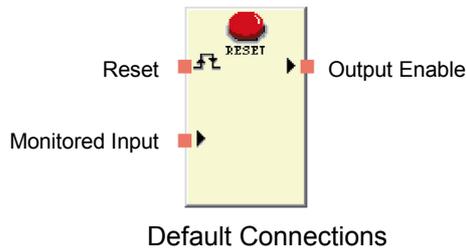
Default Connections

General Description

The Output Enable signal will turn ON if the Reset signal is correctly input while the input condition to the Reset function block is ON.
This function block can be used to prevent the machine from automatically reset, e.g., when the power to the NE1A-series Controller is turned ON, when the operating mode is changed (from IDLE Mode to RUN Mode), or when a signal from a safety input device turns ON.

Conditions for Output Enable Turning ON
- The Monitored Input and all enabled optional inputs must be ON.
- And the Reset signal must be input correctly.

Conditions for Static Release Turning ON
The Monitored Input and all enabled optional inputs must be ON.

Conditions for Reset Required Indication Turning ON
If the following condition is met, the Reset Required Indication will become a 1-Hz pulse output.
- The Monitored Input and all enabled optional inputs must be ON.
- And Output Enable must be OFF.

If the Reset Signal is set to Low-High-Low, the Reset Required Indication will turn ON when the next condition is met.
- The Reset signal turns ON.

Set Parameters

The Reset Signal can be set in NE1A-series Controllers with unit version 1.0 or later.

Parameter	Setting range	Default setting
Reset Signal	• Low-High-Low • Rising Edge	Low-High-Low

Number of Inputs Setting

The number of inputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	2 to 8 (Optional Input Settings)	2

Optional Output Settings

The outputs shown below can be used in the program. To enable either of these outputs, select the checkbox on the Out Point Tab Page of the function block properties dialog box.
- Static Release
- Reset Required Indication
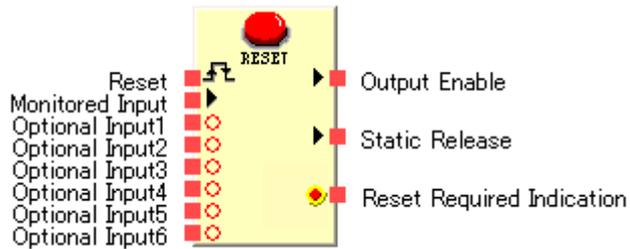
Maximum Number of Inputs and Outputs for a Reset Logic Function

Reset Signal

The Reset signal must meet the following conditions.
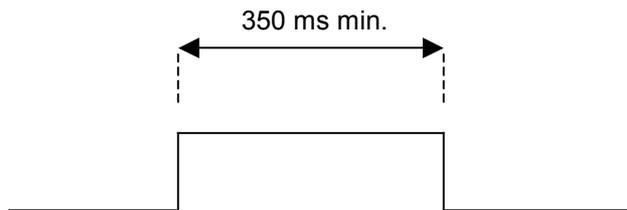
In NE1A-series Controllers with unit version 1.0 or later, the Low-to-High rising edge can be selected. To enable this signal, set the *Reset Signal* to *Rising Edge* on the Parameter Tab Page of the function block properties dialog box.

Timing Chart

Reset Signal set to Low-High-Low:
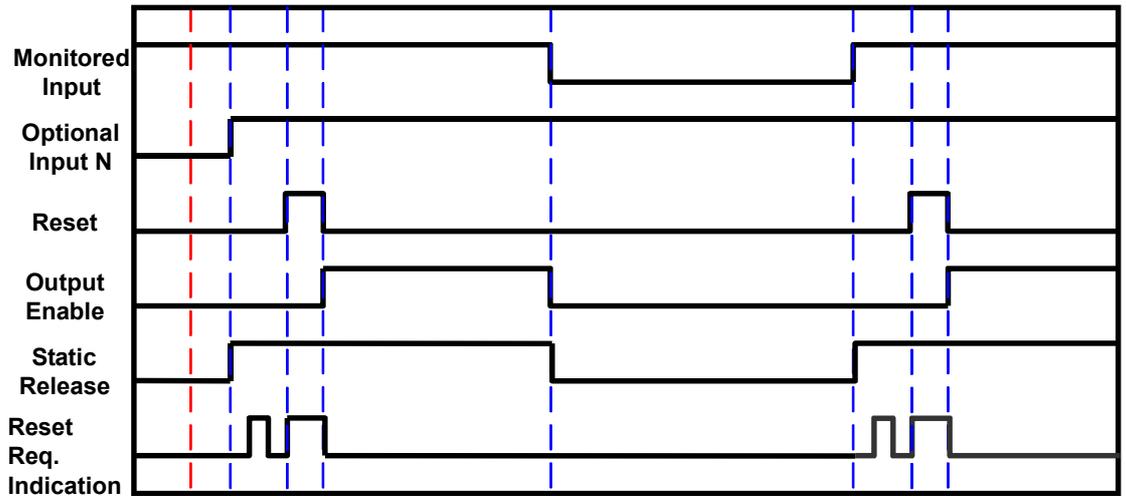
Idle to RUN

Reset Signal set to Rising Edge:
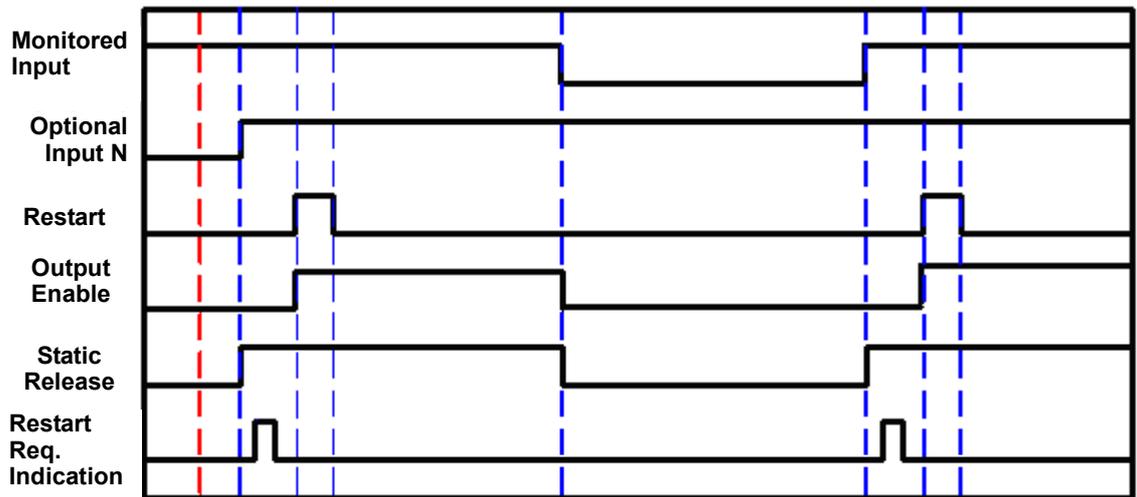
Idle to RUN

6-5-2   Function Block: Restart

Diagram
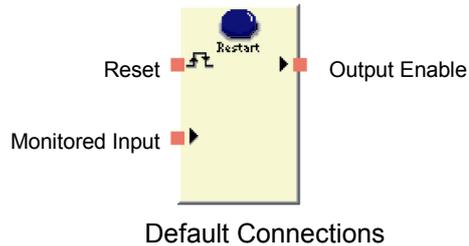
Reset

Monitored Input

Output Enable

Default Connections

General Description

The Output Enable signal will turn ON if the Reset signal is correctly input while the input condition to the Restart function block is ON.
This function block can be used to prevent the machine from automatically restarting, e.g., when the power to the NE1A-series Controller is turned ON, when the operating mode is changed (from IDLE Mode to RUN Mode), or when a signal from a safety input device turns ON.
Functionally, the Reset function block and the Restart function block are equivalent.

Conditions for Output Enable Turning ON
- The Monitored Input and all enabled optional inputs must be ON.
- And the Reset signal must be input correctly.

Conditions for Static Release Turning ON
The Monitored Input and all enabled optional inputs must be ON.

Conditions for Restart Required Indication Turning ON
If the following condition is met, the Restart Required Indication will become a 1-Hz pulse output.
- The Monitored Input and all enabled optional inputs must be ON.
- And Output Enable must be OFF.

If the Reset Signal is set to Low-High-Low, the Reset Required Indication will turn ON when the next condition is met.
- The Restart signal must be ON.

Set Parameters

The Reset Signal can be set in NE1A-series Controllers with unit version 1.0 or later.

Parameter	Setting range	Default setting
Reset Signal	• Low-High-Low • Rising Edge	Low-High-Low

Number of Inputs Setting

The number of inputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	2 to 8 (Optional Input Settings)	2

Optional Output Settings

The outputs shown below can be used in the program. To enable either of these outputs, select the checkbox on the Out Point Tab Page of the function block properties dialog box.
- Static Release
- Restart Required Indication
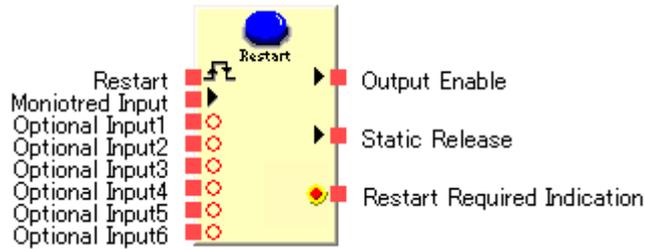
Maximum Number of Inputs and Outputs for a Restart Logic Function Block

Restart Signal

The Restart signal must meet the following conditions.
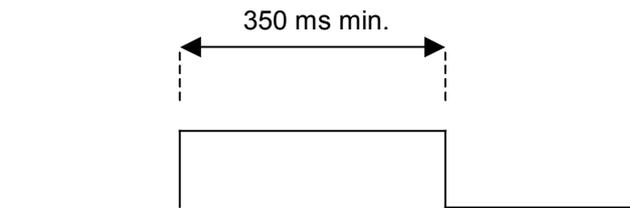
In NE1A-series Controllers with unit version 1.0 or later, the Low-to-High rising edge can be selected. To enable this signal, set the *Reset Signal* to *Rising Edge* on the Parameter Tab Page of the function block properties dialog box.
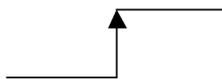
Timing Chart

Reset Signal set to Low-High-Low:
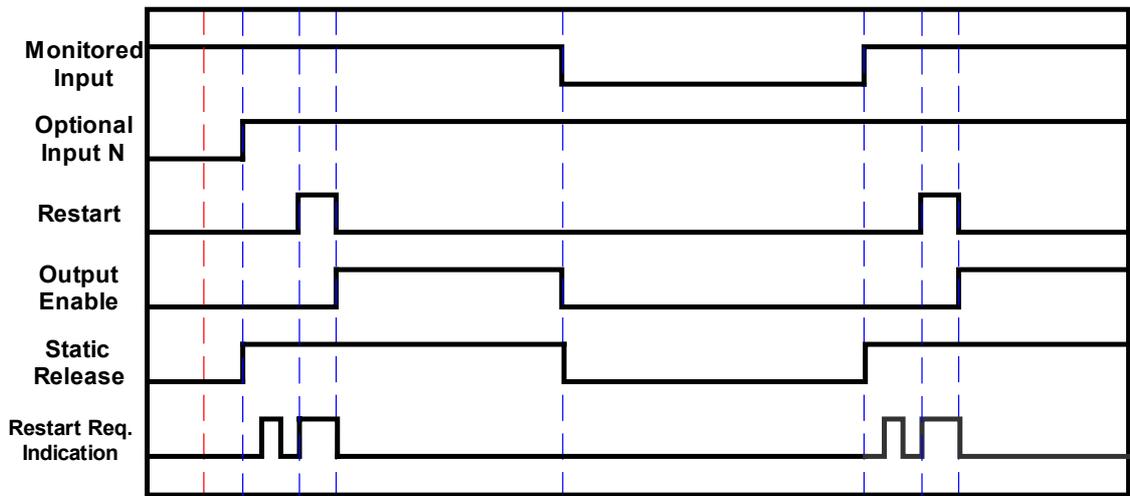
Idle to RUN

Reset Signal set to Rising Edge:
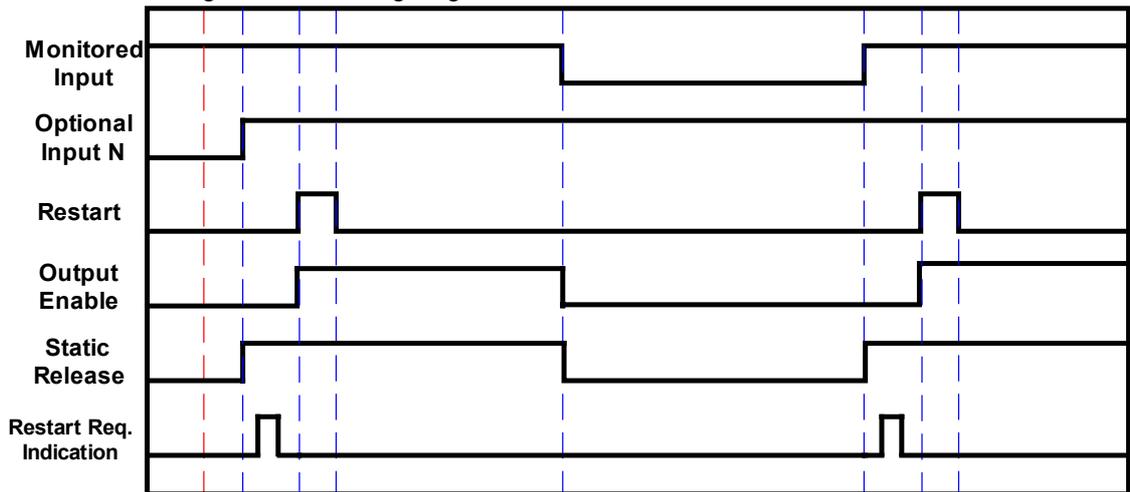
Idle to RUN

6-5-3   Function Block: Emergency Stop Pushbutton Monitoring

Diagram

Input1 (NC)

Input2 (NC)
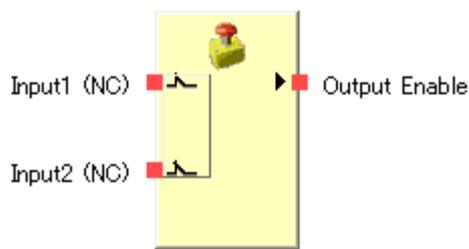
Output Enable

Default Connections

General Description

The Emergency Stop Pushbutton Monitoring function block allows the user to monitor an emergency stop pushbutton switch.

The Output Enable signal will turn ON if the input from the emergency pushbutton being monitored is active. The Output Enable signal will turn OFF if the input is inactive or if an error is detected for the function block.

IMPORTANT:
A manual reset function is required for emergency stop applications. When using the Emergency Stop Pushbutton Monitoring function block, you must also use the Reset function block.
Refer to *A-1-1 Emergency Stop Application: Dual Channel Mode with Manual Reset* for a Programming Examples.

Set Parameters

Parameter	Setting range	Default setting
Input Type	Single Channel Dual Channel Equivalent Dual Channel Complementary	Dual Channel Equivalent
Discrepancy Time	0 to 30 s in 10-ms increments A discrepancy time check will not be performed if 0 is set.	30 ms

The discrepancy time must be equal to or greater than the NE1A-series Controller's cycle time.

Optional Output Setting

The following error output can also be used in programming. To enable this optional output, select the checkbox on the Out Point Tab Page of the function block properties dialog box.

- Discrepancy Error

Fault Present Output Setting

A Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.

Maximum Number of I/O for a Emergency Stop Pushbutton Monitoring Function Block

Truth Tables

Setting: Single Channel

Input 1 (NC)	Output Enable
0	0
1	1

0: OFF, 1: ON

Setting: Dual Channel Equivalent

Input 1 (NC)	Input 2 (NC)	Output Enable
0	0	0
0	1	0
1	0	0
1	1	1

0: OFF, 1: ON

Setting: Dual Channel Complementary

Input 1 (NC)	Input 2 (NO)	Output Enable
0	0	0
0	1	0
1	0	1
1	1	0

0: OFF, 1: ON

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Discrepancy error	OFF (safety state)	ON	Discrepancy Error output: ON	Remove the cause of the error and then do the following: 1. Make the inputs inactive and then active again. 2. Or change the NE1A-series Controller's operating mode to IDLE Mode and then back to RUN Mode.

Timing Chart

When Set to Dual Channel Equivalent

Idle to RUN   Discrepancy time

6-5-4   Function Block: Light Curtain Monitoring

Diagram
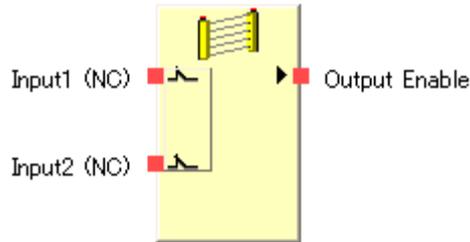
Default Connections

General Description

The Light Curtain Monitoring function block monitors a type-4 safety light curtain.

The Output Enable signal will turn ON if the input from the safety light curtain being monitored is active. The Output Enable signal will turn OFF if the input is inactive or if an error is detected for the function block.

Set Parameters

Parameter	Setting range	Default setting
Input type	Dual Channel Equivalent Dual Channel Complementary	Dual Channel Equivalent
Discrepancy time	0 to 30 s in 10-ms increments A discrepancy time check will not be per-formed if 0 is set.	30 ms

The discrepancy time must be equal to or greater than the NE1A-series Controller's cycle time.

Optional Output Setting

The following error output can also be used in programming. To enable this optional output, select the checkbox on the Out Point Tab Page of the function block properties dialog box.

• Discrepancy Error

Fault Present Output Setting

Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.

Maximum Number of I/O for a Light Curtain Monitoring Function Block

Truth Tables

Setting: Dual Channel Equivalent

Input 1 (NC)	Input 2 (NC)	Output Enable
0	0	0
0	1	0
1	0	0
1	1	1

0: OFF, 1: ON

Setting: Dual Channel Complementary

Input 1 (NC)	Input 2 (NO)	Output Enable
0	0	0
0	1	0
1	0	1
1	1	0

0: OFF, 1: ON

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Discrepancy error	OFF (safety state)	ON	Discrepancy Error output: ON	Remove the cause of the error and then do the following: 1. Make the inputs inactive and then active again. 2. Or change the NE1A-series Controller's operating mode to IDLE Mode and then back to RUN Mode.

Timing Chart

When Set to Dual Channel Equivalent

Idle to RUN   Discrepancy time

6-5-5   Function Block: Safety Gate Monitoring

Diagram

Default Connections
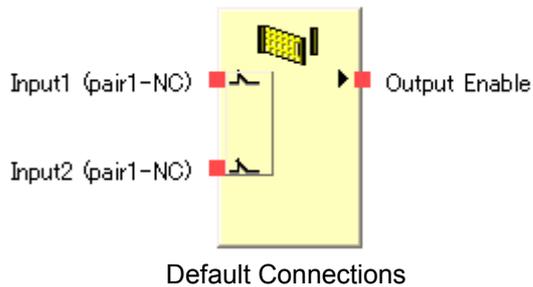
General Description

The Safety Gate Monitoring function block monitors the status of a safety gate. Safety gate status is monitored using an input signal from a safety door switch or safety limit switch connected to the door.

The Output Enable signal will turn ON if the input from the switch being monitored is active. The Output Enable signal will turn OFF if the input is inactive or if an error is detected for the function block.

Function Tests

For some safety gate applications, safeguarding devices require physical verification that the device continues to operate properly (e.g., required for Category 2 safety gate applications).

If the function test is enabled for the Safety Gate Monitoring function block, a safety gate test in which the safety gate must be opened and then closed again can be added as a condition for turning ON the Output Enable signal.
If enabled, the safety gate test must be executed under the following conditions.
(1) Startup
    The safety gate test must be executed when the NE1A-series Controller is started (i.e., when the Controller's operating mode changes from IDLE Mode to RUN Mode). If the test ends normally, the Output Enable signal will turn ON.
(2) Function Test Request from the Machine
    The safety gate test must be executed after the NE1A-series Controller detects the Function Test Signal from the machine turn ON and before the Function Test Signal turns ON again. If the Function Test Signal turns ON a second time before the safety gate test is completed normally, a function test error will occur, the Output Enable signal will turn OFF, and the Function Test Error signal will turn ON.
(3) Error Detected in Safety Gate Monitoring Function Block
    The safety gate test must be executed if a function test error, discrepancy error, or other function block error occurs (after removing the cause of the error).

The Function Test Required Signal from the Safety Gate Monitoring function block will turn ON when a safety gate test is required and it will remain ON until the safety gate test has been completed normally.

Set Parameters

Parameter	Setting range	Default setting
Input Type	Single Channel Dual Channel Equivalent (1 pair) Dual Channel Complementary (1 pair) Two Dual Channel Equivalent (2 pairs) Two Dual Channel Complementary (2 pairs)	Dual Channel Equivalent (1 pair)
Function Test	No Function Test/Function Test Required	No function test
Discrepancy Time Pair 1	0 to 30 s in 10-ms increments A discrepancy time check will not be performed if 0 is set.	30 ms
Discrepancy Time Pair 2		
Synchronization Time	0 to 30 s in 10-ms increments A synchronization time check will not be performed if 0 is set.	300 ms

The discrepancy time and synchronization time must be equal to or greater than the NE1A-series Controller's cycle time.

Optional Output Settings

The following outputs can also be used in programming. To enable any of these optional outputs, select the checkbox on the Out Point Tab Page of the function block properties dialog box.

Discrepancy Error Pair 1
Discrepancy Error Pair 2
Function Test Required Signal
Synchronization Error
Function Test Error

Fault Present Output Setting

Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.
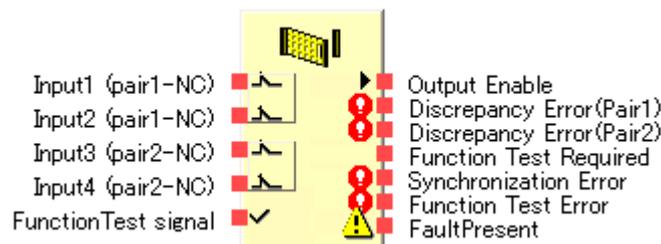
Maximum Number of I/O for a Light Curtain Monitoring Function Block

Truth Tables

Setting: Single Channel

Input 1 (pair 1-NC)	Output Enable
0	0
1	1

0: OFF, 1: ON

Setting: Dual Channel Equivalent (1 Pair)

Input 1 (pair 1-NC)	Input 2 (pair 1-NC)	Output Enable
0	0	0
0	1	0
1	0	0
1	1	1

0: OFF, 1: ON

Setting: Dual Channel Complementary (1 Pair)

| Input 1 (pair 1-NC)	Input 2 (pair 1-NO)	Output Enable
0	0	0
0	1	0
1	0	1
1	1	0

0: OFF, 1: ON

Setting: Two Dual Channel Equivalent (2 Pairs)

Input 1 (pair 1-NC)	Input 2 (pair 1-NC)	Input 3 (pair 2-NC)	Input 4 (pair 2-NC)	Output Enable
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

0: OFF, 1: ON

Setting: Two Dual Channel Complementary (2 Pairs)

Input 1 (pair 1-NC)	Input 2 (pair 1-NO)	Input 3 (pair 2-NC)	Input 4 (pair 2-NO)	Output Enable
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

0: OFF, 1: ON

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Discrepancy error at pair 1	OFF (safety state)	ON	Discrepancy Error Pair 1: ON	(1) Function Test Disabled Remove the cause of the error and then make the inputs in active and then active again (See note.), or change the NE1A-series Controller's operating mode to IDLE Mode and then back to RUN Mode. (2) Function Test Required If Function Test Required is active: Remove the cause of the error and then make the inputs active, inactive, and then active again (i.e., perform the safety gate test). If Function Test Required is inactive: Remove the cause of the error and then make the inputs in active and then active again.
Discrepancy error at pair 2			Discrepancy Error Pair 2: ON	
Function test error Safety gate test was not performed normally between Function Test signals.			Function Test Error: ON	
Synchronization error			Synchronization Test Error: ON	

Note: If a discrepancy error occurs in one of the pairs when set to Dual Channel Equivalent (2 pairs) or Dual Channel Complementary (2 pairs), to reset the error make input pairs 1 and 2 both inactive and then active.

Timing Charts

Single Channel, Function Test Set to Enabled

Idle to RUN

Dual Channel Equivalent, Function Test Set to Disabled

Dual Channel Equivalent (2 pairs), Function Test Set to Disabled
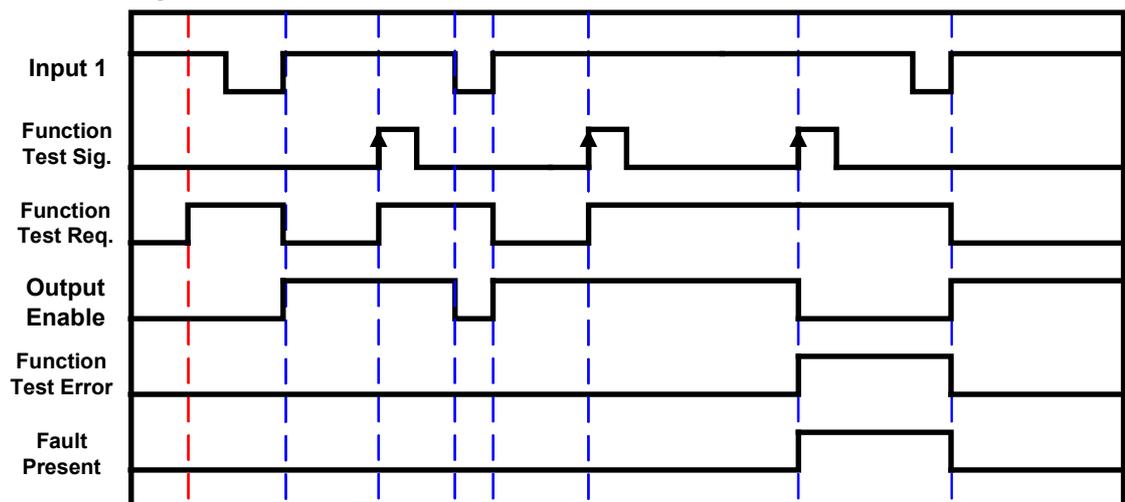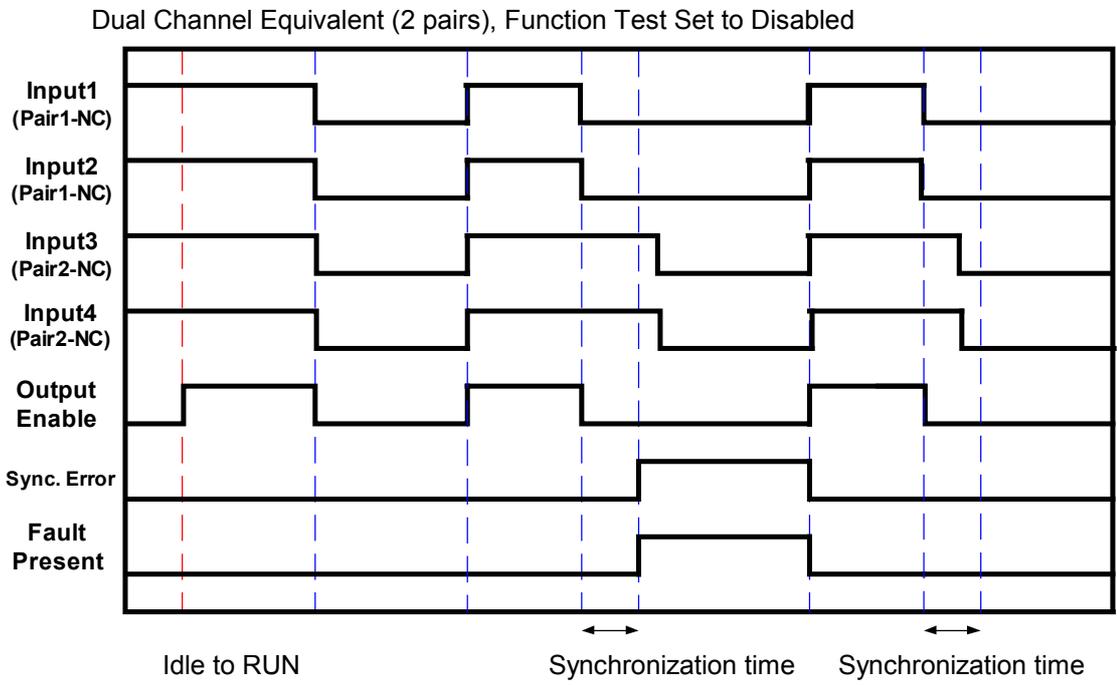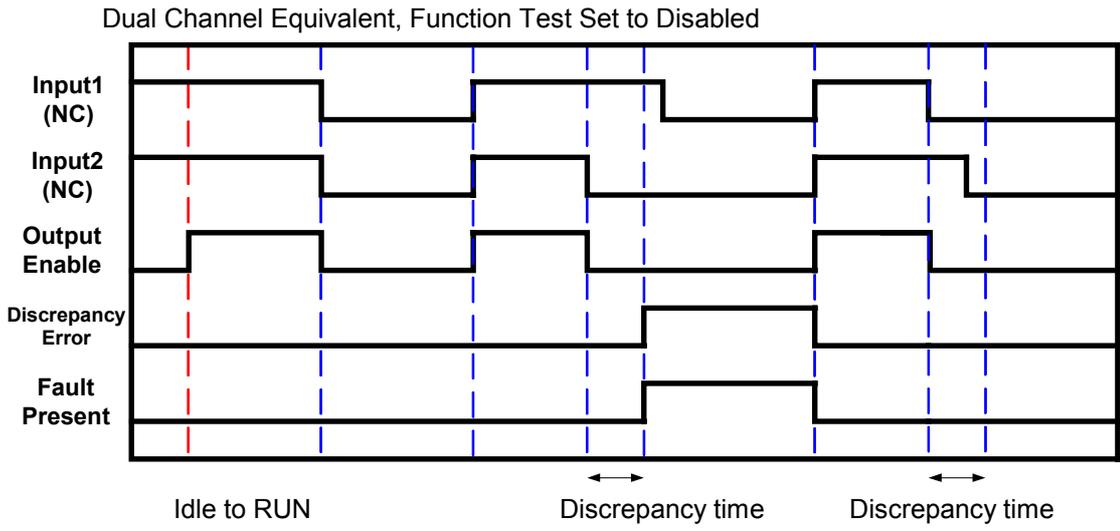
6-5-6   Function Block: Two-hand Control

Diagram

Default Connections
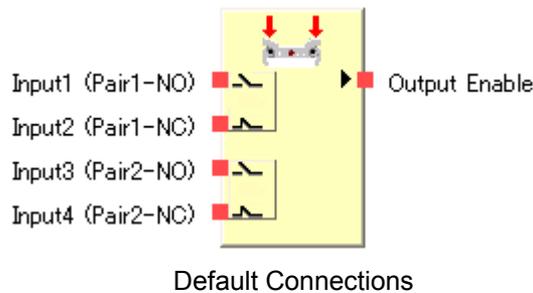
General Description

The Two-hand Control function block enables monitoring the status of a two-hand switch.

The Two-hand Control function block can be used with a suitable 2-hand switch to meet the requirements of type III C in EN 574, *Two-hand Control Devices, Functional Aspect – Principle for Design.*

The Output Enable signal will turn ON only if both inputs from the two-hand switch are active and satisfy the requirements of EN 574. The Output Enable signal will turn OFF if the inputs from the two-hand switch do not satisfy the requirements of EN 574, an input is inactive, or if an error is detected for the function block.

Set Parameters

Parameter	Setting range	Default setting
Discrepancy Time Pair 1	0 to 500 ms in 10-ms increments A discrepancy time check will not be performed if 0 is set.	30 ms
Discrepancy Time Pair 2		

The discrepancy times must be equal to or greater than the NE1A-series Controller's cycle time.

Optional Output Settings

The following error outputs can also be used in programming. To enable either of these optional outputs, select the checkbox on the Out Point Tab Page of the function block properties dialog box.

Discrepancy Error Pair 1
Discrepancy Error Pair 2

Fault Present Output Setting

Fault Present output can also be used in programming.
To enable this output, select the Use Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.
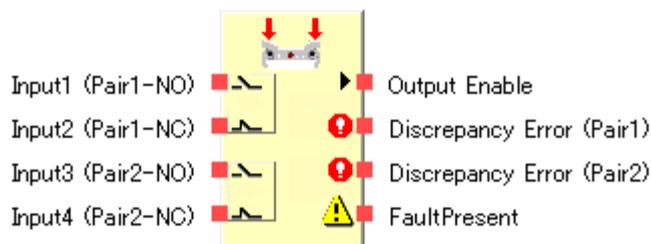
Maximum Number of I/O for a Two-hand Control Function Block

Truth Table

Input 1 (Pair 1-NO)	Input 2 (Pair 1-NC)	Input 3 (Pair 2-NO)	Input 4 (Pair 2-NC)	Output Enable
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

0: OFF, 1: ON

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Discrepancy Error at Pair 1	OFF (safety state)	ON	Discrepancy Error Pair 1: ON	Remove the cause of the error and then do the following: 1. Make the both input pair 1 and pair 2 inactive and then active again. 2. Or change the NE1A-series Controller's operating mode to IDLE Mode and then back to RUN Mode.
Discrepancy Error at Pair 2			Discrepancy Error Pair 2: ON	

Note: The Output Enable signal will not turn ON if the synchronization time requirement is not met (i.e., operation inputs for both hands must be completed within 500 ms), but this is **not** considered an error.

Timing Chart
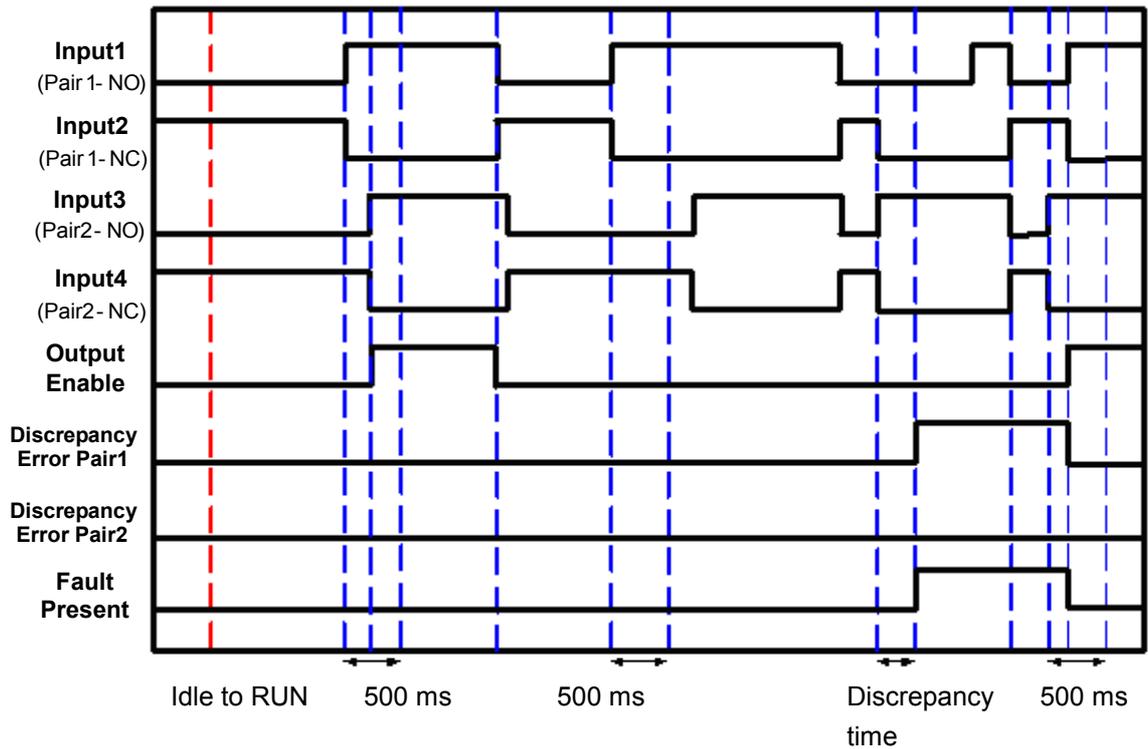
6-5-7   Function Block: OFF-delay Timer

Diagram
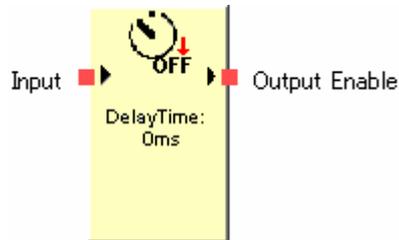
General Description

The OFF-delay Timer function block performs a timer operation for an OFF delay set in 10-ms increments. The range for this delay is from 0 ms to 300 s.

Set Parameters

Parameter	Setting range	Default setting
OFF-delay Time	0 to 300 s in 10-ms increments	0 ms

The OFF-delay time must be equal to or greater than the NE1A-series Controller's cycle time.

Timing Chart

Idle to RUN
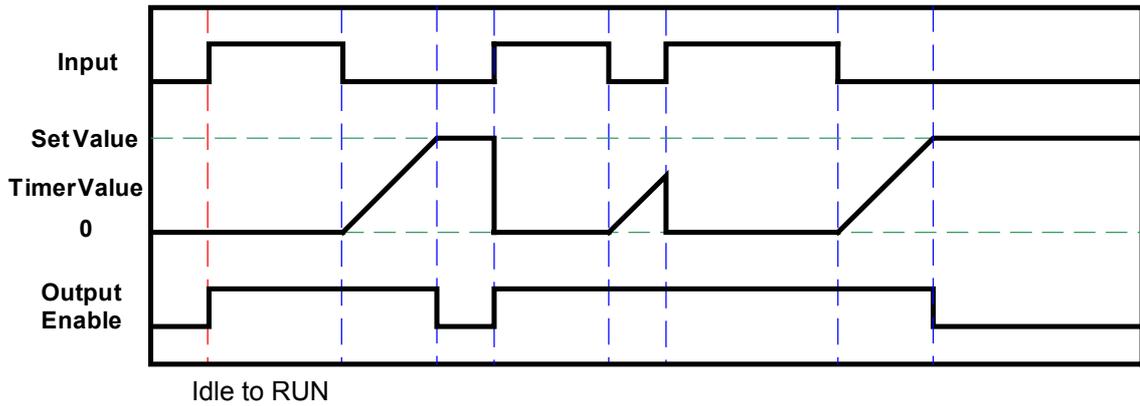
6-5-8   Function Block: ON-delay Timer

Diagram
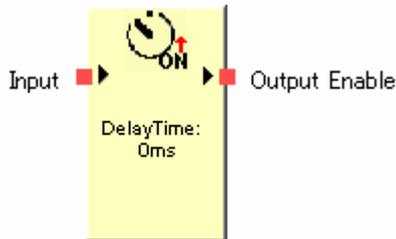
General Description

The ON-delay Timer function block performs a timer operation for an ON delay set in 10-ms increments. The range for this delay is from 0 ms to 300 s.

Set Parameters

Parameter	Setting range	Default setting
ON-delay Time	0 to 300 s in 10-ms increments	0 ms

The ON-delay time must be equal to or greater than the NE1A-series Controller's cycle time.

Timing Chart

Idle to RUN
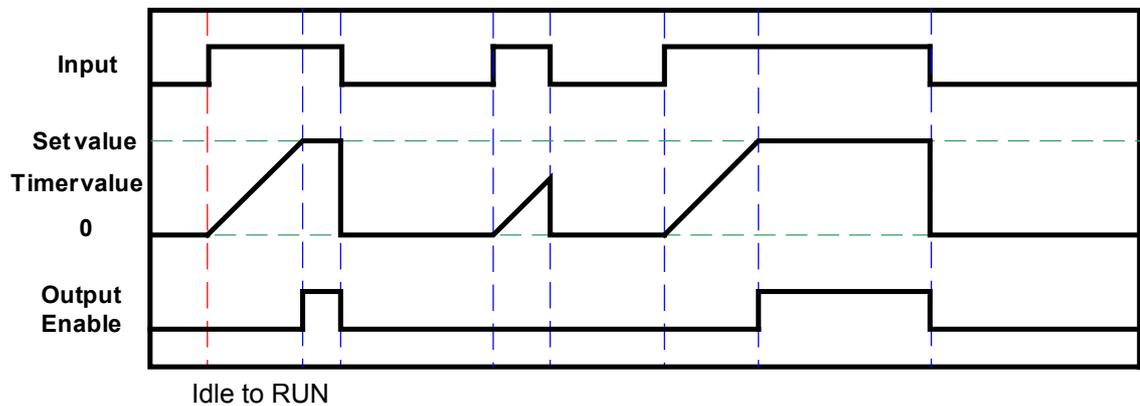
6-5-9   Function Block: User Mode Switch

Diagram

Default Connections
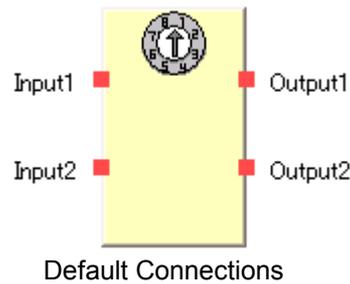
General Description

The User Mode Switch function block is used to monitor an operating mode switch in the user system or device.

The operating mode switch that can be connected with this function block must be a 1-of-N type switch (i.e., one of N contacts is ON). The function block supports a maximum of eight inputs and corresponding outputs.

The output corresponding to the input that is active is turned ON. If an error is detected for the function block, however, all outputs will turn OFF.

Optional Output Settings

The number of I/O can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	2 to 8	2
Number of outputs	2 to 8	2

Fault Present Output Setting

Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the In/Out Setting Tab Page of the function block properties dialog box.
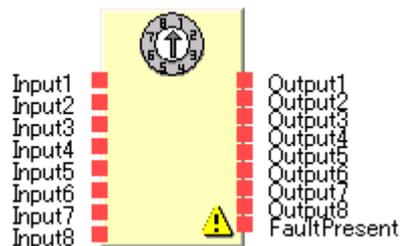
Maximum Number of Inputs for a User Mode Switch Logic Function

Truth Table

Inputs								Outputs							
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1

0: OFF, 1: ON

Error Handling and Error Resetting

Error condition	Behavior for error detection		Resetting the error condition
	Output	Fault Present	
More than one input was ON for more than 2 s	OFF (safety state)	ON	Remove the cause of the error. (Correct system so that only 1 contact is ON.)
All inputs were OFF for more than 2 s			

Note: If more than one input is ON, the output corresponding to the first input to turn ON will turn ON for 2 s. If more than one input turns ON in the same NE1A-series Controller cycle, then all outputs will turn OFF.

Timing Chart
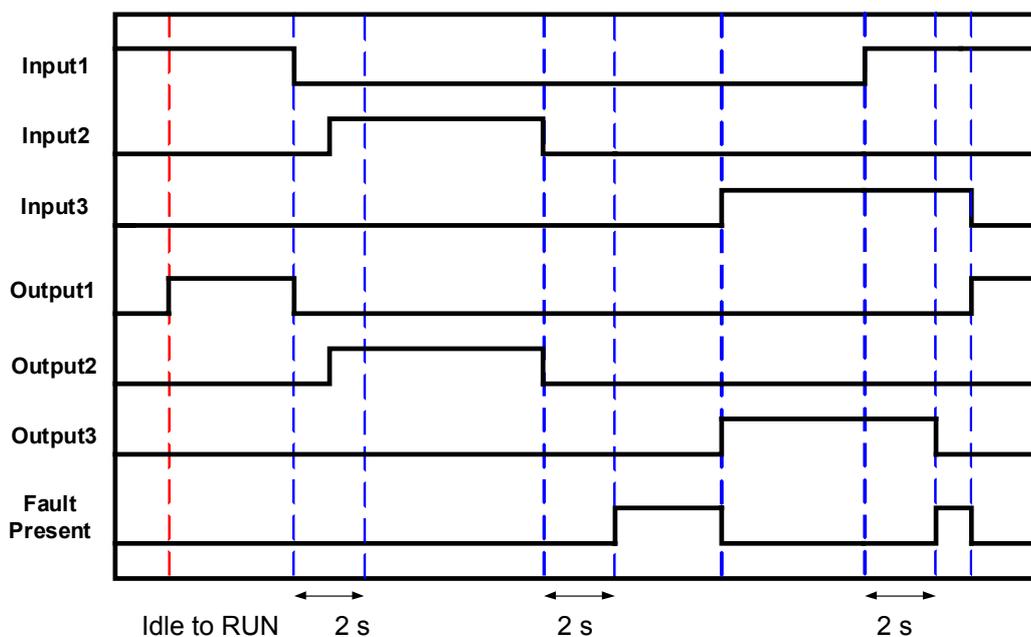
6-5-10   Function Block: External Device Monitoring

Diagram

Default Connections
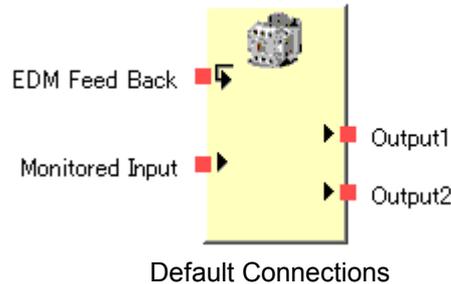
General Description

The External Device Monitoring function block evaluates the input signal and the status of an external device and outputs safety outputs to an external device.

If the input signal turns ON, the Output 1 and Output 2 signals will turn ON. When this occurs, the status of the feedback signal must change within the specified time. If the input signal turns OFF, the Output 1 and Output 2 signals will turn OFF. When this occurs, the status of the feedback signal must change within the specified time.

If the status of the feedback signal does not change within the specified time, an EDM error will occur, the Output 1 and Output 2 signals will turn OFF, and the EDM Error signal will turn ON.

Set Parameters

Parameter	Setting range	Default setting
EDM Feedback Maximum Time Delay (T_{EDM})	100 to 1000 ms in 10-ms increments	300 ms

The EDM Feedback Maximum Time Delay must be equal to or greater than the cycle time of the NE1A-series Controller.
The network response time must be taken into consideration when inputting the feedback signal from a remote device.

Optional Output Settings

The following outputs can also be used in programming. To enable either of these optional outputs, select the checkbox on the Out Point Tab Page of the function block properties dialog box.

EDM error
Output 2

Fault Present Output Setting

Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.
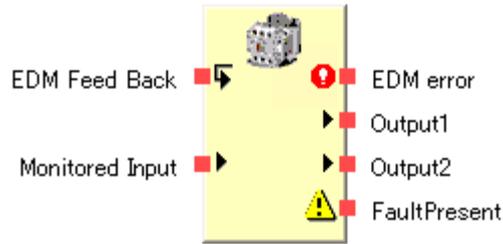
Maximum Number of I/O for a External Device Monitoring Function Block

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Outputs 1 and 2	Fault Present	Error output	
EDM feedback time error	OFF (safety state)	ON	EDM Error output: ON	Remove the cause of the error and turn ON the safety input.

Timing Chart
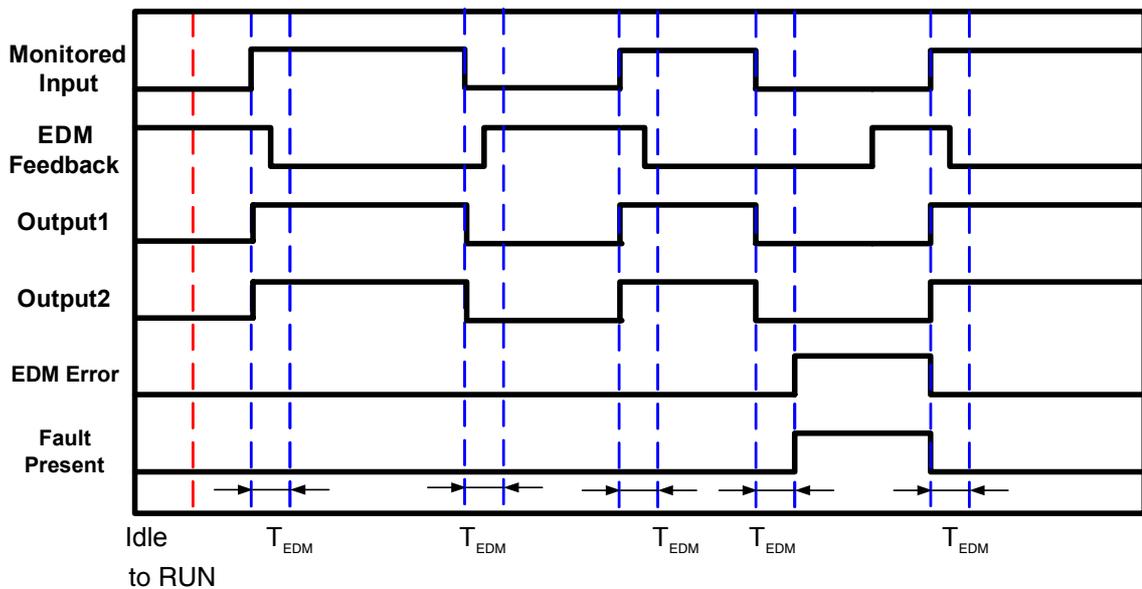
6-5-11   Logic Function: Routing

Diagram

Default Connections
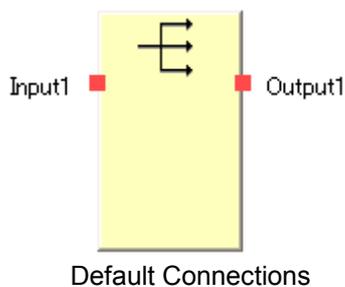
General Description

The Routing function block routes one input signal to a maximum of eight output signals. It is used to output a signal to more than one output tag.

Optional Output Settings

The number of outputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of outputs	1 to 8	1
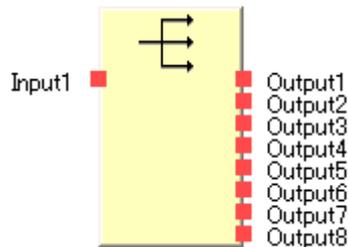
Maximum Number of Outputs for a Routing Logic Function

Truth Table

Truth Table for Routing Evaluation

Input 1	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1

0: OFF, 1: ON

6-5-12   Function Block: Muting

Diagram
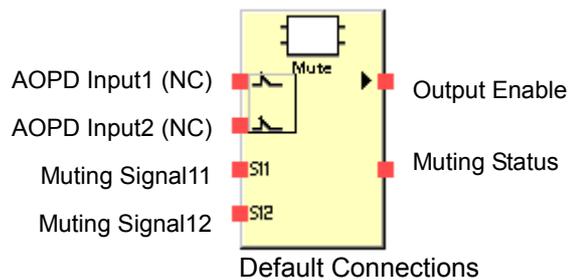
Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later. The Muting function block temporarily disables the light-interruption signal (AOPD input) in a light curtain while the muting signal is being detected. While the muting function is operating, a detection object can be removed from the light curtain's detection zone without stopping machine operation.
In addition, the Muting function block has an override function to forcibly turn ON the Output Enable signal without the condition for starting the muting function being satisfied. (For example, when a detection object stops in the light curtain's detection zone, the machine can be operated to remove the detection object.)

Any of the following four muting functions can be selected.

Muting Mode	Application
Parallel Muting with 2 Sensors	This pattern is suitable for applications at a conveyor entrance. Use this pattern when two Retro-reflective Photoelectric Sensors are set up as the muting sensors with intersecting detection zones.
Sequential Muting (Forward Direction)	This pattern is suitable for applications at a conveyor entrance. Use this pattern when four Through-beam Photoelectric Sensors are set up as the muting sensors.
Sequential Muting (both directions)	This pattern is suitable for applications at a conveyor entrance or exit. Use this pattern when four Through-beam Photoelectric Sensors are set up as the muting sensors.
Position detection	This pattern is suitable for applications in which muting is controlled by a switch input. Use this pattern to temporarily disable the light-interruption signal of the light curtain when the operator is placing an object in the machine opening.

Note: In the explanation above, the muting sensors are ON when detection is performed and OFF when detection is not performed.

Set Parameters

Parameter	Setting range	Default setting
Input Type (light curtain output)	• Dual Channel Equivalent (NC/NC) • Dual Channel Complementary (NC/NO)	Dual Channel Equivalent
Discrepancy Time (light curtain output)	10 to 500 ms in 10-ms increments (See note.) A discrepancy time check will not be performed if 0 is set.	30 ms
Input Type (Override signal)	• Single Channel • Dual Channel Equivalent (NO/NO) • Dual Channel Complementary (NC/NO) • Not used.	Not used.
Discrepancy Time (Override signal)	10 to 500 ms in 10-ms increments (See note.) A discrepancy time check will not be performed if 0 is set.	30 ms
Max. Override Time	500 ms to 127.5 s in 500-ms increments	60 s
Muting Mode	Position detection Parallel Muting with 2 Sensors Sequential Muting (Forward Direction) Sequential Muting (Both Directions)	Parallel Muting with 2 Sensors
Max Muting Time	500 ms to 127.5 s in 500-ms increments 0 to 500 ms in 10-ms increments The muting time will be unlimited if 0 is set.	60 s
Synchronization Time (between Muting Signal 11 and Muting Signal 12 or between Muting Signal 21 and Muting Signal 22)	30 ms to 3 s in 10-ms increments (See note.)	3 s

Note: The timer SV must be longer than the NE1A-series Controller's cycle time.

Optional Output Settings

The following outputs can also be used in programming. To enable any of these optional outputs, increase the number of outputs in the In/Out Setting Tab Page of the function block properties dialog box.
- Override Status
- Synchronization Error
- Sequence Error
- Discrepancy Error (AOPD)
- Discrepancy Error (Override)

Fault Present Output Setting

A Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the In/Out Setting Tab Page of the function block properties dialog box.
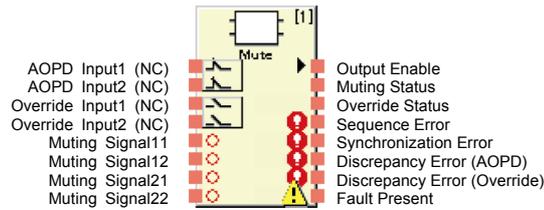
Maximum Number of I/O for a Muting Function Block

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Synchronization Error (Between Muting Signal 11 and Muting Signal 12) (Between Muting Signal 21 and Muting Signal 22) (See note 1.)	ON (See note 3.)	OFF (See note 3.)	Synchronization Error: ON	Reset when muting is applied again or when the NE1A-series Controller's operating mode is changed to IDLE Mode and then back to RUN Mode.
Sequence Error			Sequence Error: ON	
Discrepancy Error (AOPD)	OFF (Safety state)	ON	Discrepancy Error (AOPD): ON	Both light curtain input signals change from inactive to active status or the NE1A-series Controller's operating mode changes to IDLE Mode and then back to RUN Mode.
Discrepancy Error (Override)			Discrepancy Error (Override): ON	Both Override input signals change from inactive to active status or the NE1A-series Controller's operating mode changes to IDLE Mode and then back to RUN Mode.

Note 1: Detected only when *Sequential Muting (both directions)* is set.
Note 2: If more than one error occurs, errors will be indicated at all error outputs.
Note 3: If the light curtain goes from this error status to inactive (no light), the Output Enable signal will turn OFF and the Fault Present signal will turn ON. If the light curtain becomes active (light incident) or the override function is executed, the Output Enable signal will turn ON and the Fault Present signal will turn OFF.

Muting Function

Muting Start and Stop Conditions

● **Reset Conditions**
The Output Enable is ON when all of the following conditions are met.
• The light curtain signal is active (light incident).
• A Discrepancy Error has not occurred.

● **Start Conditions**
If the Muting signals meet the following conditions while the Output Enable signal is ON, muting will be applied and the Muting Status will be turned ON.
1) The muting sensors are all OFF.
2) While the muting sensors are all OFF, two Muting signals are detected in the correct sequence.
3) While the muting sensors are all OFF, the synchronization times of the two Muting signals are within the normal range (not including the position detection setting).

If one of the errors listed above occurs, the following alarm outputs will be generated.
- The Sequence Error signal will go ON if there is an invalid sequence, as described above.
- The Synchronization Error signal will go ON if an object cannot be detected within the synchronization time, as described above.

Also, the safety output will go OFF if the light curtain signal is inactive (no light) before the Controller goes into the muting state.

● **Stop Conditions**

If the following conditions are met while muting is in effect, the muting will be stopped and the Muting Status will go OFF.
- Two or more Muting signals are not ON.
- The Max. Muting Time has elapsed.
- A discrepancy error has occurred.

Also, the Output Enable signal will go OFF if muting is stopped and the light curtain is obstructed.

Note: When the operating mode of the NE1A-series Controller is changed from Idle to Run Mode, the input data from the Slaves will be OFF until communications are established. If Slave input data is used for the AOPD Input, the Fault Present and Sequence Error Outputs will turn ON just after the operating mode is changed to Run Mode. When the AOPD Input turns ON, the Fault Present Output will turn OFF. When the muting start condition is met, the Sequence Error Output will turn OFF.

Example Muting System Configurations

● **Parallel Muting with 2 Sensors**

In this example, two Retro-reflective Photoelectric Sensors are set up as the muting sensors with intersecting detection zones.
Use this configuration when the workpiece length (L) is not fixed or not long enough.

Block Diagram
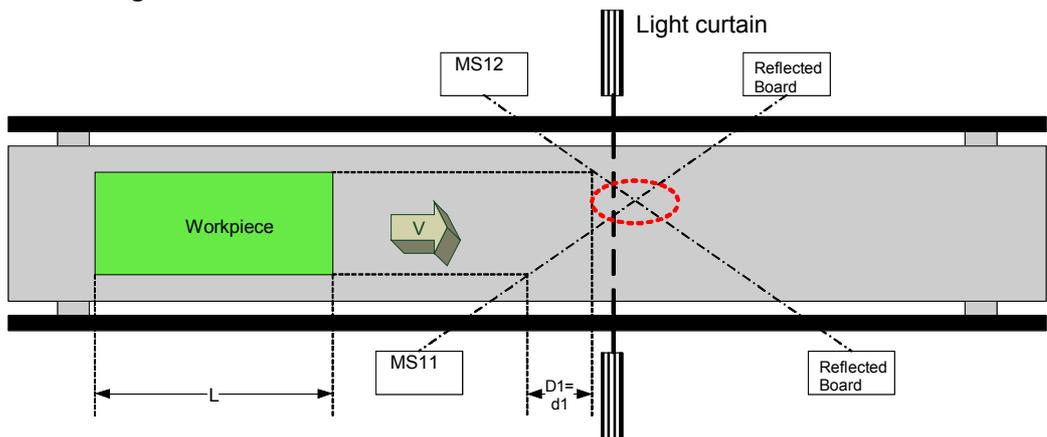
MS11: Muting sensor connected to Muting Signal 11
MS12: Muting sensor connected to Muting Signal 12

Note: The intersection of the two sensors must be after the light curtain.

Muting Sequence
1. In the block diagram above, the light is not interrupted between MS11 and MS12 and the light curtain, so the Output Enable signal is ON.
2. As the workpiece moves to the right and MS11 and MS12 go ON in order, muting is enabled.
3. As the workpiece continues advancing, the Output Enable signal is kept ON even

if the light curtain is obstructed.
4. As the workpiece continues advancing, the light from MS11 is no longer interrupted by the workpiece, the muting status is cleared and the Muting Status will go OFF.

Setup Distances
The following formula shows the minimum distance of D1 required for the muting sensors to provide effective muting function operation:

> Formula 1: D1 < L
> L: Length of the workpiece

The following formula shows the maximum distance of d1 required for the muting sensors to provide effective muting function operation:

> Formula 2: V × T1min < d1 < V × T1max
> V: Transit speed of the workpiece
> T1min: NE1A-series Controller cycle time
> T1max: Synchronization time setting time
> The default setting is 3 s.

D1 must satisfy formula 1 and d1 must satisfy formula 2 in order for the muting function to be operate effectively. These distance settings must prevent a passing person from enabling the muting function. Also, the light curtain and muting sensors must be setup so that a workpiece passes by all of the muting sensors before the next workpiece arrives at the muting sensors.

Timing Chart
Normal Operation
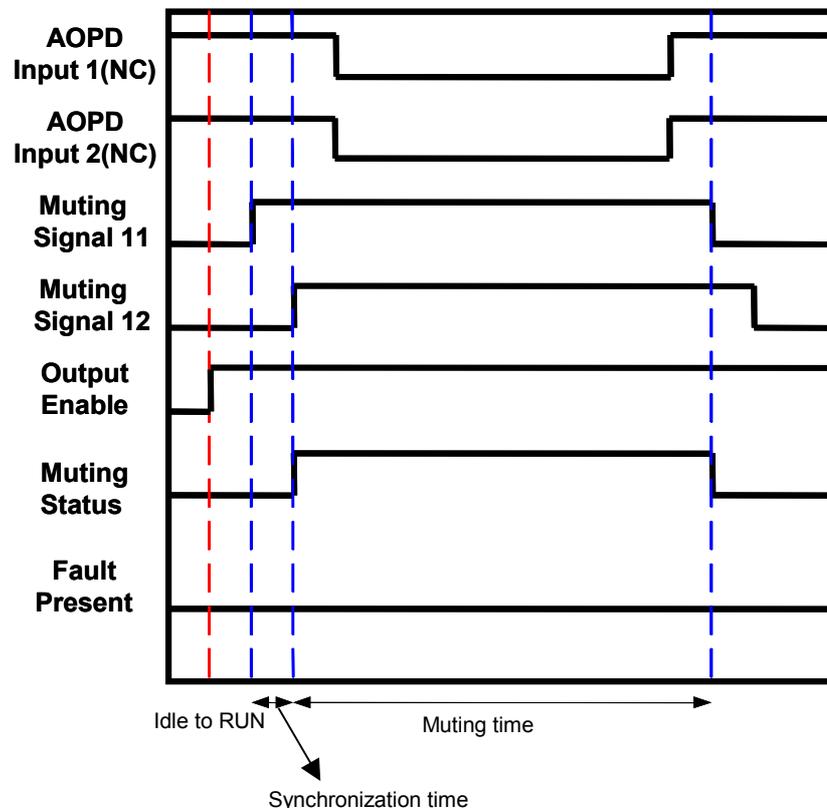
Synchronization Error
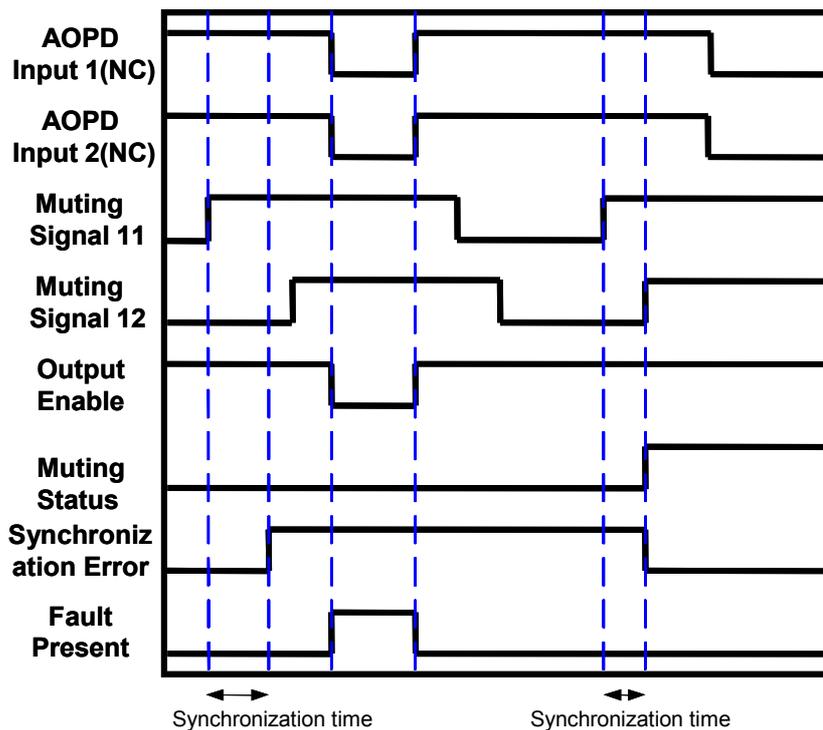
Sequence Error
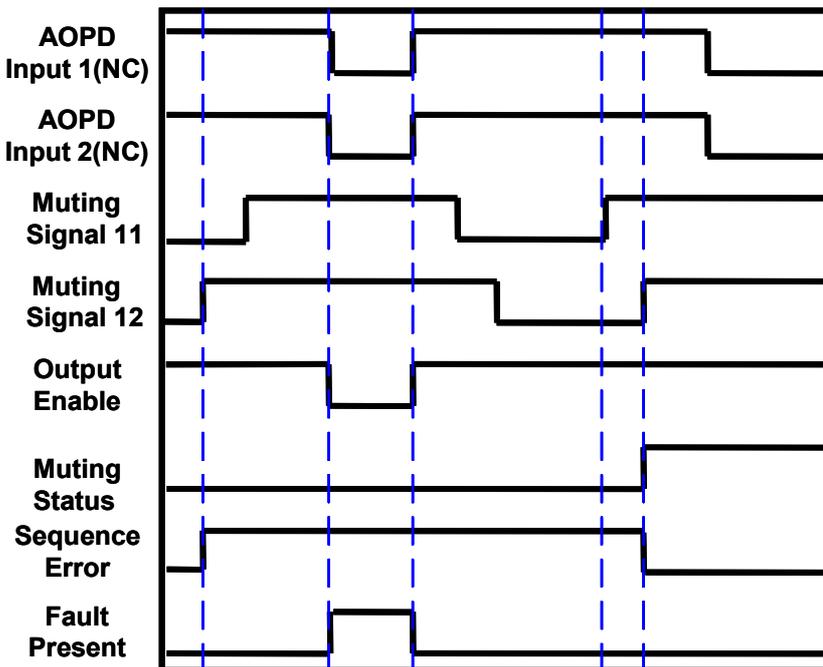
● Sequential Muting (Forward Direction)

In this example, four Through-beam Photoelectric Sensors are set up as the sensors with intersecting detection zones.

Use this configuration when the length of the workpiece being transported is longer than a fixed length.

Block Diagram
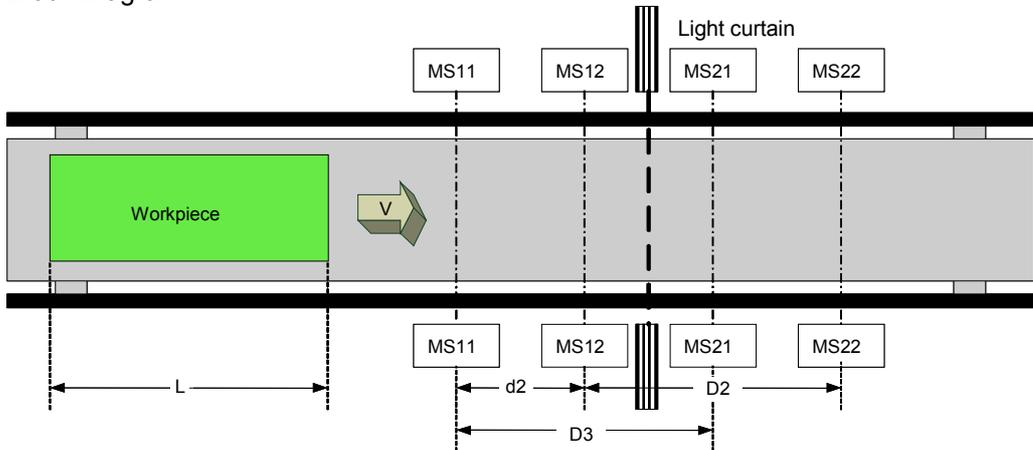
MS11: Muting sensor connected to Muting Signal 11
MS12: Muting sensor connected to Muting Signal 12
MS21: Muting sensor connected to Muting Signal 21
MS22: Muting sensor connected to Muting Signal 22

Muting Sequence

1. In the block diagram above, the light is not interrupted between MS11, MS12, MS21, and MS22 and the light curtain, so the Output Enable signal is ON.
2. As the workpiece moves to the right and MS11 and MS12 go ON in order, muting is enabled, and the Muting Status goes ON.
3. As the workpiece continues advancing, the Output Enable signal is kept ON even if the light curtain is obstructed.
4. As the workpiece continues advancing, light from MS21 is no longer interrupted by the workpiece, the muting status is cleared, and the Muting Status goes OFF.

Setup Distances

The following formulae show the minimum distances of D2 and D3 required for the muting sensors to provide effective muting function operation:

　　　Formula 3: $D2 < L$
　　　Formula 4: $D3 < L$
　　　L: Length of the workpiece

The following formula shows the maximum distance of d2 required for the muting sensors to provide effective muting function operation:

　　　Formula 5: $V \times T1min < d2 < V \times T1max$
　　　V: Transit speed of the workpiece
　　　T1min: NEA1-series Controller cycle time
　　　T1max: Synchronization time setting time
　　　　　The default setting is 3 s.

D2 must satisfy formula 3, D3 must satisfy formula 4, and d5 must satisfy formula 5 in order for the muting function to operate effectively. These distance settings must prevent a passing person from enabling the muting function. Also, the light curtain and muting sensors must be setup so that a workpiece passes by all of the muting sensors before the next workpiece arrives at the muting sensors.

Timing Chart

Idle to RUN

Muting time

Synchronization time
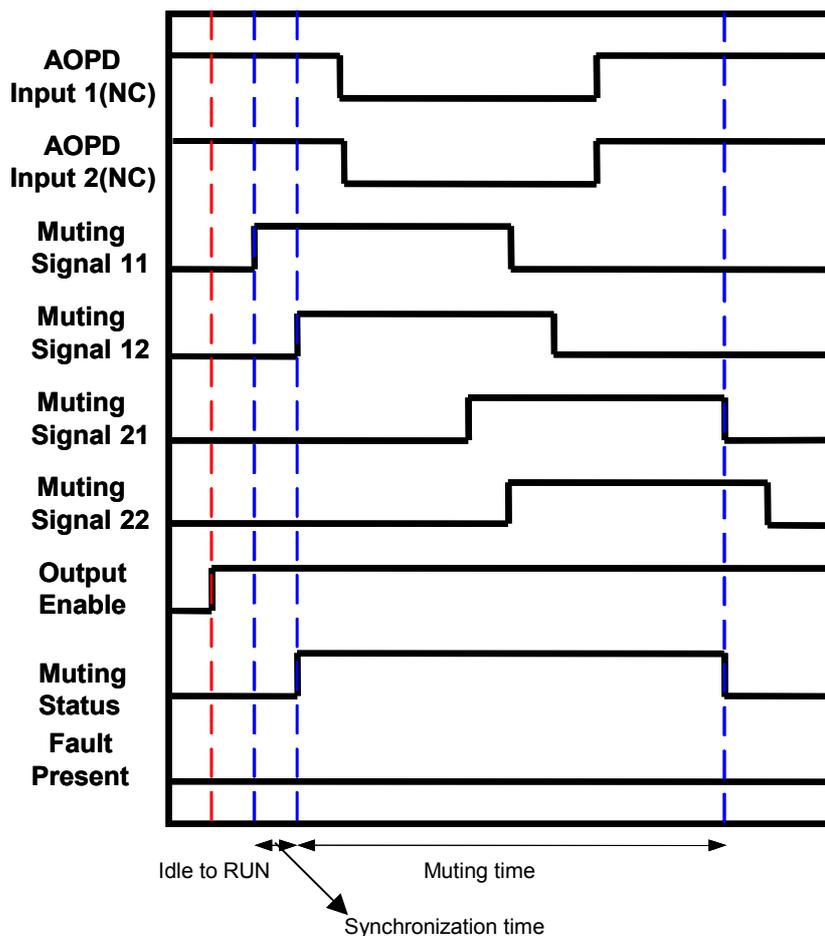
● **Sequential Muting (Both Direction)**
Block Diagram

(1) Entrance
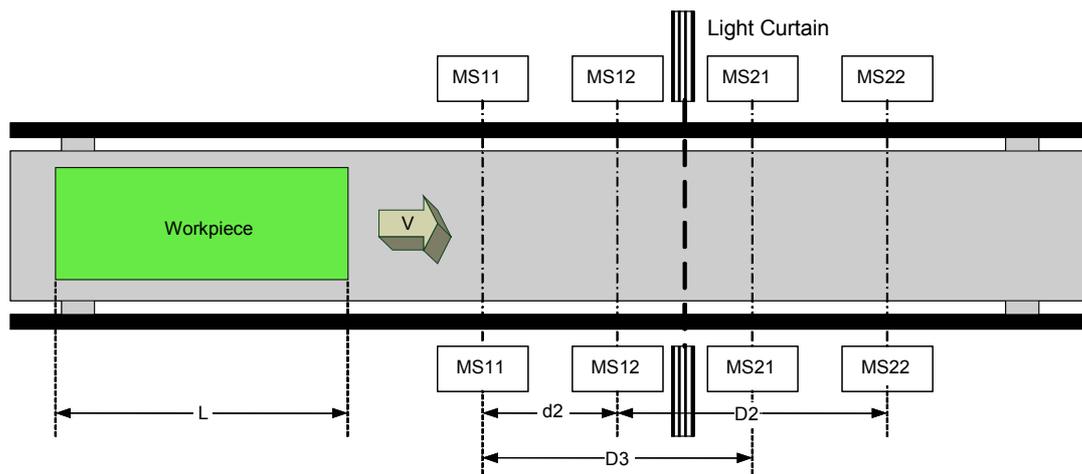
(2) Exit
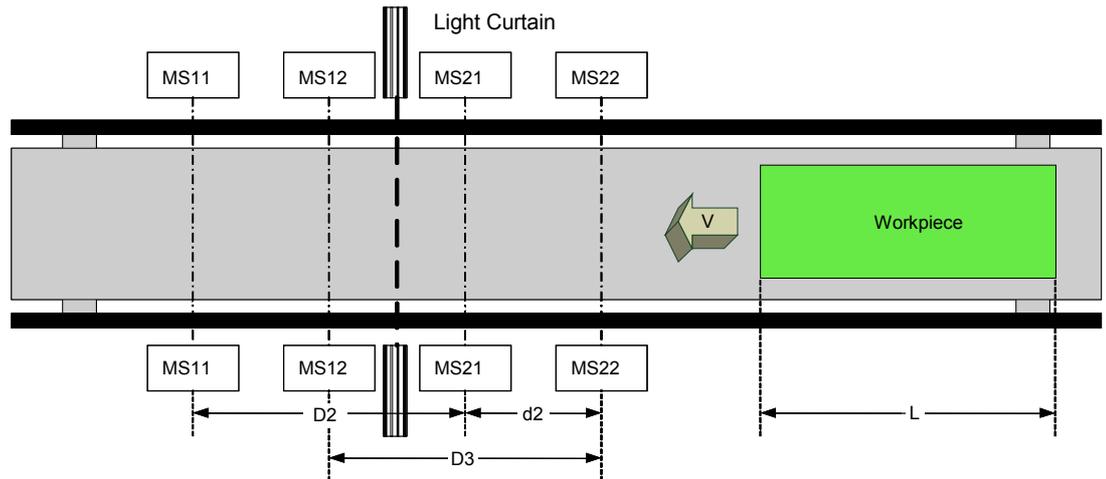
MS11: Muting sensor connected to Muting Signal 11
MS12: Muting sensor connected to Muting Signal 12
MS21: Muting sensor connected to Muting Signal 21
MS22: Muting sensor connected to Muting Signal 22

Muting Sequence
1. In the block diagram above, the light is not interrupted between MS11, MS12, MS21, and MS22 and the light curtain, so the Output Enable signal is ON.
2. For the entrance, as the workpiece moves to the right and MS11 and MS12 go ON in order (MS22 and MS21 go ON in order at the exit), muting is enabled, and the Muting Status goes ON.
3. As the workpiece continues advancing, the Output Enable signal is kept ON even if the light curtain is obstructed.
4. As the workpiece continues advancing, the workpiece is no longer detected by MS21 at the entrance (MS12 at the exit), the muting status is cleared, and the Muting Status goes OFF.

Setup Distances
The setup distance requirements are the same as for *Sequential Muting (Forward Direction)*.

Timing Chart

Entrance

Synchronization time   Muting time
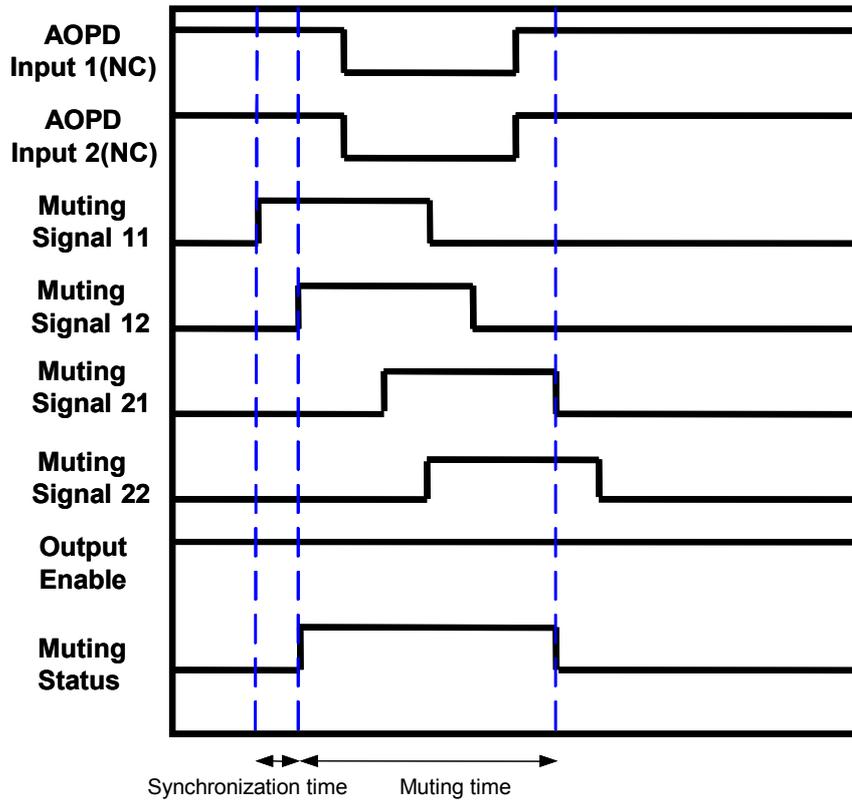
Time-difference Input Pattern 2: Exit

Synchronization time   Muting time
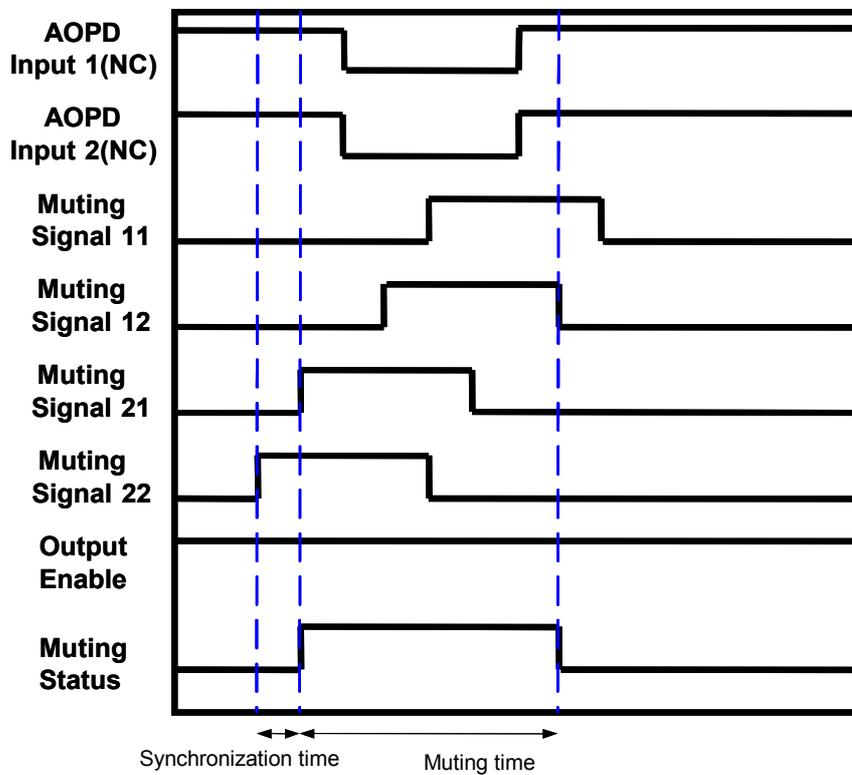
● **Position detection**

In this application, the workpiece is mounted on a machine turntable surrounded by a guard fence. The operator can disable the light-interruption signal of the light curtain safety function in order to set a workpiece on the turntable when he is on the opposite side of the machine's dangerous area.

Block Diagram
Machine's Dangerous Area is on the Operator's Side (Figure 1):
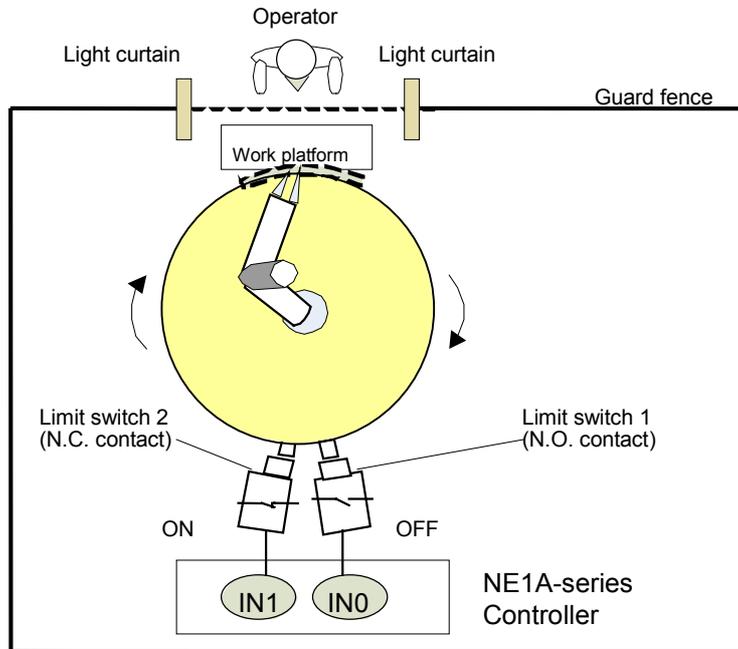
Machine's Dangerous Area is on the Opposite Side of the Operator (Figure 2):
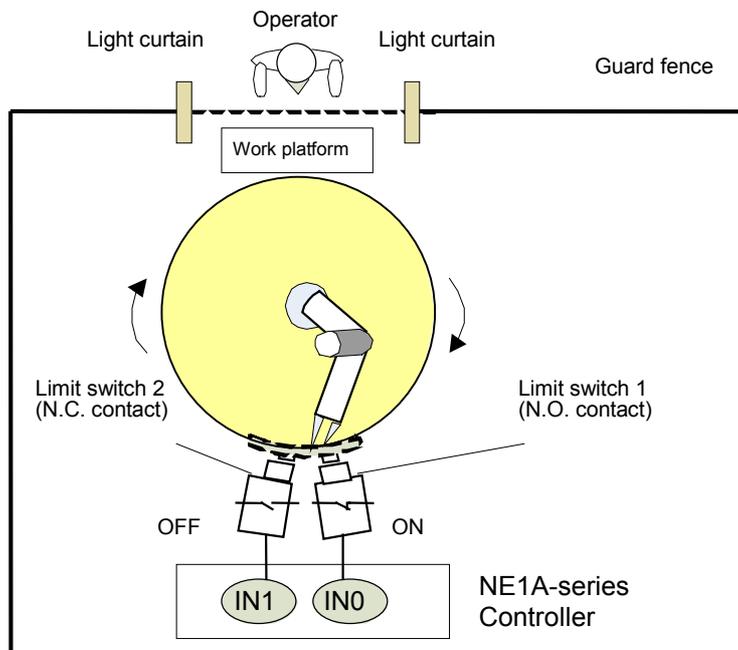
Note: Set the dual channel mode for local input in the NEA1-series Controller to dual channel complementary.

Program Example
Limit switches 1 and 2 connect to Muting Signal 11 of the Muting function block by using an AND function.
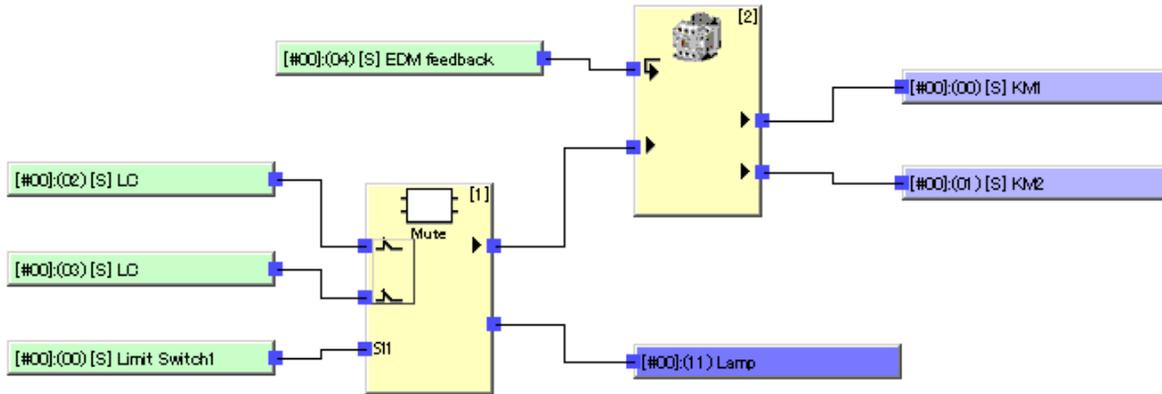
Note: Limit switches 1 and 2 are set to the dual channel complementary setting for local inputs to evaluate the input data from the two switches.

Muting Sequence
1.   In figure 1 above, N.O. limit switch 1 is OFF and N.C. limit switch 2 is ON. In addition, the light curtain is not obstructed, so the Output Enable signal is ON. Muting Signal 11, which inputs the dual channel complementary signal for limit switches 1 and 2, goes OFF.
2.   As the robotic arm rotates, limit switch 1 goes ON and limit switch 2 goes OFF as shown in figure 2. Muting Signal 11, which inputs the dual channel complementary signal for limit switches 1 and 2, goes ON, so muting is enabled, and the Muting Status goes ON.
3.   At this point, the Output Enable signal is kept ON even if the light curtain is obstructed so the operator can access the work platform.
4.   When the operator completes his task and the light curtain is unobstructed as the robotic arm rotates, Muting Signal 11 goes OFF, the muting status is cleared, and the Muting Status goes OFF.

Timing Chart

Muting time
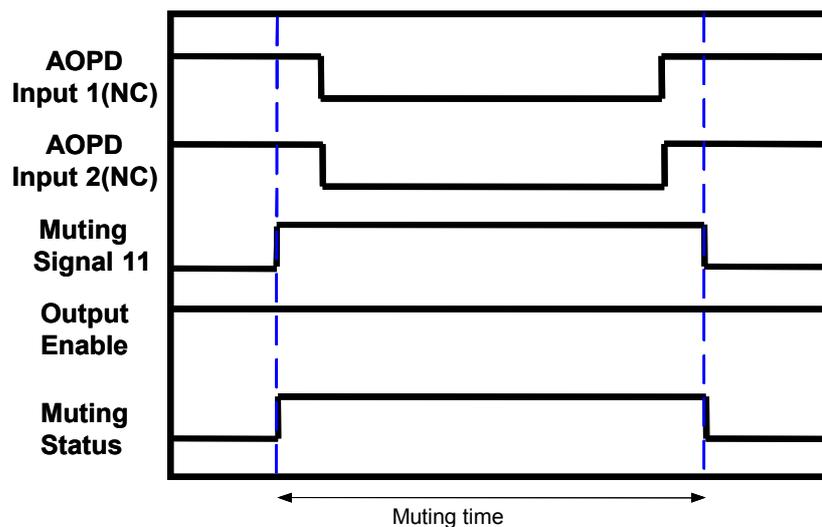
Override Function

The Override function can turn ON the safety output ON even though the light-interruption signal of the light curtain is inactive. If a workpiece gets jammed during transit as shown in the following diagram, the system cannot be returned to normal operation without forcibly removing the workpiece. In a situation like this, the Override function can be used to move the workpiece out of the light curtain detection zone.
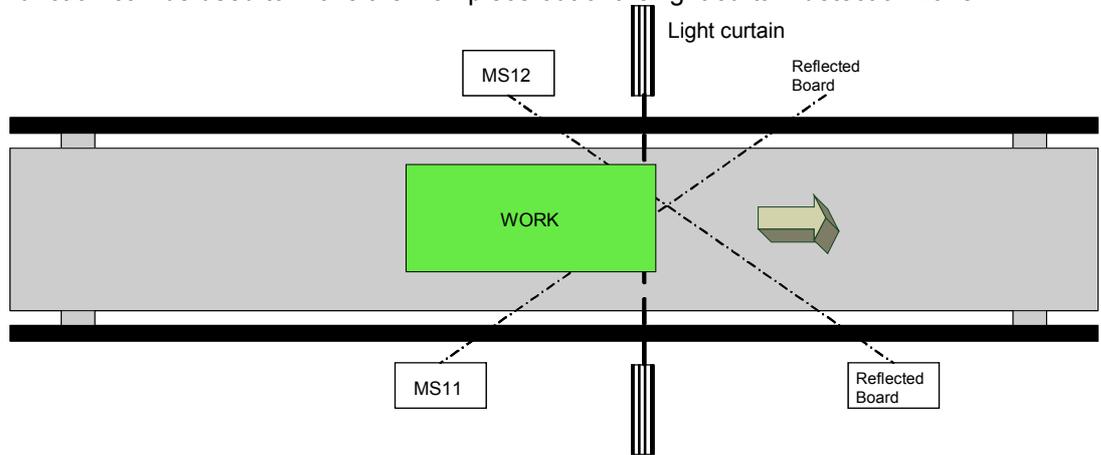
MS11: Muting sensor connected to Muting Signal 11

MS12: Muting sensor connected to Muting Signal 12

Override Sequence
1. In the block diagram above, the Output Enable signal is OFF.
2. When the Override Input goes ON, the Override function starts and the Override Status goes ON. As long as the Override inputs are ON, the muting status is forcibly enabled, and both the Muting Status and Output Enable signals are ON.
3. When the workpiece moves to the right until it is no longer detected by the MS12, the muting status forced by the Override function will be cleared, and both the Muting Status and Override Status will go OFF.

Override Start and Stop Conditions

● **Start Conditions**
If the following conditions are met, the Override function will start and the Output Enable, Muting Status, and Override Status will all go ON.
1. At least one Muting Signal is ON.
2. The light curtain is inactive (obstructed).
3. The Output Enable is OFF.
4. The Override Input is ON (when set as a Single input) or Active (when set as Dual inputs).

● **Stop Conditions**
If any of the following conditions is met, the Override function will stop and the Muting and Overriding signals will go OFF.
1. The Muting Signals are all OFF.
2. The Max. Override Time has elapsed.
3. The Override Input is OFF (when set as a Single input) or Inactive (when set as Dual inputs).
When the Override function has stopped, the Output Enable will go OFF if the light curtain is obstructed.

Timing Chart

Normal Operation of the Override Function (Muting Mode: Parallel Muting with 2 Sensors)
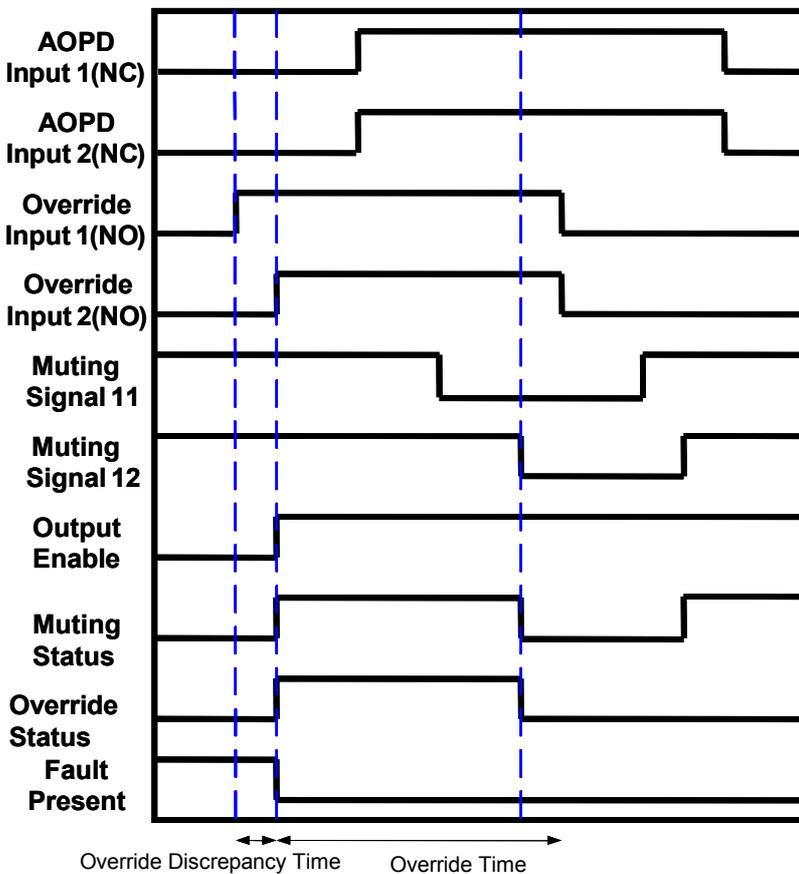
Override Signal goes OFF during Override (Muting Mode: Parallel Muting with 2 Sensors)
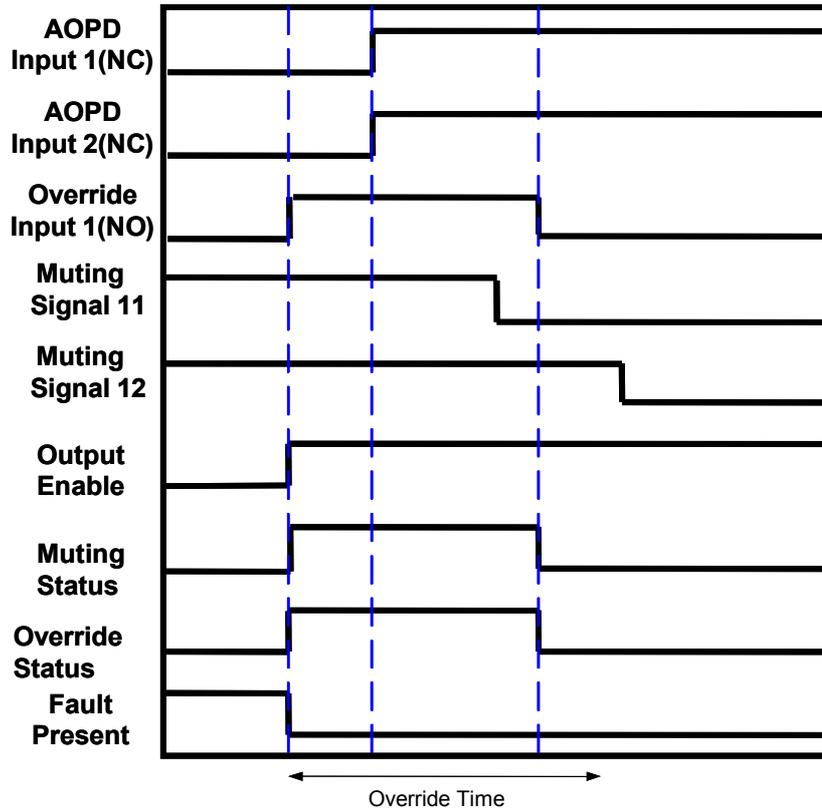
Override Timeout during Override (Muting Mode: Parallel Muting with 2 Sensors)
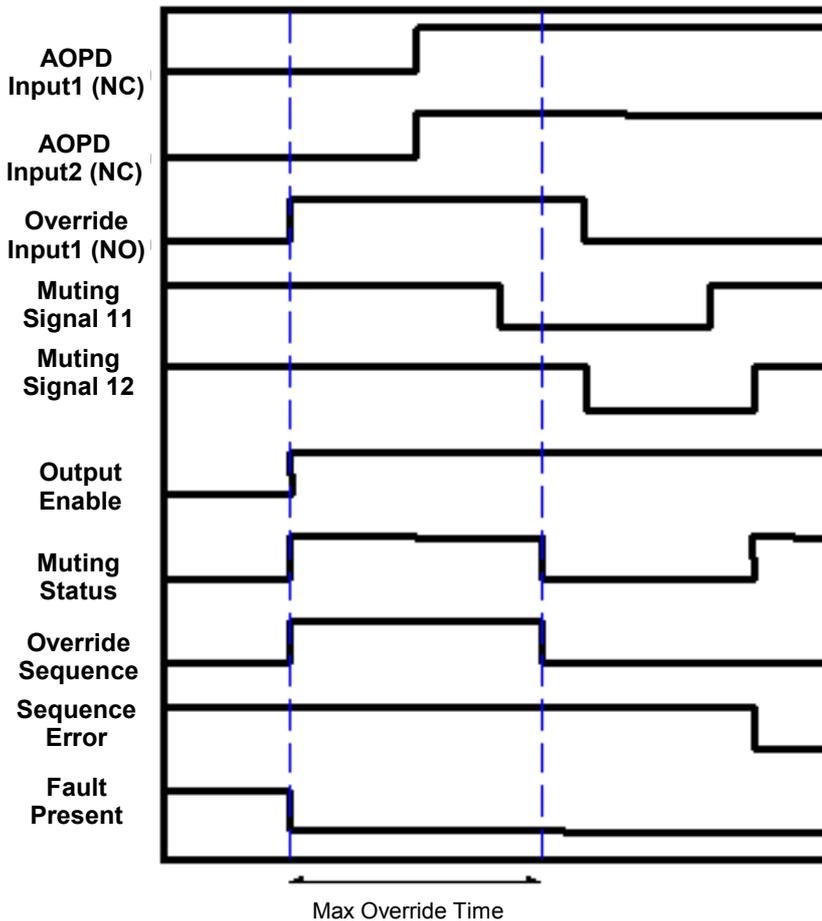
6-5-13   Function Block: Enable Switch Monitoring

Diagram
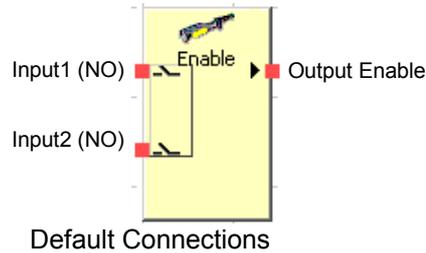
Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.

The Enable Switch function block monitors the status of the enable-switch device. The Output Enable signal is ON when the input from the monitored enable-switch device is active. The Output Enable signal is OFF when the input is not active or an error is detected in the function block.
In addition, if the enable-switch device is the type that outputs a grip signal and release signal, the device's Grip Input and Release Input signal status can be monitored. The received Grip Input and Release Input signals do not affect the status of the Output Enable signal.

Set Parameters

Parameter	Setting range	Default setting
Input Type	Single Channel Dual Channel Equivalent	Dual Channel Equivalent
Discrepancy Time	0 to 30 s in 10-ms increments A discrepancy time check will not be performed if 0 is set.	30 ms

The timer SV must be longer than the NE1A-series Controller's cycle time.

Number of I/O Points Setting

The number of inputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	2 to 4 (Optional Input Settings) There are 2 inputs even when the *Input Type* is set to *Single Channel* in the Set Parameters. The Grip Input and Release Input signals can be used when 3 or 4 inputs are set.	2

Optional Output Setting

The following outputs can also be used in programming. To enable any of these optional outputs, select the corresponding checkbox on the Out Point Tab Page of the function block properties dialog box.

- Grip Enable
- Release Enable
- Discrepancy Error

Fault Present Output Setting

A Fault Present output can also be used in programming.
To enable this output, select the Fault Present checkbox on the Out Point Tab Page of the function block properties dialog box.

Input1 (NO) → Output Enable
Input2 (NO) → Grip Enable
Grip Input → Release Enable
Release Input → Discrepancy Error
Fault Present
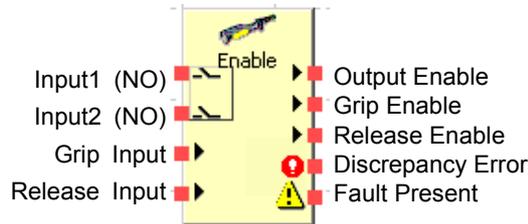
Maximum Number of Outputs for an Enable Switch Monitoring Function Block

Error Handling and Error Resetting

Error condition	Behavior for error detection			Resetting the error condition
	Output Enable	Fault Present	Error output	
Discrepancy Error	OFF (safety state)	ON	Discrepancy Error: ON	Remove the cause of the error and then do one of the following: 1. Make the input inactive and then active again. 2. Change the NE1A-series Controller's operating mode to IDLE Mode and then back to RUN Mode.

Timing Charts

Normal Operation and Discrepancy Error:

Input 1 (NO)
Input 2 (NO)
Output Enable
Discrepancy Error
Fault Present

Idle to RUN
Discrepancy Time

Grip Signal and Release Signal:

Grip input
Release Input
Grip Enable
Release Enable
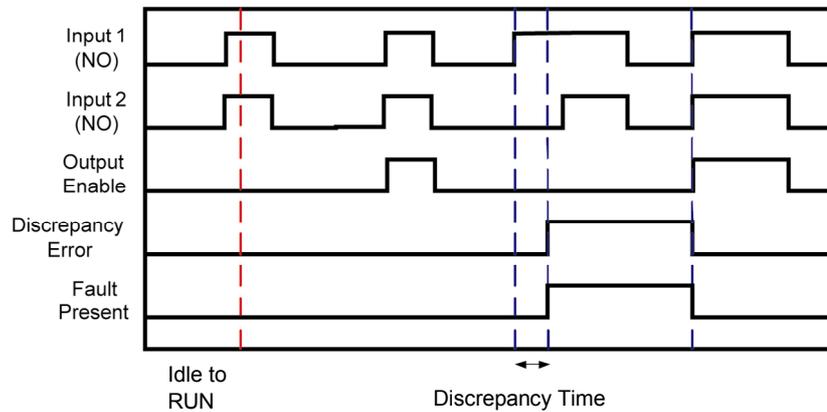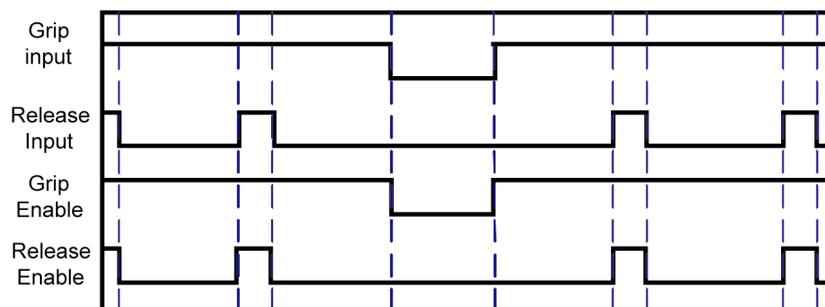
6-5-14   Function Block: Pulse Generator

Diagram
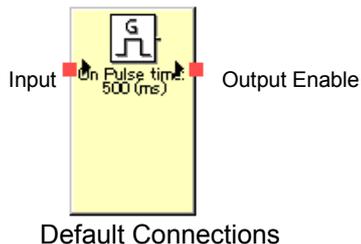
Default Connections

Input — Output Enable

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.

The Pulse Generator function block generates an ON/OFF pulse output at the Output Enable signal while the function block's Input signal is ON.
The pulse's ON time and OFF time can be set independently between 10 ms and 3 s, in 10-ms increments. When the ON time is set to 100 ms and the OFF time is set to 500 ms, the signal will repeatedly be turned ON for 100 ms and then OFF for 500 ms.

Note: The output pulse width will have an error equivalent to the cycle time. For example, if the cycle time is 7 ms and the pulse width is set to 100 ms, the output pulse will be from 93 to 107 ms.

Set Parameters

Parameter	Setting range	Default setting
ON Pulse Time	10 ms to 3 s in 10-ms increments	500 ms
OFF Pulse Time	10 ms to 3 s in 10-ms increments	500 ms

The timer SV must be longer than the NE1A-series Controller's cycle time.

Timing Chart

Idle to RUN
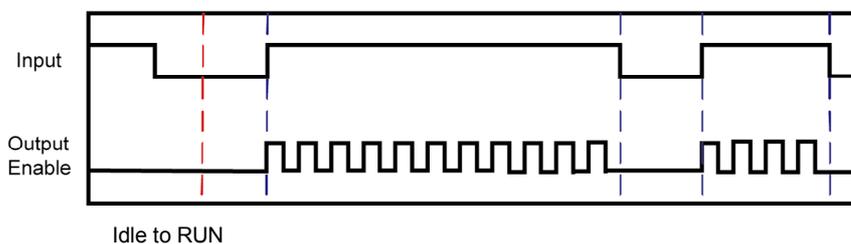
6-5-15   Function Block: Counter

Diagram
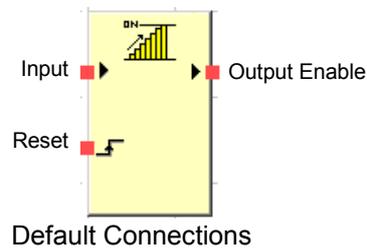
Input ■▶   ▶■ Output Enable

Reset ■

Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.

The Counter function block counts the input pulses at an input and turns ON the Output Enable signal when the count reaches a set value (SV) set with the Network Configurator. The function counts the number of OFF-to-ON transitions in the input signal.

When the input count reaches the preset SV, the Output Enable signal is turned ON and held ON. To detect pulses in the input signal, the input pulse's OFF time and ON time must be longer than the cycle time.

Reset Methods (Reset Condition)

The Reset Condition used to reset the input count (PV) can be set to Manual Reset or Auto Reset.

When the reset condition is set to Auto Reset and the input count reaches the SV set in the configuration data, the Output Enable signal is turned ON and remains ON as long as the input signal is ON. When the input signal goes OFF, the input count is reset.

When the reset condition is set to Manual Reset, the input count is reset and the Output Enable signal is turned OFF when the Reset signal goes ON. Input pulses will not be counted while the Reset signal is ON.

Counting Methods (Count Type)

The Count Type can be set to Down counter or Up counter (decrementing or incrementing counter).

With a Down (decrementing) counter, the preset SV is the counter's initial value and the counter decrements the count by 1 each time that an input pulse is detected. The Output Enable signal is turned ON when the count reaches 0.

This function block's count PV is stored in the function block's internal work area, and can be monitored from a Programming Device.

With an Up (incrementing) counter, the counter's initial value is 0 and the counter increments the count by 1 each time that an input pulse is detected. The Output Enable signal is turned ON when the count reaches the preset SV.

Set Parameters

Parameter	Setting range	Default setting
Reset Condition	Auto Reset Manual Reset	Manual Reset
Count Type	Down counter (decrementing counter) Up counter (incrementing counter)	Down counter (decrementing counter)
Counter	1 to 65,535 (count)	1 (count)

Timing Charts

(1) Auto Reset
   Incrementing counter:
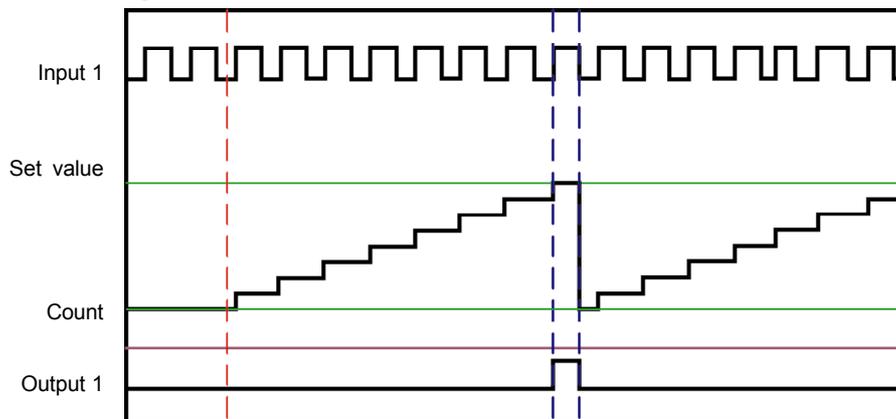
Idle to RUN

Decrementing counter:
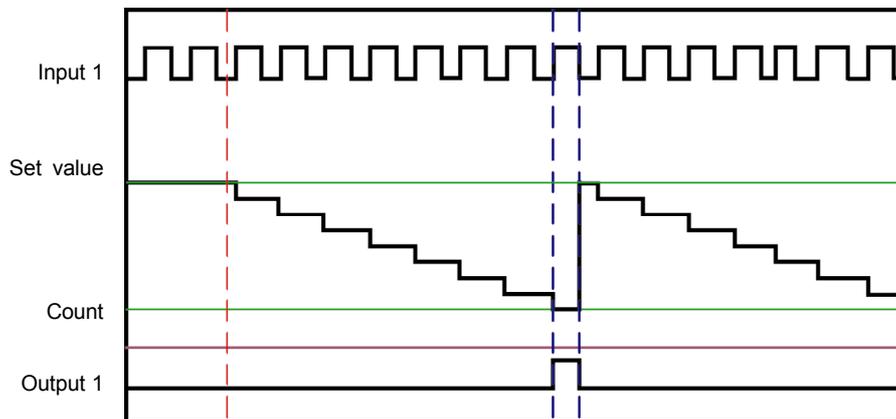
Idle to RUN

(2) Manual Reset
   Decrementing counter:
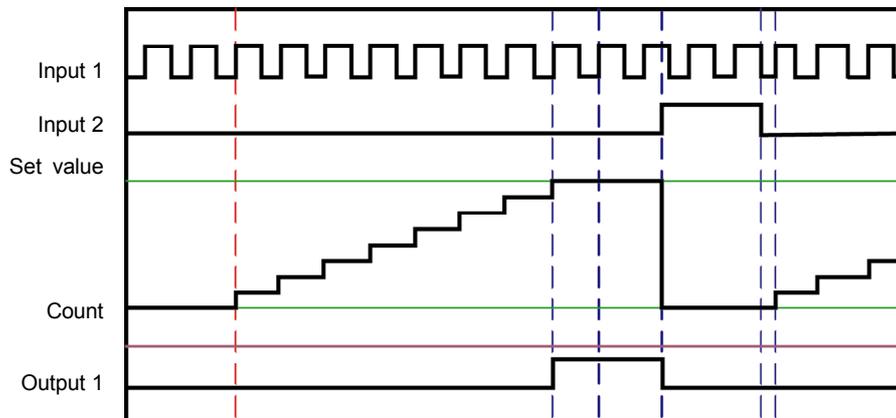
Idle to RUN

Decrementing counter:

Idle to RUN
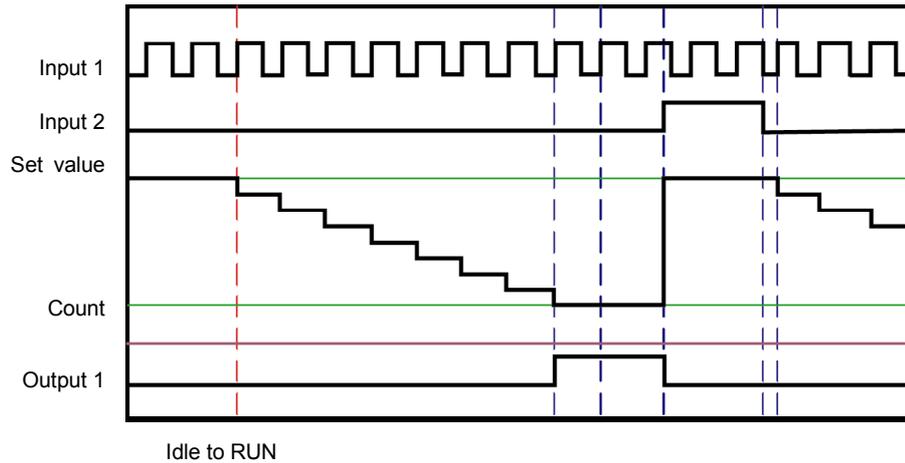
6-5-16   Logic Function: Multi Connector

Diagram
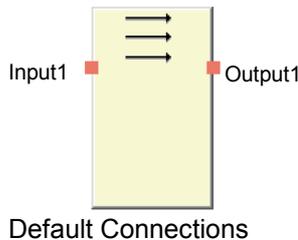
Default Connections

General Description

This function can be used only in NE1A-series Controllers with unit version 1.0 or later.

The Multi Connector function outputs input signals (up to 8 inputs) to output signals (up to 8 outputs).
The input signals and output signals are associated one-to-one from number 1 to 8.
The status of other input signals has no effect.

Optional Output Settings

The number of outputs can be increased on the In/Out Setting Tab Page in the function block property dialog box.

Parameter	Setting range	Default setting
Number of inputs	1 to 8	1
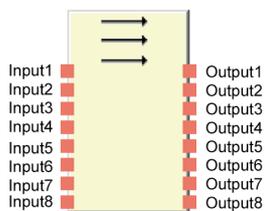
Maximum Number of outputs for a Multi Connector Logic Function

Truth Tables

Multi Connector Truth Table:

Input								Output							
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
0	x	x	x	x	x	x	x	0	x	x	x	x	x	x	x
1	x	x	x	x	x	x	x	1	x	x	x	x	x	x	x
x	0	x	x	x	x	x	x	x	0	x	x	x	x	x	x
x	1	x	x	x	x	x	x	x	1	x	x	x	x	x	x
x	x	0	x	x	x	x	x	x	x	0	x	x	x	x	x
x	x	1	x	x	x	x	x	x	x	1	x	x	x	x	x
x	x	x	0	x	x	x	x	x	x	x	0	x	x	x	x
x	x	x	1	x	x	x	x	x	x	x	1	x	x	x	x
x	x	x	x	0	x	x	x	x	x	x	x	0	x	x	x
x	x	x	x	1	x	x	x	x	x	x	x	1	x	x	x
x	x	x	x	x	0	x	x	x	x	x	x	x	0	x	x
x	x	x	x	x	1	x	x	x	x	x	x	x	1	x	x
x	x	x	x	x	x	0	x	x	x	x	x	x	x	0	x
x	x	x	x	x	x	1	x	x	x	x	x	x	x	1	x
x	x	x	x	x	x	x	0	x	x	x	x	x	x	x	0
x	x	x	x	x	x	x	1	x	x	x	x	x	x	x	1

0: OFF, 1: ON, x: Either ON or OFF

Section 7
Other Functions

7-1   Configuration Lock

The configuration data saved in the NE1A-series Controller can be locked using the Network Configurator to protect the data after downloading and verifying the configuration data. Once the configuration is locked, the configuration data cannot be changed until it is unlocked.

The following occurs when the configuration lock is set.
- The LOCK LED indicator on the front face of NE1A-series Controller lights yellow. (When unlocked, the indicator will flash yellow.)

Lock LED indicator

- On the Network Configurator, the icon indicating the LOCK status is displayed.

Icon indicating lock status.
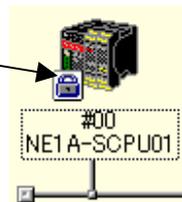
7-2   Reset

7-2-1   Reset Types

The Network Configurator can reset the NE1A-series Controller in the following three ways. A password is required to enter reset.

Reset type	Configuration data	Error history
Emulate cycling power	Settings before the reset are retained.	Log before the reset is retained.
Return to the default configuration, and then emulate cycling power. (Initialize all data.)	Initialization (Default)	Initialized. (All data cleared.)
Return to the default configuration except to preserve the following parameters, and then emulate cycling power. (Retain specified data.)	Depends on user specifications.	Initialized. (All data cleared.)

Configuration data includes DeviceNet communications (safety/standard), device parameters such as I/O settings, user program, and passwords.
The NE1A-series Controller stores this data in its nonvolatile memory. Some information, however, cannot be changed once it is set. Select the corresponding reset type to return the information to the default parameter settings.
Depending on the type of reset that is used, however, maintenance data such as the total ON times, contact operation counter monitor settings, or monitor values for the contacts of the local inputs, test outputs, and local outputs will not be cleared.

Refer to *DeviceNet Safety System Configuration Manual* (Cat. No. Z905) for the configurable parameters.

7-2-2   Reset Type and NE1A-series Controller Status

Depending on the reset type and NE1A-series Controller's status, reset might not be possible.

Reset type	NE1A-series Controller's status			
	RUN and configuration locked. - MS indicator lit green - LOCK indicator lit	RUN and configuration unlocked. - MS indicator lit green - LOCK indicator flashing	Not RUN, and configuration locked. - MS not lit green - LOCK indicator lit	Not RUN, and configuration unlocked. - MS not lit green - LOCK indicator flashing or OFF
Emulate cycling power	Able to reset	Able to reset	Able to reset	Able to reset
Return to the default configuration, and then emulate cycling power.	Unable to reset	Able to reset	Unable to reset	Able to reset
Return to the default configuration except to preserve the following parameters, and then emulate cycling power.	Unable to reset	Able to reset	Unable to reset	Able to reset

Note: Resetting is not possible after a safety I/O connection has been established.

7-3   Access Control with Password

The NE1A-series Controller can register a password in its nonvolatile memory. The password can be used to prevent unexpected or unauthorized access to the Controller from a person other than a user (i.e., a safety manager). No password is set by default; the user needs to register one.

Use the Network Configurator to set or change the password for the NE1A-series Controller. For information on procedures for setting the password using the Network Configurator, refer to *3-6 Device Password Protection* in the *DeviceNet Safety System Configuration Manual* (Cat. No. Z905).

7-3-1   Scope of Access Control

The following operations require the user to enter a password. The NE1A-series Controller does not perform the following operations unless the password matches.
- Downloading configuration data
- Locking or unlocking the configuration
- Executing the NE1A-series Controller reset service
- Changing the operating mode
- Changing the password

7-3-2   Lost Password

Contact OMRON if you lose your password and it has been set for NE1A-series Controller devices.

Section 8
Operating Modes and Power Supply Interruptions

8-1   NE1A-series Controller Operating Modes

8-1-1   Operating Mode Overview

The following modes are supported by the NE1A-series Controller.

SELF-DIAGNOSTIC Mode

The NE1A-series Controller performs self-diagnosis internally. This is required to ensure safety functions.

CONFIGURING Mode

CONFIGURING Mode exists while waiting for the completion of configuration from the Network Configurator. The NE1A-series Controller switches to Configurating Mode when it is not yet configured after initialization has been completed or when there is an error in the configuration data.

IDLE Mode

IDLE Mode exists while waiting for RUN Mode after initialization has been completed. Non-safety-related control (standard I/O communications, message communications, etc.) is supported.

RUN Mode

Safety control (user program, safety I/O communications, safety I/O refresh control) and non-safety-related control (standard I/O communications, message communications, etc.) are both supported.

ABORT State

The NE1A-series Controller switches to Abort Mode if the Controller's switch setting is changed after the configuration has been completed. The Controller stops all functions except for message communications and puts them in the safety state.

When Controller's switch settings must be changed due to user system changes, reset the Controller to the default settings. Refer to *Section 7 Other Functions* for the reset function.

CRITICAL ERROR State

The NE1A-series Controller switches to this state if a critical error occurs.
The Controller stops all functions and puts them in the safety state.

8-1-2   Confirming the Operating Mode

Confirming with the MS Indicator

The user can confirm the operating mode using the MS indicator on the front of the NE1A-series Controller.

MS (module status) indicator
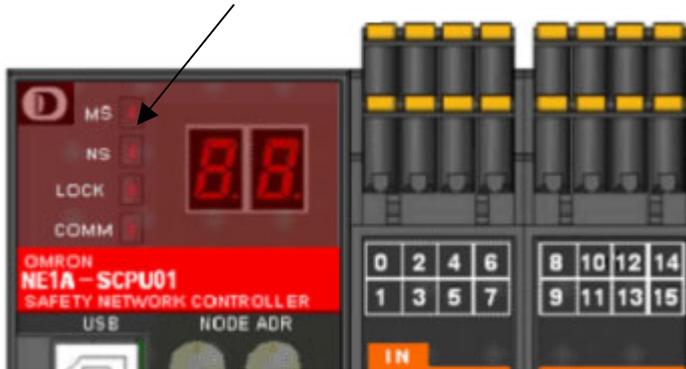
Indicator name	Color	State	Meaning
MS (module status)	Green	⊃□⊂	RUN Mode
		⊃◢⊂	IDLE Mode
	Red	⊃□⊂	Critical error
		⊃◢⊂	Abort
	Green/ red	⊃◢⊂	Self-diagnosis, waiting for TUNID setting, or waiting for configuration.
	-	■	Power is not supplied.

⊃□⊂ : ON   ⊃◢⊂ : Flashing   ■ : OFF

Confirming with the Operating Mode Flag

The user can determine whether the NE1A-series Controller's operating mode is RUN Mode or not by checking bit 6 (Operating Mode Flag) of the Unit General Status.

8-1-3   Functions Supported in Each Operating Mode

The following table shows the conditions in each NE1A-series Controller mode and operations supported from the Network Configurator in each mode.

Operating mode	Safety functions			Standard functions		Operations from Network Configurator (See note 1.)				
	User program	Safety I/O communications	Local I/O control (including test outputs)	Standard I/O communications	Message communications	Configuration	Configuration lock/ unlock	Reset	Changing password	Online monitor
RUN	Supported	Supported	Refreshed	Supported	Supported	Supported (See note 3.)	Supported	Supported (See note 4.)	Supported	Supported
IDLE	Stopped	Stopped	Safety State	Supported (See note 2.)	Supported	Supported (See note 3.)	Supported	Supported (See note 4.)	Supported	Supported
CONFIG-URING	Stopped	Stopped	Safety State	Stopped	Supported	Supported	Not supported	Supported	Supported	Supported
ABORT	Stopped	Stopped	Safety State	Stopped	Supported	Not supported	Not supported	Supported (See note 4.)	Supported	Supported
CRITICAL ERROR	Stopped	Stopped	Safety State	Stopped	Stopped	Not supported	Not supported	Not supported	Not supported	Not supported
INITIALI-ZATION	Stopped	Stopped	Safety State	Stopped	Stopped	Not supported	Not supported	Not supported	Not supported	Not supported

Note 1: A password could be required for operations from the Network Configurator. For details, refer to *Section 7 Other Functions*.

Note 2: When the operating mode of the NE1A-series Controller is changed from RUN to IDLE, input data to the Master depends on the hold setting of the Standard I/O Area. For details, refer to *Section 4 DeviceNet Communications Functions*.

Note 3: Depends on the configuration lock setting. For details, refer to *Section 7 Other Functions*.

Note 4: Depends on reset types and the configuration lock setting. For details, refer to *Section 7 Other Functions*.

8-1-4   Operating Mode Setting at Startup

The user can select the NE1A-series Controller's operating mode from the following two modes at startup, after the normal completion of configuration.

Operating mode on startup	Description
Normal Mode	The NE1A-series Controller starts in IDLE Mode after configuration has been completed. To switch to RUN Mode, use the Network Configurator to change the mode at every startup.
Automatic Execution Mode	When this mode is selected and the following operations are performed, the NE1A-series Controller starts up in RUN Mode thereafter. • Configuration lock • Power supply interruptions after switching to RUN Mode.

IMPORTANT: When the power supply is interrupted in IDLE Mode, the NE1A-series Controller will not start in RUN Mode at the next startup even though Automatic Execution Mode is set and the configuration is locked. Make sure to turn OFF the power supply in RUN Mode.

8-1-5   Operating Mode Changes

NE1A-series Controller operating modes can be changed using the Network Configurator.
A password may be required to change the operating mode.

- IDLE Mode → RUN Mode
- RUN Mode → IDLE Mode
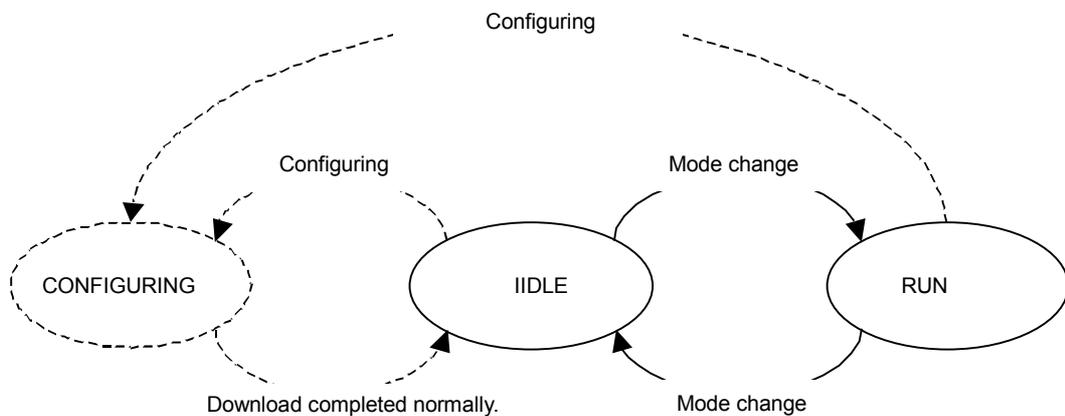
8-2   Behavior for Power Supply Interruptions

8-2-1   Behavior in Voltage Drop

Low Power Supply Voltage for the Internal Circuits

If the power supply voltage for the internal circuit drops to 85% of the rated voltage or lower, the NE1A-series Controller will turn OFF the outputs.

Low Power Supply Voltage for I/O Circuits

If the power supply voltage for input drops to 85% of the rated voltage or lower when the power supply voltage for the internal circuit is normal, the NE1A-series Controller will continue operation but will stop refreshing inputs. Similarly, if the power supply voltage for output drops to 85% of the rated voltage or lower, the Controller will continue operation but will stop refreshing outputs.

The I/O power supply monitor function of the NE1A-series Controller can be used to monitor the I/O power supply voltage to confirm if it is normal.

8-2-2   Automatic Recovery from Voltage Drops

Power Supply Voltage for the Internal Circuits

If the power supply is recovered (to 85% of the rated voltage or more) because of a fluctuation in the power supply voltage, the following might occur:
(1) Operation will automatically restart or
(2) A critical error will occur, which will require cycling the power supply to restart operation.

These operations occur because the NE1A-series Controller's operation becomes unstable and it detects a self-diagnosis error. Operation (1) occurs if the power supply to the Controller is completely stopped because the power supply voltage is 85% of the rated voltage or lower, and operation (2) occurs if the power supply fluctuates around the lower operation limit of the internal power/voltage detection circuit.

Power Supply Voltage for the I/O Circuits

I/O refreshing is automatically restarted when the power supply is recovered (to 85% of the rated voltage or more). The I/O power monitor error is also automatically canceled.

Section 9
Remote I/O Communications Performance and Local I/O Response Time

9-1   Outline

The NE1A-series Controller's remote I/O communications performance and local I/O response time are described in this section.

The calculations shown here are assumed to satisfy the following conditions:

- The configuration is correct.
- The power has been turned ON, the SNC self-diagnostic function has been completed, and the NE1A-series Controller is in RUN Mode.
- The necessary Safety Slaves have been added to the system.

9-2   Operational Flow and Cycle Time

The NE1A-series Controller's operations are outlined here.

The NE1A-series Controller initializes itself internally when the power is turned ON. Unless there are errors, the Controller then cyclically executes system processing, DeviceNet/USB communications processing, I/O refreshing, and user program.

In Standalone Controller mode, the Controller cyclically executes all but the DeviceNet processes. The cycle time depends on the scale of the user program and the configuration of DeviceNet remote I/O communications.

■ Normal mode flow

Power ON → Initialize → System processing → DeviceNet/USB communications processing → I/O refresh → User application calculation

Cycle time

■ Standalone Controller mode flow

Power ON → Initialize → System processing → USB communications processing → I/O refresh → User application calculation
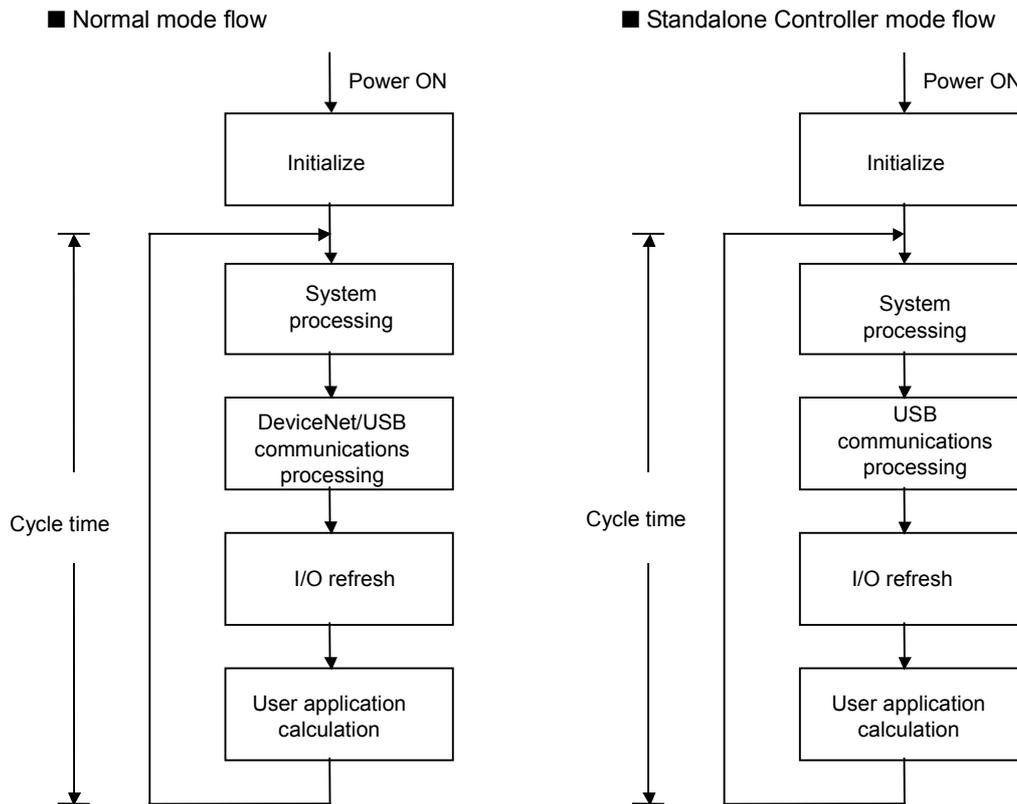
Cycle time

Note: Approximately 6 s is required to complete initialization after the power is turned ON. Initialization processing includes the self-diagnosis required for the NE1A-series Controller to perform safety functions.

The cycle time is expressed by the following formula.

Controller cycle time = System processing time
  + DeviceNet/USB or USB communications time
  + I/O refresh time
  + User application execution time

The cycle time of the NE1A-series Controller is set in 1-ms increments depending on the configuration. The cycle time can be checked from the Network Configurator.

Note: After the NE1A-series Controller has started operating, DeviceNet connection will be established and then devices will be verified to start DeviceNet safety I/O communications. This process can take up to 2 s to be completed depending on the configuration (i.e., on the setting for the number of connections). The following formula gives the time from the when the processing to establish the above connection has been completed until enabled I/O data is sent and received using that connection.

(Processing time after the connection is established until enabled safety I/O data is sent and received) =
  EPI setting x 3 + NE1A-series Controller cycle time x 6

Note: After the NE1A-series Controller is initialized, it will be added to the DeviceNet network once it has been confirmed that there are no duplicate addresses on the DeviceNet network. This process will take approximately 2 s. This process is not completed before starting operation if the NE1A-series Controller is set for automatic execution at startup (i.e., automatic execution when the power supply is turned ON). This time must also be taken into account when considering the time until DeviceNet I/O communications data becomes valid.

The cycle time of the NE1A-series Controller can be checked on the Mode/Cycle Time Tab Page of the Edit Device Parameters Window.
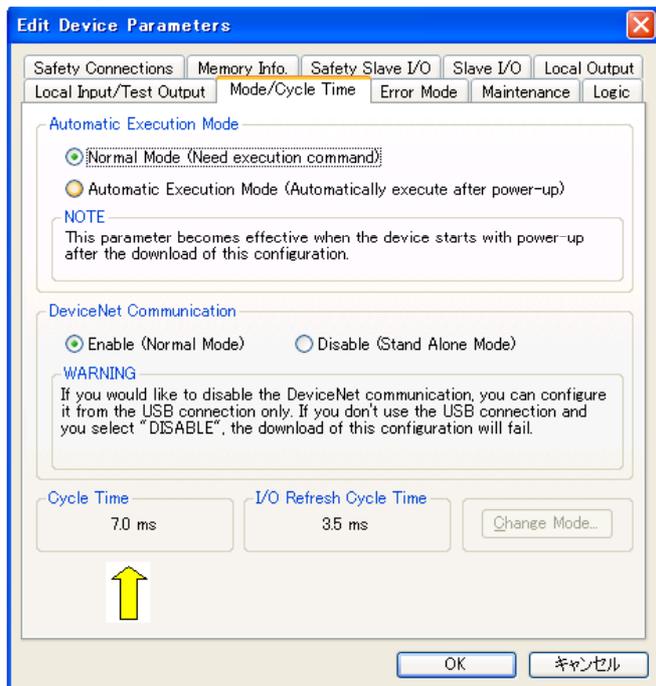
Note   The minimum set for the EPI is either the cycle time of the Safety Network Controller or the cycle time of the Safety Slaves (always 6 ms), whichever is greater. The minimum setting for the EPI will therefore be affected if the cycle time of the Safety Network Controller is longer then 6 ms.

9-3   I/O Refresh Cycle Time and Network Reaction Time

The I/O refresh cycle time and network reaction time parameters are required to evaluate local I/O response and I/O communications performance for the NE1A-series Controller.

I/O Refresh Cycle Time

The I/O reaction time of the NE1A-series Controller is used when calculating the local I/O reaction time. The I/O refresh cycle time is set to the optimum value for the configuration from among the following settings: 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, or 6.5 ms. The I/O refresh cycle time can be checked from the Network Configurator.

The I/O refresh cycle time of the NE1A-series Controller can be checked on the Mode/Cycle Time Tab Page of the Edit Device Parameters Window.
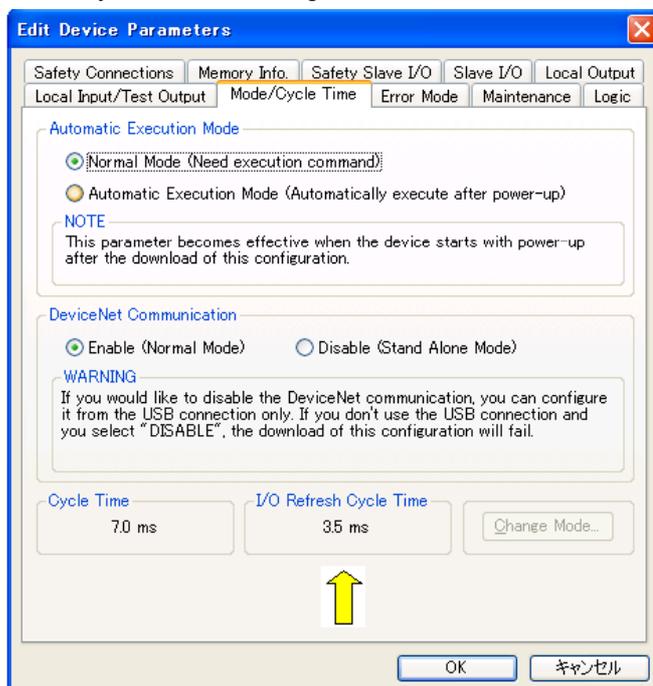
The network reaction time
The network reaction time of the NE1A-series Controller is used when calculating the remote I/O reaction time.

The network reaction time can be checked on the Safety Connections Tab Page of the Edit Device Parameters Window.
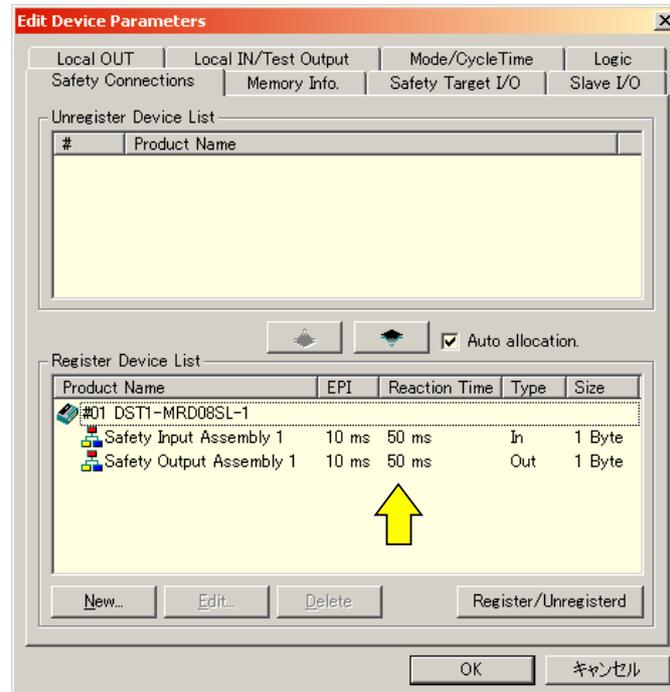
9-4   Reaction Time

9-4-1   Reaction Time Concepts

The reaction time is the time required to stop machine operation in a worst-case scenario considering the occurrence of faults and failures in the safety chain.
The reaction time is used to calculate the safety distance.

The reaction time is calculated for each safety chain. Some typical safety chains are shown below.

(1) Local Input - Local Output

Safety sensor/switch	NE1A Series	Actuator

(2) Remote Input - Local Output

Safety sensor/switch	Safety I/O Terminal	Network	NE1A Series	Actuator

(3) Local Input/Remote Output

Safety sensor/switch	NE1A Series	Network	Safety I/O Terminal	Actuator

(4) Remote Input/Remote Output

Safety sensor/switch	Safety I/O Terminal	Network	NE1A Series	Network	Safety I/O Terminal	Actuator
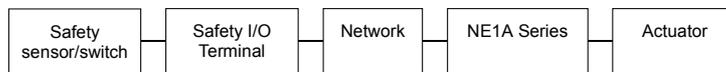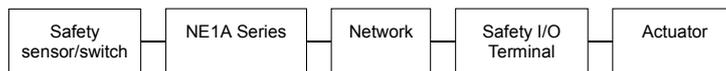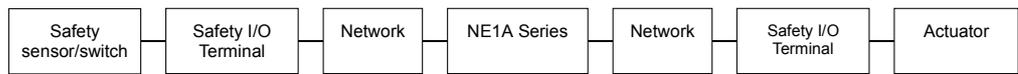
Note: There is no I/O response time required in the reaction time when operation is normal.
With the reaction time, the output shutoff time will be maintained even if there are faults or failures in devices or the network.

9-4-2   Calculating the Reaction Time

Elements of the Reaction Time

The elements of the reaction time are given below for each safety chain.

(1) Local Input – Local Output

Safety sensor/switch	NE1A Series	Actuator
Sensor/switch reaction time	Local input/local output reaction times (A)	Actuator reaction time

(2) Remote Input – Local Output
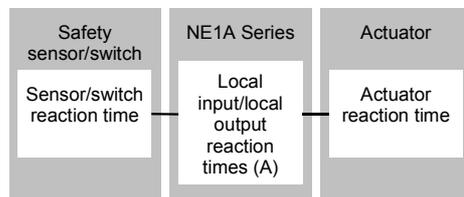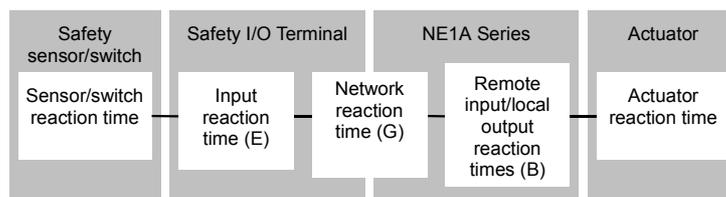
Safety sensor/switch	Safety I/O Terminal		NE1A Series	Actuator
Sensor/switch reaction time	Input reaction time (E)	Network reaction time (G)	Remote input/local output reaction times (B)	Actuator reaction time

(3) Local Input - Remote Output

Safety sensor/switch	NE1A Series		Safety I/O Terminal	Actuator
Sensor/switch reaction time	Local input/remote output reaction times (C)	Network reaction time (G)	Output reaction time (F)	Actuator reaction time

(4) Remote Input - Remote Output

Safety sensor/switch	Safety I/O Terminal		NE1A Series	Safety I/O Terminal		Actuator
Sensor/switch reaction time	Input reaction time (E)	Network reaction time (G)	Remote input/remote output reaction times (D)	Network reaction time (G)	Output reaction time (F)	Actuator reaction time

Reaction Time Calculation

	Item	Formula
A	Local input/local output reaction time (ms) at NE1A-SCPU01	= ON/OFF delay time + I/O refresh cycle + NE1A-SCPU01 cycle time × 2 + 2.5
B	Remote input/local output reaction time (ms) at NE1A-SCPU01	= NE1A-SCPU01 cycle time + 2.5
C	Local input/remote output reaction time (ms) at NE1A-SCPU01	= ON/OFF delay time + I/O refresh cycle + NE1A-SCPU01 cycle time × 2
D	Remote input/remote output reaction time (ms) at NE1A-SCPU01	= NE1A-SCPU01 cycle time
E	Input reaction time (ms) at Safety I/O Terminal	= ON/OFF delay time + Input reaction time
F	Output reaction time (ms) at Safety I/O Terminal	= Output reaction time
G	Network reaction time (ms)	= Result of Network Configurator calculation

Note: If an output from a function block is fed back to the input side of the same function block, the cycle time of the NE1A-series Controller must be added to the reaction time for the safety chain.

Reaction Time Calculation Examples

Example 1: Local Input – Local Output
The following example shows calculating the reaction time from a local input to a local output for the NE1A-SCPU01 configuration shown in the illustration.

NE1A-SCPU01 configuration:
- Program: 1 AND (2 inputs)
- Standard Slaves: 2 connections
- Safety Masters: None
- Safety Slaves: None

Cycle time = 4 ms
I/O refresh cycle = 4 ms

Switch → NE1A-SCPU01 → Actuator

DeviceNet
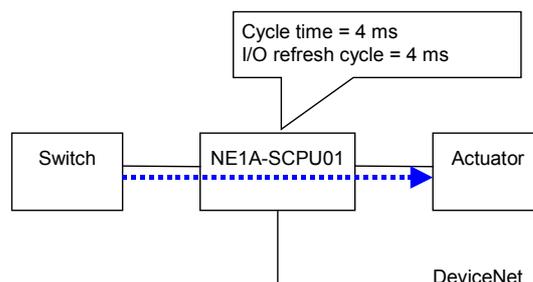
The cycle times read by the Network Configurator will be as follows:
    Controller cycle time = 4 ms
    I/O refresh cycle time = 4 ms
The cycle time of the NE1A-SCPU02 is 6 ms and the I/O refresh time is 6 ms.
The reaction time is obtained using the following equation:

Reaction time (ms) = Switch reaction time

       + NE1A-SCPU01 local input/local output reaction time
       + Actuator reaction time
       = Switch reaction time
       + ON/OFF delay time (NE1A-SCPU01) + 4 + 4 $\times$ 2 + 2.5
       + Actuator reaction time
      = <u>14.5 + ON/OFF delay time (NE1A-series Controller)</u>
        <u>+ Switch reaction time + Actuator reaction time</u>

Note: Example 1 above shows the configuration for minimizing reaction time in the NE1A-series Controllers. The guideline for the minimum reaction time is 15 ms for the NE1A-SCPU01(-V1) and 21 ms for the NE1A-SCPU02. The Controller cannot be used when a reaction time lower than these values is required from the Controller by the user system.

Example 2: Remote Input – Local Output
The following example shows calculating the reaction time from a remote input to a local output for the NE1A-SCPU01 configuration shown in the illustration.
NE1A-SCPU01 configuration:
- Program: 1 Safety Gate Monitor, 1 Reset, 1 E-STOP, 1 AND, 1 External Device Monitor
- Standard Slaves: 2 connections
- Safety Master: 1 connection (EPI = 6 ms)
- Safety Slaves: None
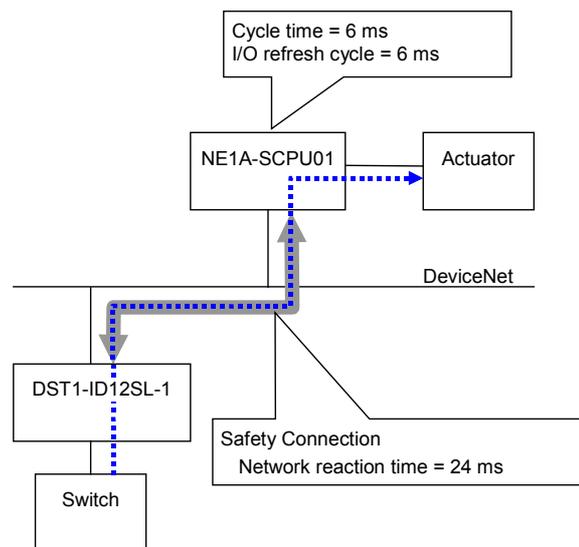
The cycle times read by the Network Configurator will be as follows:
    NE1A-SCPU01 cycle time = 6 ms
    I/O refresh cycle time = 6 ms

The network reaction time will be 24 ms based on a safety connection EPI of 6 ms.
The reaction time is obtained using the following equation:

Reaction time (ms) = Switch reaction time

+ Safety I/O Terminal input reaction time
+ Network reaction time
+ NE1A-SCPU01 remote input/local output reaction time
+ Actuator reaction time
= Switch reaction time
+ ON/OFF delay time (DST1-ID12SL-1) + 16.2
 (= Input reaction time of DST1-ID12SL-1)
                       + 24
                       + 6 + 2.5
                       + Actuator reaction time
       = **48.7 + ON/OFF delay time (DST1-ID12SL-1)**
         + Switch reaction time + Actuator reaction time

Example 3: Local input - Remote output

The following example shows calculating the reaction time from a local input to a remote output, for the NE1A-SCPU01 node 1 and node 2 configuration shown in the illustration.

NE1A-SCPU01 node 1 (#1) configuration:
- Program: 1 Safety Gate Monitor, 1 Reset, 1 E-STOP, 1 AND,1 External Device Monitor
- Standard Slaves: 2 connections
- Safety Masters: None
- Safety Slave: 1 connection (EPI = 7 ms)

NE1A-SCPU01 node 2 (#2) configuration:
- Program: 1 Safety Gate Monitor, 1 Reset, 1 E-STOP, 1 AND, 1 External Device Monitor
- Standard Slaves: 2 connections
- Safety Masters: 3 connections (EPI = 7 ms)
- Safety Slaves: None
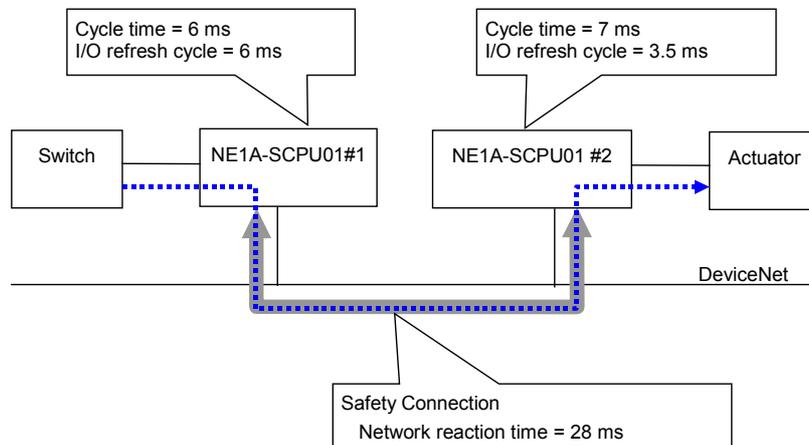
The node 1 (#1) cycle times read by the Network Configurator will be as follows:
   NE1A-SCPU01 cycle time = 6 ms
   I/O refresh cycle time = 6 ms

The node 2 (#2) cycle times will be as follows:
   NE1A-SCPU01 cycle time = 7 ms
   I/O refresh cycle time = 3.5 ms

The network reaction time will be 28 ms based on a safety connection EPI of 7 ms.
The reaction time is obtained using the following equation:

Reaction time (ms) = Switch reaction time

+ NE1A-SCPU01 #1 local input/remote output reaction time
+ Network reaction time
+ NE1A-SCPU01 #2 remote input/local output reaction time
+ Actuator reaction time
= Switch reaction time
+ ON/OFF delay time (NE1A-SCPU01) + 6 + 6 $\times$ 2
+ 28
+ 7 + 2.5
+ Actuator reaction time
= **55.5 + ON/OFF delay time (NE1A-SCPU01)**
   + Switch reaction time + Actuator reaction time

Example 4: Remote Input - Remote Output
The following example shows calculating the reaction time from a remote input to a remote output, for the NE1A-SCPU01 configuration shown in the illustration.

NE1A-SCPU01 node configuration:
- Program: 1 Reset, 1 E-STOP, 1 External Device Monitor
- Standard Slaves: 2 connections
- Safety Masters: 3 connections (EPI = 6 ms)
- Safety Slaves: None
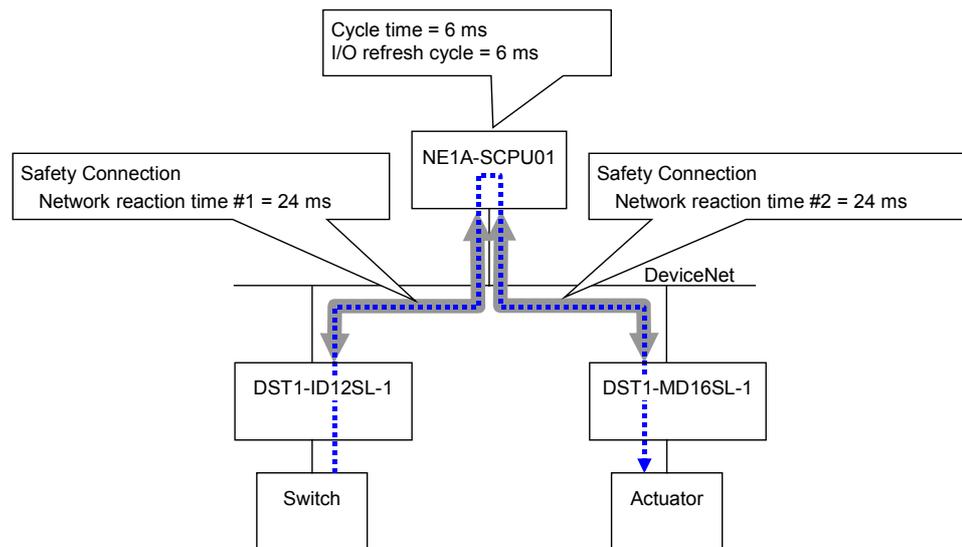
The cycle times read by the Network Configurator will be as follows:
   NE1A-SCPU01 cycle time = 6 ms
   I/O refresh cycle time = 6 ms

Network reaction times #1 and #2 will be 24 ms each, based on a safety connection EPI of 6 ms. The reaction times are obtained using the following equation:

Reaction time (ms) = Switch reaction time

+ Safety I/O Terminal input reaction time
+ Network reaction time #1
+ NE1A-SCPU01 remote input/remote output reaction time
+ Network reaction time #2
+ Safety I/O Terminal output reaction time
+ Actuator reaction time #2
= Switch reaction time

+ ON/OFF delay time (DST1-ID12SL-1) + 16.2
(= Input reaction time of DST1-ID12SL-1)
+ 24
+ 6
+ 24
+ 6.2 (= Output reaction time of DST1-MD16SL-1)
+ Actuator reaction time
= **76.4 + ON/OFF delay time (DST1-ID12SL-1)**
   + Switch reaction time + Actuator reaction time

9-4-3   Verifying the Reaction Time

Always confirm the reaction time calculated for each safety change satisfies the required specifications. If the reaction time exceeds the required specifications, consider the following items and correct the design of the network for that reaction time requirements are satisfied.

- The network reaction time can be reduced by shortening the EPI. This, however, will also reduce the network band that can be used for other connections.
- The cycle time of the NE1A-series Controller is automatically calculated based on the size of the program, the number of connections, and other factors. The cycle time can be reduced by using separate NE1A-series Controllers for safety chains that require high-speed reaction times.

Section 10
Troubleshooting

10-1   Error Categories

NE1A-series Controller errors can be categorized into the following three categories:

Nonfatal Errors

The part where an error has occurred stops at each local I/O or safety I/O connection terminal and places it in the safety state. The Controller, however, continues in RUN Mode.

Abort Errors

The NE1A-series Controller completely stops safety functions and places them in the safety state when this error occurs. To enable checking the error state, explicit message communications or partial Network Configurator functions are supported.

Critical Error

The NE1A-series Controller completely stops its functions when this error occurs.

Note: Refer to *10-5 Errors When Downloading* for setting errors that occur during c onfiguration.

Note: Refer to *10-6 Errors When Resetting* for errors that occur when resetting the NE1A-series Controller.

Note: Refer to *10-7 Errors When Changing Modes* for errors that occur when changing the operating mode of the NE1A-series Controller.

10-2   Confirmation of Error State

Error details can be checked from the following two pieces of information:

- LED indicator status on the front of the NE1A-series Controller
- Reading the NE1A-series Controller's error history using the Network Configurator

10-3   Indicator/Display Status and Corrective Actions for Errors

Critical Errors

Indicators/display			Error history		Cause	Corrective actions
MS	NS	Seven-segment display	Name	Saved in nonvolatile memory		
▬ OFF	▬ OFF	OFF	None	Not sup-ported	• Noise level higher than expected. • Critical hardware fault	Cycle the power supply and check operation. If the problem recurs, the NE1A-series Controller may be faulty. • Check whether there is any influence from noise, and take whatever corrective actions are required.
⌑ Lit red	▬ OFF	Left: H Right: ---	System Failure	As much saved as possible.	• Before operation, the safety output terminal or test output terminal was short-circuited to 24 VDC. • Noise impact more than expected. • Critical hardware fault	• Check the external wiring for power supply short-circuiting at the output terminal. • Check whether there is any influence from noise, and take whatever corrective actions are required. • Turn the power OFF and back ON and check operation. If the problem recurs, the NE1A-series Controller may be faulty.

Abort Errors

Indicators/display			Error history		Cause	Corrective actions
MS	NS	Seven-segment display	Name	Saved in nonvolatile memory		
⌑ Flashing red	◣ Flashing green or ⌑ Lit green	E8 ⇔ Node address of error	Switch Setting Mismatch	Yes	The node address and baud rate were changed after the normal completion of configuration download.	• Configure the switches properly. • Reset the configuration data.
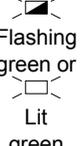
Nonfatal Errors

Indicators/display			Error history		Cause	Corrective actions
NS	Seven-segment display	I/O	Name	Saved in non-volatile memory		
⌑ Lit red	F0⇔ Node address of error	---	Duplicate MAC ID	See note 1.	Node address duplication (Same node address set for more than one node.)	Check the node addresses of other nodes. Switch ON the power supply again after reconfiguring without duplication.

Indicators/display			Error history		Cause	Corrective actions
NS	**Seven-segment display**	**I/O**	**Name**	**Saved in non-volatile memory**		
▭ Lit red	F1⇔Node address of error	---	Bus OFF	See note 1.	Bus Off (Comunications cut off because of frequent data errors.)	Check the following points and take corrective actions for each, then turn ON the power supply. • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (main/branch) are not too long. • Make sure the cable is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure that there is not a lot of noise.
◢ Flashing red	L9⇔ Master node address		Standard I/O Connection Timeout	See note 1.	Standard I/O connection timeout	Check the following points: • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (main/branch) are not too long. • Make sure the cable is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure that there is not a lot of noise.
◢ Flashing red	dA⇔ Des-tination slave node address		Safety I/O Connection Timeout	See note 1.	Safety I/O connection timeout	
◢ Flashing red	d5⇔ Desti-nation slave node ad-dress		Nonexistent Slave Device	See note 1.	No slave	
◢ Flashing red	d6⇔ Desti-nation slave node ad-dress	---	Safety I/O Connection Establishment Failure	See note 1.	Safety I/O con-nection estab-lishment error	Check the slave device. • Make sure it its configured. • Make sure it is in a normal operational state.
◢ Flashing red	d6⇔ Desti-nation slave node address	---	Invalid Slave Device	See note 1.	Invalid slave device (verifica-tion error)	Verify the slave device (select *Device - Parameters - Com-pare*) and connect a suitable slave device.
■ OFF	E0⇔ Node address of error	---	Network PS Voltage Low	See note 1.	Network power supply voltage low error	Check the following points: • Make sure the power supply voltage is set within the specified range. • Make sure a cable or wire is not disconnected.
---	E2⇔ Node address of error	---	Transmission Timeout	See note 1.	Transmission timeout	Check the following points: • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (main/branch) are not too long. • Make sure the cable is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure that there is not a lot of noise.
◢ Flashing red	A0⇔ Node address of error	---	Relevant Safety I/O communication stopped because of a Safety I/O com-munication error	Yes (See note 2.)	A safety I/O connection timed out, interrupting the relevant I/O connection.	Check the following points: • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (main/branch) are not too long. • Make sure the cable is not dis-connected or loose. • Make sure terminating resis-tance is at both ends of the main line and only at both ends. • Make sure that there is not a lot of noise.
◢ Flashing red	A1⇔ Node address of error	---	All Safety I/O com-munication stopped because of a Safety I/O com-munication error	Yes (See note 2.)	A safety I/O connection timed out, interrupting the all I/O con-nection	

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Indicators/display			Error history		Cause	Corrective actions
NS	Seven-segment display	I/O	Name	Saved in non-volatile memory		
---	P1⇔ Node address of error	Target terminal ◯ lit red Paired terminal (Dual Setting) ◐ flashing red	External Test Signal Failure at Safety Input	See note 1.	External wiring error in safety input.	Check the following points: • Make sure the input signal wire is not contacting the power source (positive side). • Make sure the input signal wire does not have an earth fault. • Make sure the input signal wire is not disconnected. • Make sure there is not a short circuit between input signal wires. • Make sure there is no failure in the connected devices. • Make sure the Discrepancy Time setting values are valid. To recover from the above error state, the following conditions are required. Latch input error time must have passed and the root cause must have been removed. The target safety input terminal inputs must turn OFF. To change the discrepancy time, reconfiguration is required.
---	P1⇔ Node address of error	Target terminal (Dual Setting) ◯ lit red	Discrepancy Error at Safety Input	See note 1.	Discrepancy error between 2 inputs at safety input.	
---	P1⇔ Node address of error	Target terminal ◯ lit red Paired terminal (Dual Setting) ◐ flashing red	Internal Input Failure at Safety Input	See note 1.	Internal circuit failure at safety input.	
---	P2⇔ Node address of error	No LED indicator	Overload Detected at Test Output	See note 1.	Overloading was detected at test output (when a test output terminal was set as a standard signal output).	Check whether the output signal wire has an earth fault or is over loaded.
---	P2⇔ Node address of error	No LED indicator	Stuck-at-high Detected at Test Output	See note 1.	Stuck-on-high at test output (when a test output terminal was set as a standard signal output).	For the wires, check if the power supply source (positive side) is contacting the output signal wire. After the latch input error time has passed, turn OFF the input after the cause of the error has been removed. The error will be reset. If there is no fault with the wires, replace the unit.
--	P2⇔ Node address of error	No LED indicator	Under Current Detected Using Muting Lamp	See note 1.	Disconnection of indicator light was detected at test output (when Terminal T3 is set as the muting lamp signal output)	Check whether the output signal wire is disconnected. If there is no error, check the indicator light.

Indicators/display			Error history		Cause	Corrective actions
NS	**Seven-segment display**	**I/O**	**Name**	**Saved in non-volatile memory**		
---	P3⇔ Node address of error	Target terminal ⟩○⟨ lit red Paired terminal (Dual Setting) ⟩◐⟨ flashing red	Over Current Detected at Safety Output	See note 1.	Overcurrent was detected at safety output.	Check the following points: • Make sure there is no over-current for the output. • Make sure the output signal wire does not have an earth fault. • Make sure the output signal wire is not contacting the power source (positive side). • Make sure there is not a short circuit between output signal wires. To recover from these errors, the following conditions are required: Latch input error time must have passed, and the root cause must have been removed. The output signal from the user application for the target safety output must turn OFF.
---	P3⇔ Node address of error	Target terminal ⟩○⟨ lit red Paired terminal (Dual Setting) ⟩◐⟨ Flashing red	Short Circuit Detected at Safety Output	See note 1.	Short circuit was detected at safety output.	
---	P3⇔ Node address of error	Target terminal ⟩○⟨ lit red Paired terminal (Dual Setting) ⟩◐⟨ Flashing red	Stuck-at-high Detected at Safety Output	See note 1.	Stuck-on-high at safety output	
---	P3⇔ Node address of error	Target terminal ⟩○⟨ lit red Paired terminal (Dual Setting) ⟩◐⟨ Flashing red	Cross Connection Detected at Safety Output	See note 1.	Short circuit was detected between output signal wires at safety output	
---	P3⇔ Node address of error	Target terminal (Dual Setting) ⟩○⟨ lit red	Dual Channel Violation at Safety Output	See note 1.	Output data error at safety output	Check whether program output data (for two outputs) in the Dual Channel Mode are configured as equivalent channels.

Indicators/display			Error history		Cause	Corrective actions
NS	**Seven-segment display**	**I/O**	**Name**	**Saved in non-volatile memory**		
---	P4⇔ Node address of error	● All OFF	Input PS Voltage Low	See note 1.	I/O power (input) is not connected although a safety input terminal or test output terminal is used.	Check the following points: • Make sure the power supply voltage is set within the specified range. • Make sure a cable or wire is not disconnected.
---	P5⇔ Node address of error	● All OFF	Output PS Voltage Low	See note 1.	I/O power (output) is not connected although a safety output terminal is used.	

Note 1: Not saved in Pre-Ver. 1.0 Controllers, but saved in Controllers with unit version 1.0 or later.

Note 2: These functions are not supported by Pre-Ver. 1.0 Controllers. The error information is saved in Controllers with unit version 1.0 or later.

10-4   Error History

The error history records errors that the NE1A-series Controller detects in the total operating time of the Controller.
The error history can be read from the Network Configurator.

10-4-1   Error History Table

Error History Table

When an error is detected in a Pre-Ver. 1.0 NE1A-series Controller, the error is recorded in the error history table in the RAM of the Controller. The error history contains one record per error and can hold up to 20 records. If the error history table already contains 20 records, the oldest record is deleted and the new error data is stored.

When an error is detected in a NE1A-series Controller with unit version 1.0 or later, the error is recorded in the error history table in the RAM of the Controller. The error history contains one record per error and can hold up to 100 records. If the error history table already contains 100 records, the oldest record is deleted and the new error data is stored.

The following information is stored in the error history table:
- Status information when an error occurs
- The time when an error occurs (total operating time of the NE1A-series Controller)
- The node address where the error occurred or the error response value (when an explicit message is sent)

Error History Saving Area

The description of an error is recorded as an error history in the NE1A-series Controller's RAM, and if the error is critical, it is also saved in the nonvolatile memory. The error history recorded in nonvolatile memory is retained even when the power supply of the Controller is not supplied or restarted. The error history in the nonvolatile memory is copied to the RAM at the start of the Controller's power cycle.
The error history in RAM is read when reading the error history from the Network Configurator. When clearing the error history, however, the error history in both the RAM and nonvolatile memory are cleared.

Reading and Clearing the Error History Table

The error history can be displayed in realtime using the Error History Display function of the Network Configurator. The error history data can also be saved on the computer.

Note: (1) The total operating time of the NE1A-series Controller is recorded as the accumulated time in 6-minutes increments while the power supply for the internal circuit is ON. The total operating time is cleared using a Controller Reset Command addressed to the NE1A-series Controller to clear all or only specified variables to their default settings.

(2) When the error history is read from the Network Configurator, the node address where the error occurred or the error response value is displayed as manufacturer-specific ALARM exception detail [7] 0x**.

(3) When the NE1A-series Controller's error history is read from the Network Configurator, both the error status information and the node address where the error occurred or the error response value are displayed for each error history record.

The NE1A-series Controller's error histories are read by the Network Configurator as shown below.

The time when an error occurs (total operating time)

1 record in the error history

Status information when an error occurs

Node address of an error device

10-4-2   Error Information Details

Message		Corrective Actions
NE1A-series Controller System Failures		
System Failure	System failure	Replace the unit if the system failure still occurs after turning ON the power supply again.
Invalid Configuration	Configuration invalid	Configuration differs from the original configuration. Reconfigure after checking.
Logic Programming-related Errors		
Function Block Status Error	Function Block Status Error	An incompatible signal input was set as an input condition in the function block's Set Parameters. Check the inputs entered in the function block or the program logic.
DeviceNet Communications Errors		
Switch Setting Mismatch	Switch setting mismatch	Check that the node address is the same as the one in the last configuration. If not, change back to the same node address or reconfigure. If the error occurs again, replace the unit.
Duplicate MAC ID	Node address duplication	Check the node address of other nodes. Correct the configuration so that each node address is used only once and then cycle the power supply.
Network PS Voltage Low	Network power supply voltage low error	Check the following points: • Make sure the power supply voltage is set within the specification range. • Make sure a cable or wire is not disconnected.
Bus Off	Bus OFF (Communications cut off by frequent data errors.)	Check the following points: • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (of main/branch lines) are not too long. • Make sure a cable or wire is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure there is not a lot of noise. • Make sure power is being supplied to the Slave.
Transmission Timeout	Transmission timeout	
Standard I/O Connection Timeout	Standard I/O connection timeout	
Relevant Safety I/O communication stopped because of a Safety I/O communication error	The corresponding safety I/O connection was stopped due to a safety I/O connection timeout.	
All Safety I/O communication stopped because of a Safety I/O communication error	All safety I/O connections were stopped due to a safety I/O connection timeout.	
Safety I/O Connection Timeout	Safety I/O connection timeout	
Nonexistent Slave Device	No slave	
Safety I/O Connection Establishment Failure	Safety I/O connection establishment error	Check the following points on the slave device: • Make sure it is configured. • Make sure it is operating normally.
Invalid Slave Device	Unauthorized slave device (verification error)	Verify the slave device (select ***Device - Parameters - Compare***) and connect a suitable slave device.
EM Transmission Error (Duplicate MAC ID)	Unable to transmit due to node address duplication.	Refer to the section on *Duplicate MAC ID*.
EM Transmission Error (Invalid Header)	Unable to transmit due to invalid header.	Check the following points: • Node address of the transmission message • Class ID of the transmission message • Instance ID of the transmission message
EM Transmission Error (Device Offline)	Unable to transmit because local device is not on the network.	Check the following points: • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (of main/branch lines) are not too long. • Make sure a cable or wire is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure there is not a lot of noise. • Make sure the power supply voltage for the network power source is set within the specification range.
EM Transmission Error (Message ID Error)	Unable to transmit due to message ID error.	
EM Transmission Error (Response Timeout)	Unable to transmit due to response timeout.	

Message		Corrective Actions
EM Transmission Error (Destination Device Absence)	Unable to transmit because the destination device is not on the network.	Check the following points: • Node address of the destination node • Node address of the transmission message • Make sure the power supply voltage for the destination node is set within the specification range. • Make sure the baud rate is the same for all nodes. • Make sure the cable lengths (of main/branch lines) are not too long. • Make sure a cable or wire is not disconnected or loose. • Make sure terminating resistance is at both ends of the main line and only at both ends. • Make sure there is not a lot of noise.
EM Transmission Error (Destination Buffer Full)	Unable to transmit because the destination buffer was busy.	Check the message receive size at the destination node.
EM Transmission Error (Command Length Error)	Unable to transmit because the command is longer than the maximum length.	Check the response message size from the destination. Or check that the response size expected in the request message is correct.
EM Transmission Error (New Request Received)	Message was deleted due to receiving the new request.	No
Received Error Response (UEM)	Receiving an error response when the user explicit message function is used.	Check that the specified service or data size in the user explicit message matches the destination object specifications.
Error Related to Power Supply for I/O		
Input PS Voltage Low	I/O power supply (input) is not connected.	Check the following points: • Make sure the power supply voltage is set within the specification
Output PS Voltage Low	I/O power supply (output) is not connected.	range. • Make sure that a cable or wire is not disconnected.
Safety Input Terminal-related Failures		
External Test Signal Failure at Safety Input	Failure in the external wire at safety input	Check the following points: • Make sure the input signal wire is not contacting the power source (positive side). • Make sure the input signal wire does not have an earth fault. • make sure the input signal wire is not disconnected. • Make sure there is not a short circuit between input signal wires. • Make sure a failure had not occurred in the connected device. • Make sure the set value of discrepancy time is valid.
Discrepancy Error at Safety Input	Discrepancy error between two inputs at safety input	To recover from these failures, the following conditions are required: Latch input error time must have passed, and the root cause must have been removed. The target safety input terminal inputs must turn OFF. When changing the discrepancy time, reconfiguration is required.
Internal Input Failure at Safety Input	Internal circuit failure at safety input	Replace the unit if the system failure still occurs after cycling the power supply.
Test Output Terminal-related Failures		
Overload Detected at Test Output	Overloading was detected at test output.	Check whether the output signal wire has an earth fault or is overloaded.
Stuck-at-high Detected at Test Output	Stuck-at-high at test output	Check whether the power source (positive side) is contacting the output signal wire. After the latch input error time has passed, turn OFF the input when the cause of the error has been removed, and the error will be reset. If there is no fault with the wires, replace the unit.
Under Current Detected Using Muting Lamp	Lower limit error of current was detected at test output.	Check whether the output signal wire is disconnected. If there is no fault with the wires, check the indicators.
Safety Output Terminal-related Failures		
Over Current Detected at Safety Output	Overcurrent was detected at safety output.	Check the following points: • Make sure there is no overcurrent for the output. • Make sure the output signal wire does not have an earth fault.

Section 10-4   Error History

Message		Corrective Actions
Short Circuit Detected at Safety Output	Short circuit was detected at safety output.	• Make sure the output signal wire is not contacting the power source (positive side). • Make sure there is not a short circuit between output signal wires. To recover from these failures, the following conditions are required: Latch output error time must have passed, and the root cause must have been removed. The output signal from the user application for the target safety output must turn OFF.
Stuck-at-high Detected at Safety Output	Stuck-at-high at safety output	
Cross Connection Detected at Safety Output	Short circuit was detected between output signal wires at safety output.	
Dual Channel Violation at Safety Output	Output data error at safety output	Check whether the data of the two outputs in the Dual Channel Mode are configured as equivalent channels.

10-5   Errors When Downloading

10-5-1   Outline

An NE1A-series Controller or other Safety Device may return an error when configuration data is downloaded to them. The cause of the error can be determined from the error information displayed on the Network Configurator.

10-5-2   Error Messages and Countermeasures

Message displayed on the Network Configurator	Countermeasure
Cannot be executed in the current mode.	A fatal error (Abort) (MS indicator flashes red) has occurred. Set the switches correctly or execute reset (Out-of-Reset) to clear the configuration data.
The device is locked.	The configuration data is locked. (LOCK indicator is lit.) Release the lock.
The TUNID is different.	The device is waiting for a TUNID setting after being reset (NS indicator is flashing green/red) or the TUNID of the Network Configurator is different from the device when downloading. Use the following steps to check the setting. (1) Reset the device to default settings then download the parameters again. The network number may, however, be different from other devices. If the Controller's 7-segment display shows "d6" (A *Safety I/O Connection Establishment Failure* message appears on the Error History Tab Page in the Network Configurator Monitor Device Window) after the operating mode has been changed, use steps (2) or (3) to correct the error. (2) Select **Network – Upload** in the Network Configurator. Unify the network numbers and reset all devices to the default settings. Once reset, download the parameters to all devices again. (3) Select **Network – Property** to display the Network Property Dialog Box in Network Configurator then click the **Get from Network** Button in the Network Number Field. If there are multiple network numbers, select one of these numbers to unify all to that network number.
Privilege violation.	1. The password that is being used does not have the right to change the configuration. Check to see if the password is correct.
	2. An attempt was made to set Standalone Mode through a DeviceNet connection. Connect the Network Configurator via the USB connector and download the configuration again.
Cannot be executed in the current device mode.	Downloading from more than one Network Configurator at the same time. Wait until other downloads have been completed.
An error was found during parameter check.	1. There is a non-alignment between configuration parameters. Check the following items and change the parameters. • The time parameters (e.g., Discrepancy Time) set for function blocks in the NE1A-series Controller's settings is shorter than the Controller's cycle time. • The safety connection EPI is shorter than the cycle time. • The safety input channel mode is set to *Used with test pulse,* but the test source has not been set. • One of the safety inputs in a dual channel setting is set as a standard input and the other has a different setting. • One of the safety inputs in a dual channel setting is set to *Not used* and the other has a different setting. • One of the safety outputs in a dual channel setting is set to *Not used* and the other has a different setting. • The maximum number of connection IDs for one Safety Master (12) has been exceeded in the safety I/O configuration. Change the ID allocation under **Edit Safety Connection – Expansion Connection Setting** to "Check Produced IDs in the Safety Slave" in the corresponding Safety I/O Connection (Safety Input Assembly) setting, then download the device parameters to the Safety Master again.

Message displayed on the Network Configurator	Countermeasure
	2. The program may have been created with an earlier Network Configurator than version 1.5☐. The checks for safety functions have been improved in version 1.5☐ so programs created in an earlier version cannot be downloaded as is. Use the following procedure to convert the program and then download the program again. (1) Click the **Edit** Button on the Logic Tab page in the Edit Device Parameters Window of the NE1A-series Controller to open the Logic Editor. (2) Select *Edit – Find Function Blocks with Open Connections* to check all function block I/O are connected. For information on open function block connections, refer to *6-3-10 Precautions When Moving from Version 1.3☐ to 1.5☐* in the *DeviceNet Safety System Configuration Manual* (Z905) for details. (3) Select *File – Apply* to save the logic program then close the Logic Editor. (4) Return to the NE1A-series Controller's Edit Device Parameters Window and click the **OK** Button.
	3. The hardware may be malfunctioning. Cycle the NE1A-series Controller's power and execute self-diagnosis. If the MS indicator is lit red, replace the hardware.
The data used by the logic program is not aligned with other data.	The network configuration has changed, which has resulted in a non-alignment between the logic program data and other data. Start Logic Editor and check changed I/O locations and make the settings again.
Could not access the device.	Device is waiting for a TUNID setting (NS indicator is flashing green/red) after reset was executed from another node during download. Set the TUNID and download again. Refer to *3-4-2 Network Numbers* in the *DeviceNet Safety System Configuration Manual* (Z905) for information on TUNIDs.
Could not open connection.	1. Could not establish connection with device when downloading to the device via DeviceNet. Check that the power is ON to the device and download again.
	2. The connection resources available for the device are being used to establish safety I/O connections with the Safety Master, so a connection cannot be established with the Network Configurator. Change the operation mode of the Safety Master to which the safety connections are registered to IDLE mode.
	3. If the above causes do not apply, noise or other factors may be making communications unstable. Check the following items. • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line?
Message could not be sent.	Downloaded via USB to the device but could not connect to the device. Check that the power is turned ON to the device and download again.
Connection failed.	Tried to configure a device on the DeviceNet network via the NE1A-series Controller's USB port, but connection failed. Check that power is turned ON to the device and download again. If the above cause does not apply, noise or other factors may be making communications unstable. Check the following items. • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise?
Program incomplete. Start Logic Editor and check program.	There are open inputs or outputs in a function block used in the logic program. Click the **Edit** Button on the Logic Tab Page to open the logic and perform the following measures. • Connect the open inputs or outputs. • Change the number of I/O setting for the function block to delete the open input or output. Function blocks with open inputs or outputs can be searched by using *Edit – Find Function Blocks with Open Connections*. Refer to *Finding Function Block with Open Connections* in *6-3-3 Programming Using Function Blocks* and *6-3-10 Precautions When Moving from Version 1.3☐ to 1.5☐* in the *DeviceNet Safety System Configuration Manual* (Z905) for details.

10-6   Errors When Resetting

10-6-1   Outline

The NE1A-series Controller may return an error response when it is reset.
The messages displayed on the Network Configurator can be used to identify and correct the error.

10-6-2   Error Messages and Countermeasures

Message displayed on the Network Configurator	Countermeasures
Cannot execute in current mode.	The specified reset cannot be executed in the current device status. Refer to *7-2-2 Reset Type and NE1A-series Controller Status* and change the operating mode or configuration lock status of the Controller. Then execute the reset again.
The device has a different TUNID. The device TUNID will be used to reset. Is that OK?	The TUNID saved to the device and the TUNID specified by Network Configurator do not match. Check that the device node address matches and execute the reset if it is OK to use the device TUNID.
Access error	The password used does not provide authority to change configurations. Check that the correct password is being used.
The device cannot be accessed or the device type or password is different.	1. The device has just been reset or the power cycled and the device is not ready for communications (i.e., not online with the NS indicator flashing or lit green.) Check that the device is communications ready then reset.
	2. The device specified for reset may not support that service. Check that the device node address is correct.
	3. The configuration data is locked. (The LOCK indicator is lit.) Remove the lock then execute the specified reset.
	4. The device is performing safety I/O communications and cannot, therefore, execute the specified reset. Change the operating mode of the relevant Safety Master to IDLE mode. Then execute the specified reset.
Connection failed.	Tried to reset a device on the DeviceNet network via the NE1A-series Controller's USB port, but connection failed. Check that power is turned ON to the device and reset again. If the above cause does not apply, noise or other factors may be making communications unstable. Check the following items. • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise?

10-7   Errors When Changing Modes

10-7-1   Outline

The NE1A-series Controller may return an error response when its operating mode is being changed. The messages displayed on the Network Configurator can be used to identify and correct the error.

10-7-2   Error Messages and Countermeasures

Message Displayed on the Network Configurator	Countermeasures
Cannot be executed in the current mode.	1. The device has not been configured (Configurating Mode). Download the device parameters.
	2. A fatal error (Abort) has occurred. Set the switches correctly or execute reset (Out-of-Reset) to clear the configuration data. Once the configuration data is cleared, download the device parameters again.
Already set to the specified mode.	The device is already in the specified operating mode.
The device has a different TUNID.	The TUNID saved to the device and the TUNID specified by the Network Configurator do not match. Check that the device node address matches. If it does, it means that the device network number and the network number in the Network Configurator do not match. Select **Network – Upload** in the Network Configurator to match the network numbers.
Access error	The password used does not provide authority to change the operating mode. Check that the correct password is being used.
The device cannot be accessed or the device type or password is different.	1. The device has just been reset or the power cycled and the device is not ready for communications (i.e., not online with the NS indicator flashing or lit green.) Check that the device is communications ready then reset.
	2. The device for which the operating mode change request was made may not support that service. Check that the device node address is correct.
Connection failed.	Tried to change the operating mode of a device on the DeviceNet network via the NE1A-series Controller's USB port, but connection failed. Check that power is turned ON to the device and reset again.
	If the above cause does not apply, noise or other factors may be making communications unstable. Check the following items.
	• Do all nodes have the same baud rate?
	• Is the cable length correct (trunk lines and branch lines)?
	• Is the cable disconnected or slack?
	• Is the terminating resistance only on both ends of the main line?
	• Is there a lot of noise?

10-8   Connection Status Tables

10-8-1   Outline

If an error occurs when the NE1A-series Controller tries to establish a safety connection with a DST1-series Safety I/O Terminal or an NE1A-series Controller set as a Slave, the 7-segment display will display the error code "d6" or "d5".
Check the status code (error code) shown on the Safety Connection Tab Page in the Monitor Device Window and take the corresponding countermeasure.

10-8-2   Connection Status for DST1 Series

Status		Countermeasure
00:0001	Normal communications	The Safety I/O connection status is normal.
01:0001	Safety I/O Connection Timeout	The Safety I/O connection has timed out. Check the following items. • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise? • Is the network bandwidth allocation suitable?
01:0105	Configuration Owner Error	The Safety Slave was configured from a configuration tool or Safety Master at a different node address last time. Reset the Safety Slave to the default settings and download the device parameters again. Refer to *5-1-2 Setting Safety Connection Parameters* in the *DeviceNet Safety System Configuration Manual (Z905)* for information on configuration owners.
01:0106	Output connection Owner Error	The Safety Slave established output safety I/o connections with a Safety Master at a different node address last time. Reset the Safety Slave to the default settings and download the device parameters again. Refer to *5-1-2 Setting Safety Connection Parameters* in the *DeviceNet Safety System Configuration Manual (Z905)* for information on output connection owners.
01:0110	Device Not Configured	The Safety Slave has not been configured. Download the device parameters to the Safety Slave.
01:0113	No. of Connections Error	The setting for the number of safety I/O connections exceeds the upper limit supported by the Safety Slave. Adjust the Safety Connection setting for the relevant Safety Master.
01:0114	Vendor ID or Program Code Error	The device data (vendor ID or product code) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.
01:0115	Device Type Error	The device data (device type) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.
01:0116	Revision Error	The device data (revision) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.

Status		Countermeasure
01:0117	Connection Path Error	1: Two or more output safety I/O connections have been set for the Safety Slave. • Change the Safety Connection setting for the Safety Master so there is only one connection. Then reset the Safety Slave to default settings and download the device parameters to the Safety Slave again. 2: The same output assembly number for a Safety Slave has been used for both a Safety Master and a Standard Master. • Input assembly numbers can be duplicated but output assembly numbers cannot. Check the Safety Connection setting for both the Safety Master and the Standard Master then return the Safety Slave to default settings and download the device parameters to the Safety Slave again. • If the error remains even after the above countermeasure has been performed, delete and re-register the connections registered to the Safety Master.
01:031E	No. of Connections Error	The setting for the number of safety I/O connections exceeds the upper limit supported by the Safety Slave. Adjust the Safety Connection setting for the relevant Safety Master. In particular, check that no more than 15 Safety Masters are set for each Multi-cast connection, with a maximum total of 30.
01:031F	Connection ID Resource Error	The maximum number of connection IDs for one Safety Master (12) has been exceeded. Change the ID allocation under *Edit Safety Connection – Expansion Connection Setting* to "Check Produced IDs in the Safety Slave" in the corresponding Safety I/O Connection (Safety Input Assembly) setting, then download the device parameters to the Safety Master again.
01:07FF	Non-existent Safety Slave	The Safety Slave may not have been added to the network correctly. Check that the corresponding Safety Slave is online (i.e., the NS indicator is flashing green or lit green.) If the Safety Slave is not online, check the following items. • Is the node address for the Safety Slave correct? • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise?
01:080C	Safety Signature Mismatch	The safety signature for the Safety Slave monitored by the Safety Master does not match the safety signature of the Safety Slave itself. • Reset the Safety Slave to default settings then download the device parameters again. • If the above remedy does not work, delete then re-register the connections registered to the Safety Master.
01:080E	TUNID Mismatch	The TUNID for the Safety Slave monitored by the Safety Master does not match the TUNID of the Safety Slave itself. • Reset the Safety Slave to default settings then download the correct device parameters. • If the above remedy does not work, delete then re-register the connections registered to the Safety Master. Refer to *3-4-2 Network Numbers* in the *DeviceNet Safety System Configuration Manual (Z905)* for information on TUNIDs.
01:080F	Safety Configuration not possible	The Safety Slave is configuration locked and *Configure the target device* is selected for the Open Type setting for the Safety Master connection. • Release the configuration lock on the Safety Slave to configure the Safety Slave from the Safety Master. • To configure the Safety Slave from a configuration tool, set the Safety Master connection to *Check the safety signature* under Open Type. Then reset the Safety Slave to default settings and download the device parameters to the Safety Slave again.

10-8-3   Connection Status for the NE1A-series Controller (Safety Slave Function)

	Status	Countermeasures
00:0001	Normal communications	The Safety I/O connection status is normal.
01:0001	Safety I/O Connection Timeout	The Safety I/O connection has timed out. Check the following items. • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise? • Is the network bandwidth allocation suitable?
01:0106	Output Connection Owner Error	The Safety Slave has previously established an output safety I/O connection with a Safety Master at a different node address. Reset the Safety Slave to the default settings, and then download the device parameters again. Refer to *5-1-2 Setting Safety Connection Parameters* in the *DeviceNet Safety System Configuration Manual (Z905)* for information on output connection owners.
01:0109	Data Size Error	The Safety Slave I/O size set to the NE1A-series Safety Slave and the size set under the Safety Master safety connection setting does not match. The Safety Slave I/O setting may have been changed, so delete then re-register the connections registered to the Safety Master.
01:0110	Unconfigured Device	The Safety Slave has not been configured. Download the device parameters to the Safety Slave.
01:0111	EPI Error	The EPI set under the Safety Master safety connection setting is smaller than the Safety Slave cycle time. The EPI must be longer than both the Safety Master and the Safety Slave cycle times. Check the Safety Master safety connection setting.
01:0113	No. of Connections Error	The setting exceeds the maximum number of safety I/O connections supported by the Safety Slave. Check the relevant Safety Master safety connection settings.
01:0114	Vendor ID or Product Code Error	The device data (vendor ID or product code) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.
01:0115	Device Type Error	The device data (device type) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.
01:0116	Firmware Revision Error	The device data (firmware revision) for the device on the Configurator and the device used in the actual system does not match. • Use Safety Slave Verification (***Device – Parameter – Verify***) to check that the device in the system and the device registered to the Safety Master match. • If they do match, delete then re-register the connections registered to the Safety Master.
01:0117	Connection Path Error	Two ore more single-cast safety I/O connections or a multi-cast safety I/O connection with a different EPI has been set for a safety slave I/O. • To share one safety slave I/O on a Safety Slave with more than one Safety Master, make the EPI all the same and set the connection type to Multi-cast. • NE1A-series Safety Slaves cannot have more than one single-cast safety I/O connection for each Safety Slave I/O. Set multiple connection paths for the NE1A-series Safety Slave Safety Slave I/O. • If the connection is not restored with the above remedy, delete then re-register the connections registered to the Safety Master.
01:031E	No. of Connections Error	The setting for the number of safety I/O connections exceeds the upper limit supported by the Safety Slave. Adjust the Safety Connection setting for the relevant Safety Master. In particular, check that no more than 15 Safety Masters are set for each Multi-cast connection, with a maximum total of 60.

Status		Countermeasures
01:031F	Connection ID Resource Error	The maximum number of connection IDs for one Safety Master (12) has been exceeded. Change the ID allocation under **Edit Safety Connection – Expansion Connection Setting** to "Check Produced IDs in the Safety Slave" in the corresponding Safety I/O Connection (Safety Input Assembly) setting, then download the device parameters to the Safety Master again.
01:07FF	Non-existent Safety Slave	The Safety Slave may not have been added to the network correctly. Check that the corresponding Safety Slave is online (i.e., the NS indicator is flashing green or lit green.) If the Safety Slave is not online, check the following items. • Is the node address for the Safety Slave correct? • Do all nodes have the same baud rate? • Is the cable length correct (trunk lines and branch lines)? • Is the cable disconnected or slack? • Is the terminating resistance only on both ends of the main line? • Is there a lot of noise?
01:080C	Safety Signature Mismatch	The safety signature for the Safety Slave monitored by the Safety Master does not match the safety signature of the Safety Slave itself. • Reset the Safety Slave to default settings then download the device parameters again. • If the above remedy does not work, delete then re-register the connections registered to the Safety Master.
01:080E	TUNID Mismatch	The TUNID for the Safety Slave monitored by the Safety Master does not match the TUNID of the Safety Slave itself. • Reset the Safety Slave to default settings then download the correct device parameters. • If the above remedy does not work, delete then re-register the connections registered to the Safety Master. Refer to *3-4-2 Network Numbers* in the *DeviceNet Safety System Configuration Manual (Z905)* for information on TUNIDs.
D0:0001	IDLE Mode	The NE1A-series Safety Master is in IDLE mode, so safety I/O connections have not been established. Change the NE1A-series Safety Master operating mode to RUN mode.

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Section 11
Maintenance and Inspection

11-1   Inspection

To use an NE1A-series Controller's functions in the best condition, daily or periodical inspection must be performed.

- Check that the NE1A-series Controller is used within the range of specifications.
- Check that installation conditions and wiring of the NE1A-series Controller are proper.
- Diagnose the safety functions to maintain a level of operating reliability in safety functions.

11-2   NE1A-series Controller Replacement

Note the following points when you find a defect and replace the NE1A-series Controller:

- Do not disassemble, repair, or modify the NE1A-series Controller. To do so is dangerous because the original safety functions would be lost.
- Replace the unit in conditions where safety is ensured.
- To prevent electric shocks or unexpected performance of the device, perform the replacement after turning OFF the power supply.
- Check that there is no error in the new unit after replacement.
- When returning the defective unit for repair, attach a sheet of paper to the unit describing in as much detail as possible the defect. Send the unit to the OMRON branch or sales office listed in the back of this operation manual.

⚠ WARNING
Serious injury may possibly occur due to loss of required safety function. To restart operation after replacing the NE1A-series Controller, reset all necessary configuration information, such as the user program. Check that the safety functions perform properly before starting actual operation.

Appendix

Appendix 1: Application and Configuration Examples

A-1-1 Emergency Stop Application: Dual Channel Mode with Manual Reset

Wiring Diagram
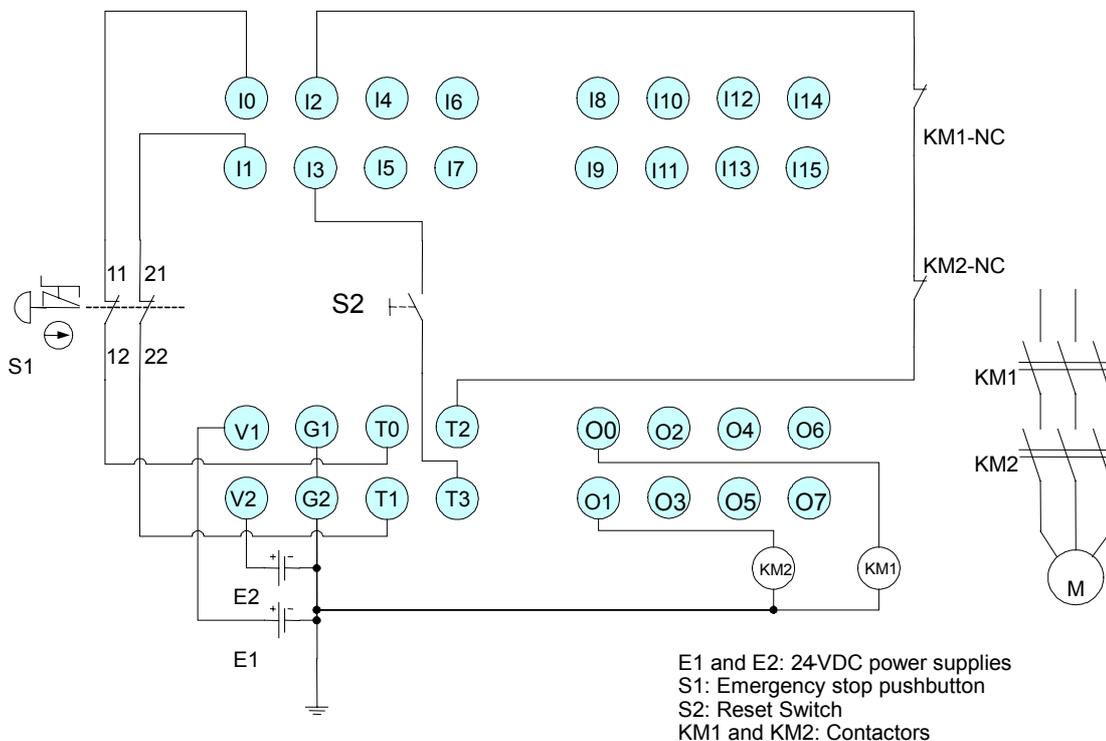
E1 and E2: 24-VDC power supplies
S1: Emergency stop pushbutton
S2: Reset Switch
KM1 and KM2: Contactors

Note 1: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).
Note 2: This example shows the NE1A-SCPU01(-V1) Controller's terminal layout.

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Timing Diagram
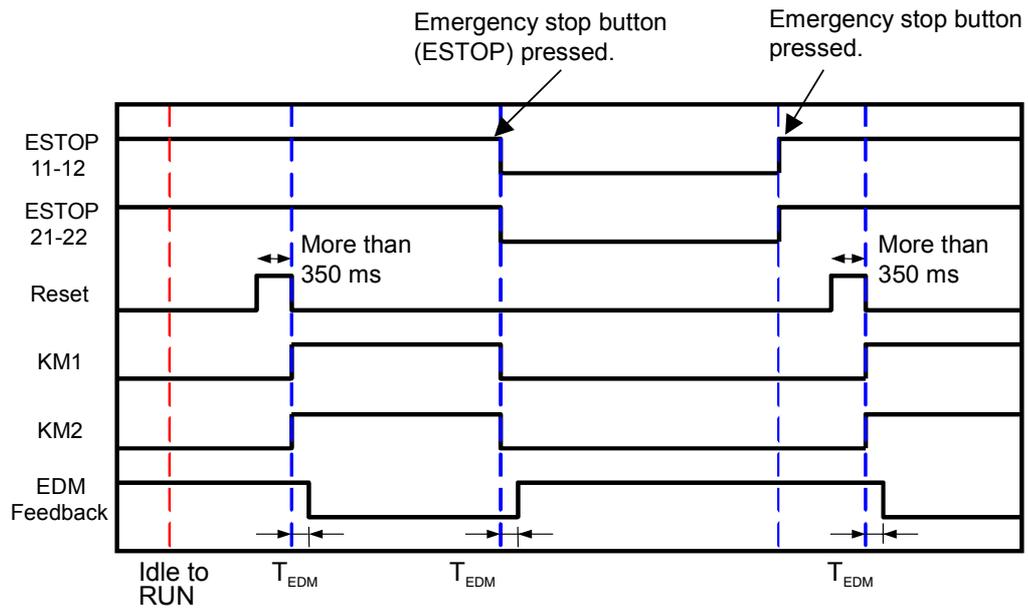
Programming Example
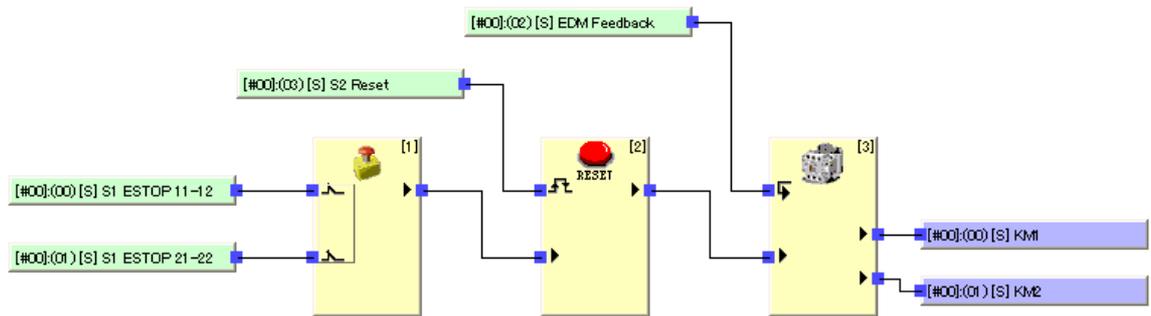
Local Input and Test Output Setting Example
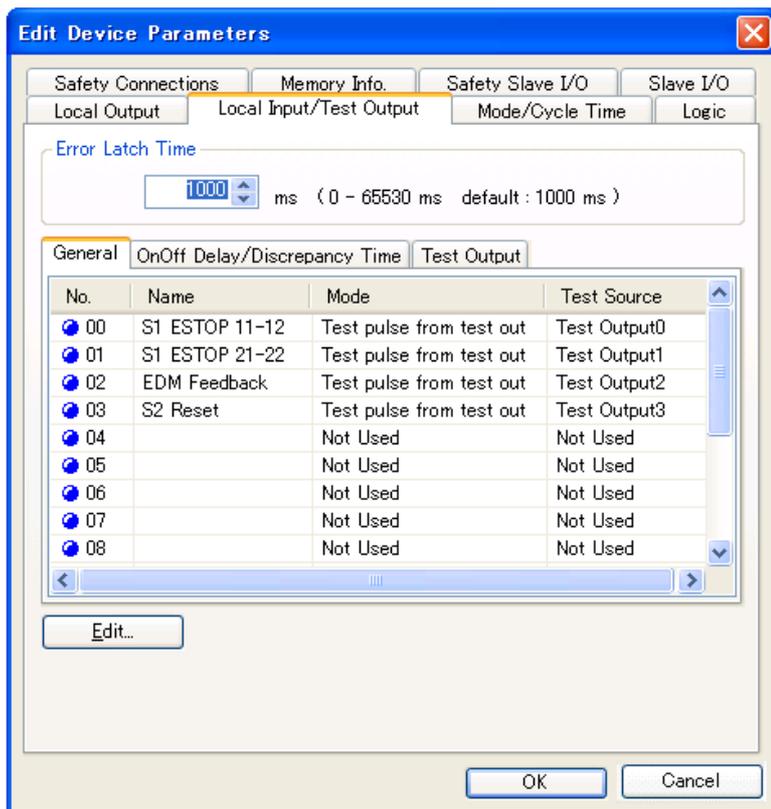
Local Output Setting Example
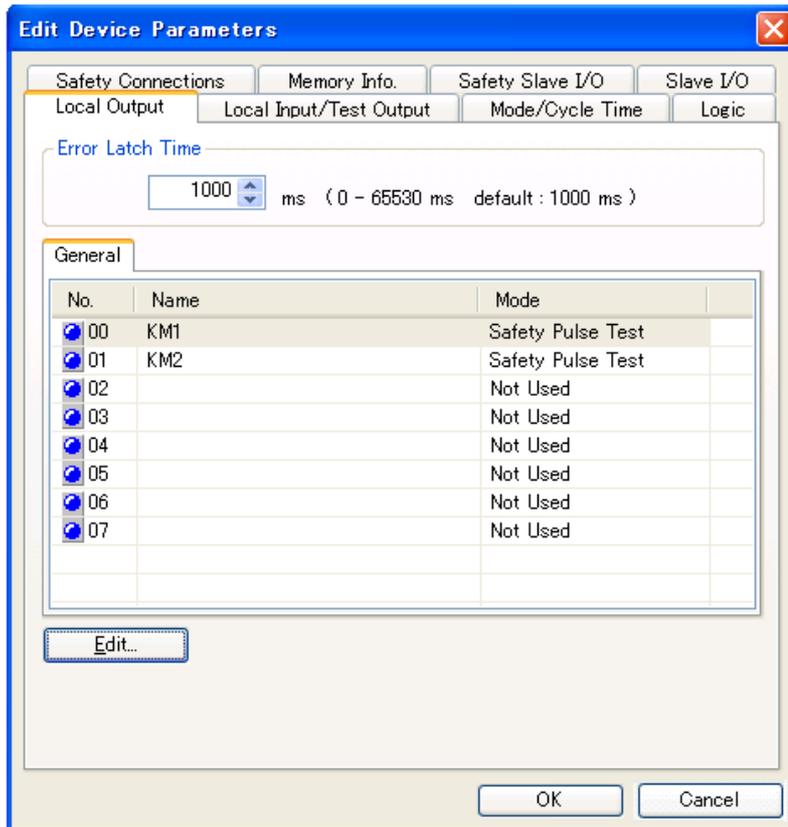
A-1-2 Safety Gate Application: Dual Channel Mode Limit Switches with Automatic Reset

Wiring Example
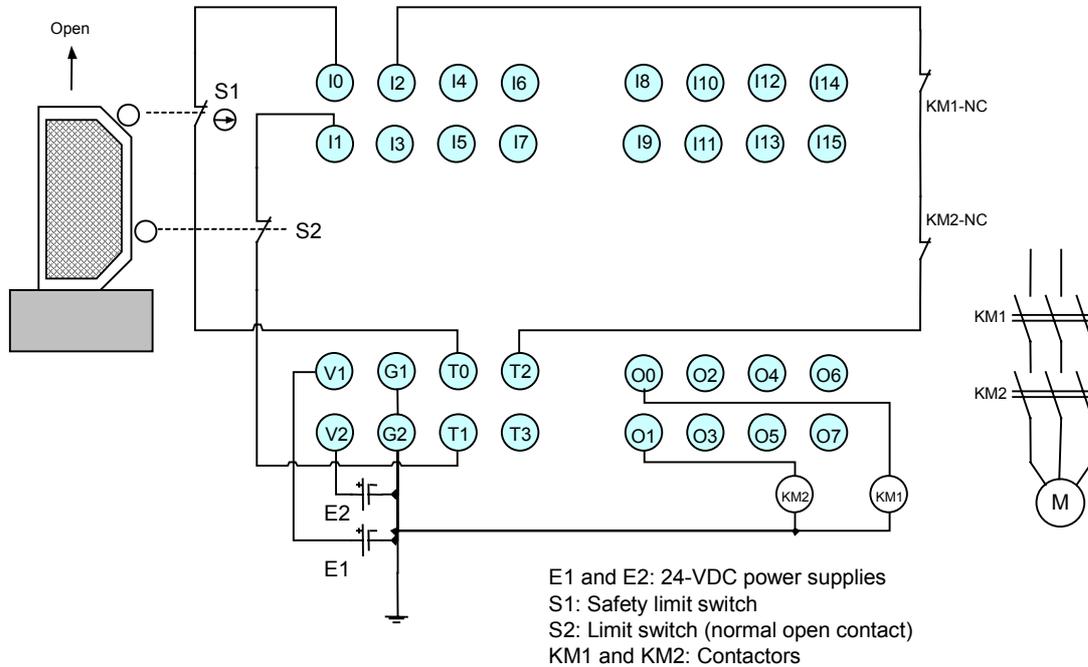
E1 and E2: 24-VDC power supplies
S1: Safety limit switch
S2: Limit switch (normal open contact)
KM1 and KM2: Contactors

Note 1: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).
Note 2: This example shows the NE1A-SCPU01(-V1) Controller's terminal layout.

Timing Diagram
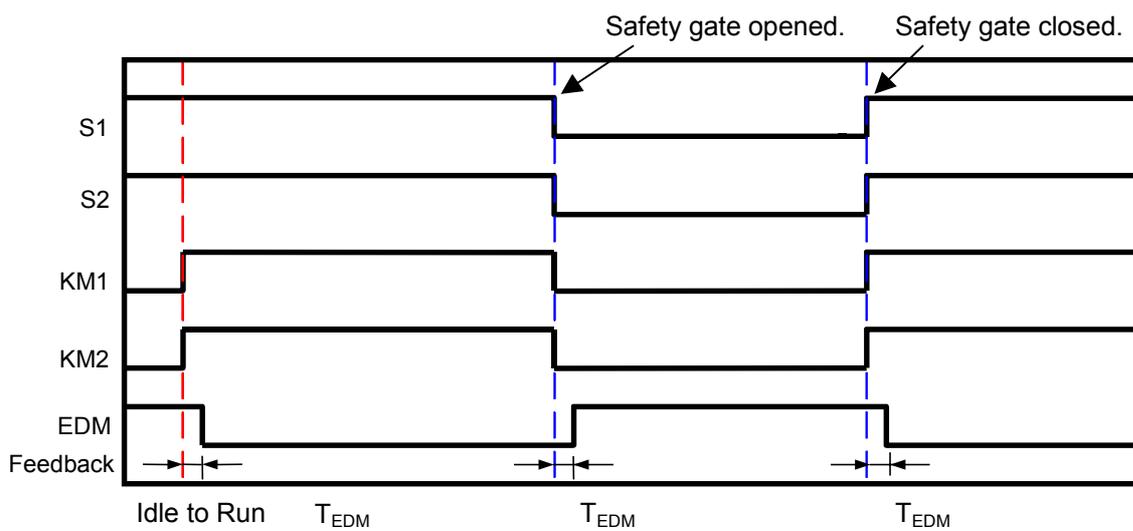
Programming Example
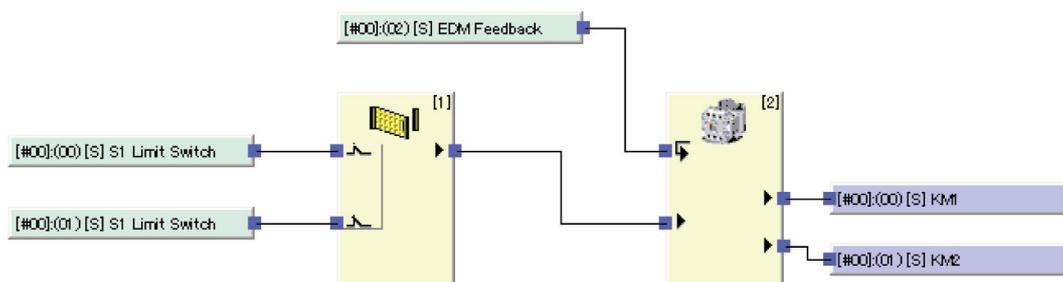
Local Input and Test Output Setting Example
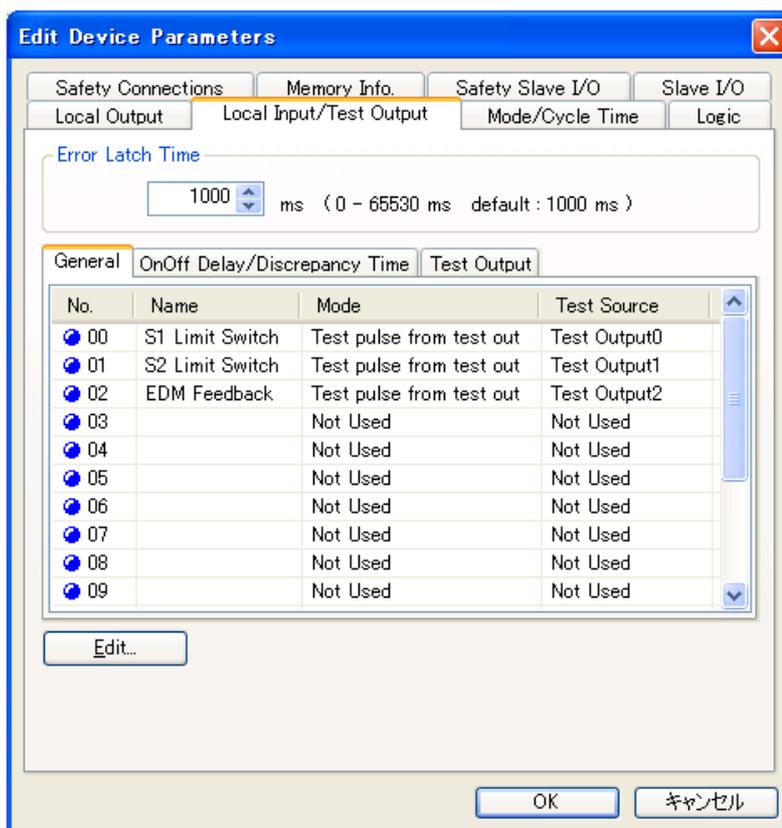
Local Output Setting Example
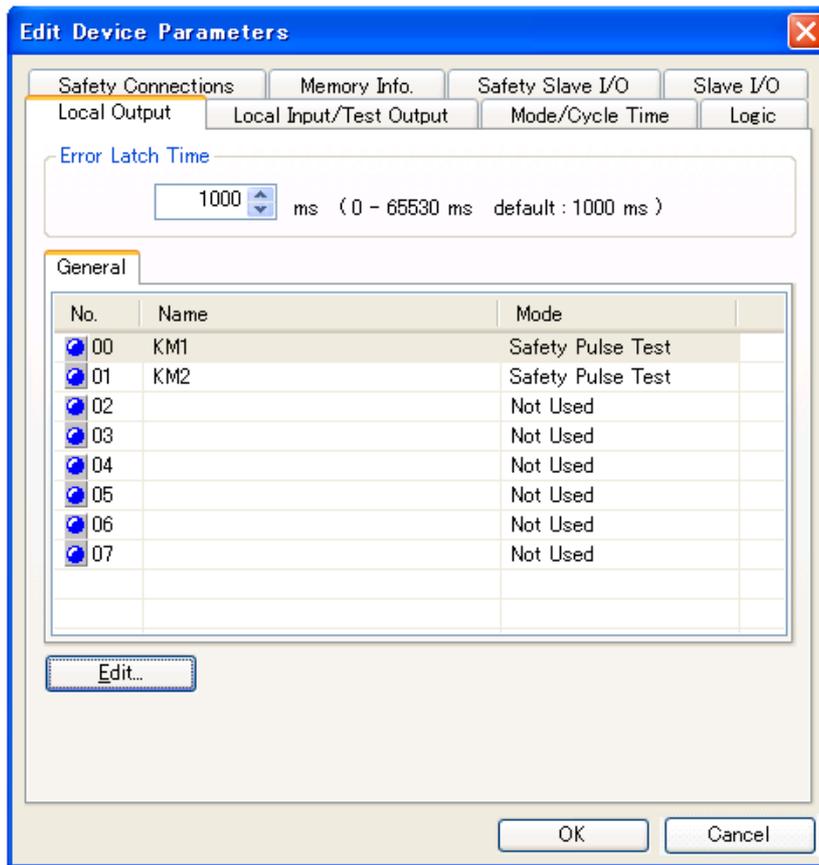
A-1-3 Safety Gate Application: Dual Channel Door Switches with Automatic Reset and Dual Channel Emergency Stop Switch with Manual Reset

Wiring Example

E1 and E2: 24-VDC power supply
S1: Emergency stop pushbutton
S2: Reset Switch
S3 and S5:Safety limit switch
S4 and S6: Limit switch
KM1, KM2, KM3, and KM4: Contactors

Note 1: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).

Note 2: This example shows the NE1A-SCPU01(-V1) Controller's terminal layout.

Timing Diagram

Idle to RUN T_{EDM}: EDM feedback time

Programming Example

Local Input and Test Output Setting Example

Local Output Setting Example

A-1-4 Safety Light Curtain: Dual Channel Safety Light Curtain with Manual Reset and Dual Channel Emergency Stop Switch with Manual Reset

Wiring Example
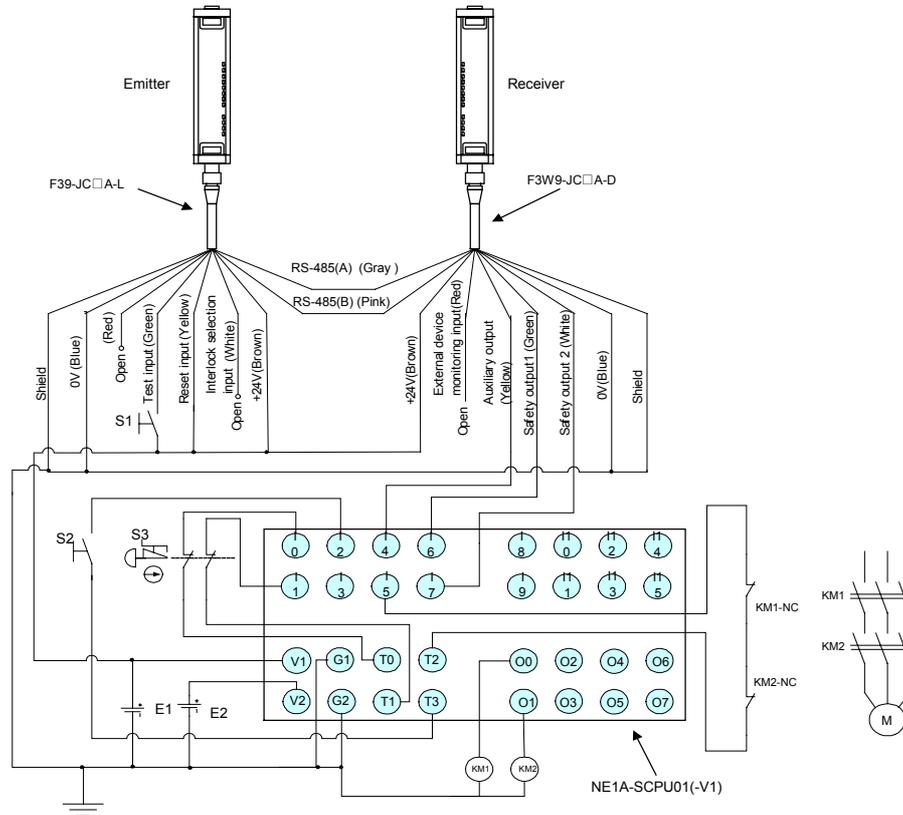
E1 and E2: 24-VDC power supply
S1: Reset switch
S2: Reset switch
S3: Emergency stop pushbutton
KM1 and KM2: Contactors

Note 1: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).
Note 2: This example shows the NE1A-SCPU01(-V1) Controller's terminal layout.

Timing Diagram

Emergency stop button (ESTOP) pressed.

350 ms min. 350 ms min.

ESTOP
S3

RESET
S2

SLC

KM1,2

EDM
Feedback

T_{EDM} T_{EDM} T_{EDM} T_{EDM}

Idle to RUN T_{EDM}: Feedback time

Programming Example

[#00]:(05) [S] EDM Feedback

[#00]:(02) [S] Reset

[#00]:(00) [S] Estop1

[#00]:(01) [S] Estop2

Estop

[#00]:(06) [S] SLC1

[#00]:(07) [S] SLC2

SLC

RESET [3]

[4]

[#00]:(00) [S] KM1

[#00]:(01) [S] KM2
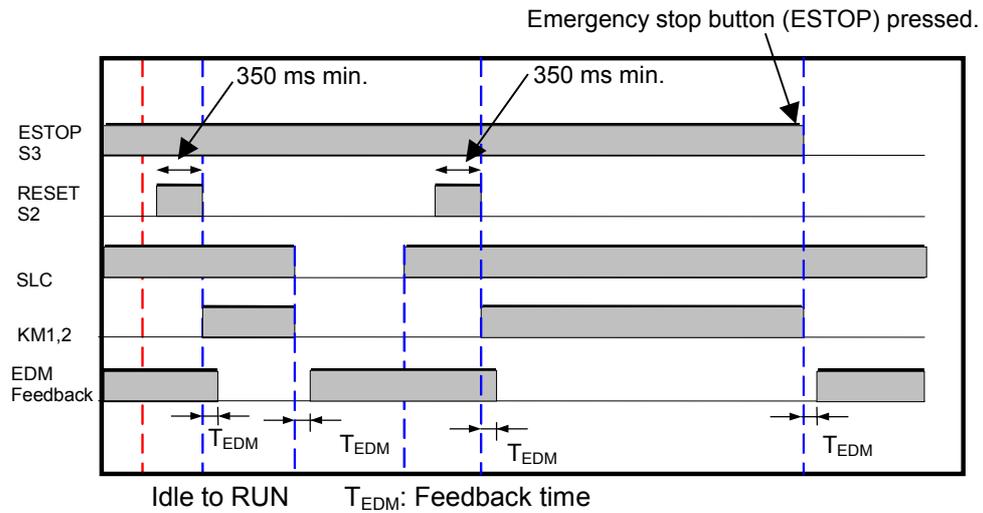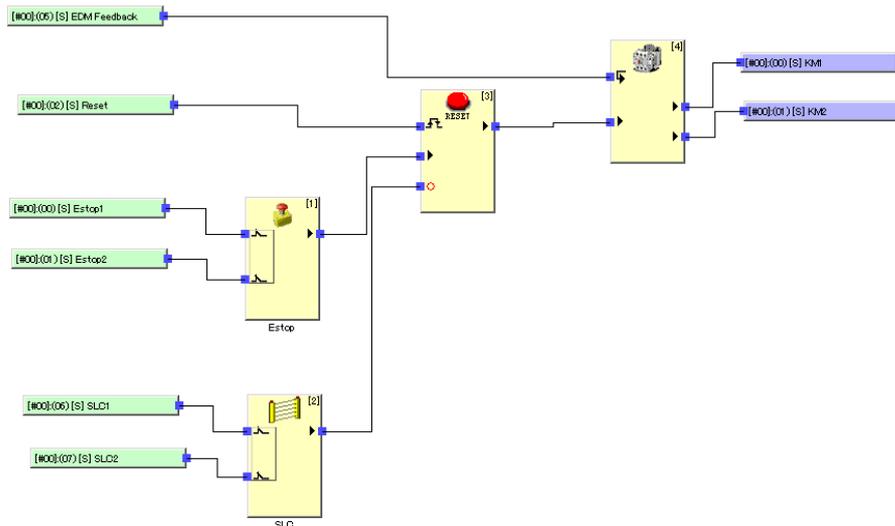
Local Input and Test Output Setting Example
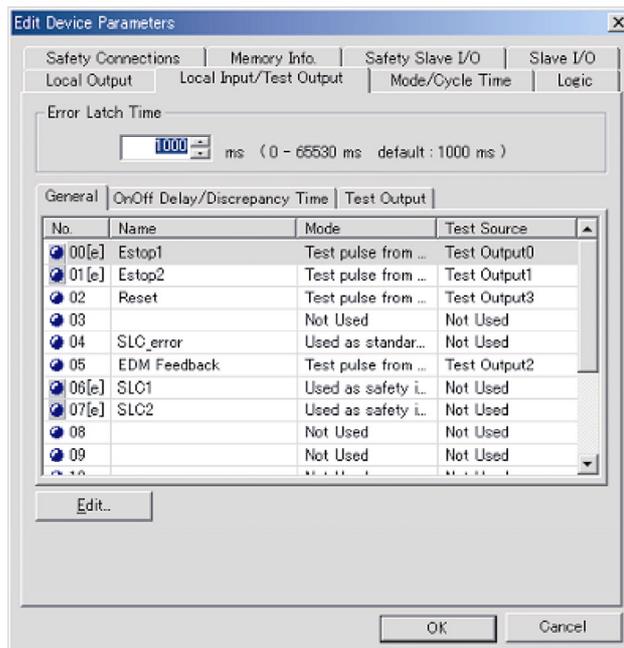
Local Output Setting Example
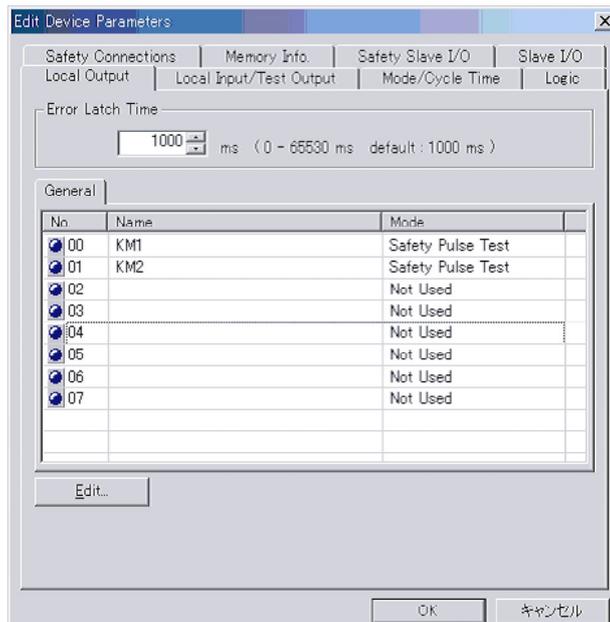
A-1-5   Safety Mat: Dual Channel Safety Mat with Manual Reset and Dual Channel Emergency Stop Switch with Manual Reset

Wiring Example

E1 and E2: 24-VDC power supply
S1: Reset switch
S2:   Emergency stop pushbutton
KM1 and KM2: Contactors

Note 1: Connect a 24-VDC power supply to terminals V0 and G0 (power supply terminals for internal circuits).

**Note 2:** This example shows the NE1A-SCPU01(-V1) Controller's terminal layout.

Timing Diagram

Idle to RUN T_{EDM}: EDM feedback time
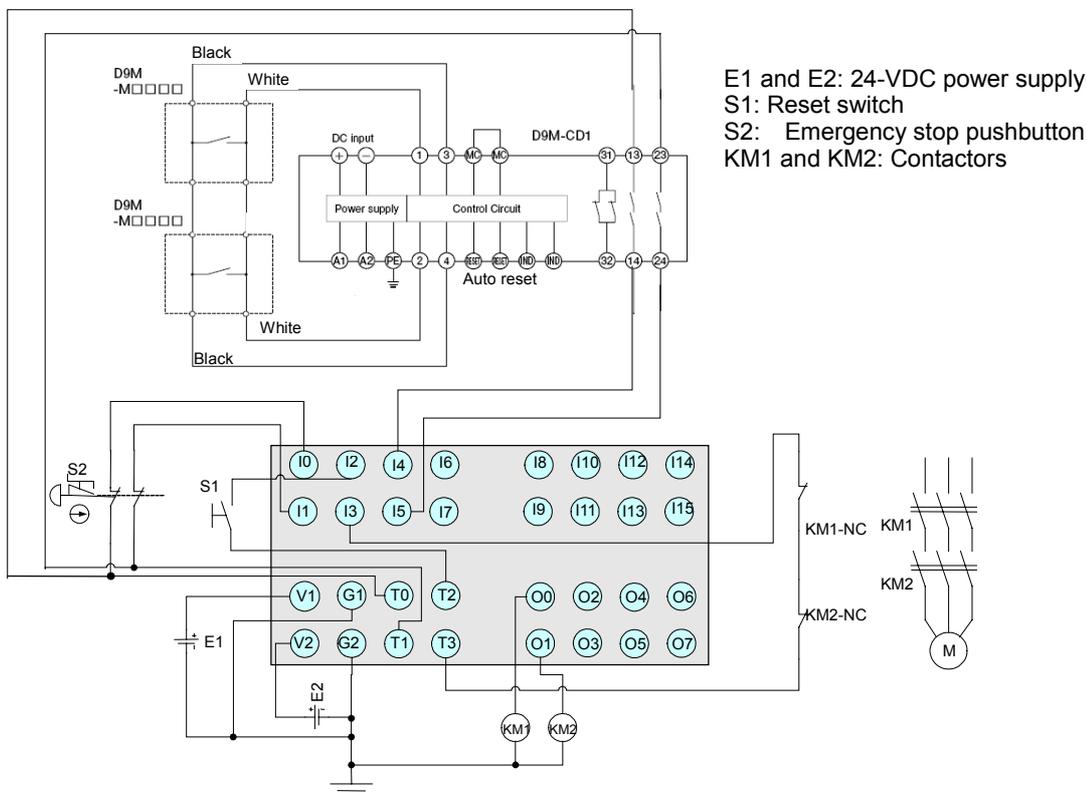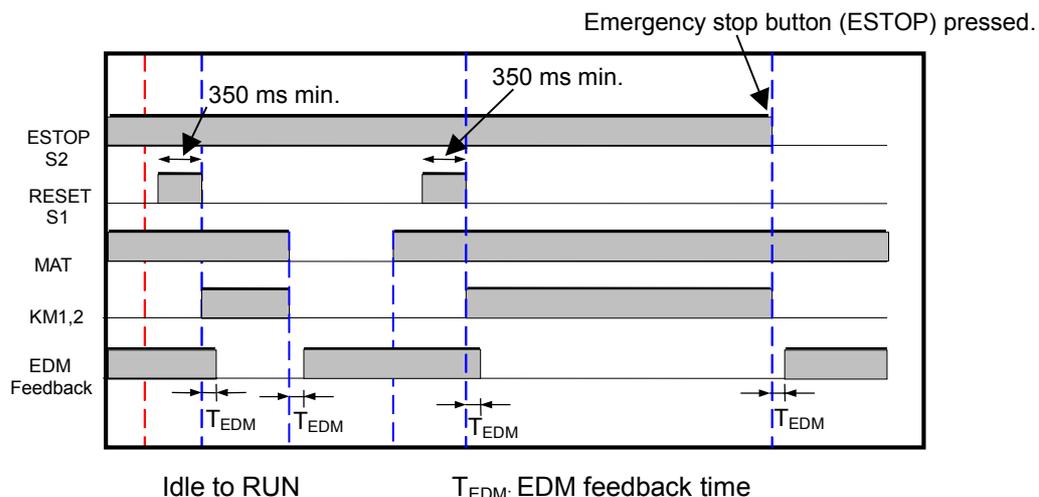
Programming Example
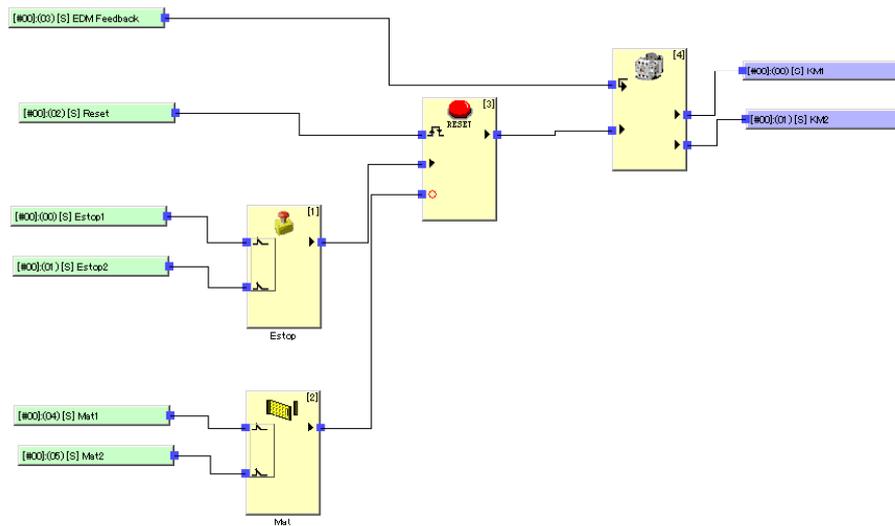

Local Input and Test Output Setting Example
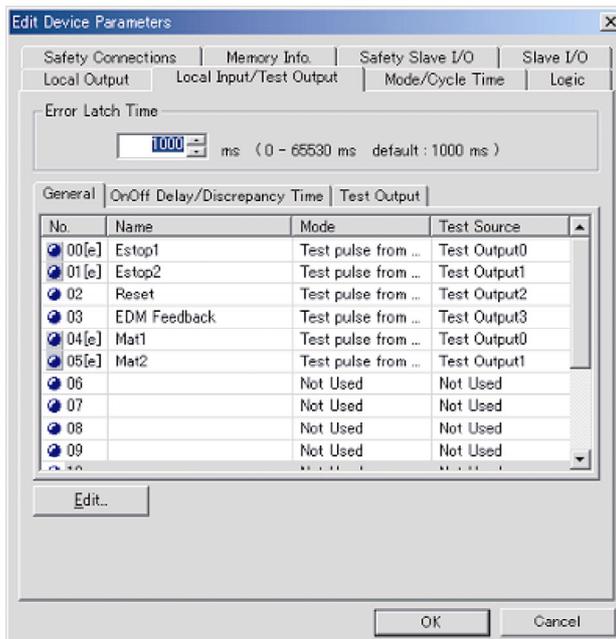
Local Output Setting Example
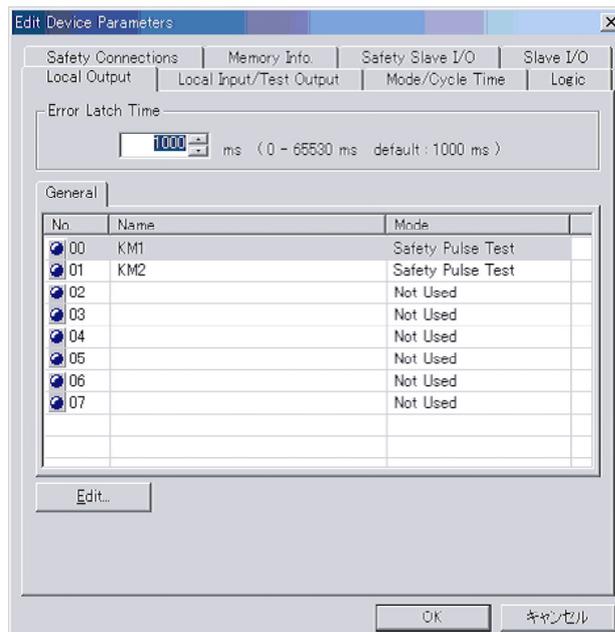
Appendix 2: Calculated Values of PFD and PFH

Calculated values of PFD and PFH for the NE1A-series Controller are given in the following tables. These values must be calculated for the overall
devices within the system to comply with the SIL required for application.

A-2-1   Calculated PFD Values

Model	Proof test interval (years)	PFD
NE1A-SCPU01(-V1)	0.25	4.68E-07
	0.5	9.32E-07
	1	1.86E-06
	2	3.72E-06
NE1A-SCPU02	0.25	5.90E-07
	0.5	1.17E-07
	1	2.34E-06
	2	4.68E-06

A-2-2   Calculated PFH Values

Model	PFH
NE1A-SCPU01(-V1)	4.25E-10
NE1A-SCPU02	5.39E-10

Appendix 3: DeviceNet Explicit Messages

User-specified NE1A parameters can be read and written by sending DeviceNet explicit messages to the NE1A-series Controller. The NE1A-series Controller will process the received messages and return responses. This appendix describes the messages that are supported by the NE1A-series Controller.

A-3-1 Explicit Messages: NE1A-SCPU01-V1

Reading General Status: NE1A-SCPU01-V1

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Read Unit General Status	Read	Reads the Unit's general status.	0E hex	39 hex	01 hex	6E hex	–	1 byte

Reading I/O Area: NE1A-SCPU01-V1

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Read I/O Area	Read	Reads the Unit's I/O data. Instance ID Specification Range: Local input = 01 Local output/test output = 02 Safety input = 05 Safety output = 06 Address Specification Range: Local input: 0 or 1 Local output/test output: 0 or 1 Safety input: 0 to 511 Safety output: 0 to 511	0E hex	306 hex	01, 02, 05, or 06 hex	–	First and second byte offset address: 0000 to 01FF hex (0 to 511), Third and fourth byte read size: 0001 to 0100 hex (1 to 256)	Read data

Setting and Monitoring Safety Input Terminals: Inputs (NE1A-SCPU01-V1)

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Monitor Mode for Terminal Maintenance Information	Read	Reads the monitor mode of maintenance information for the input (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	65 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode of maintenance information for the input (1 to 16) specified by the Instance ID.	10 hex	3D hex	01 to 10 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Input Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	68 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Writes the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 16) specified by the Instance ID.	10 hex	3D hex	01 to 10 hex	68 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Input Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	66 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Input Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 16) specified by the Instance ID.	05 hex	3D hex	01 to 10 hex	66 hex	–	–
Read Monitor Status of Input Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact operation counter for the input (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	67 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Safety Input Normal Flag	Read	Reads the normal flag status of the number (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	04 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety Input Error Information Cause	Read	Reads the cause for the normal flag of the number (1 to 16) specified by the Instance ID being OFF (error).	0E hex	3D hex	01 to 10 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Test signal error 03 hex: Internal circuit error 04 hex: Discrepancy error 05 hex: Error in other channel of dual channels
Read AND of Safety Input Normal Flags	Read	Reads the logical AND of the normal flag status for all inputs 1 to 16.	0E hex	3E hex	01 hex	05 hex	–	1 byte 00 hex: Error 01 hex: All normal
Read OR of Monitor Status of Input Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of the total ON time or contact operation counter for all inputs 1 to 16.	0E hex	3E hex	01 hex	72 hex	–	1 byte 00 hex: All in range 01 hex: Input out of range (over monitor value)

Setting and Monitoring Safety Output Terminals: Outputs

(NE1A-SCPU01-V1)

Explicit message	Service	Function	Service code	Class ID	Instance ID	Attribute ID	Data size	Response
Monitor Mode for Terminal Maintenance Information	Read	Reads the monitor mode of maintenance information for the output (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	65 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode of maintenance information for the output (1 to 8) specified by the Instance ID.	10 hex	3B hex	01 to 08 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Output Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	68 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Writes the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 8) specified by the Instance ID.	10 hex	3B hex	01 to 08 hex	68 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Output Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	66 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Output Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: operations) for the output (1 to 8) specified by the Instance ID.	05 hex	3B hex	01 to 08 hex	66 hex	–	–
Read Monitor Status of Output Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact operation for the output (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	67 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Safety Output Normal Flag	Read	Reads the normal flag status of the number (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	05 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety Output Error Information Cause	Read	Reads the cause for the normal flag of the number (1 to 8) specified by the Instance ID being OFF (error).	0E hex	3B hex	01 to 08 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Overcurrent detection 03 hex: Short-circuit detection 04 hex: High constant error 05 hex: Error in other channel of dual channels 06 hex: Internal relay circuit error 07 hex: Relay error 08 hex: Data error between dual channel outputs 09 hex: Detection of short circuit between wires
Read AND of Safety Output Normal Flags	Read	Reads the logical AND of all outputs 1 to 8.	0E hex	3C hex	01 hex	05 hex	–	1 byte 00 hex: Error 01 hex: All normal
Read OR of Monitor Status of Output Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of the total ON time or contact operation counter for all outputs 1 to 8.	0E hex	3C hex	01 hex	72 hex	–	1 byte 00 hex: All in range 01 hex: Output out of range (over monitor value)

Monitoring Test Output Terminals: NE1A-SCPU01-V1

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Monitor Mode for Terminal Maintenance Information	Read	Reads the monitor mode of maintenance information of the test output (1 to 4) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	83 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode of maintenance information of the test output (1 to 4) specified by the Instance ID.	10 hex	307 hex	01 to 04 hex	83 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Test Output Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 4) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	86 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Writes the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 4) specified by the Instance ID.	10 hex	307 hex	01 to 04 hex	86 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Test Output Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 16) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	84 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Test Output Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: operations) for the test output (1 to 4) specified by the Instance ID.	05 hex	307 hex	01 to 04 hex	84 hex	–	–
Read Monitor Status of Test Output Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact operation counter of the test output (1 to 4) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	85 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Test Output Safety Flag	Read	Reads the normal flag status for the test output (1 to 4) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	68 hex	–	1 byte 00 hex: Normal 01 hex: Error
Read Test Output Error Information Cause	Read	Reads the cause for the normal flag of the test output (1 to 4) specified by the Instance ID being OFF (error).	0E hex	307 hex	01 to 04 hex	76 hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Overcurrent detection 05 hex: High constant error 06 hex: Undercurrent detection
Read OR of Test Output Safety Flags	Read	Reads the logical OR of the normal flag status for all test outputs 1 to 4.	0E hex	308 hex	01 hex	69 hex	–	1 byte 00 hex: All normal 01 hex: Error
Read OR of Monitor Status of Test Output Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of the total ON time or contact operation counter for all test outputs 1 to 4.	0E hex	308 hex	01 hex	72 hex	–	1 byte 00 hex: All in range 01 hex: Test output out of range (over monitor value)

A-3-2   Explicit Messages: NE1A-SCPU02

Reading General Status: NE1A-SCPU02

Explicit message	Service	Function	Command					Response
			Service code	Class ID	In-stance ID	Attrib-ute ID	Data size	
Read Unit General Status	Read	Reads the Unit's general status.	0E hex	39 hex	01 hex	6E hex	–	1 byte

Reading I/O Area: NE1A-SCPU02

Explicit message	Service	Function	Command					Response
			Service code	Class ID	In-stance ID	Attrib-ute ID	Data size	
Read I/O Area	Read	Reads the Unit's I/O data. Instance ID Specification Range: Local input = 01 Local output/test output = 02 Safety input = 05 Safety output = 06 Address Specification Range: Local input: 0 to 4 Local output/test output: 0 or 1 Safety input: 0 to 511 Safety output: 0 to 511	4B hex	306 hex	01, 02, 05, and 06 hex	–	First and second byte offset address: 0000 to 01FF hex (0 to 511), Third and fourth byte read size: 0001 to 0100 hex (1 to 256)	Read data

Setting and Monitoring Safety Input Terminals: Inputs

(NE1A-SCPU02)

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Monitor Mode for Terminal Maintenance Information	Read	Reads the monitor mode of maintenance information for the input (1 to 40) specified by the Instance ID.	0E hex	3D hex	01 to 28 hex	65 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode of maintenance information for the input (1 to 40) specified by the Instance ID.	10 hex	3D hex	01 to 28 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Input Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 40) specified by the Instance ID.	0E hex	3D hex	01 to 28 hex	68 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Writes the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 40) specified by the Instance ID.	10 hex	3D hex	01 to 28 hex	68 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Input Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 40) specified by the Instance ID.	0E hex	3D hex	01 to 28 hex	66 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Input Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: operations) for the input (1 to 40) specified by the Instance ID.	05 hex	3D hex	01 to 28 hex	66 hex	–	–
Read Monitor Status of Input Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact operation counter for the input (1 to 40) specified by the Instance ID.	0E hex	3D hex	01 to 28 hex	67 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Safety Input Normal Status	Read	Reads the normal flag status of the number (1 to 40) specified by the Instance ID.	0E hex	3D hex	01 to 28 hex	04 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety input Error Information Cause	Read	Reads the cause for the normal flag status of the number (1 to 40) specified by the Instance ID being OFF (error).	0E hex	3D hex	01 to 28 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Test signal error 03 hex: Internal circuit error 04 hex: Discrepancy error 05 hex: Error in other channel of dual channels
Read AND of Safety Input Normal Flags	Read	Reads the logical AND of the normal flag status for all inputs 1 to 40.	0E hex	3E hex	01 hex	05Hex	–	1 byte 00 hex: Error 01 hex: All normal
Read OR of Monitor Status of Input Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of the total ON time or contact operation counter for all inputs 1 to 40.	0EHex	3EHex	01 hex	72Hex	–	1 byte 00 hex: All in range 01 hex: Input out range (over monitor value)

Setting and Monitoring Safety Output Terminals: Outputs

(NE1A-SCPU02)

Explicit message	Service	Function	Service code	Class ID	Instance ID	Attribute ID	Data size	Response
Monitor Mode for Terminal Maintenance Information	Read	Reads the monitor mode of maintenance information for the output (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	65 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode of maintenance information for the output (1 to 8) specified by the Instance ID.	10 hex	3B hex	01 to 08 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Output Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the output (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	68 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: operations) for the output (1 to 8) specified by the Instance ID.	10 hex	3B hex	01 to 08 hex	68 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Output Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the output (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	66 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Output Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: operations) for the output (1 to 8) specified by the Instance ID.	05 hex	3B hex	01 to 08 hex	66 hex	–	–
Read Monitor Status of Output Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact operation of the number (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	67 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Safety Output Normal Flag	Read	Reads the normal flag status of the number (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	05 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety Output Error Information Cause	Read	Reads the cause for the normal flag status of the number (1 to 8) specified by the Instance ID being OFF (error).	0E hex	3B hex	01 to 08 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Overcurrent detection 03 hex: Short-circuit detection 04 hex: High constant error 05 hex: Error in other channel of dual channels 06 hex: Internal relay circuit error 07 hex: Relay error 08 hex: Data error between dual channel outputs 09 hex: Detection of short circuit between wires
Read AND of Safety Output Normal Flags	Read	Reads the logical AND of the normal flag status for all outputs 1 to 8.	0E hex	3C hex	01 hex	05 hex	–	1 byte 00 hex: Error 01 hex: All normal
Read OR of Monitor Status of Output Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of the total ON time or contact operation counter for all outputs 1 to 8.	0E hex	3C hex	01 hex	72 hex	–	1 byte 00 hex: All in range 01 hex: Output out of range (over monitor value)

Monitoring Test Output Terminals: NE1A-SCPU02

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Monitor Mode for Terminal Mainte-nance Information	Read	Reads the monitor mode of maintenance information for the test output (1 to 8) specified by the Instance ID.	0E hex	307 hex	01 to 08 hex	83 hex	–	1 byte 00 hex: Total ON time mode 01 hex: Contact opera-tion counter mode
	Write	Writes the monitor mode of maintenance information for the test output (1 to 8) specified by the Instance ID.	10 hex	307 hex	01 to 08 hex	83 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	–
SV for Test Output Total ON Time or Contact Operation Counter	Read	Reads the SV of the total ON time (unit: seconds) or contact operation counter (unit: opera-tions) for the test output (1 to 8) specified by the Instance ID.	0E hex	307 hex	01 to 08 hex	86 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
	Write	Writes the SV of the total ON time (unit: seconds) or contact operation counter (unit: opera-tions) for the test output (1 to 8) specified by the Instance ID.	10 hex	307 hex	01 to 08 hex	86 hex	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)	–
Read Test Output for Total ON Time or Contact Operation Counter	Read	Reads the total ON time (unit: seconds) or contact operation counter (unit: operations) for the test output (1 to 8) specified by the Instance ID.	0E hex	307 hex	01 to 08 hex	84 hex	–	4 bytes 0000 0000 to FFFF FFFF hex (0 to 4,294,967,295)
Reset Test Output for Total ON Time or Contact Operation Counter	Reset	Resets to 0 the total ON time (unit: seconds) or contact operation counter (unit: opera-tions) for the test output (1 to 8) specified by the Instance ID.	05 hex	307 hex	01 to 08 hex	84 hex	–	–
Read Monitor Status of Test Output Total ON Time or Contact Operation Counter	Read	Reads the monitor status of the total ON time or contact opera-tion counter for the text output (1 to 8) specified by the In-stance ID.	0E hex	307 hex	01 to 08 hex	85 hex	–	1 byte 00 hex: In range 01 hex: Out of range (over monitor value)
Read Test Output Normal Flag	Read	Reads the normal flag status for the text output (1 to 8) specified by the Instance ID.	0E hex	307 hex	01 to 08 hex	68 hex	–	1 byte 00 hex: Normal 01 hex: Error
Read Test Output Error Information Cause	Read	Reads the cause for the normal flag of the test output (1 to 8) specified by the Instance ID being OFF (error).	0E hex	307 hex	01 to 08 hex	76 hex	–	1 byte 00 hex: No error 01 hex: Invalid configura-tion 02 hex: Overcurrent detection 05 hex: High constant error 06 hex: Undercurrent detection
Read OR of Test Output Normal Flags	Read	Reads the normal flag status of all test outputs 1 to 8.	0E hex	308 hex	01 hex	69 hex	–	1 byte 00 hex: All normal 01 hex: Error
Read OR of Monitor Status of Test Out-put Total ON Times or Contact Operation Counters	Read	Reads the logical OR of the monitor status of total ON time or contact operation counter for all test outputs 1 to 8.	0E hex	308 hex	01 hex	72 hex	–	1 byte 00 hex: All in range 01 hex: Test output out of range (over monitor value)

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A-3-3   Explicit Messages: NE1A-SCPU01

Reading General Status: NE1A-SCPU01

Explicit message	Service	Function	Command					Response
			Service code	Class ID	In-stance ID	Attrib-ute ID	Data size	
Read Unit General Status	Read	Reads the Unit's general status.	0E hex	39 hex	01 hex	6E hex	–	1 byte

Reading I/O Area: NE1A-SCPU01

Explicit message	Service	Function	Command					Response
			Service code	Class ID	In-stance ID	Attrib-ute ID	Data size	
Read I/O Area	Read	Reads the Unit's I/O data. Instance ID Specification Range: Local input = 01 Local output/test output = 02 Safety input = 05 Safety output = 06 Address Specification Range: Local input: 0 or 1 Local output/test output: 0 or 1 Safety input: 0 to 511 Safety output: 0 to 511	4B hex	306 hex	01, 02, 05, and 06 hex	–	First and second byte offset address: 0000 to 01FF hex (0 to 511), Third and fourth byte read size: 0001 to 0100 hex (1 to 256)	Read data

Safety Input Terminal Settings and Monitors: Input (NE1A-SCPU01)

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attrib-ute ID	Data size	
Read Safety Input Normal Flag	Read	Reads the normal flag status of the number (1 to 16) specified by the Instance ID.	0E hex	3D hex	01 to 10 hex	04 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety input Error Information Cause	Read	Reads the cause for the normal flag of the number (1 to 16) specified by the Instance ID being OFF (error).	0E hex	3D hex	01 to 10 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Test signal error 03 hex: Internal circuit error 04 hex: Discrepancy error 05 hex: Error in other channel of dual channels
Read AND of Safety Input Normal Flags	Read	Reads the logical AND of the normal flag status for all inputs 1 to 16.	0E hex	3E hex	01 hex	05 hex	–	1 byte 00 hex: Error 01 hex: All normal

Setting and Monitoring Safety Output Terminals: Outputs (NE1A-SCPU01)

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Read Safety Output Normal Flag	Read	Reads the normal flag status of the number (1 to 8) specified by the Instance ID.	0E hex	3B hex	01 to 08 hex	05 hex	–	1 byte 00 hex: Error 01 hex: Normal
Read Safety Output Error Information Cause	Read	Reads the cause for the normal flag of the number (1 to 8) specified by the Instance ID being OFF.	0E hex	3B hex	01 to 08 hex	6E hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Overcurrent detection 03 hex: Short-circuit detection 04 hex: High constant error 05 hex: Error in other channel of dual channels 06 hex: Internal relay circuit error 07 hex: Relay error 08 hex: Data error between dual channel outputs 09 hex: Detection of short circuit between wires
Read AND of Safety Output Normal Flags	Read	Reads the logical AND of the normal flag status for all outputs 1 to 8.	0E hex	3C hex	01 hex	05 hex	–	1 byte 00 hex: Error 01 hex: All normal

Monitoring Test Output Terminals: NE1A-SCPU01

Explicit message	Service	Function	Command					Response
			Service code	Class ID	Instance ID	Attribute ID	Data size	
Read Test Output Normal Flag	Read	Reads the normal flag status of the test output (1 to 4) specified by the Instance ID.	0E hex	307 hex	01 to 04 hex	68 hex	–	1 byte 00 hex: Normal 01 hex: Error
Read Test Output Error Information Cause	Read	Reads the cause for the normal flag of the test output (1 to 4) specified by the Instance ID being OFF (error).	0E hex	307 hex	01 to 04 hex	76 hex	–	1 byte 00 hex: No error 01 hex: Invalid configuration 02 hex: Overcurrent detection 05 hex: High constant error 06 hex: Undercurrent detection
Read OR of Test Output Normal Flags	Read	Reads the logical OR of the normal flag status for all outputs 1 to 4.	0E hex	308 hex	01 hex	69 hex	–	1 byte 00 hex: All normal 01 hex: Error

Glossary

Glossary

Term	Definition
assembly	Internal data in a device gathered as one group to be accessed externally.
Busoff	Status that occurs when the error rate is extremely high over a communications cable. An error is detected when the internal error counter exceeds a certain threshold value. (The internal error counter is cleared when the Master is started or restarted, and it is decremented when a normal frame is received.)
configuration	The settings for a device and a network.
connection	A logical communications path used to communicate between devices.
DeviceNet Safety	A safety network that adds a safety protocol to DeviceNet to comply with up to SIL3 according to IEC61508, up to Safety Category 4 according to EN954-1.
discrepancy time	The time period from a change in one of two inputs until the other input changes.
dual channel	Using two inputs or outputs as the input or output for redundancy.
Dual Channel Complementary	Setting to evaluate that two logic states are complementary.
Dual Channel Equivalent	Setting to evaluate that two logic states are equivalent.
EPI	The interval of safety data communications between the Safety Master and the Safety Slave.
error latch time	The time period to hold an error state (control data, status data, and LED indications).
Fault Present	Several function blocks have Fault Present as an optional output. This is an error output that indicates that the applicable function block has detected an internal logic error or an input data timing error.
multi-cast connection	Safety I/O communications in a 1:n configuration (n = 1 to 15).
open type	The open method for Safety Connection. One of three types is selected in the settings of a connection to the Safety Master.
PFD	Probability of Failure on Demand Shows the average failure rate for a system or device demand. Used for calculating the SIL (Safety Integrity Level) for a safety system.
PFH	Probability of Failure per Hour Shows the failure rate per hour for a system or device. Used for calculating the SIL (Safety Integrity Level) for a safety system.
safety chain	The logical chain to actualize a safety function, that consists of the input device (sensor), the control device (including a remote I/O device), and the output device (actuator).
safety controller (safety PLC)	A controller with high reliability used for the safety control.
safety data	Extremely reliable data, with risk reduced to a permissible level.
safety protocol	The communications hierarchy added to actualize highly reliable communications.
safety signature	A certificate of the configuration data issued to a device from the Network Configurator. The device verifies that the configuration data is correct by using the safety signature.
single channel	Using only one input or output as the input or output.
single-cast connection	Safety I/O communications in 1:1 configuration.
standard	A device or device function to which safety measures are not applied.
test pulse	A signal used to detect external wiring coming into contact with the power supply (positive) or short circuits between signal lines.
TUNID	The UNID of the local node. Usually the TUNID is set from the Network Configurator.
UNID	A identifier to specify one device in all the network domains. Values combining the network address and the node address are used.

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Revision History

A manual revision code appears as a suffix to the catalog number on lower left corners of the front and back covers of the manual.

Cat. No.	Z906-E1-03

Revision code

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	April 2005	Original production
02	April 2006	**Page 16**: Regulations and standards modified. **Page 34**: Seven-segment display information modified. **Page 38**: Information added on DeviceNet communications specifications. **Page 59**: Information added on node address setting. **Page 60**: Information added on baud rate setting. **Page 63**: Seven-segment display information modified. **Pages 64 to 67**: Information added on Remote I/O Area data configuration. **Page 80**: Information added on explicit message transmission. **Pages 88 and 92**: Information added on error latch time setting. **Page 103**: Information changed on number of inputs and outputs setting. **Page 103**: Information changed on output points setting. **Pages 114 and 116**: Headings changed. **Pages 113, 118, 121, 124, and 128**: Information changed on optional output setting. **Pages 126 and 134**: Information added on error handling and resetting. **Pages 154 to 157**: Information added on calculating reaction times. **Page 161**: Information added on indicator status. **Page 166**: Information added on error history table. **Page 167**: Information added to error information details. **Pages 169 to 172**: Information changed and added on corrections in response to display messages. **Pages 173 to 176**: Information added on connection status tables. **Page 184**: Changes and additions made to glossary.
03	September 2006	Information added describing the functions added to the NE1A-SCPU01-V1 Ver. 1.0 and NE1A-SCPU02 Ver.1.0 Controllers.

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