

Programmable Terminal NA-series Startup Guide

NA5-15W101□

NA5-12W101□

NA5-9W001□

NA5-7W001□




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Introduction

Thank you for purchasing an NA-series Programmable Terminal.

This manual contains information that is necessary to use the NA-series Programmable Terminal. Please read this manual and make sure you understand the functionality and performance of the NA-series Programmable Terminal before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

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

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

Applicable Products

This manual covers the following products.

- NA-series Programmable Terminals

Relevant Manuals

The basic information required to use an NA-series PT is provided in the following three manuals.

- *NA-series Programmable Terminal Hardware User's Manual* (Cat. No. V117)
- *NA-series Programmable Terminal Software User's Manual* (Cat. No. V118)
- *NA-series Programmable Terminal Device Connection User's Manual* (Cat. No. V119)

Operations are performed from the Sysmac Studio Automation Software.

Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for information on the Sysmac Studio.

Other manuals are necessary for specific system configurations and applications.

Manual Structure

Page Structure and Markings

The following page structure is used in this manual.

Level 1 heading

Level 2 heading

Level 3 heading

Give the current headings.

Page tab
Gives the number of the main section.

Level 2 heading — 3-3 Installing NA-series PTs

Level 3 heading — 3-3-1 Installation in a Control Panel

A step in a procedure
Indicates a procedure.

Special information
Icons indicate precautions, additional information, or reference information.

Manual name — NA Series Programmable Terminal Hardware User's Manual (V117)

Note This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:



Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.



Precautions for Correct Use

Indicates precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.



Version Information

Information on differences in specifications and functionality with different versions is given.

Sections in this Manual

1	System Configurations and Startup Procedures	1
2	HMI Application Basics	2
3	Preparations	3
4	Creating and Debugging the HMI Application	4
5	Useful Functions	5
I	Index	I

CONTENTS

Introduction	1
Relevant Manuals	2
Manual Structure	3
Sections in this Manual	5
Terms and Conditions Agreement.....	9
Warranty, Limitations of Liability	9
Application Considerations	10
Disclaimers	10
Safety Precautions	11
Precautions for Safe Use	13
Precautions for Correct Use.....	16
Regulations and Standards	17
Related Manuals	19
Terminology	23
Revision History	24

Section 1 System Configurations and Startup Procedures

1-1 Startup Procedures	1-2
1-2 System Configurations and Units for Use.....	1-3
1-3 HMI Application to Create	1-4

Section 2 HMI Application Basics

2-1 Pages	2-2
2-2 Variables	2-3
2-3 Subroutines.....	2-4

Section 3 Preparations

3-1 Installing the Sysmac Studio	3-2
3-2 Assembling the Hardware	3-3
3-2-1 Wiring the Power Supply	3-3
3-2-2 Connecting the Ethernet Communications Cable	3-4

Section 4 Creating and Debugging the HMI Application

4-1	Flowchart of Operations	4-2
4-2	Creating a New Project	4-3
4-3	Creating the HMI Application	4-6
4-4	Adding the HMI to the Project	4-7
4-5	Mapping HMI Variables and Controller Variables	4-8
4-6	Making the Initial HMI Settings.....	4-10
4-7	Creating Pages	4-12
4-8	Debugging the HMI Application	4-18
4-8-1	Preparations for Online Debugging	4-18
4-8-2	Preparations for Offline Debugging	4-23
4-8-3	Debugging	4-24

Section 5 Useful Functions

5-1	Global Events.....	5-2
5-2	Protecting User Programming Assets.....	5-5

Index

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Warranty, Limitations of Liability

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Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of the NA-series Programmable Terminal. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in mild or moderate injury or at the worst, serious injury or death. Additionally, there may be severe property damage.



Caution

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



Precautions for Safe Use

Indicates precautions on what to do and what not to do to ensure safe usage of the product.



Precautions for Correct Use

Indicates precautions on what to do and what not to do to ensure proper operation and performance.

Symbols



The circle and slash symbol indicates operations that you must not do.
The specific operation is shown in the circle and explained in text.
This example indicates prohibiting disassembly.



The triangle symbol indicates precautions (including warnings).
The specific operation is shown in the triangle and explained in text.
This example indicates a general precaution.

Warnings

WARNING

Do not attempt to take the NA Unit apart and do not touch the product inside while the power is being supplied. Otherwise it may result in electric shock.



Always ensure that the personnel in charge confirm that installation, inspection, and maintenance were properly performed for the NA Unit. "Personnel in charge" refers to individuals qualified and responsible for ensuring safety during machine design, installation, operation, maintenance, and disposal.



Ensure that installation and post-installation checks are performed by personnel in charge who possess a thorough understanding of the machinery to be installed.



Do not use the input functions such as the touch panel or function keys of the NA Unit, in applications that involve human life, in applications that may result in serious injury, or for emergency stop switches.

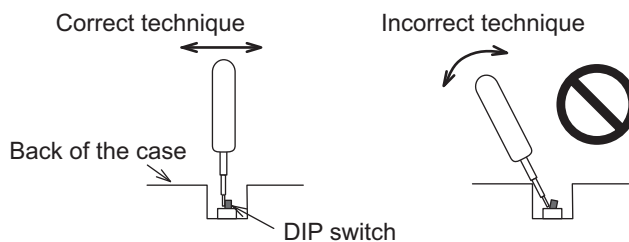
Do not attempt to disassemble, repair, or modify the NA Unit. It may cause NA Unit to lose its safety function.



Never press two points or more on the touch panel of the NA Unit at a time. Touching two points or more interrupts normal touch panel operations.

Precautions for Safe Use

- When unpacking the NA Unit, check carefully for any external scratches or other damages. Also, shake the NA Unit gently and check for any abnormal sound.
- The NA Unit must be installed in a control panel.
- The mounting panel must be between 1.6 and 6.0 mm thick. Tighten the Mounting Brackets evenly to a torque of between 0.5 and 0.6 N·m to maintain water and dust resistance. If the tightening torque exceeds the specified value, or the tightening is not even, deformation of the front panel may occur. What is more, make sure the panel is not dirty or warped and that it is strong enough to hold the NA Unit.
- Do not let metal particles enter the NA Unit when preparing the panel.
- Turn OFF the power supply before connecting or disconnecting cables.
- Periodically check the installation conditions in applications where the NA Unit is subject to contact with oil or water.
- Be certain to use the cables with lock mechanism such as serial cable or the Ethernet cable after confirming if it is securely locked.
- Do not touch the packaging part of the circuit board with your bare hands. Discharge any static electricity from your body before handling the board.
- Do not use volatile solvents such as benzene and thinners or chemical cloths.
- Water and oil resistance will be lost if the front sheet is torn or is peeling off. Do not use the NA Unit, if the front sheet is torn or is peeling off.
- As the rubber packing will deteriorate, shrink, or harden depending on the operating environment, periodical inspection is necessary.
- Confirm the safety of the system before turning ON or OFF the power supply, or pressing the reset switch.
- The whole system may stop depending on how the power supply is turned ON or OFF. Turn ON/OFF the power supply according to the specified procedure.
- Operate DIP switch according to the following way.



The DIP switch may break if it is levered with a tool against the case as shown in the figure.

- Once the DIP switch settings are changed, reset by pressing the reset switch, or restart the power supply.
- Initialize the project, after confirming that existing project is backed up at the Sysmac Studio.
- When changing the password, do not reset or turn OFF the power supply until the writing is completed. A failure to store the password may cause the project to fail to function.
- While uploading or downloading a project or a system program, do not perform the operations as follows. Such operations may corrupt the project or the system program:
 - Turning OFF the power supply of the NA Unit
 - Resetting the NA Unit.
 - Removing the USB devices or SD card.
 - Disconnecting the cable between a support tool and the NA Unit.
- Do not connect an AC power supply to the DC power terminals.
- Do not perform a dielectric strength test.

- Use a DC power with a slight voltage fluctuation and that will provide a stable output even if the input is momentarily interrupted for 10 ms. Also use the one with reinforced insulation or double insulation. Rated Power Supply Voltage: 24VDC (Allowable range 19.2 to 28.8VDC)
- Use a power cable with AWG#12 to #22 thick (0.35mm² to 3.31mm²). Peel the coating 7mm length and tighten the terminal screw with the torque in the range of 0.5 to 0.6 N·m. Also confirm if the terminal screw is tighten appropriately.
- To prevent malfunctions caused by noise, ground the NA Unit correctly.
- Do not use any battery if strong impact is applied to it (e.g. by dropping on the floor) because such a battery may cause a leakage.
- Confirm the type of the battery to install the battery properly.
- Apply power for at least five minutes before changing the battery. Mount a new battery within five minutes after turning OFF the power supply. If power is not supplied for at least five minutes, the clock data may be lost. Check the clock data after changing the battery.
- Do not dismantle a battery nor let it short-circuit.
- Do not apply an impact with the lithium battery, charge it, dispose it into a fire, or heat it. Doing either of them may cause an ignition or a bursting.
- Dispose of the NA Units and batteries according to local ordinances as they apply.



- The following precaution must be displayed on all products containing lithium primary batteries with a perchlorate content of 6ppb or higher when exporting them to or shipping them through California, USA.

Perchlorate Material - special handling may apply.

See www.dtsc.ca.gov/hazardouswaste/perchlorate

The NA-Series contains a lithium primary battery with a perchlorate content of 6ppb or higher. When exporting a product containing the NA-Series to or shipping such a product through California, USA, label all packing and shipping containers appropriately.

- Do not connect the USB devices in the environment subject to the strong vibration.
- Do not connect USB devices which are not allowed to connect to NA Unit.
- Start actual system application only after checking normal operation of the system including storage devices such as USB memory and SD card.
- When connecting peripheral devices which do not meet the performance level of the NA Unit for noise and static electricity, ensure sufficient countermeasures against noise and static electricity during installation of the peripheral devices to the NA Unit.
- Do not carry out the following operations when accessing USB devices or SD card:
 - Turning OFF the power supply of the NA Unit
 - Press the Reset switch of the NA Unit
 - Pull out the USB devices or SD card
- When using the No. 6 pin of the serial port connector for a voltage of DC+5V, make sure the supply equipment's current capacity is below 250mA before using it. The DC+5V voltage output of the NA Unit is +5V±5%, and the maximum current is 250mA.
- To ensure the system's safety, make sure to incorporate a program that call periodically signals during the operation at connected device side and can confirm the normal functionality of the NA Unit before running the system.
- Start actual system application only after sufficiently checking project, subroutine and the operation of the program at the connected device side.
- To use numeric input functions safely, always make maximum and minimum limit settings.
- Do not press the touch panel with a force greater than 30 N.
- Do not use hard or pointed objects to operate or scrub the screen, otherwise the surface of the screen may be damaged.

- The deterioration over time may cause the touch points to move on the touch panel. Calibrate the touch panel periodically.
- A touch position detection error of approximately 20 pixels may occur due to the precision of the touch panel. Always take this into account when positioning objects on the panel so adjoining objects will not be activated by mistake.
- Confirm the safety of the system before pressing the touch panel.
- Do not accidentally press the touch panel when the backlight is not lit or when the display does not appear or is too dark to identify visually.
- You can change the brightness by changing the setting such as in the system menu or by downloading project.
If the brightness is set to very dark, it causes flickering or unreadable screen. Additionally, the brightness can be restored by transferring the project again after setting the property of the brightness appropriately.
In a case of the applications where end users can control the brightness, create the applications so as keeping on operations by such as assigning the function which restores the brightness to one of function keys, if necessary.
- Signals from the touch panel may not be entered if the touch panel is pressed consecutively at high speed. Make sure to go on the next operation after confirming that the NA Unit has detected the input of the touch panel.
- The function keys have the restrictions as follows:
 - Using both anti-reflection sheet and protective cover interrupts the normal function key operation. Do not use them together.
 - When you use gloves or others, the function keys may not work correctly depending on the material and thickness of the gloves. Take actual conditions of the gloves usage into considerations prior to the system startup to perform the confirmation.
 - The function keys do not work when covered with water. Remove the water completely before use.

Precautions for Correct Use

- **Do not install or store the NA Unit in any of the following locations:**

- Locations subject to severe changes in temperature
- Locations subject to temperatures or humidity outside the range specified in the specifications
- Locations subject to condensation as the result of high humidity
- Locations subject to corrosive or flammable gases
- Locations subject to strong shock or vibration
- Locations outdoors subject to direct wind and rain
- Locations subject to strong ultraviolet light
- Locations subject to dust
- Locations subject to direct sunlight
- Locations subject to splashing oil or chemicals

- **Take appropriate and sufficient countermeasures when installing systems in the following locations:**

- Locations subject to static electricity or other forms of noise
- Locations subject to strong electric field or magnetic field
- Locations close to power supply lines
- Locations subject to possible exposure to radioactivity

Regulations and Standards

Conformance to EC Directives

Applicable Directives

- EMC Directive

Concepts

● EMC Directive

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*

Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

- * Applicable EMC (Electromagnetic Compatibility) standards are as follows:
EMS (Electromagnetic Susceptibility): EN 61131-2:2007
EMI (Electromagnetic Interference): EN 61131-2:2007

● Conformance to EC Directives

The NA-series PTs comply with EC Directives. To ensure that the machine or device in which the NA-series PT is used complies with EC Directives, the NA-series PT must be installed as follows:

- The NA Unit must be installed within a control panel.
- You must use reinforced insulation or double insulation for the DC power supplies connected to the NA Unit.
- NA-series PTs that comply with EC Directives also conform to the Common Emission Standard (EN 61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.
You must therefore confirm that the overall machine or equipment complies with EC Directives.
- This is a Class A product (for industrial environments). In a residential environment, it may cause radio interference, in which case the user may be required to take appropriate measures.

Conformance to KC Standards

Observe the following precaution if you use NA-series PTs in Korea.

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Class A Device (Broadcasting Communications Device for Business Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes. Sellers and/or users need to take note of this.

Related Manuals

The following manuals are related to the NA-series PTs. Use these manuals for reference.

Manual name	Cat. No.	Models	Applications	Description
NA-series Programmable Terminal Hardware User's Manual	V117	NA5-□W□□□□	Learning the specifications and settings required to install an NA-series PT and connect peripheral devices.	Information is provided on NA-series PT specifications, part names, installation procedures, and procedures to connect an NA Unit to peripheral devices. Information is also provided on maintenance after operation and troubleshooting.
NA-series Programmable Terminal Software User's Manual	V118	NA5-□W□□□□	Learning about NA-series PT pages and object functions.	NA-series PT pages and object functions are described.
NA-series Programmable Terminal Device Connection User's Manual	V119	NA5-□W□□□□	Learning the specifications required to connect devices to an NA-series PT.	Information is provided on connection procedures and setting procedures to connect an NA-series PT to a Controller or other device.
NA-series Programmable Terminal Startup Guide	V120	NA5-□W□□□□	Learning in concrete terms information required to install and start the operation of an NA-series PT.	The part names and installation procedures are described followed by page creation and transfer procedures with the Sysmac Studio. Also operation, maintenance, and inspection procedures after the project is transferred are described. Sample screen captures are provided as examples.
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on a Controller built with a CPU Unit. <ul style="list-style-type: none"> • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Inspection and maintenance Use this manual together with the <i>NJ-series CPU Unit Software User's Manual</i> (Cat. No. W501).

Manual name	Cat. No.	Models	Applications	Description
NJ-series CPU Unit Software User's Manual	W501	NJ501-□□□□ NJ301-□□□□	Learning how to program and set up an NJ-series CPU Unit. Mainly software information is provided.	Provides the following information on a Controller built with an NJ-series CPU Unit. <ul style="list-style-type: none"> • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the <i>NJ-series CPU Unit Hardware User's Manual</i> (Cat. No. W500).
CJ Series Programmable Controllers Operation Manual	W393	CJ1H-CPU□□H-R CJ1G/H-CPU□□H CJ1G-CPU□□P CJ1M-CPU□□ CJ1G-CPU□□	Learning the basic specifications of the CJ-series PLCs, including introductory information, designing, installation, and maintenance.	The following information is provided on a CJ-series PLC. <ul style="list-style-type: none"> • Introduction and features • System configuration design • Installation and wiring • I/O memory allocation • Troubleshooting Use this manual together with the <i>Programming Manual</i> (Cat. No. W394).
CS/CJ/NSJ Series Programmable Controllers Operation Manual	W394	CS1G/H-CPU□□H CS1G/H-CPU□□-V1 CS1D-CPU□□H CS1D-CPU□□S CJ1H-CPU□□H-R CJ1G/H-CPU□□H CJ1G-CPU□□P CJ1M-CPU□□ CJ1G-CPU□□ NSJ□-□□□□(B)-G5D NSJ□-□□□□(B)-M3D	Learning about the functions of the CS/CJ-series and NSJ-series PLCs.	The following information is provided on a CS/CJ-series or NSJ-series PLC. <ul style="list-style-type: none"> • Programming • Master function • File memory • Other functions Use this manual together with the <i>Operation Manual</i> (CS-series PLCs: W339, CJ-series PLCs: W393).
CS/CJ/NJ-series Instructions Reference Manual	W340	CS1□-CPU-□□□-□□ CJ1□-CPU-□□□-□□□ CJ2H-CPU-□□□-□□□ NSJ□□-□□□□□-□□□	Learning detailed information on programming instructions.	Instructions are described in detail. When programming, use this manual together with the <i>Operation Manual</i> (CS-series PLCs: W339, CJ-series PLCs: W393) and the <i>Programming Manual</i> (W394).
CS/CJ Series Programming Consoles Operation Manual	W341	CQM1H-PRO01 CQM1-PRO01 C200H-PRO27 +CS1W-KS001	Learning the operating procedures of the Programming Consoles.	The operating procedures of the Programming Consoles are described. When programming, use this manual together with the <i>Operation Manual</i> (CS-series PLCs: W339, CJ-series PLCs: W393), the <i>Programming Manual</i> (W394), and the <i>Instructions Reference Manual</i> (W340).

Manual name	Cat. No.	Models	Applications	Description
CS/CJ/NSJ Series Communications Commands Reference Manual	W342	CS1G/H-CPU□□H CS1G/H-CPU□□-V1 CS1D-CPU□□H CS1D-CPU□□S CS1W-SCU□□-V1 CS1W-SCB□□-V1 CJ1G/H-CPU□□H CJ1G-CPU□□P CJ1M-CPU□□ CJ1G-CPU□□ CJ1W-SCU□□-V1	Learning detailed specifications on the communications instructions addressed to CS/CJ-series CPU Units and NSJ-series PLCs.	1) C-mode commands and 2) FINS commands are described in detail. Refer to this manual for information on communications commands (C-mode commands and FINS commands) addressed to CPU Units. Note This manual describes communications commands that are addressed to a CPU Unit. The communications path is not relevant. (The communications commands can be sent through the serial communications port of the CPU Unit, the communications port of a Serial Communications Board/Unit, or a communications port on another Communications Unit.)
CJ-series CJ2 CPU Unit Hardware User's Manual	W472	CJ2H-CPU6□-EIP CJ2H-CPU6□ CJ2M-CPU□□	Learning the hardware specifications of CJ2 CPU Units.	The following information is provided on a CJ2 CPU Unit. <ul style="list-style-type: none"> • Introduction and features • Basic system configuration • Part names and functions • Installation and setting procedures • Troubleshooting Use this manual together with the <i>Software User's Manual</i> (Cat. No. W473).
CJ-series CJ2 CPU Unit Software User's Manual	W473	CJ2H-CPU6□-EIP CJ2H-CPU6□ CJ2M-CPU□□	Learning the software specifications of CJ2 CPU Units.	The following information is provided on a CJ2 CPU Unit. <ul style="list-style-type: none"> • CPU Unit operation • Internal memory • Programming • Settings • Functions built into the CPU Unit Use this manual together with the <i>Hardware User's Manual</i> (Cat. No. W472).
Ethernet Units Operation Manual Construction of Networks	W420	CS1W-ETN21 CJ1W-ETN21	Learning how to use an Ethernet Unit.	Information is provided on the Ethernet Units. Information is provided on the basic setup and FINS communications. Refer to the <i>Communications Commands Reference Manual</i> (Cat. No. W342) for details on FINS commands that can be sent to CS/CJ-series CPU Units when using the FINS communications service.

Manual name	Cat. No.	Models	Applications	Description
Ethernet Units Operation Manual Construction of Applications	W421	CS1W-ETN21 CJ1W-ETN21	Learning how to use an Ethernet Unit.	Information is provided on constructing host applications, including functions for sending/receiving mail, socket service, automatic clock adjustment, FTP server functions, and FINS communications.
CS/CJ-series EtherNet/IP™ Units Operation Manual	W465	CJ2H-CPU6□-EIP CJ2M-CPU3□ CS1W-EIP21 CJ1W-EIP21	Learning how to use the built-in EtherNet/IP port of the CJ2 CPU Units.	Information is provided on the built-in EtherNet/IP port and EtherNet/IP Units. Basic settings, tag data links, FINS communications, and other functions are described.
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	The operating procedures of the Sysmac Studio are described.
CX-Programmer Operation Manual	W446	CXONE-AL□□C-V4 CXONE-AL□□D-V4	Learning about the CX-Programmer except for information on function blocks, ST programming, and SFC programming.	The operating procedures of the CX-Programmer are described.

Terminology

Term	Description
HMI	A general term for interface devices that indicates both hardware and software elements. In this manual, "HMI" refers to an OMRON Sysmac-brand product unless otherwise specified.
PT	The hardware elements of the HMI.
NA Series	The NA Series of Programmable Terminals and peripheral devices.
HMI Project	A Sysmac Studio project for an HMI.
NA Unit	An NA-series Programmable Terminal.
Download	Transferring data from the Sysmac Studio to an HMI.
IAG collection	When you provide IAGs, you provide them as IAG collections. IAGs are also imported as IAG collections. An IAG collection contains one or more IAGs.

Revision History

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

Cat. No. V120-E1-02

↑ Revision code

Revision code	Date	Revised content
01	June 2014	Original production
02	October 2014	Corrected mistakes.



1

System Configurations and Startup Procedures

This section describes the system configurations and the operation of the programming that is created for the startup procedures given in this guide.

1-1	Startup Procedures	1-2
1-2	System Configurations and Units for Use	1-3
1-3	HMI Application to Create	1-4

1-1 Startup Procedures

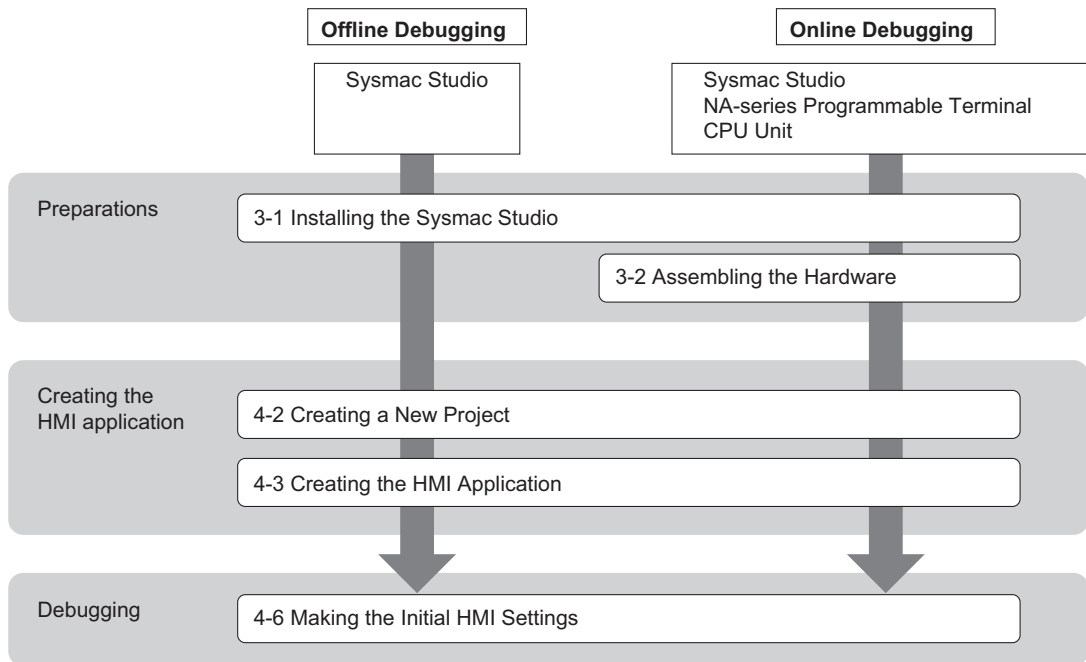
This guide describes the startup procedures for an NA-series Programmable Terminal, from creating the HMI application to debugging.

Refer to programming examples given in the *NJ-series Machine Automation Controller Startup Guide (CPU Unit) (W513)* for information on the Controller connected to the HMI.

The procedures from creating the HMI application to debugging can be performed with the following system configurations.

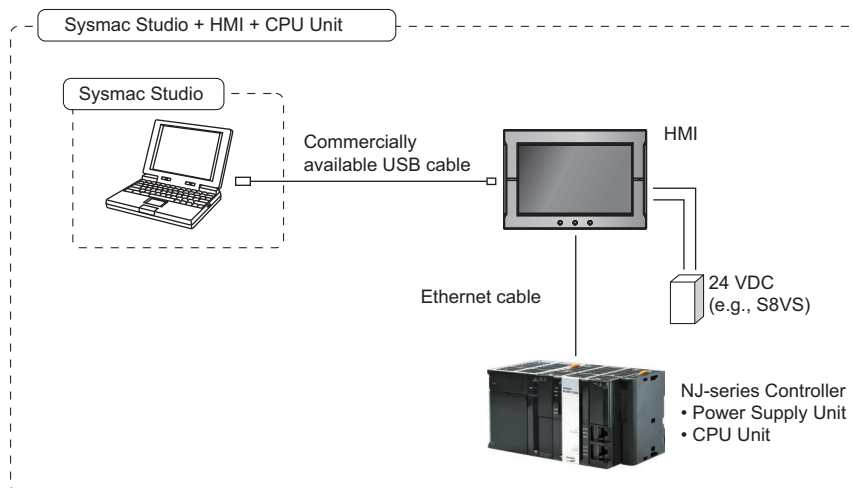
System configuration	Operations	
<ul style="list-style-type: none"> • Sysmac Studio only 	Offline debugging	The HMI application and user program for the Controller are created with the Sysmac Studio. The operation of a virtual HMI and NJ-series CPU Unit is simulated on the Sysmac Studio to debug the HMI application.
<ul style="list-style-type: none"> • Sysmac Studio • NA-series Programmable Terminal • CPU Unit 	Online debugging	The HMI application and user program for the Controller are created with the Sysmac Studio. The HMI application is debugged on the actual HMI and NJ-series CPU Unit.

The startup procedures for each system configuration are given in the following figure.



1-2 System Configurations and Units for Use

The system configurations that are used in this guide are shown in the following figure. To use the HMI, connect a computer running the Sysmac Studio to the USB port of the HMI.



Devices That Are Used

The models of the devices that are used in the system configurations shown above are given in the following table. Refer to the manuals for the individual devices that you will use for information on selecting the actual devices.

Name	Model	Manual name
NA-series Programmable Terminal	NA5-12W101B (version 1.00)	<i>NA-series Programmable Terminal Hardware User's Manual (V117)</i>
Power Supply Unit	S8VS Series	---
NJ-series CPU Unit	NJ501-1500 (version 1.01)	<i>NJ-series CPU Unit Hardware User's Manual (W500)</i>
NJ-series Power Supply Unit	NJ-PA3001	
Ethernet cable	Commercially available Ethernet cable ^{*1}	---
USB cable	Commercially available USB cable ^{*2}	---

*1. Use a category 5 cable.

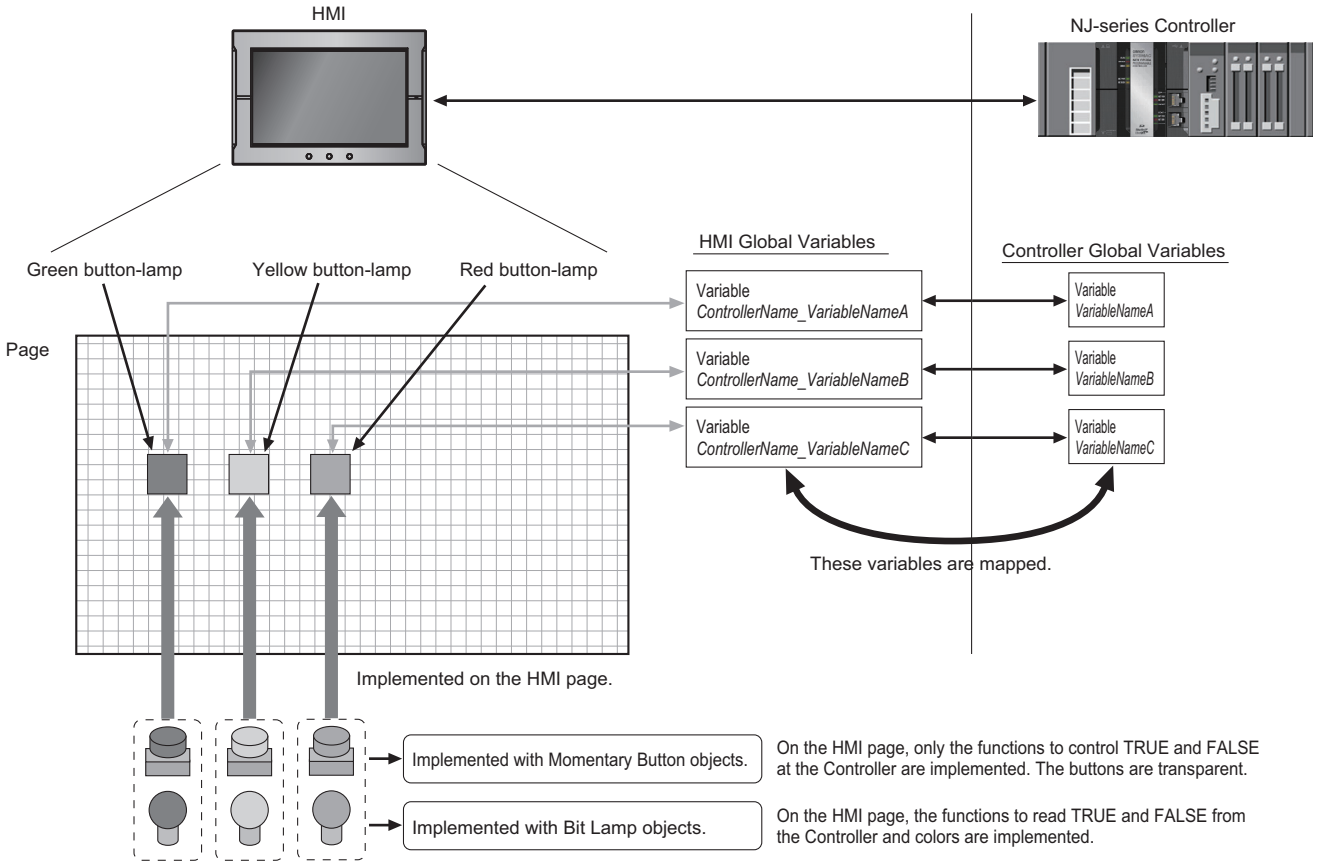
*2. Use a USB 2.0 (or 1.1) cable (A connector - B connector) that is 5.0 m or shorter.

Automation Software

Name	Number of licenses	Model
Sysmac Studio Standard Edition version 1.10	None (media only)	SYSMAC-SE200D
	1 license	SYSMAC-SE201L

1-3 HMI Application to Create

This guide provides an example of creating an HMI page (i.e., the data displayed on the screen) by overlapping button and lamp functions on the page.



2

HMI Application Basics

This section provides necessary basic knowledge of HMI applications for the NA-series Programmable Terminals.

2-1 Pages	2-2
2-2 Variables	2-3
2-3 Subroutines	2-4

2-1 Pages

“Page” is used to refer to the screen data that is displayed on an HMI. You place objects on pages to implement the required functions.

Pages and objects have the following three types of attributes.

Attributes of pages and objects	Description
Properties	Properties set the appearance of an object or page, such as the position, size, and color.
Animations	Animations set motion, such as blinking and movement.
Events and Actions	You can set events and the actions to perform when the events occur.

Event-driven Applications

The NA-series Programmable Terminals use event-driven applications in which the actions to perform when events occur are specified. You can use events and actions to create more flexible applications than is possible with conventional HMIs.

Applications with High Reusability

After you register a highly versatile subroutine as a global subroutine, you can call the subroutine from anywhere in the project. This improves reusability and maintainability.

Also the use of Visual Basic allows you to reuse any of the many samples that are available on the Internet to improve development productivity.

2-2 Variables

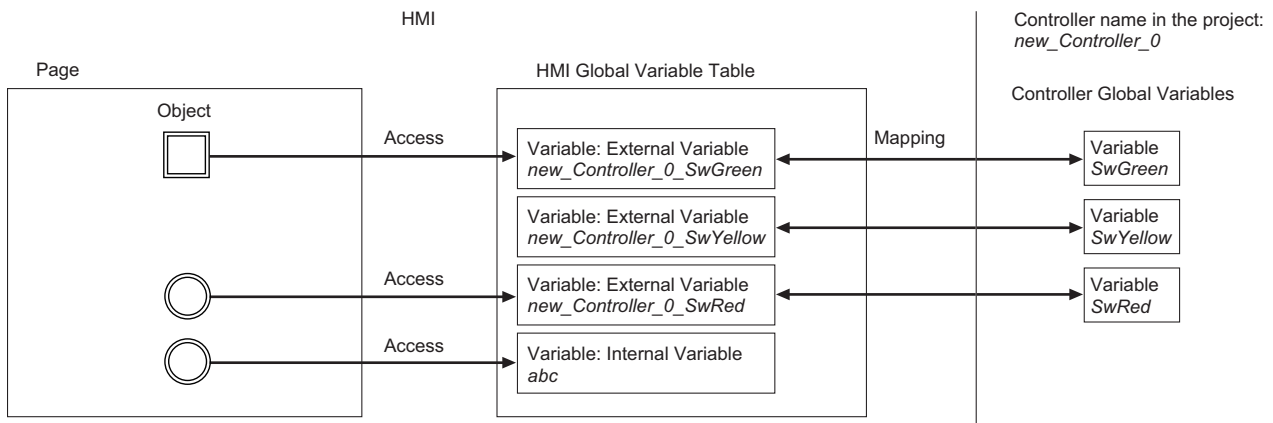
A variable is a container to store the I/O data that is exchanged with external devices or temporary data for internal processing.

In the HMI, all the operations such as exchanging I/O data with external devices or arithmetic processing on data are performed with variables.

Therefore, it is possible to create an HMI application that does not depend on the memory addresses in the hardware.

Each object on a page accesses a variable in the global variable table of the HMI as shown below.

Some variables are mapped to global variables in the Controller (external variables) and other variables are not mapped (internal variables).



Subroutine Variables and Global Variables

A subroutine variable can be read and written only from within one subroutine. A global variable, however, can be read and written from everywhere in the project. The application that is described in this guide defines the variables to access the pushbutton switches and lamps as global variables.

Data Types of Variables

The data type is an attribute that defines the format and range of values that a variable can express. When a variable is defined, the data type must always be specified.

In an NA-series Programmable Terminal, you can use the same data types as those used in Visual Basic. Refer to the *NA-series Programmable Terminal Software User's Manual* (Cat. No. V118) for details.

2-3 Subroutines

A subroutine is a sequence of instructions that is written in Visual Basic. You can create powerful applications by programming the processing to execute when events occur as subroutines.

There are the following two types of subroutines.

Type of subroutine	Definition
Page subroutine	A subroutine that can be accessed only within one page.
Global subroutine	A subroutine that can be accessed from anywhere in the project.

3

Preparations

This section describes how to install the Sysmac Studio and how to mount and wire the hardware.

3-1	Installing the Sysmac Studio	3-2
3-2	Assembling the Hardware	3-3
3-2-1	Wiring the Power Supply	3-3
3-2-2	Connecting the Ethernet Communications Cable	3-4

3-1 Installing the Sysmac Studio

With the NA-series Programmable Terminals, the Sysmac Studio is used as the Support Software to make settings for the NA Unit and connected devices and to create, debug, and simulate the applications.

Use the following procedure to install the Sysmac Studio on a computer.

- 1** Insert the Sysmac Studio installation disk into DVD-ROM drive. The setup program is automatically started and the Select Setup Language Dialog Box is displayed.
- 2** Select the language to install and click the **OK** Button. The Sysmac Studio Setup Wizard is displayed.
- 3** Install the Sysmac Studio according to the instructions provided by the Setup Wizard.
- 4** When the installation is completed, restart the computer.



Additional Information

- The system requirements for the computer on which to install the Sysmac Studio are given in the following table.

OS	Processor		RAM	Display
Windows XP SP3 Windows Vista Windows 7, 32-bit or 64-bit edition	Minimum	Computer with a Celeron 540 (1.8 GHz) processor or higher.	2 GB	XGA 1,024 x 768 dpi 16,000,000 colors
Windows 8, 32-bit or 64-bit edition	Recommended	Computer with a Core i5 M520 (2.4 GHz) processor, equivalent, or higher.	2 GB	WXGA 1,280 x 800 dpi 16,000,000 colors

- If the Sysmac Studio cannot be installed with the above procedure, refer to the *Sysmac Studio Version 1 Operation Manual (W504)*.



Precautions for Correct Use

If CX-One version 4 or lower is installed on the computer, installation of the Sysmac Studio is cancelled and installation is not possible. Uninstall the CX-One first and then install the Sysmac Studio.

3-2 Assembling the Hardware

Connect and wire all the devices that are used in the system configuration. This section provides an overview of the assembling methods. For details and safety precautions, refer to the manuals for individual devices.



Precautions for Safe Use

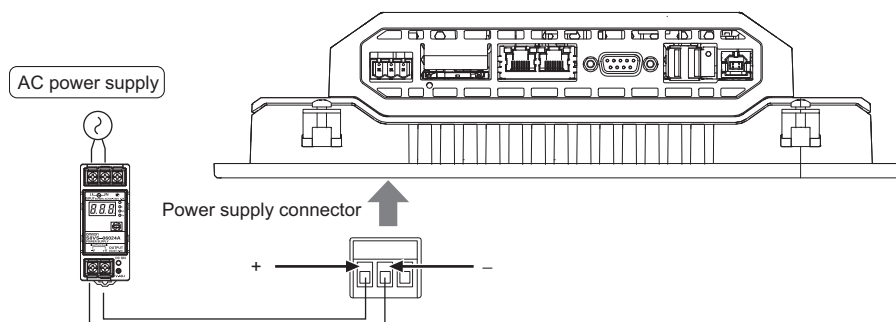
Before you perform any of the following operations, turn OFF the power supply to the NA Unit.

- Assembling a panel
- Setting DIP switches
- Connecting and wiring cables
- Connecting or disconnecting connectors

After you turn OFF the power supply, the Power Supply Unit may continue to supply power to the NA Unit for several seconds. The RUN indicator will remain lit as long as power is supplied. Make sure that the RUN indicator is not lit before you perform any of the above operations.

3-2-1 Wiring the Power Supply

Wire the power supply to the Power Supply Unit and to the power terminals on the NA Unit.

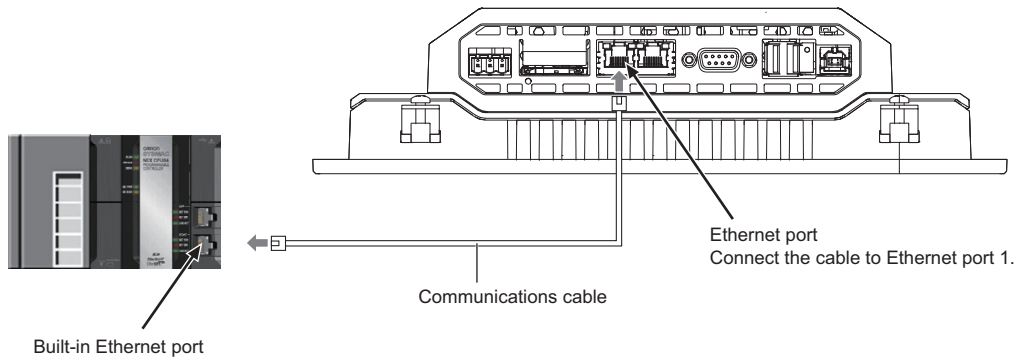


Additional Information

The S8VS-06024 Power Supply Unit is used in this guide. However, you can use any power supply that satisfies the specifications.

3-2-2 Connecting the Ethernet Communications Cable

Connect the Ethernet port and the Ethernet cable as shown in the following figure.



4

Creating and Debugging the HMI Application

This section describes the basic operations from creating the HMI application to debugging the HMI application.

4

4-1	Flowchart of Operations	4-2
4-2	Creating a New Project	4-3
4-3	Creating the HMI Application	4-6
4-4	Adding the HMI to the Project	4-7
4-5	Mapping HMI Variables and Controller Variables	4-8
4-6	Making the Initial HMI Settings	4-10
4-7	Creating Pages	4-12
4-8	Debugging the HMI Application	4-18
4-8-1	Preparations for Online Debugging	4-18
4-8-2	Preparations for Offline Debugging	4-23
4-8-3	Debugging	4-24

4-1 Flowchart of Operations

The basic flow of operation from creating the HMI application to debugging the HMI application is given below.

You can use variables to create the HMI application for the NA-series Programmable Terminal, so you do not have to be conscious of the addressable memory space. This allows you to develop your application independently without being concerned with the memory map of the Controller.

To help you understand the advantages of the creating HMI application with variables, this guide describes the operating procedures to create the HMI application without connecting to the actual hardware.

STEP 1. Creating a New Project (P. 4-3)

A project file is created and the HMI is inserted into the project.

STEP 2. Making the Software Settings and Creating the HMI Application (P. 4-6)

STEP 2-1 Software Settings (Variable Mapping and HMI Settings) (P. 4-8)

STEP 2-2 Creating the HMI Application (Registering Variables and Creating Pages)

STEP 3. Debugging the HMI Application (P. 4-18)

The project data is transmitted to the HMI to check operation (online debugging). When the actual hardware is not used, a simulation on the Sysmac Studio is used to check operation (offline debugging).

STEP 5-1 Preparations for Online Debugging (P. 4-18)

Preparations for Offline Debugging (P. 4-23)

STEP 5-2 Debugging the HMI Application (P. 4-24)

4-2 Creating a New Project

Start the Sysmac Studio and open the project that was created in the *NJ-series Machine Automation Controller Startup Guide (CPU Unit) (W513)*.

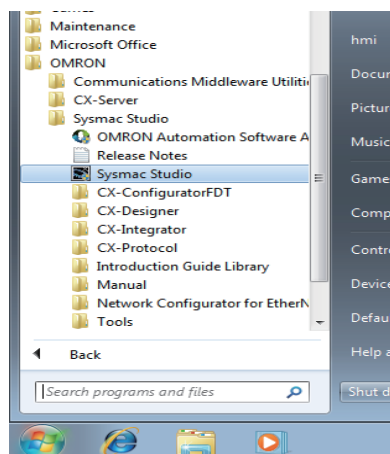
Starting the Sysmac Studio

Use the following procedure to start the Sysmac Studio.

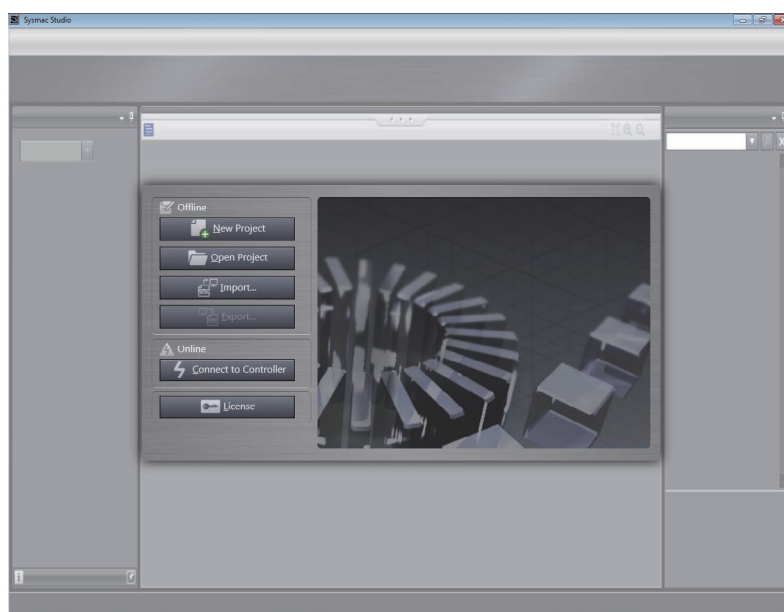
- 1 Use one of the following methods to start the Sysmac Studio.
 - Double-click the Sysmac Studio shortcut icon on the desktop.



- Select **All programs – OMRON – Sysmac Studio – Sysmac Studio** from the Windows Start Menu.




The Sysmac Studio is started and the following window is displayed.

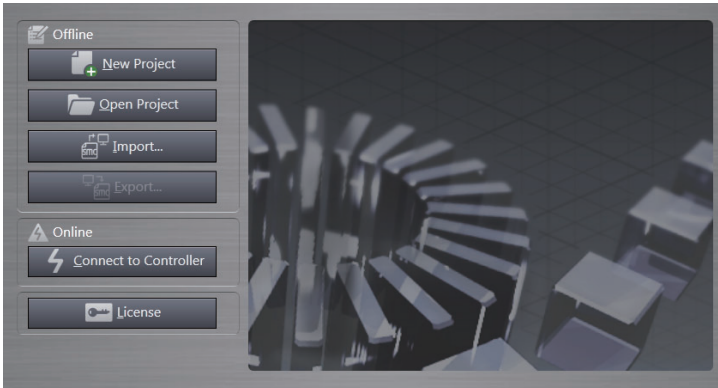


Opening an Existing Project

Use the following procedure to open an existing project.


- 1 Click the **Open Project** Button in the Project Window.

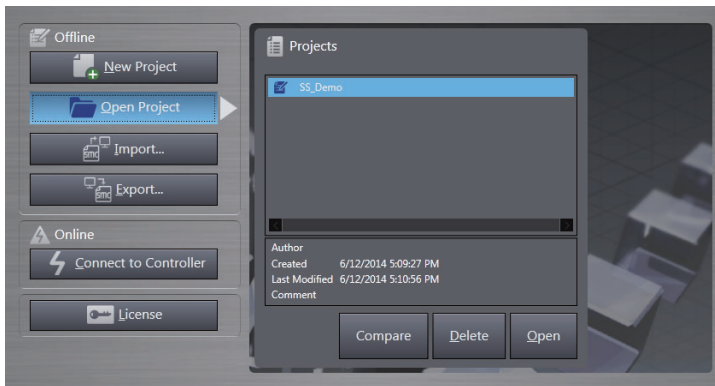
Click the  **Open Project** Button.



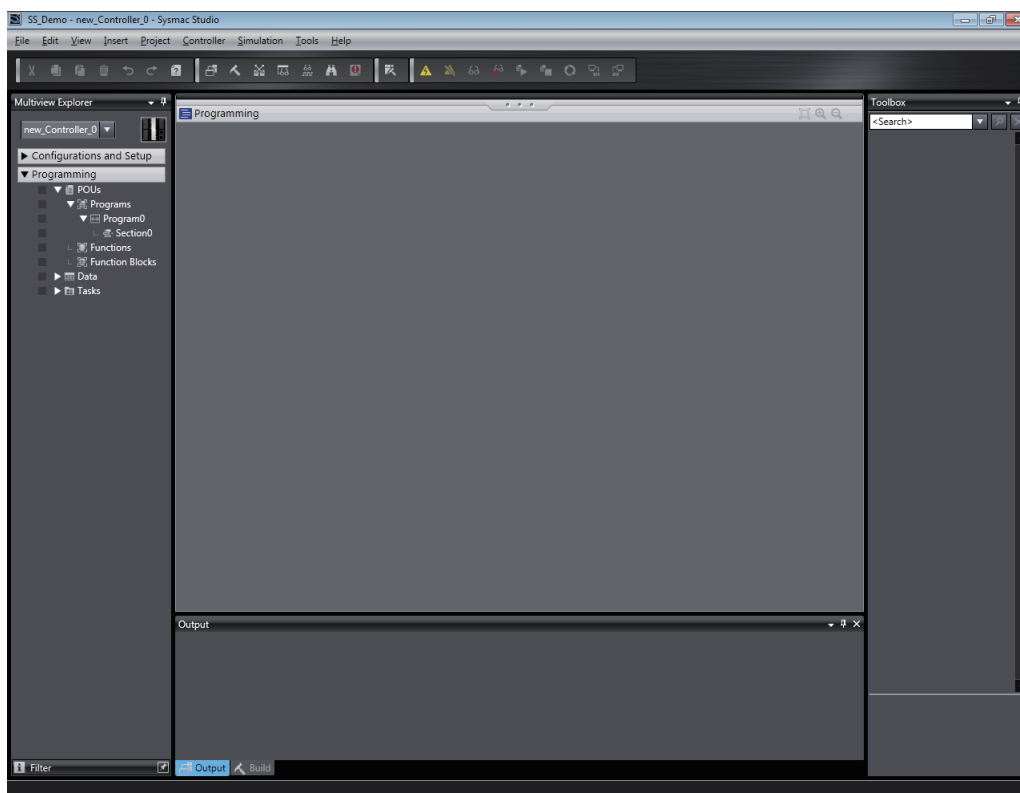
The Project List Dialog Box is displayed.

- 2 Select the project that was created in the *NJ-series Machine Automation Controller Startup Guide (CPU Unit) (W513)* in the Project List Dialog Box and click the **Open** Button.

Click the  **Open** Button.



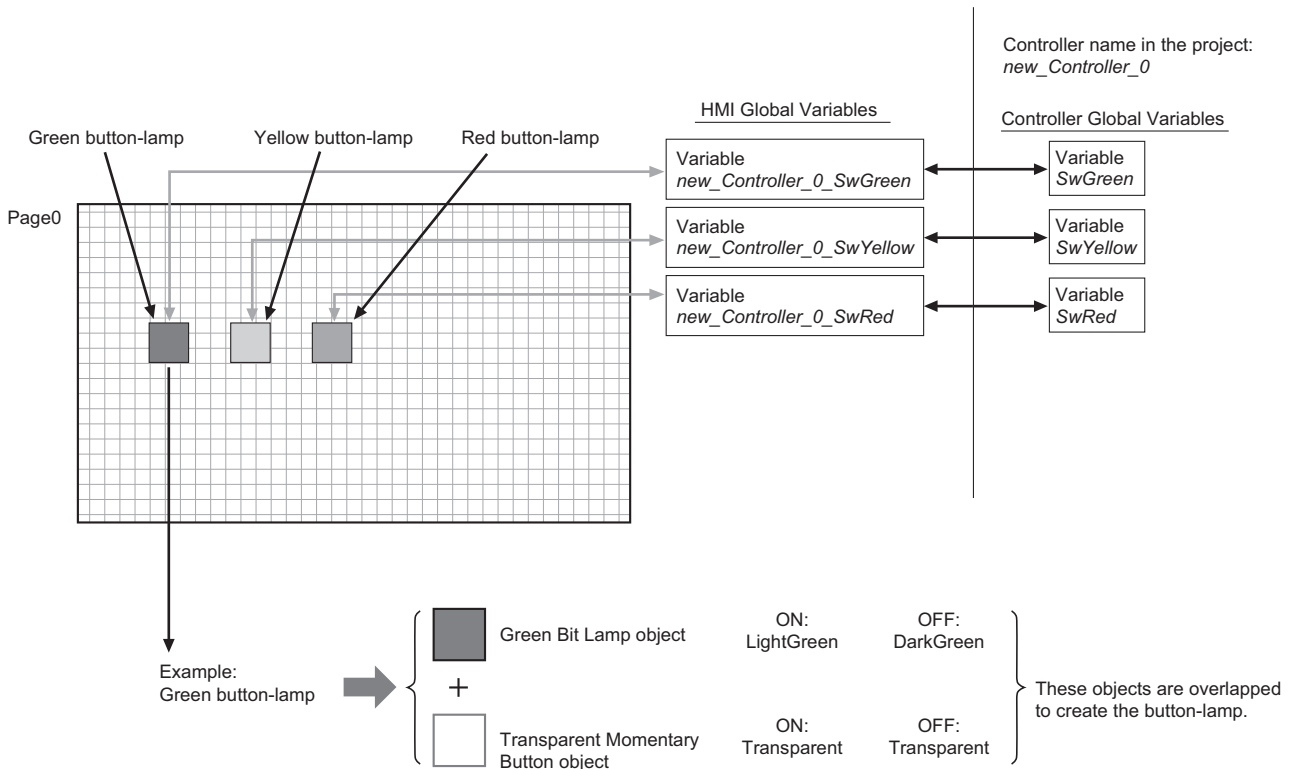
The following window is displayed.



4-3 Creating the HMI Application

Create the following application.

Each of the green, yellow, and red button-lamps is created by combining a colored Bit Lamp object and a transparent Momentary Button object.



Position the Bit Lamp objects and set the colors as shown below for the TRUE and FALSE status in the Controller.

Assign the variables in the HMI as shown in the table.

Type of object	Basic color	ON color	OFF color	Specified variable in Controller
Bit Lamp objects	Green	LightGreen	DarkGreen	<code>new_Controller_0_SwGreen</code>
	Yellow	Yellow	Goldenrod	<code>new_Controller_0_SwYellow</code>
	Red	Red	Firebrick	<code>new_Controller_0_SwRed</code>
Momentary Button objects	Green	Transparent	Transparent	<code>new_Controller_0_SwGreen</code>
	Yellow	Transparent	Transparent	<code>new_Controller_0_SwYellow</code>
	Red	Transparent	Transparent	<code>new_Controller_0_SwRed</code>



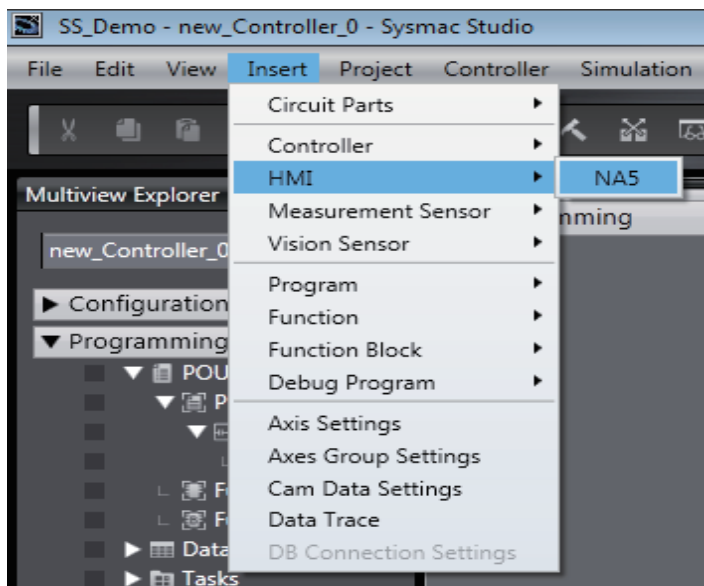
Additional Information

The Sysmac Studio provides a development environment for creating HMI applications with variables. Therefore, you do not have to be conscious of the system configuration when you create the HMI application.

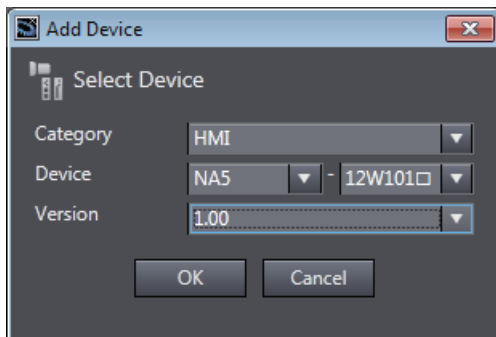
4-4 Adding the HMI to the Project

Use the following procedure to add the HMI to the project.

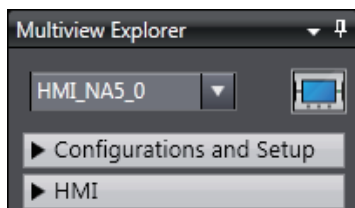
- 1 Select **HMI – NA5** from the Insert Menu.



- 2 Select **NA5-12W101□** for the device and **1.00** for the version, and then click the **OK** Button.

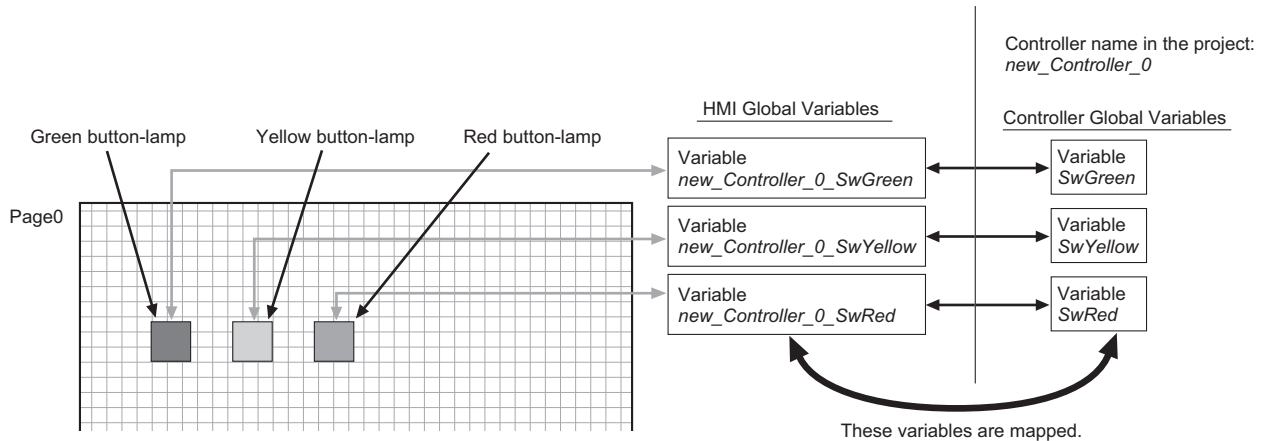


The HMI is added to the project.

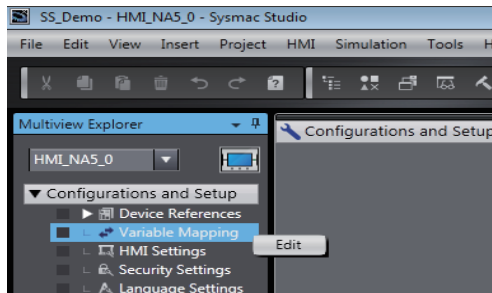


4-5 Mapping HMI Variables and Controller Variables

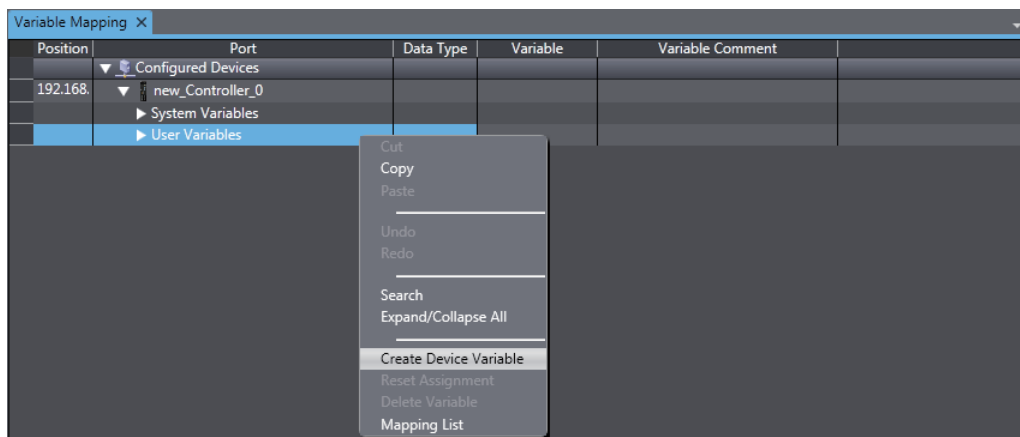
Use the following procedure to map the Controller global variables to the HMI global variables.



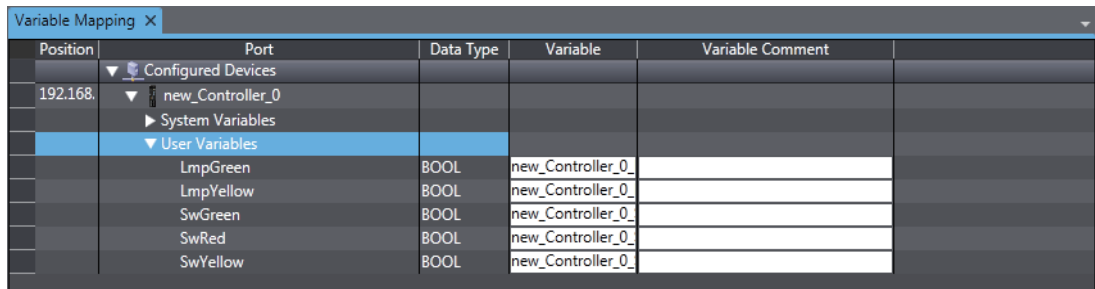
- 1 Double-click **Variable Mapping** under **Configurations and Setup** in the Multiview Explorer. Or right-click **Variable Mapping** under **Configurations and Setup** in the Multiview Explorer and select **Edit** from the menu.



- 2 Right-click **User Variables** under **new_Controller_0** and select **Create Device Variable** from the menu.



The Controller global variables are automatically mapped to the HMI global variables.



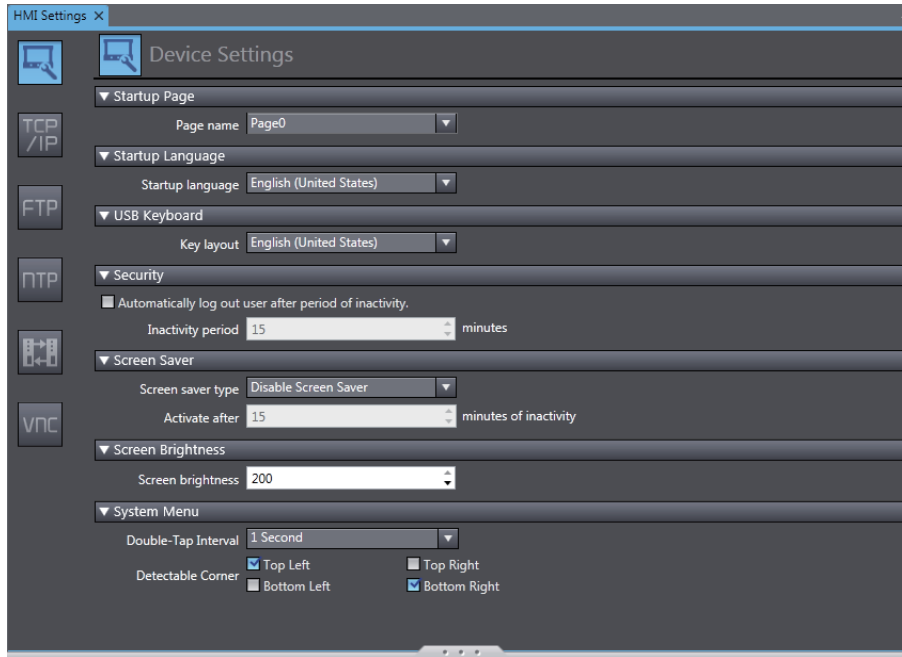
The screenshot shows a 'Variable Mapping' dialog box with a table. The table has five columns: Position, Port, Data Type, Variable, and Variable Comment. The 'Port' column is expanded to show a tree view of 'Configured Devices' containing 'new_Controller_0', which is further expanded to show 'System Variables' and 'User Variables'. Under 'User Variables', five entries are listed: LmpGreen, LmpYellow, SwGreen, SwRed, and SwYellow. Each entry has a 'Data Type' of 'BOOL' and a 'Variable' name starting with 'new_Controller_0.'. The 'Variable Comment' column is empty for all entries.

Position	Port	Data Type	Variable	Variable Comment
	Configured Devices			
192.168.	new_Controller_0			
	System Variables			
	User Variables			
	LmpGreen	BOOL	new_Controller_0.	
	LmpYellow	BOOL	new_Controller_0.	
	SwGreen	BOOL	new_Controller_0.	
	SwRed	BOOL	new_Controller_0.	
	SwYellow	BOOL	new_Controller_0.	

4-6 Making the Initial HMI Settings

Use the following procedure to make the device settings and TCP/IP settings as the initial HMI settings.

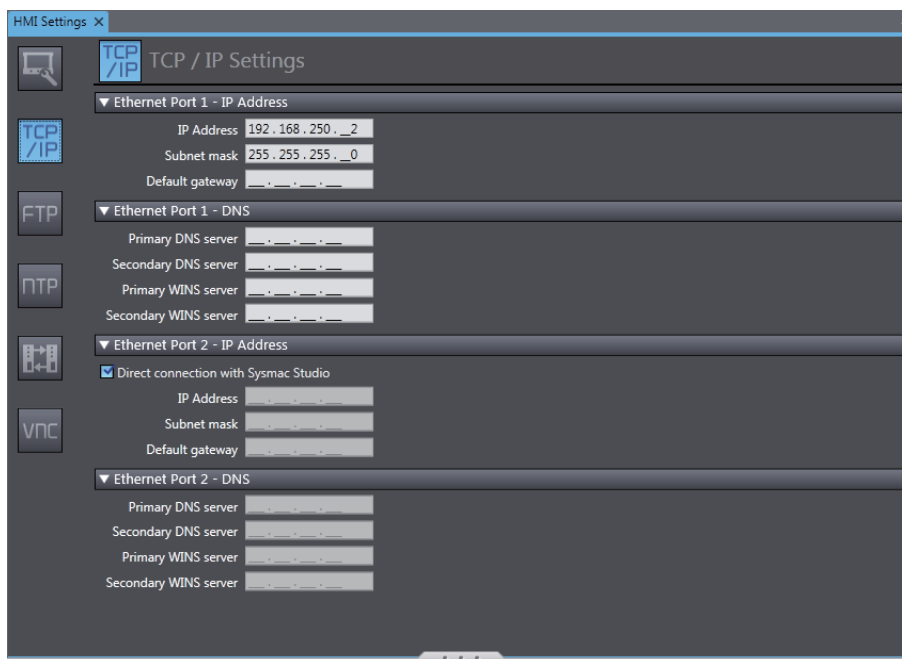
- 1 Double-click **HMI Settings** under **Configurations and Setup** in the Multiview Explorer. The HMI Settings Tab Page is displayed in the Configurations and Setup Layer.
- 2 The Device Settings View shown below is displayed. Here, the default settings are used.
 - Device Settings



Item	Description
Startup Page	
Page name	Sets the page to display first when the HMI is started.
Startup Language	
Startup language	Sets the project language to use when the HMI is started.
USB Keyboard	
Key layout	Sets the layout of a USB keyboard.
Security	
Automatically log out user after period of inactivity.	Select this check box to automatically log out the user after a specified period of inactivity.
Inactivity period	Specifies the time of inactivity before the user is logged out automatically.
Screen Saver	
Screen saver type	Sets the type of screen saver.
Active after	Sets the time after the screen is touched before the screen saver is started.
Screen Brightness	
Screen brightness	Sets the brightness of the screen.
System Menu	
Double-tap Interval	Sets the interval to use to detect double taps.
Detectable corner	Select the corners in which to detect the operation to display the System Menu.

- TCP/IP Settings

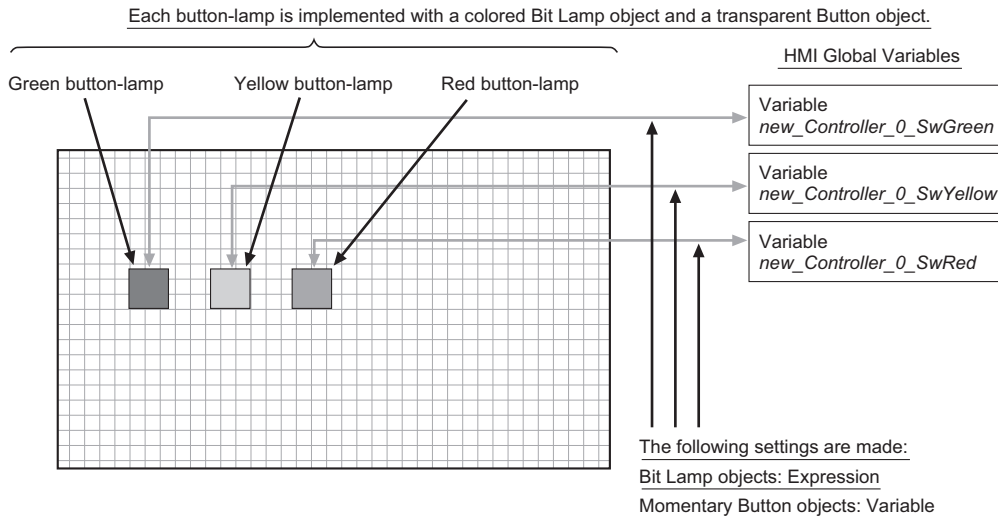
These settings are for the Ethernet port. Here, the default settings are used.



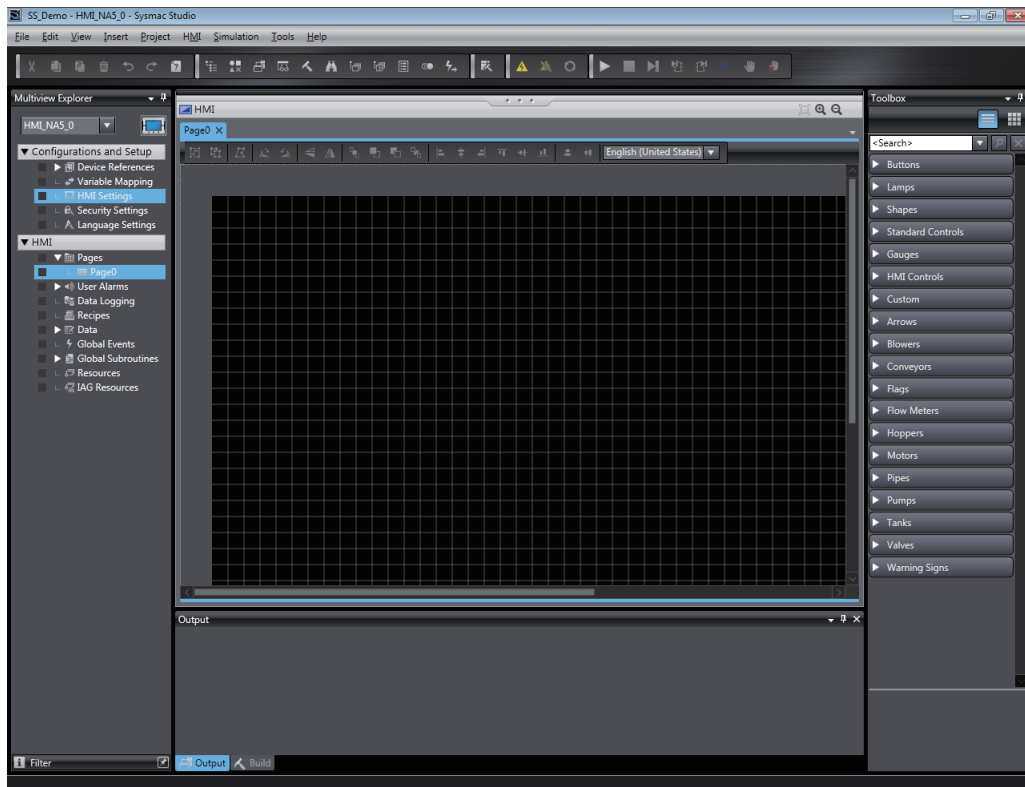
Item	Description
Ethernet Port 1 - Settings	
IP Address	Sets the local IP address.
Subnet mask	Sets the subnet mask.
Default gateway	Sets the IP address of the default gateway. This setting is not required when a default gateway is not used.
Primary DNS server	Sets the IP address of the primary DNS server.
Secondary DNS server	Sets the IP address of the secondary DNS server.
Primary WINS server	Sets the IP address of the primary WINS server.
Secondary WINS server	Sets the IP address of the secondary WINS server.
Ethernet Port 2 Settings	
Direct connection with Sysmac Studio	Select this check box to connect Ethernet port 2 directly to the Sysmac Studio without going through an Ethernet switch. If you select this check box, the IP addresses and other settings for Ethernet port 2 are ignored.
IP Address	Sets the local IP address.
Subnet mask	Sets the subnet mask.
Default gateway	Sets the IP address of the default gateway. This setting is not required when a default gateway is not used.
Primary DNS server	Sets the IP address of the primary DNS server.
Secondary DNS server	Sets the IP address of the secondary DNS server.
Primary WINS server	Sets the IP address of the primary WINS server.
Secondary WINS server	Sets the IP address of the secondary WINS server.

4-7 Creating Pages

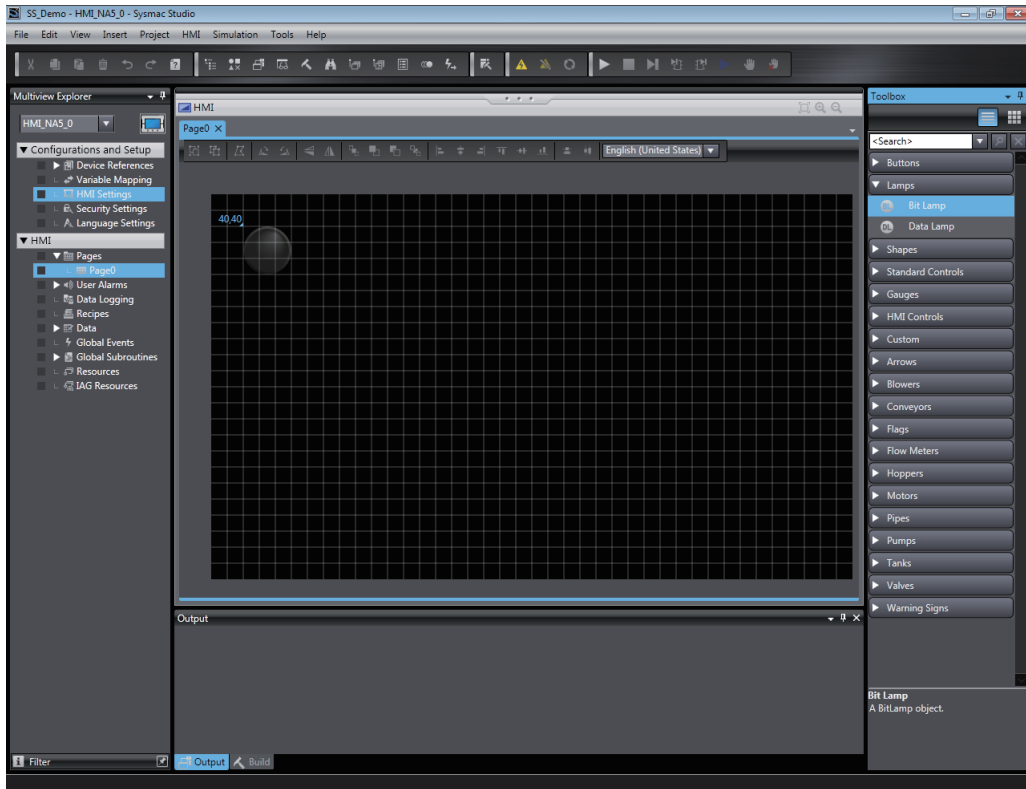
Use the following procedure to position the Bit Lamp and Momentary Button objects on a page.



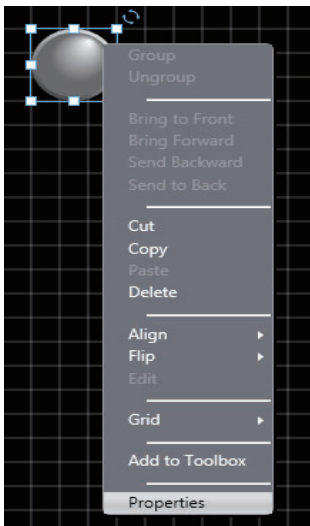
- 1 Double-click **Page0** under **HMI – Pages** in the Multiview Explorer. Or right-click **Page0** under **HMI – Pages** and select **Edit** from the menu.



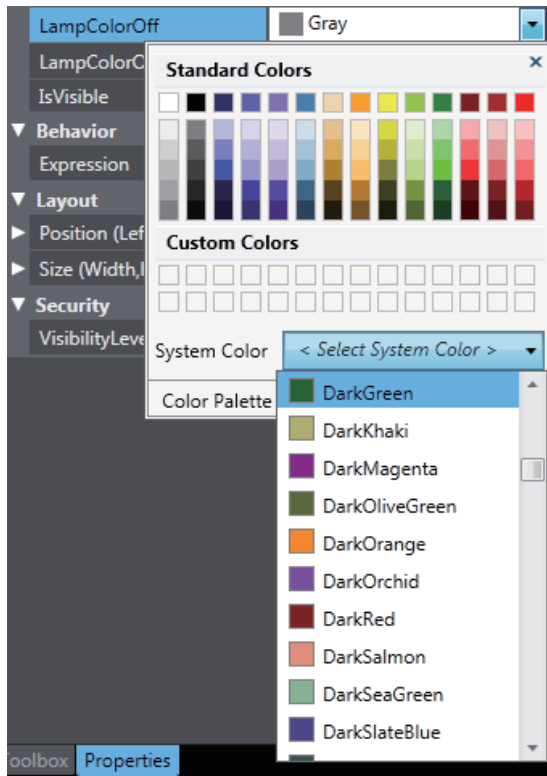
- 2** Overlay a Momentary Button object on a Bit Lamp object to implement the actual button. Drag a Bit Lamp object from the Toolbox to the page.



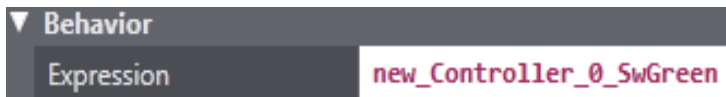
- 3** Set the properties of the Bit Lamp object. Right-click the object and select **Properties** from the menu.



- 4** Set **Appearance – LampColorOff** to *DarkGreen* in the properties. Also set **LampColorOn** to *LightGreen*.



- 5** Assign a variable to the object. Set **Behavior – Expression** in the properties to *new_Controller_0_SwGreen*.



- 6** Use the same steps to create the red and yellow lamps. The settings are shown below.

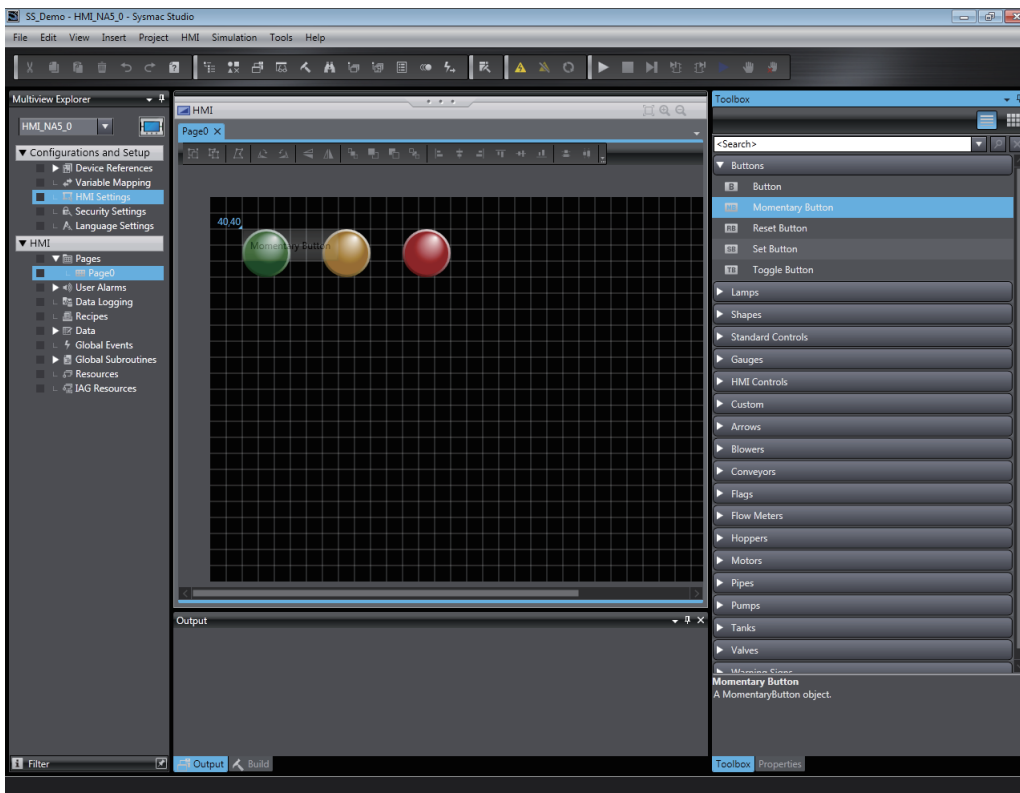
- Yellow Lamp



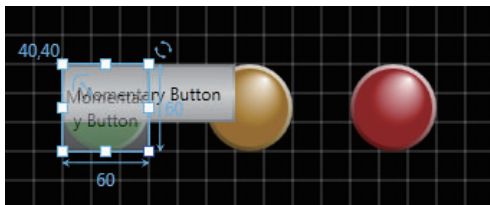
- Red Lamp



- 7 Drag a Momentary Button object from the Toolbox to the page and overlay it on the Bit Lamp object.



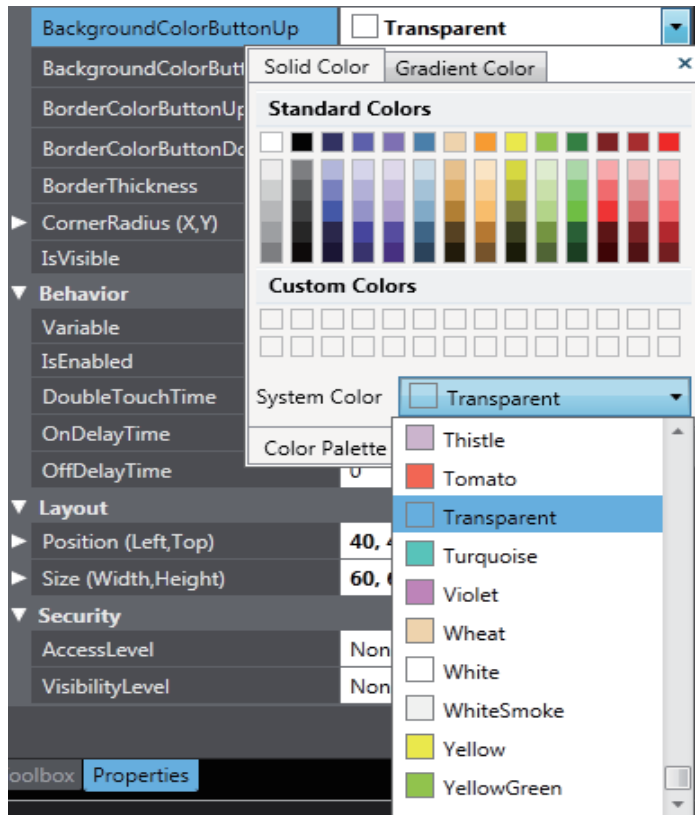
- 8 Match the size of the Momentary Button object with the size of the Bit Lamp object.



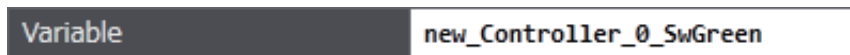
- 9 Delete the text. It is not necessary. Leave **Appearance – TextButtonUp (Default)** blank. Also leave **TextButtonDown (Default)** blank.

TextButtonUp (Default)	
TextButtonDown (Default)	

- 10** The Momentary Button object is not displayed. Set the color to *Transparent*. Click the **Solid Color** Tab under **Appearance – BackgroundColorButtonUp**, and select *Transparent*. Set **BackgroundColorButtonDown**, **BorderColorButtonUp**, and **BorderColorButtonDown** in the same way.



- 11** Assign a variable to the Momentary Button object. Set **Behavior – Variable** in the properties to *new_Controller_0_SwGreen*.



- 12** Create buttons for the red and yellow lamps in the same way. The settings are shown below.
- Yellow Button

TextButtonUp (Default)	
TextButtonDown (Default)	
BackgroundColorButtonUp	<input type="checkbox"/> Transparent
BackgroundColorButtonDown	<input type="checkbox"/> Transparent
BorderColorButtonUp	<input type="checkbox"/> Transparent
BorderColorButtonDown	<input type="checkbox"/> Transparent
Variable	new_Controller_0_SwYellow

- Red Button

TextButtonUp (Default)	
TextButtonDown (Default)	
BackgroundColorButtonUp	<input type="checkbox"/> Transparent ▼
BackgroundColorButtonDown	<input type="checkbox"/> Transparent ▼
BorderColorButtonUp	<input type="checkbox"/> Transparent ▼
BorderColorButtonDown	<input type="checkbox"/> Transparent ▼
Variable	new_Controller_0_SwRed

This concludes creating the page.

4-8 Debugging the HMI Application

You can verify the operation of an NA-series Programmable Terminal by performing simulations on the Sysmac Studio. Simulations like this are used for offline debugging. If the actual hardware is not available, operation is verified with offline debugging. There are two ways to perform offline debugging: Execute only the HMI project to verify the operation of the HMI independently or connect to the Controller Simulator to verify operation.



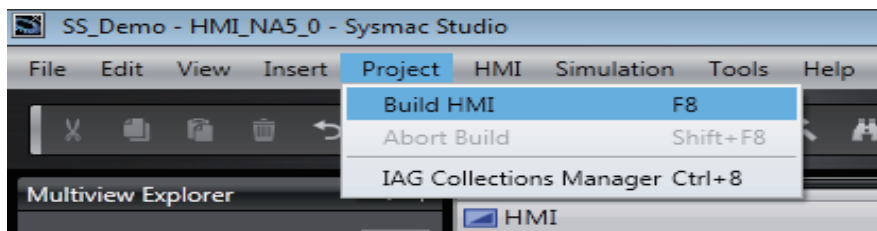
Additional Information

If you verify operation only with the HMI Simulator, you can check the operation of objects, but there is no way to verify operation according to values in the Controller. To debug the operation for values in the Controller, you must connect to the Controller Simulator.

4-8-1 Preparations for Online Debugging

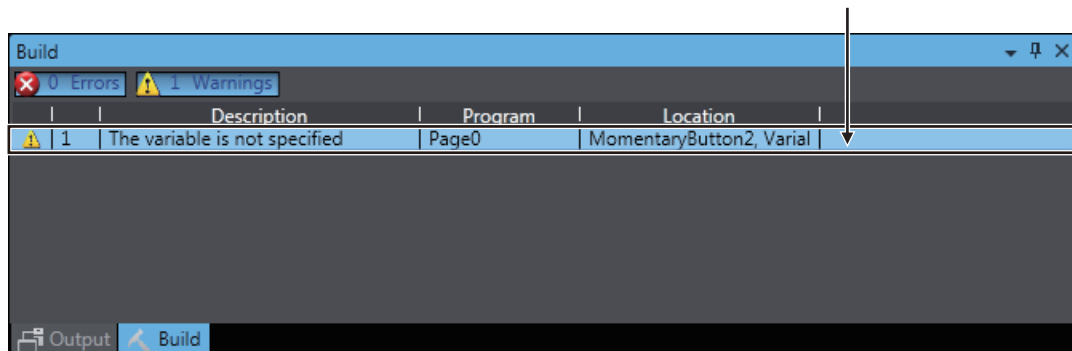
Use the following procedure to build the project to prepare for online debugging.

- 1 Select **Build HMI** from the Project Menu.



The results of building the project are displayed in the Build Tab Page. If you find an error, correct the project.

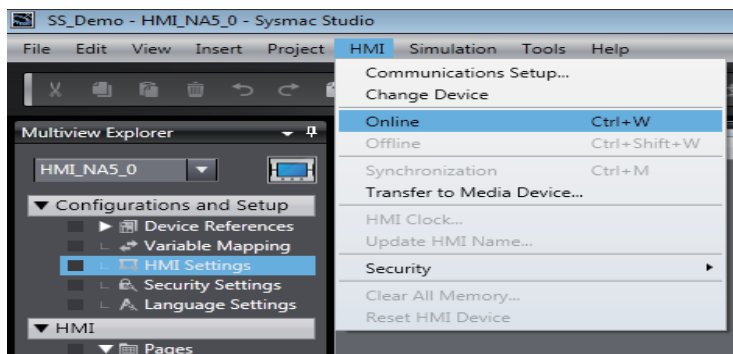
Useful Function
If you click an error line, you can jump to the corresponding rung.




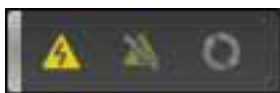
Going Online

- 1 Turn ON the power supply to the HMI.
- 2 Go online with one of the following methods.

Method 1: Select **Online** from the HMI Menu.



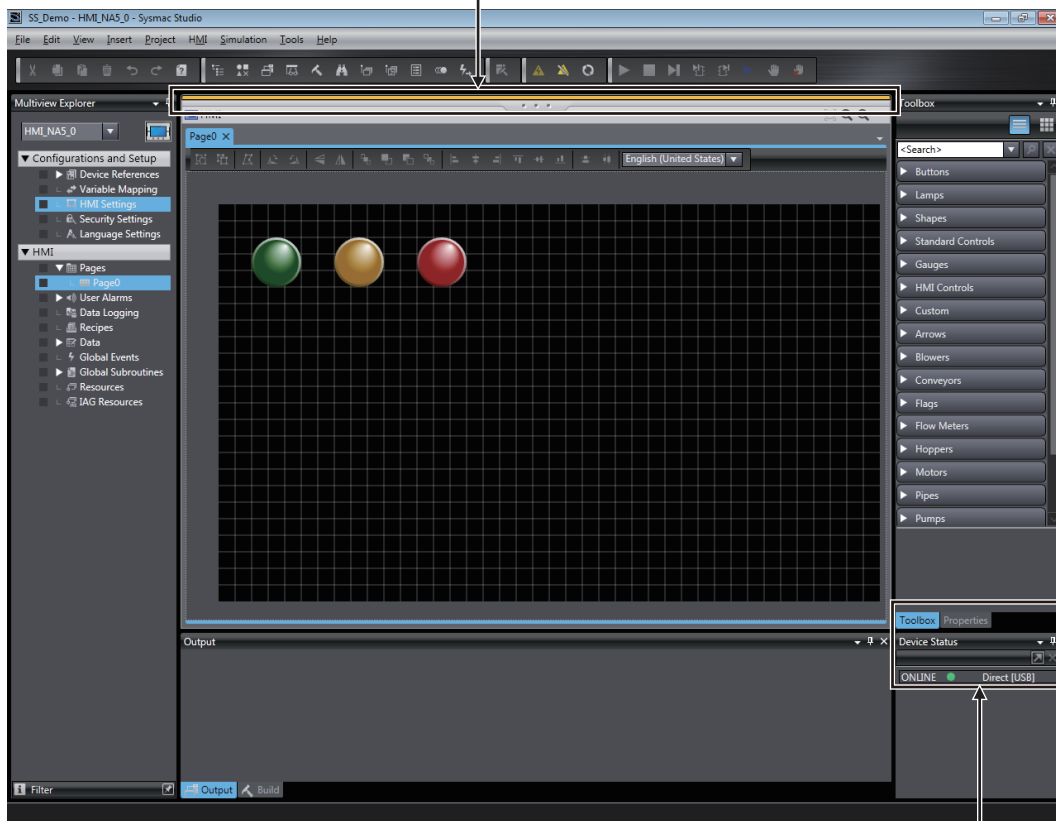
Method 2: Click  in the Toolbar.



Method 3: Press the  (Ctrl) +  (W) Keys.

The Sysmac Studio goes online with the HMI.

When the Sysmac Studio goes online, the color of the bar at the top of the Edit Pane changes to yellow.



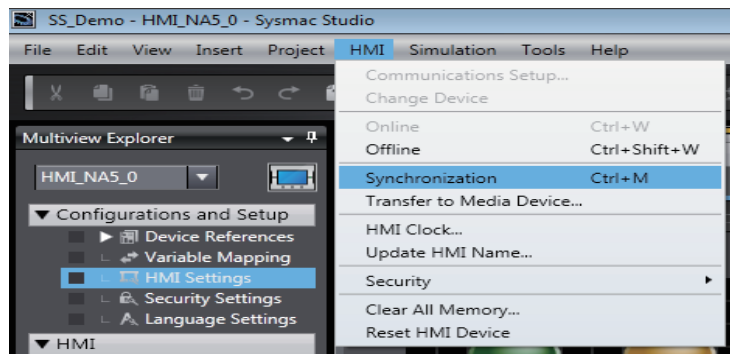
The HMI status is displayed.

Transferring the Project

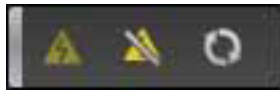
Use the following procedure to transfer the project to the HMI. Use synchronization to transfer the project. You can use synchronization on the Sysmac Studio to automatically compare the data on the computer with the data in the HMI and transfer data to the HMI.

- 1 Use one of the following methods to display the Synchronization Window.

Method 1: Select **Synchronization** from the HMI Menu.



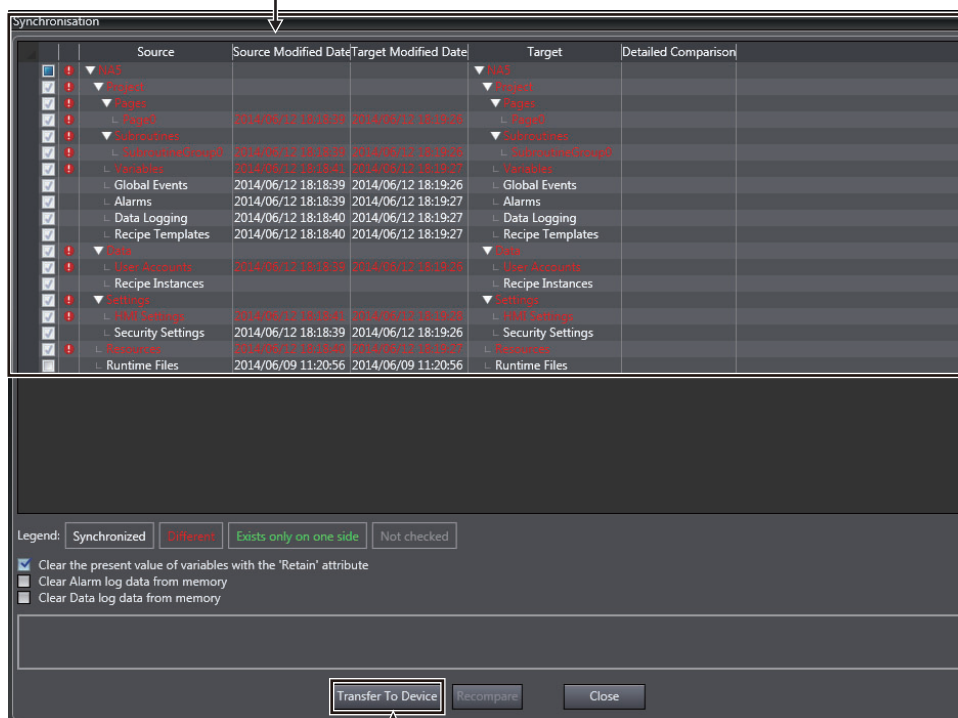
Method 2: Click  in the Toolbar.



Method 3: Press the  (Ctrl) +  (M) Keys.

Comparison of the data on the computer and the data in the HMI starts. When the comparison is completed, the comparison results are displayed.

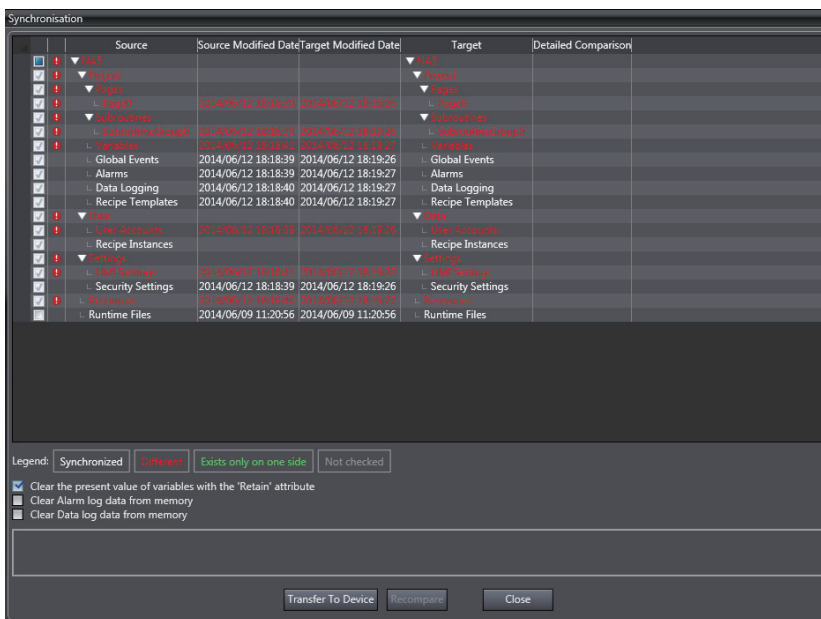
The results of comparing the data on the computer and in the HMI are displayed.



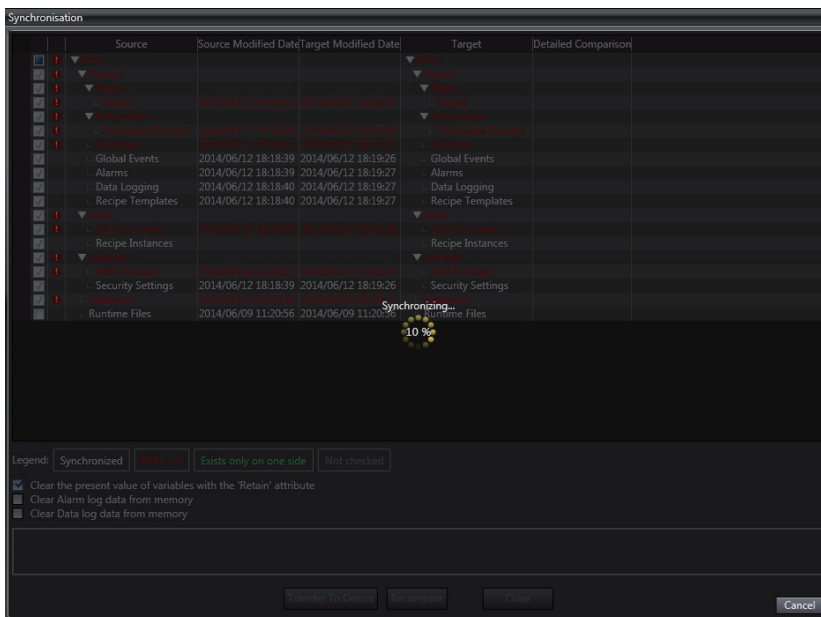
Click this button to transfer the project from the computer to the HMI.

2 Click the **Transfer to Device** Button.

Click the **Transfer To Device** Button.



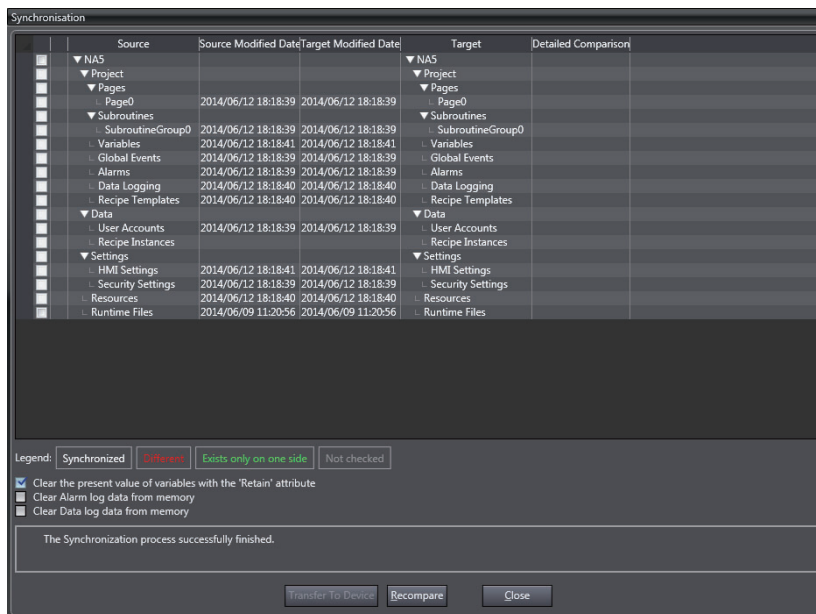
Transferring the project to the HMI starts. During the transfer, progress is displayed in the Synchronisation Window.



3 When the transfer is completed, the HMI is restarted automatically.

4 Click the **Close** Button at the bottom right of the Synchronization Window.

Click the  Button.



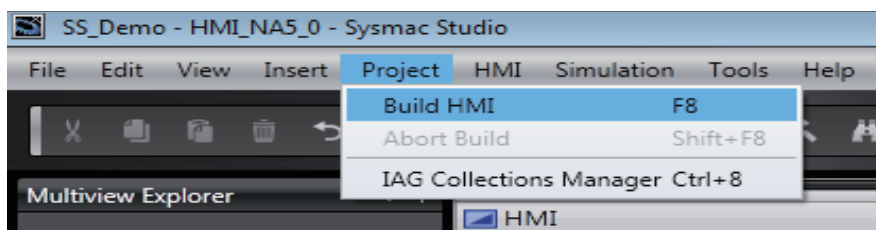
The Synchronization Window is closed.

4-8-2 Preparations for Offline Debugging

To prepare for offline debugging, use the following procedures to build the project and start the HMI Simulator.

Building the Project

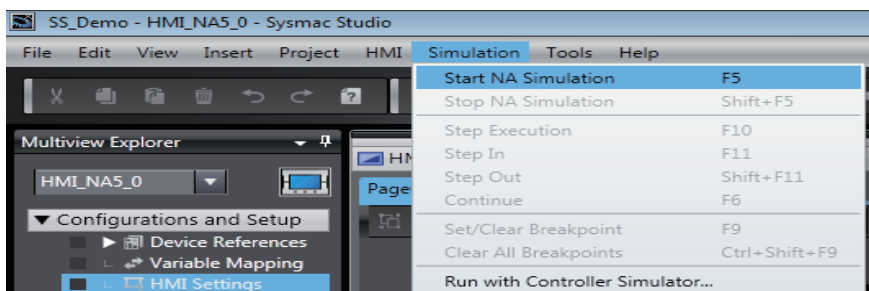
- 1 Select **Build HMI** from the Project Menu.



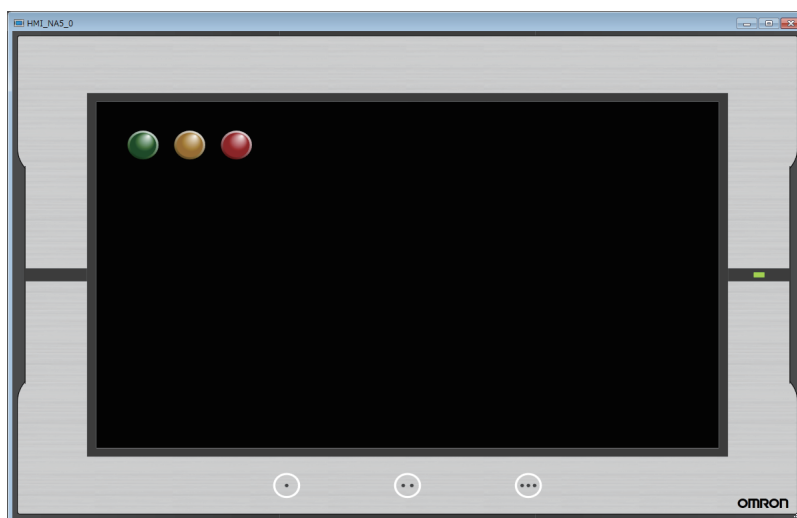
The results of building the project are displayed in the Build Tab Page. If any errors are found, correct the project.

Starting the Simulator

- 1 Select **Start NA Simulation** from the Simulation Menu.



The Simulation Window is displayed.



This concludes starting the Simulator.



Additional Information

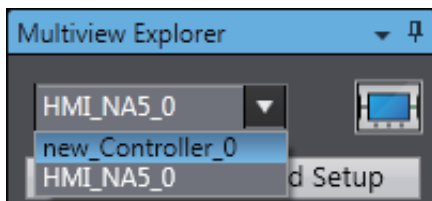
The Simulator is not totally the same as the actual HMI. Final verification of operation on the actual HMI is always required.

4-8-3 Debugging

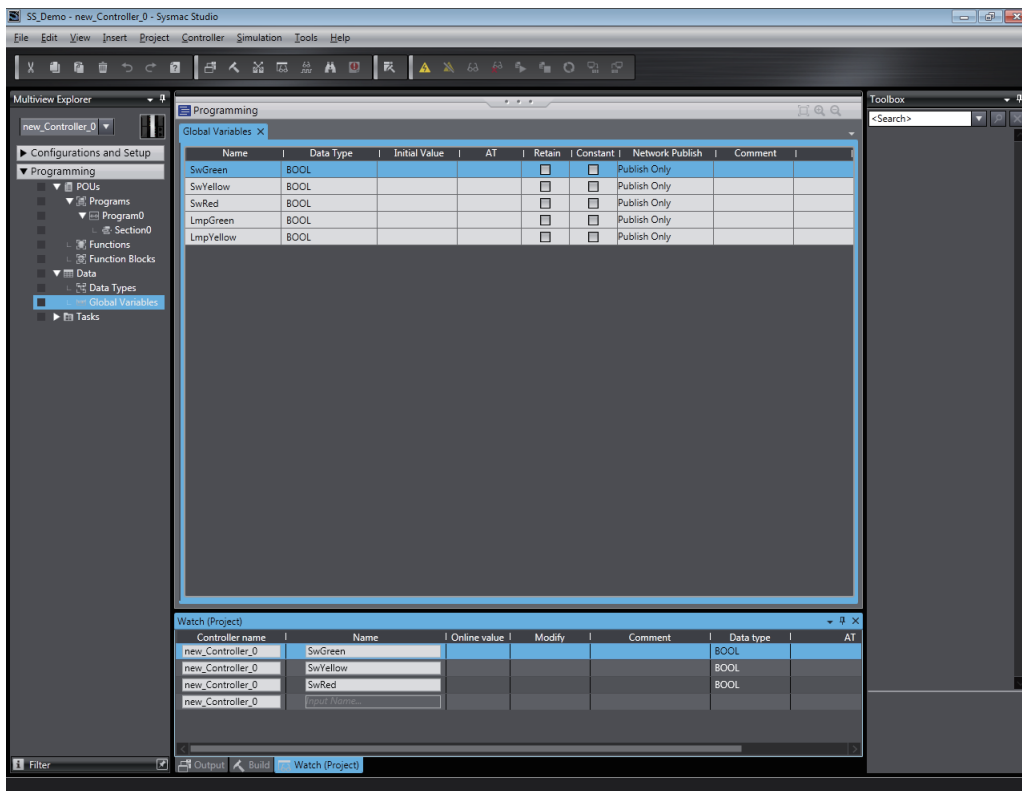
Use the following procedure to debug the project that you created to ensure that it operates correctly.

Use the Simulator to click each button to confirm whether values are set in the Controller correctly and lamps are displayed correctly.

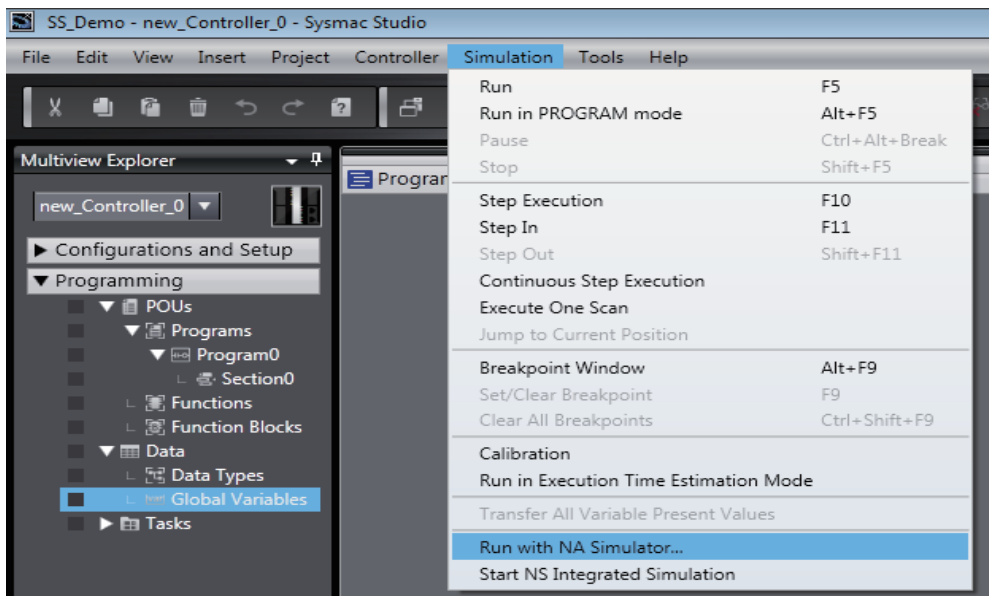
- 1 Change the device to the Controller.



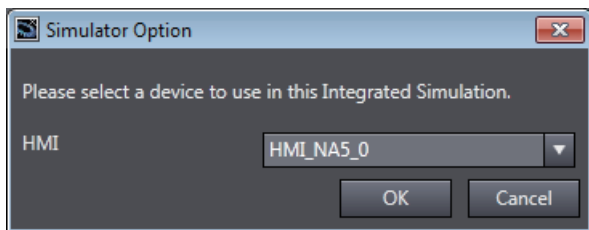
- 2 Open the Global Variables Tab Page and register *SwGreen*, *SwRed* and *SwYellow* in a Watch Tab Page.



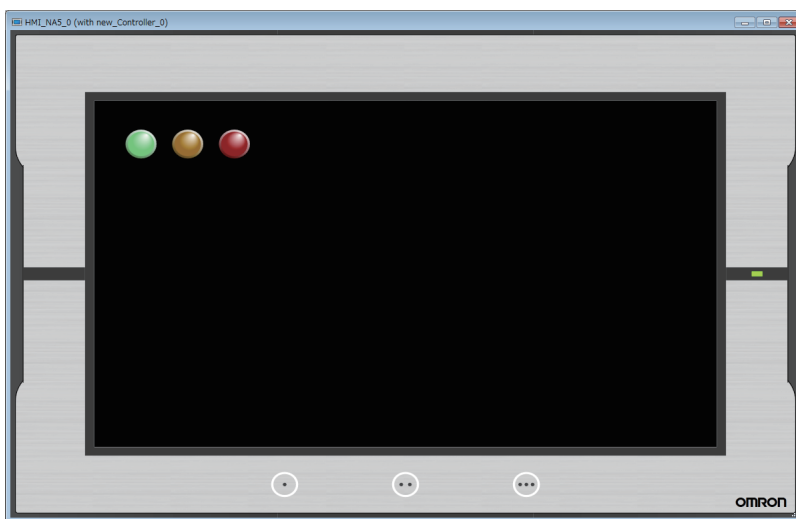
3 Select *Run with NA Simulator* from the Simulation Menu.



4 Click the **OK** Button.



- 5 Confirm that the values of the Controller variables change when you press the buttons on the page. In the same way, confirm that changes to the values on the Watch Tab Page are shown on the page.



Controller name	Name	Online value	Modify		Comment	Data type	AT
new_Controller_0	SwGreen	True	TRUE	FALSE		BOOL	
new_Controller_0	SwYellow	False	TRUE	FALSE		BOOL	
new_Controller_0	SwRed	False	TRUE	FALSE		BOOL	
new_Controller_0	Input Name...						

5

Useful Functions

This section describes useful functions that you can use with an NA-series Programmable Terminal and the Sysmac Studio.

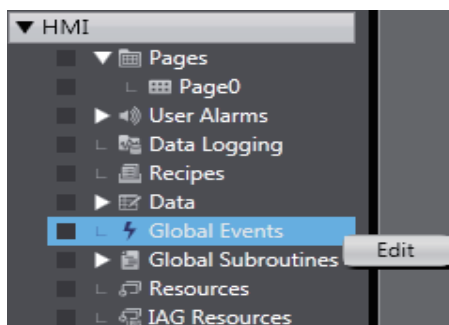
5-1 Global Events	5-2
5-2 Protecting User Programming Assets	5-5

5-1 Global Events

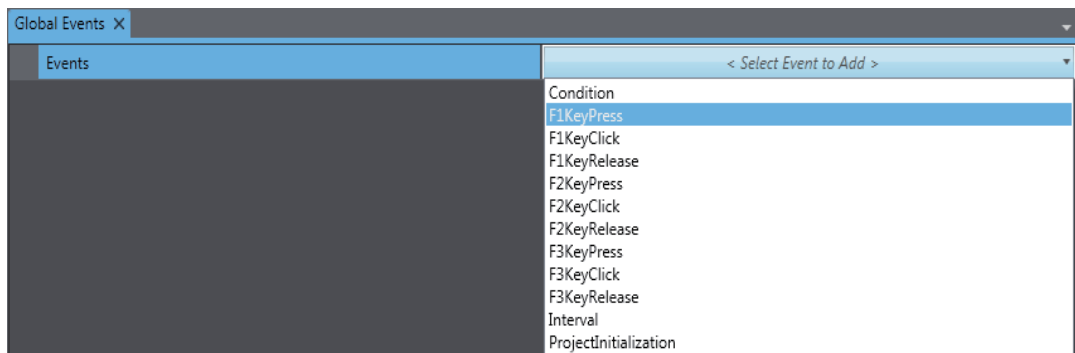
Global events allow the user to execute a specific action when a specified condition is met. A global event can be executed from anywhere within the project. You can monitor the value of a device and, for example, display a specific page when the value of a device reaches a specified value, or you can specify the operation to perform when a function key is pressed.

This section describes an example to implement the function of a green button with a function key.

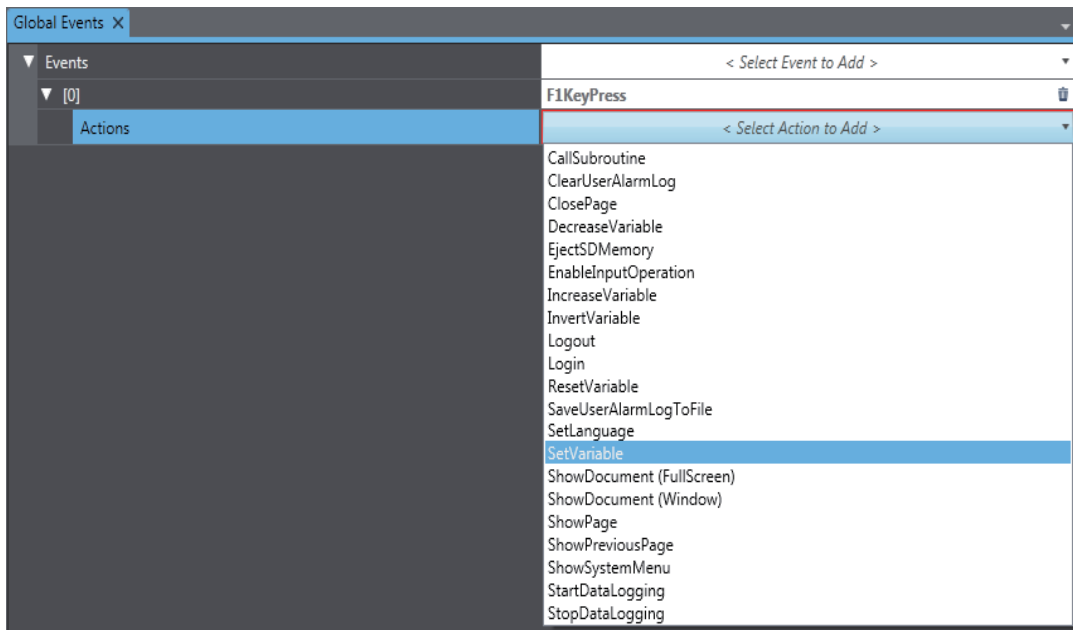
- 1 Double-click **Global Event** under **HMI** in the Multiview Explorer. Or, right-click **Global Event** under **HMI** and select **Edit** from the menu.



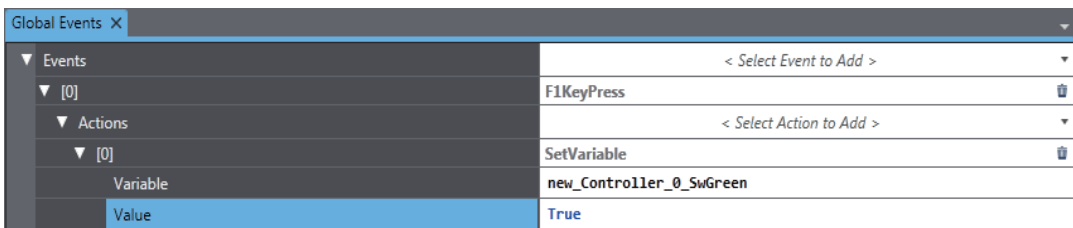
- 2 Select *F1KeyPress* from **Events**.



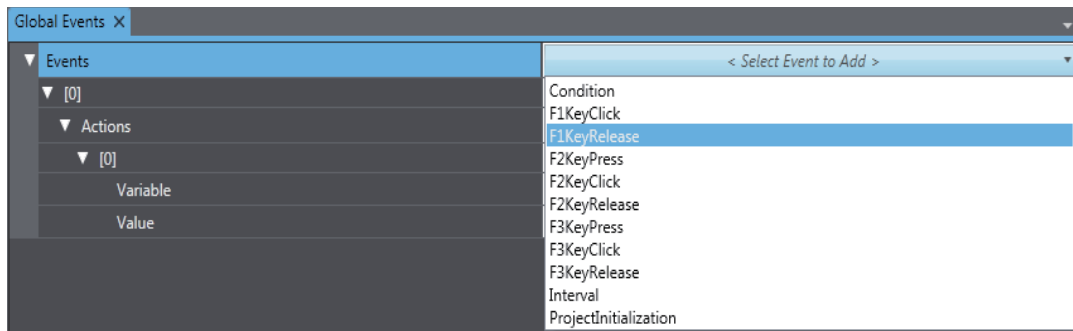
3 Select *SetVariable* from **Actions**.



4 Set **Variable** to *new_Controller_0_SwGreen* and set **Value** to *True*.



5 Select *F1KeyRelease* from **Events**.



6 Select *SetVariable* from **Actions**.

The screenshot shows the 'Global Events' configuration window. The tree view on the left is expanded to show the following structure:

- Global Events X
 - Events
 - [0]
 - FIKeyPress
 - Actions
 - [0]
 - SetVariable
 - Variable: new_Controller_0_SwGreen
 - Value: True
 - [1]
 - FIKeyRelease
 - Actions
 - < Select Action to Add >
 - CallSubroutine
 - ClearUserAlarmLog
 - ClosePage
 - DecreaseVariable
 - EjectSDMemory
 - EnableInputOperation
 - IncreaseVariable
 - InvertVariable
 - Logout
 - Login
 - ResetVariable
 - SaveUserAlarmLogToFile
 - SetLanguage
 - SetVariable
 - ShowDocument (FullScreen)
 - ShowDocument (Window)
 - ShowPage
 - ShowPreviousPage
 - ShowSystemMenu
 - StartDataLogging
 - StopDataLogging

7 Set **Variable** to *new_Controller_0_SwGreen* and set **Value** to *False*.

The screenshot shows the 'Global Events' configuration window after the second step. The tree view on the left is expanded to show the following structure:

- Global Events X
 - Events
 - [0]
 - FIKeyPress
 - Actions
 - < Select Action to Add >
 - [0]
 - SetVariable
 - Variable: new_Controller_0_SwGreen
 - Value: True
 - [1]
 - FIKeyRelease
 - Actions
 - < Select Action to Add >
 - [0]
 - SetVariable
 - Variable: new_Controller_0_SwGreen
 - Value: False

5-2 Protecting User Programming Assets

You can use security to protect your programming assets. The following security functions are supported. This section provides an overview of the security functions.

Security function	Purpose
Overall project file protection	Preventing the theft of assets
Operation authority verification	Preventing incorrect operation
Write protection	
HMI device names	Preventing incorrect connections



Additional Information

For the details on security, refer to the *Sysmac Studio Version 1 Operation Manual (W504)* and *NA-series Programmable Terminal Software User's Manual (V118)*.



Index



Index

A		V	
animations	2-2	variables	2-3
application with high reusability	2-2		
automation software	1-3	W	
D		wiring the power supply	3-3
data types	2-3		
data types of variables	2-3		
debugging	4-18, 4-24		
devices that are used	1-3		
E			
event-driven applications	2-2		
events and actions	2-2		
G			
global events	5-2		
global subroutines	2-4		
global variables	2-3		
I			
initial settings	4-10		
installing the Sysmac Studio	3-2		
M			
mapping	4-8		
O			
offline debugging	1-2, 4-23		
online debugging	1-2, 4-18		
P			
page subroutines	2-4		
properties	2-2		
S			
security function	5-5		
startup procedures	1-2		
subroutine variables	2-3		
subroutines	2-4		
system configuration	1-3		

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