OMRON

V120-E1-01

Programmable Terminal

NA-series

Startup Guide

NA5-15W101☐
NA5-12W101☐
NA5-9W001☐
NA5-7W001☐

sysmac
always in control

V120-E1-01

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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.

The following manual is also available to walk you through installations and operations up to starting actual operation using simple examples.

Refer to it as required.
• *NA-series Programmable Terminal Startup Guide Manual* (Cat. No. V120)

Manual Structure

Page Structure and Markings

The following page structure is used in this manual.

Level 2 heading

Level 3 heading

A step in a procedure

Indicates a procedure.

Special information

Icons indicate precautions, additional information, or reference information.

Manual name

Level 1 heading

Level 2 heading

Level 3 heading

Give the current headings.

Page tab

Gives the number of the main section.

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3 Installation and Wiring

3-3 Installing NA-series PTs

3-3-1 Installation in a Control Panel

Installation in a Control Panel

The NA-series PT is installed by embedding it in a control panel. Panel Mounting Brackets and a Phillips screwdriver are required to mount the NA-series PT. The required number of Panel Mounting Brackets are included with the NA-series PT.

Panel Mounting Bracket   Phillips screwdriver

Use the following installation procedure.

1 Open a hole in which to embed the NA-series PT with the following dimensions and insert the NA-series PT from the front side of the panel.

Vertical

Horizontal

Recommended panel thickness: 1.6 to 6.0 mm

Model	Dimensions
NA5-15W□□□□	392 $^{+1/-0}$ × 268 $^{+1/-0}$ mm (horizontal × vertical)
NA5-12W□□□□	310 $^{+1/-0}$ × 221 $^{+1/-0}$ mm (horizontal × vertical)
NA5-9W□□□□	261 $^{+1/-0}$ × 166 $^{+1/-0}$ mm (horizontal × vertical)
NA5-7W□□□□	197 $^{+0.5/-0}$ × 141 $^{+0.5/-0}$ mm (horizontal × vertical)

Additional Information

You can use an NS-USBEXT-1M USB Relay Cable to extend the USB slave connector on the back panel of the NA-series PT to the front surface of a control panel. If you use the USB Relay Cable, open a hole with the following dimensions and install the Cable.

2 Attach the panel mounting brackets from the back of the panel as shown in the following figure.

The number of mounting brackets depends on the size of the NA-series PT, as shown in the following table. Refer to Bracket Mounting Locations for Different NA-series PT Sizes on page 3-8, below.

Model	Number of Panel Mounting Brackets
NA5-15W□□□□	8 locations
NA5-12W□□□□	6 locations
NA5-9W□□□□	4 locations
NA5-7W□□□□	4 locations

Catch the brackets in the mounting holes in the NA-series PT, pull forward lightly, and then use a Phillips screwdriver to tighten the screws and secure the NA-series PT to the panel, which will be held between the mounting brackets and the NA-series PT.

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

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(Page tab: 3-3 Installing NA-series PTs | 3 | 3-3-1 Installation in a Control Panel)

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.

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Terms and Conditions Agreement

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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.
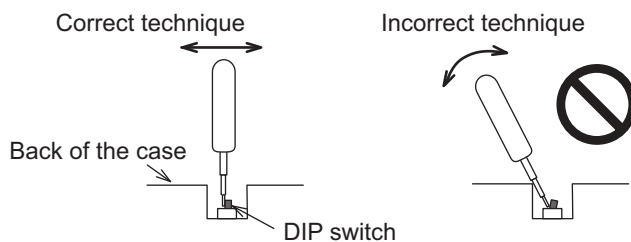
The DIP switch may break if it is levered with a tool against the case as shown in the figure.
- Once the DIP switch settings are changed, reset by pressing the reset switch, or restart the power supply.
- Initialize the project, after confirming that existing project is backed up at the Sysmac Studio.
- 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.

  廢電池請回收

- 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.

A급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A급) 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. • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Inspection and maintenance Use this manual together with the *NJ-series CPU Unit Software User's Manual* (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. • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (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. • Introduction and features • System configuration design • Installation and wiring • I/O memory allocation • Troubleshooting Use this manual together with the *Programming Manual* (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. • Programming • Master function • File memory • Other functions Use this manual together with the *Operation Manual* (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 *Operation Manual* (CS-series PLCs: W339, CJ-series PLCs: W393) and the *Programming Manual* (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 *Operation Manual* (CS-series PLCs: W339, CJ-series PLCs: W393), the *Programming Manual* (W394), and the *Instructions Reference Manual* (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. • Introduction and features • Basic system configuration • Part names and functions • Installation and setting procedures • Troubleshooting Use this manual together with the *Software User's Manual* (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. • CPU Unit operation • Internal memory • Programming • Settings • Functions built into the CPU Unit Use this manual together with the *Hardware User's Manual* (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 *Communications Commands Reference Manual* (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-E1-01

Revision code

Revision code	Date	Revised content
01	June 2014	Original production

1

System Configurations and Startup Procedures

This section describes startup procedure provided in this guide, the system configurations used for the startup, and operations to be created.

1-1   Startup procedures

This guide describes the operations from creating HMI application to debugging in regard to the NA-series Programmable Terminal as startup procedures.

As to the Controller connected to HMI, referring to a sample of the program created in the *NJ-series Machine Automation Controller Startup Guide* (CPU Unit) (W513).

The operations from creating HMI application to debugging can be performed in the system configurations as follows.

System configurations	Descriptions of operation	
• Sysmac Studio only	Offline debugging	Creating HMI application and user program for the Controller with Sysmac Studio.
		Operating the virtual HMI and the NJ-series CPU Unit with simulator on Sysmac Studio and debugging the application and the program.
• Sysmac Studio • NA-series Programmable Terminal • CPU Unit	Online debugging	Creating HMI application and user program for the Controller with Sysmac Studio.
		Debugging them on HMI actual Unit and the NJ-series CPU Unit.

Startup procedures for each system configurations are as follows.
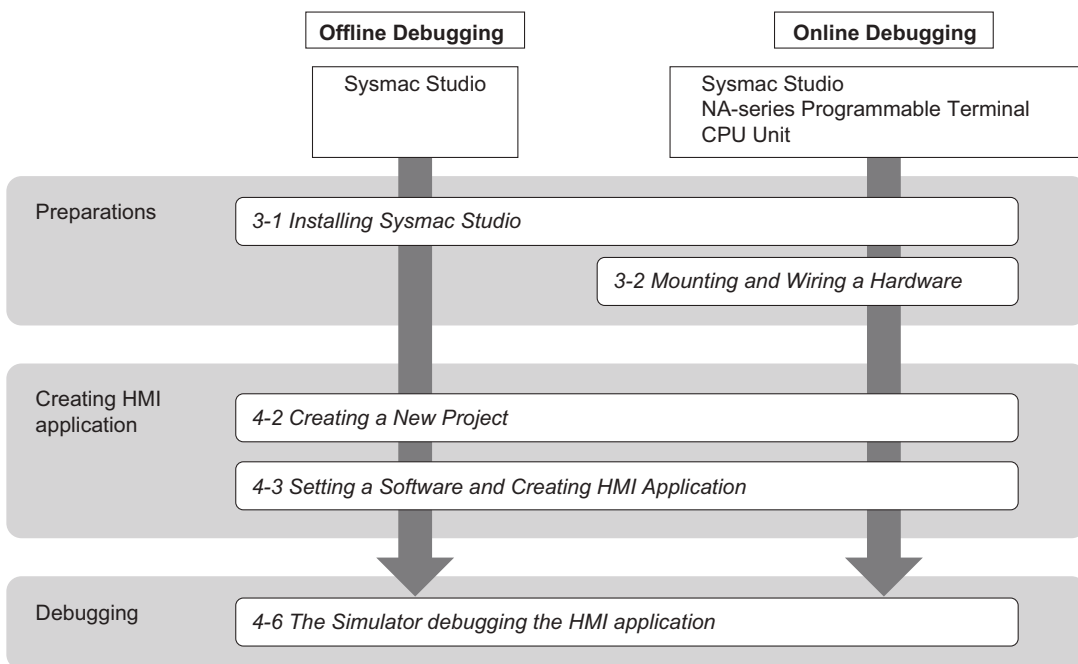
1-2   System Configurations and Units for Use

The following diagram is the system configuration used in this guide. When using HMI, connect the PC with which the Sysmac Studio is installed to USB port of the HMI.
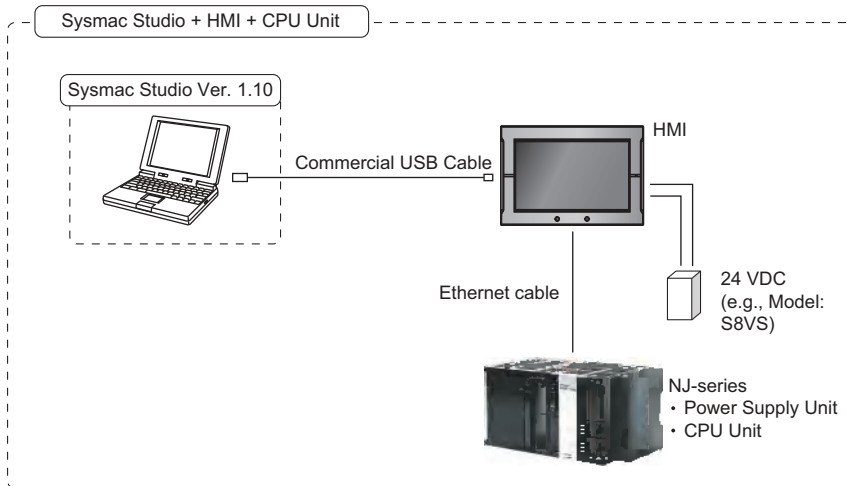
Unit for use

The Models of the Units used in the system configuration mentioned above are shown as follows. In order to determine the actual Units, refer to the manual of each Unit.

Unit name	Model	Manual name
NA-series Programmable Terminal	NA5-12W101B (Ver. 1.00)	*NA-series Programmable Terminal Hardware User's Manual* (V117)
Unit Power Supply	S8VS Series	
NJ-series CPU Unit	NJ501-1500 (Ver. 1.01)	*NJ-series CPU Unit Hardware User's Manual* (W500)
NJ-series Power Supply Unit	NJ-PA3001	
Ethernet cable	Commercial Ethernet cable [*1]	–
USB cable	Commercial USB cable [*2]	

*1. Use a category 5 cable.

*2. Use a cable for USB2.0 or USB1.1 (A connector – B connector) 5.0 m at max.

Automation Software

Software name	Number of License	Model
Sysmac Studio Standard Edition Ver. 1.10	– (Media only)	SYSMAC-SE200D
	1 license	SYSMAC-SE201L

1-3   HMI application to be created

An example to create an HMI Page which is referred to as screen data placing the Button Function over the Lamp Function on the Page.

2
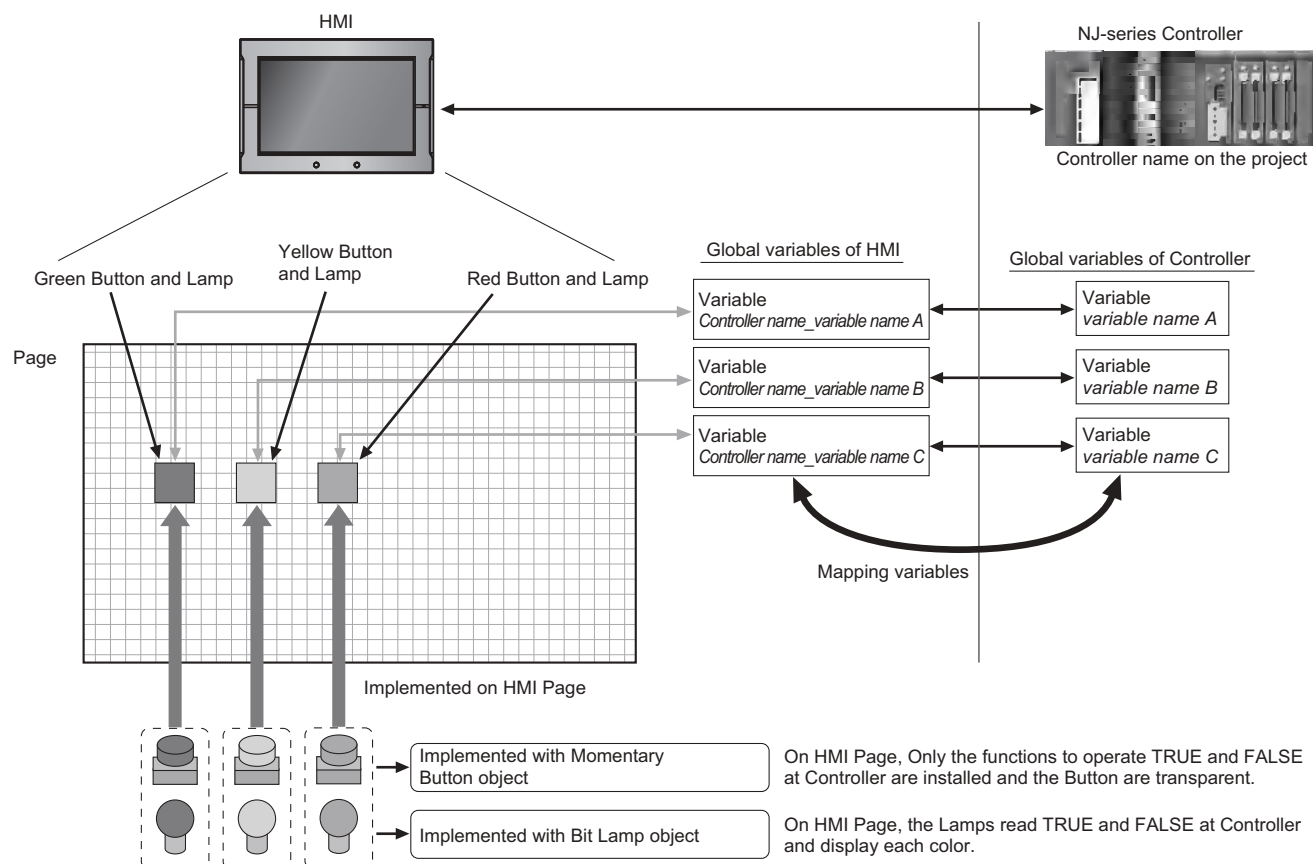
HMI Application Basics

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

2-1   Pages

Page is screen data displayed on HMI. Placing objects on the Page allows necessary functions to be implemented.

The Page and the object have three Attributes as follows.

Attributes of Page and object	Descriptions
Properties	It sets the properties of appearances such as position, size, and color.
Animations	It sets the properties of motions such as blink and movement.
Events and Actions	It sets an Event and Action corresponding to the Event.

Event-driven Application

The NA-series Programmable Terminal adopts event-driven application model that describes the processions corresponding to events occurred. Adopting the model allows to create more flexible applications than conventional HMI does.

Application with High Reusability

Once the subroutine with high versatility is registered to global subroutine, the subroutine can be called from anywhere in the project and it improves reusability and maintainability.

Also adoption of Visual Basic allows to reuse abundant samples that are released on the Internet to improve the development productivity.

2-2   Variables

A variable is like a container to store the I/O data exchanged with external devices and the temporal data at internal processing. In the HMI, all the operations such as I/O data exchanging with external devices or data arithmetic processing are performed through the variable. Therefore, it is possible to create the HMI application that does not depend on memory addresses of hardware.

Each object on a Page accesses to the variables in global variable table of HMI as follows. There are a variable (external variable) map onto global variable of the Controller and a variable (internal variable) not to map onto it.
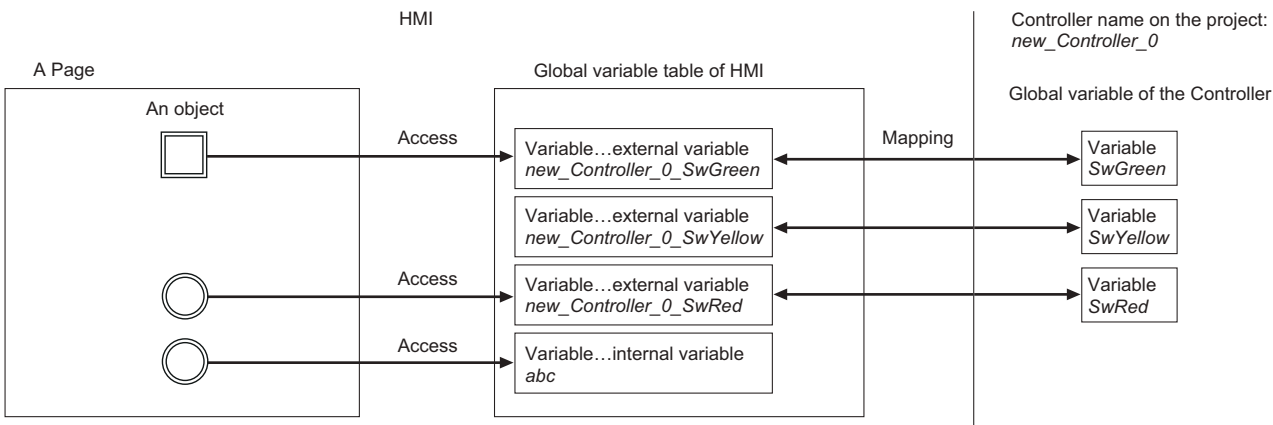
Subroutine variable and global variable

A subroutine variable is readable and writable only within the subroutine. On the other hand, a global variable is readable and writable from everywhere in the project. The application described in this guide defines the variable accessing to pushbutton switch and lamp as global variable.

Data Type of Variable

Data type is property that defines the data format and the range of value expressed with a variable. When the variable is defined, the data type should always be specified.

In the NA-series Programmable Terminal, the data type that is the same with the one of Visual Basic is available. For details, refer to the *NA-series Programmable Terminal Software User's Manual* (V118).

2-3   Subroutines

Subroutine is a program that is described with Visual Basic. Describing the operations to be executed at Event occurring as subroutine allows creating powerful application.

The subroutines include the following two types.

Type of task	Definition
Page subroutine	It is a subroutine that can be referred only within a Page.
Global subroutine	It is a subroutine that can be referred from anywhere in the project.

3

Preparing in advance

This section describes installation of the Sysmac Studio and mounting and wiring a hardware.

3-1   Installing Sysmac Studio

In the NA-series Programmable Terminal, Sysmac Studio is used as the supporting software that operates settings of the NA Unit and devices to be connected, creating applications, debugging, and simulation.

Install the Sysmac Studio to PC according to the procedures as follows.

1   Insert Sysmac Studio installation disc into DVD-ROM drive. Set-up program is automatically started and Select Setup Language dialog box is displayed.

2   Select the language to be installed and click **OK** button.

Sysmac Studio Setup wizard will be displayed.

3   Install the Sysmac Studio according to the Setup wizard.

4   When the installation is completed, restart the PC.

Additional Information

• Hardware requirement of PC to install Sysmac Studio is shown as follows.

OS	CPU		RAM	Display
Windows XP SP3 Windows Vista Windows 7 (32-bit, 64-bit) Windows 8 (32-bit, 64-bit)	Minimum	PC required with a processor Celeron 540 (1.8 GHz) or more.	2 GB	XGA 1,024 x 768 dpi 16,000,000 colors
	Recom-mended	PC required with a processor Core i5 M520 (2.4 GHz) or the equivalent or more.	2 GB	WXGA 1,280 x 800 dpi 16,000,000 colors

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

Precautions for Correct Use

When the CX-One ver.4 or lower is installed, the installation of the Sysmac Studio is cancelled and the installation is unavailable. In this case, uninstall the CX-One at first and then install the Sysmac Studio.

3-2   Assembling a Hardware

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

Precautions for Safe Use

In order to perform any of the following operations, turn OFF the power supply to the NA Unit.

- When assembling a panel.
- When setting DIP switch.
- When connecting and wiring cables.
- When connecting or disconnecting the connectors.

After turning OFF the power, the Power Supply Unit may continue to supply power to the NA Unit up to several seconds. The RUN indicator remains lit as long as the power is supplied. Make sure that the RUN indicator is unlit before performing the operation as above.

3-2-1   Wiring Power Supply

Wire the power supply of the Power Supply Unit and the power terminal of the NA Unit.
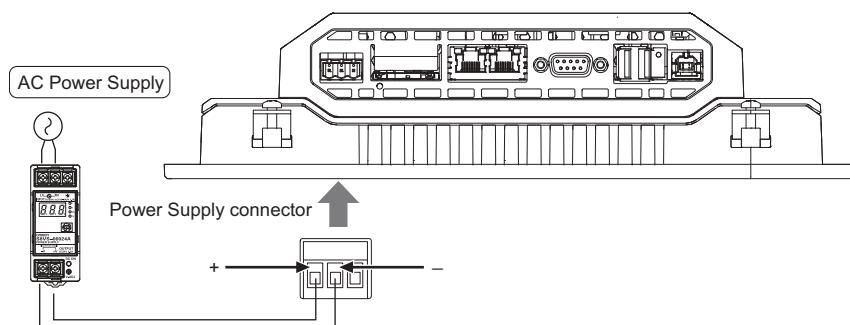
Additional Information

This guide uses the Power Supply Unit, S8VS-06024. However, you can use any Power Supply Unit that satisfies the specifications.

3-2-2   Wiring Ethernet communication cable

Wire the Ethernet port and the Ethernet cable according to the diagram as below.

The Ethernet port
Connect to Ethernet port 1.

Communication cable

The internal Ethernet/IP port

4
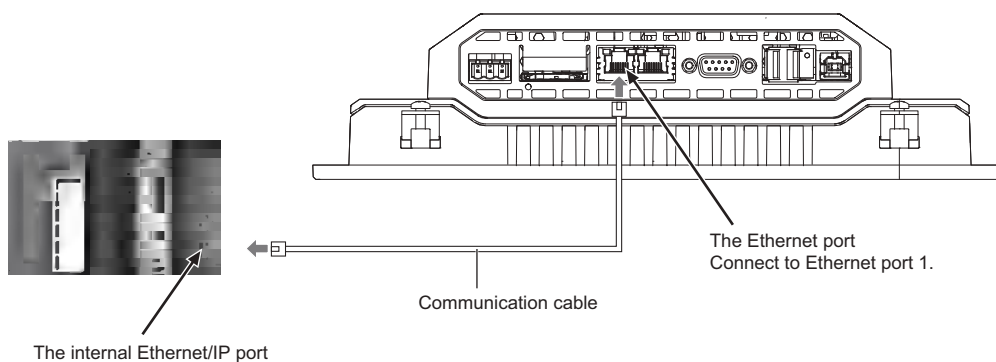
Creating HMI Application and Debugging

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

4-1   Operation Flowchart

The basic operation flowchart from creating HMI application to debugging is shown.

As the NA-series Programmable Terminal is available to create HMI application with variables, users do not have to be conscious of addressable memory space. This allows the design to be developed independently and parallel, without being conscious of memory assignment on the Controller.

For understanding advantages of the creating HMI application with the variables, this guide describes the operation procedures when creating HMI application is performed without connecting to the Unit.

STEP 1. Creating a new project. (P. 4-3)
Create a project file and insert an HMI.

STEP 2. Setting a software and creating an HMI application. (P. 4-6)	
STEP2-1	Software setting (variable mapping and HMI setting) (P. 4-8)
STEP2-2	Creating HMI application (variable registration and creating Page)

STEP 3. Debugging the HMI application. (P. 4-18)	
The project data is transmitted to the HMI to check the operation (online debugging). When the Unit is not used, simulation function of the Sysmac Studio is used to check the operation (offline debugging).	
STEP5-1	Preparations for online debugging. (P. 4-18)
	Preparations for offline debugging. (P. 4-22)
STEP5-2	Debugging the HMI application. (P. 4-24)

4-2   Creating a New Project

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

Startup the Sysmac Studio

Startup the Sysmac Studio.

1   Startup the Sysmac Studio with either of the methods as follow.

   • Double-click the *Sysmac Studio* shortcut icon on the desktop.

   • Select *Sysmac Studio* – *Start* in Windows – *All the programs* – *OMRON* – *Sysmac Studio*.
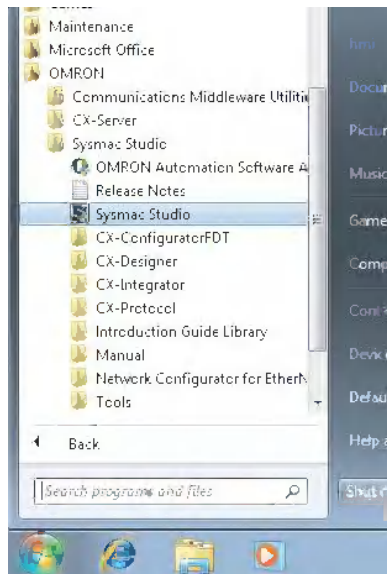
The Sysmac Studio will be started and the following screen will be displayed.

Opening the Existing Project

Open an existing project.

1   Click the **Open Project** button in a project window.

Click

[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 **Open**.

Click
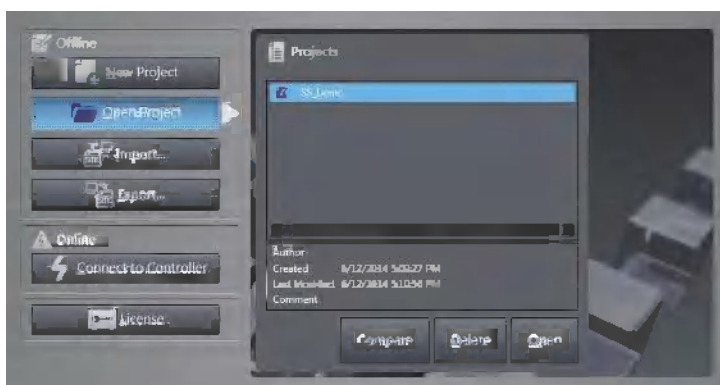
The following screen will be opened.
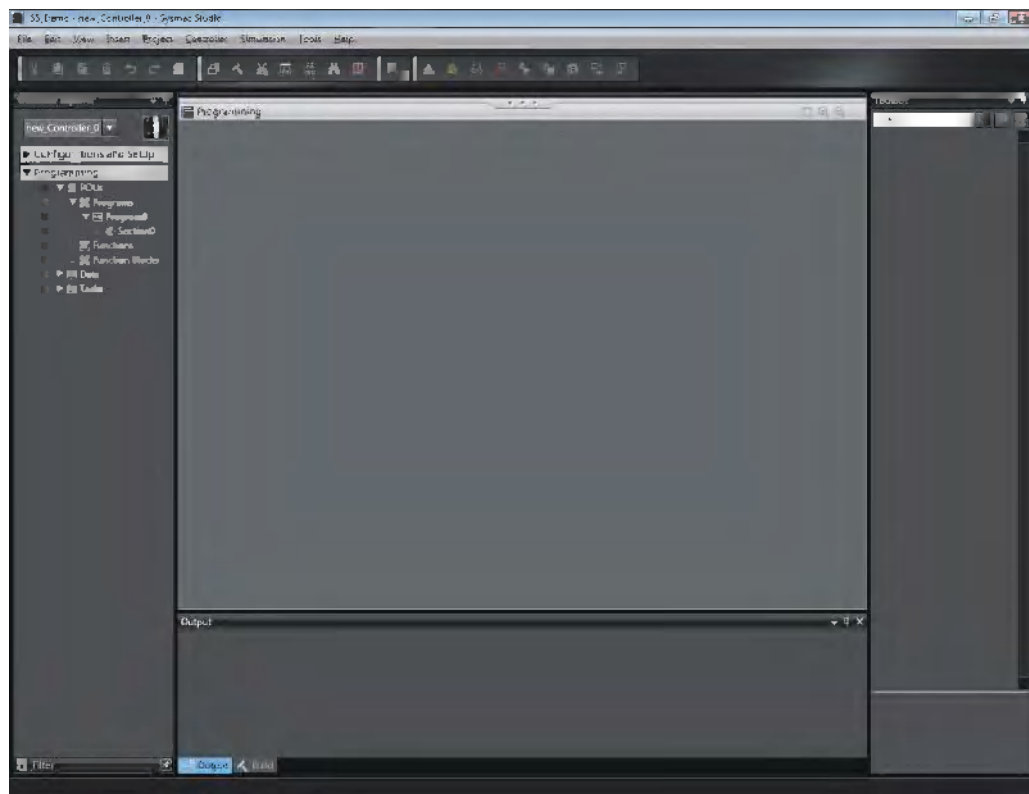
4-3   Creating an HMI Application

Creating an application as follows.

Each Green, Yellow, and Red Button and Lamp is implemented by composing a Bit Lamp with the color and a transparent Momentary Button.
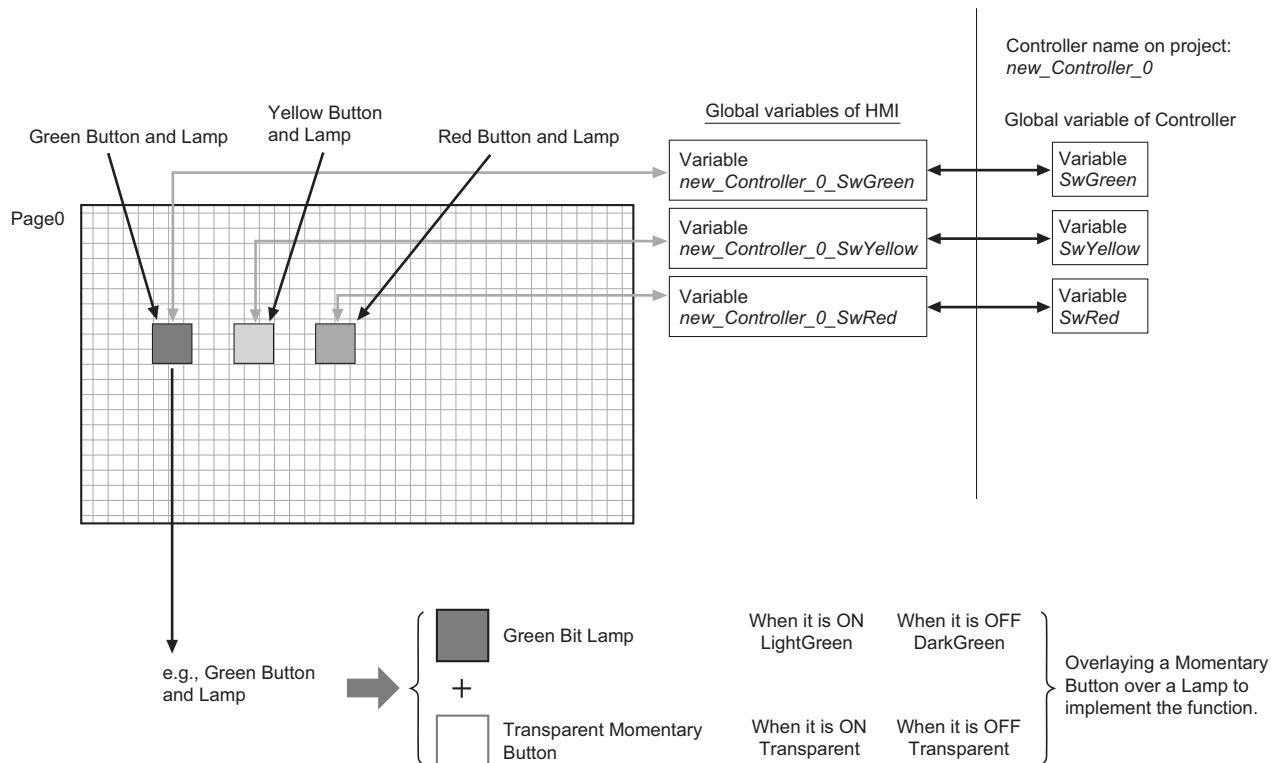
Place a Bit Lamp Object and select the color among those as follow according to the color in either of TRUE and FALSE at Controller side. Also assign the following variables on the HMI.

Type of Object	Color series	ON color	OFF color	Specified variable at Controller side
Bit Lamp Object	Green	LightGreen	DarkGreen	new_Controller_0_SwGreen
	Yellow	Yellow	Goldenrod	new_Controller_0_SwYellow
	Red	Red	Firebrick	new_Controller_0_SwRed
Momentary Button Object	Green	Transparent	Transparent	new_Controller_0_SwGreen
	Yellow	Transparent	Transparent	new_Controller_0_SwYellow
	Red	Transparent	Transparent	new_Controller_0_SwRed

📓 **Additional Information**

As the Sysmac Studio provides HMI application environment with variables, the users do not have to be conscious of system configurations of the Unit when creating HMI application.

4-4   Adding HMI to Project

Add HMI to the project.

1 Select **NA5** – **HMI** – **Insert** in Menu.
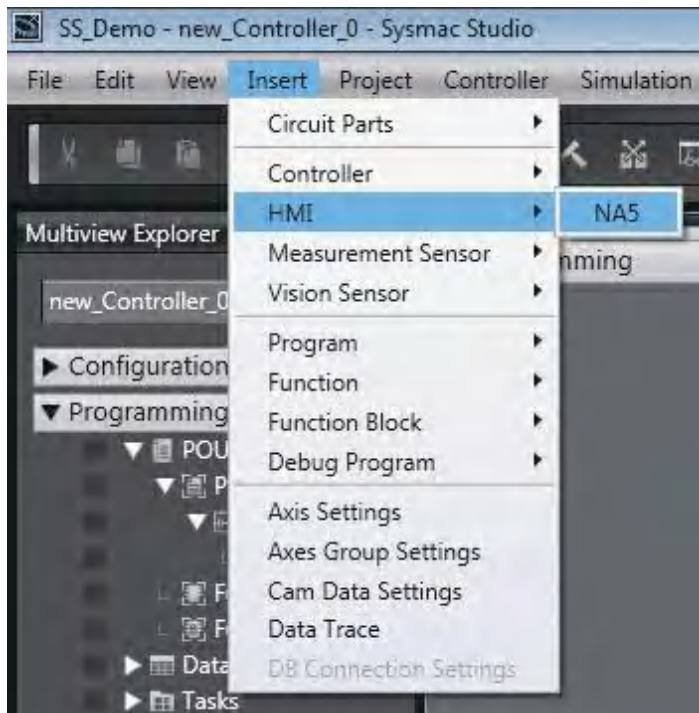
Select **NA5-12W101□** for Device and **1.00** for Version, and then click **OK**.

HMI is added to the project.
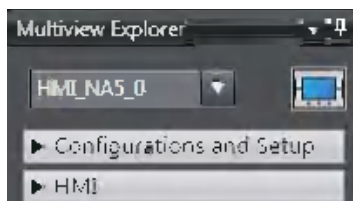
4-5   Mapping the variables of HMI and Controller

Map global variables of the HMI and of Controller.
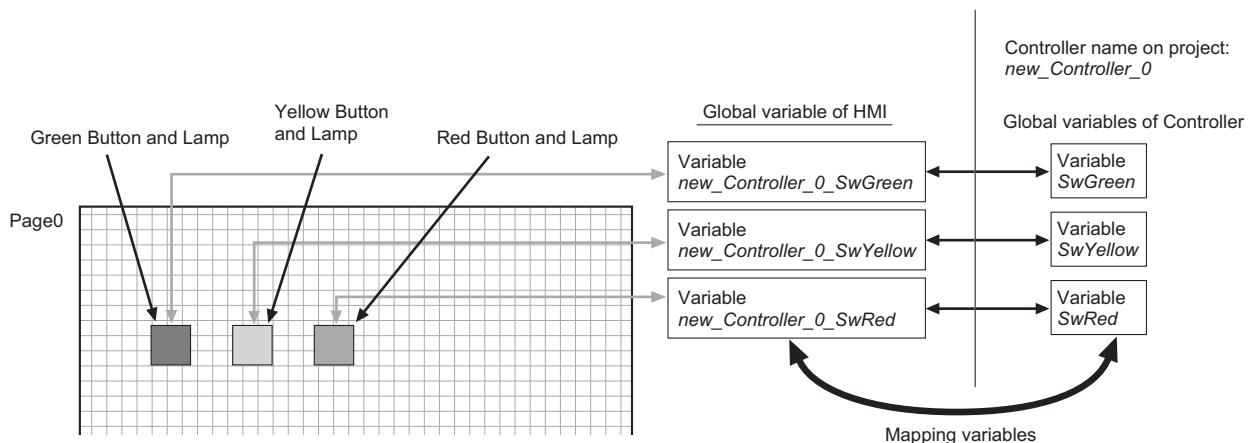
1   Double-click *Variable Mapping* – *Configurations and Setup* in Multiview Explorer. Or right-click *Variable Mapping* – *Configurations and Setup* in Multiview Explorer and select **Edit** in Menu.
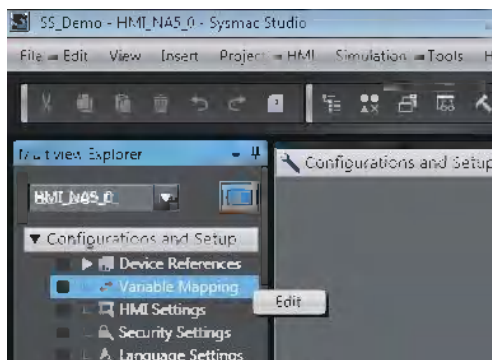
2   Click **new_Controller_0**, right-click a user variable, and select *Create Device Variable* in Menu.
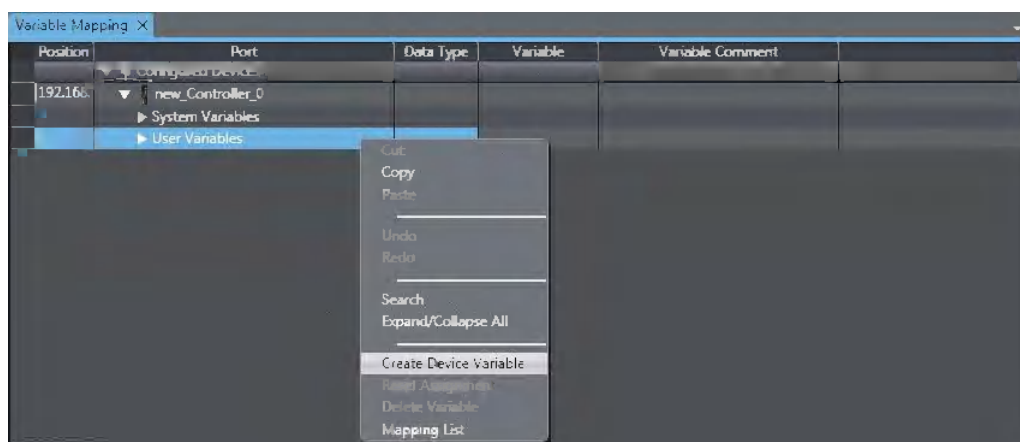
The Controller global variables are mapped into the HMI global variables.

Position	Port	Data Type	Variable	Variable Comment	
	▼ Configured Device...				
192.168.	▼ new_Controller_0				
	▶ System Variables				
	LmpGreen	BOOL	new_Controller_C_		
	LmpYellow	BOOL	new_Controller_C_		
	SwGreen	BOOL	new_Controller_C_		
	SwRed	BOOL	new_Controller_C_		
	SwYellow	BOOL	new_Controller_C_		

4-5 Mapping the variables of HMI and Controller

4

4-6   Initial Configuration of HMI

Setting devices and TCP/IP as initial configuration of HMI.

1   Double-click the **HMI Settings** – **Configurations and Setup** in Multiview Explorer. HMI Settings is displayed in Configuration layer.

2   The dialog box of Device Settings is displayed. The initial configuration is to be remained.
   • Device Settings
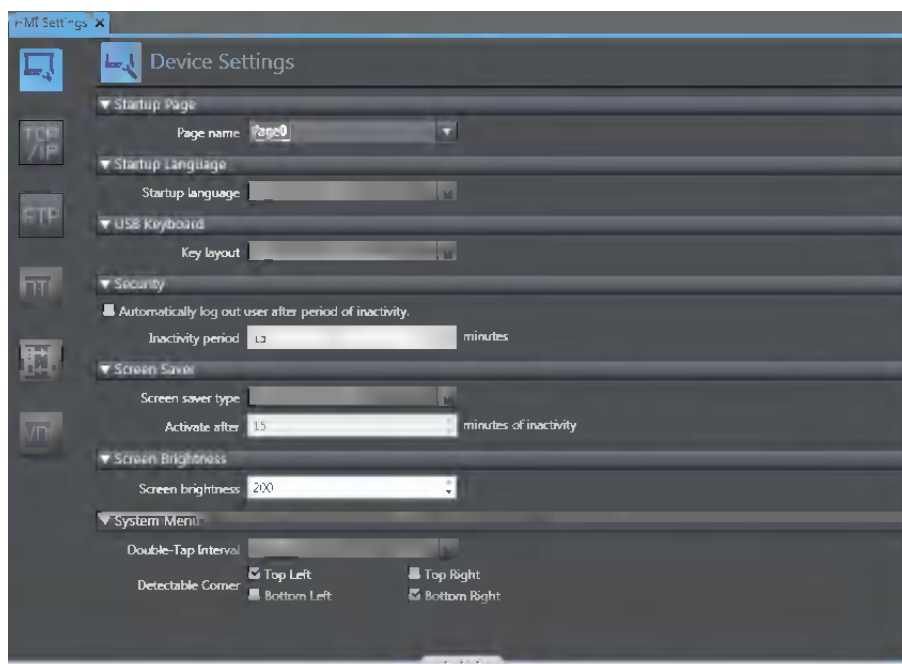
Item	Description
Startup Page	
Page name	Sets the page to display first when the HMI is started.
Startup Language	
Startup language	Sets the project language to use when the HMI is started.
USB Keyboard	
Key layout	Sets the layout of a USB keyboard.
Security	
Automatically log out user after period of inactivity.	Select this check box to automatically log out the user after a specified period of inactivity.
Inactivity period	Specify 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

Setting of the Ethernet port. The initial configuration is to be remained.
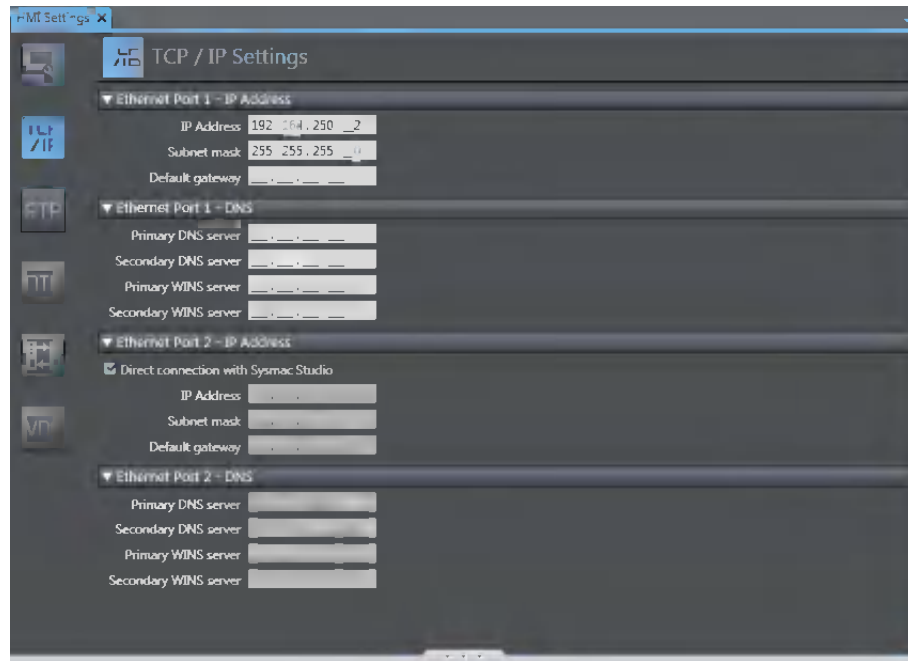
Item	Description
Ethernet Port 1 - Settings	
IP Address	Sets the local IP address.
Subnet mask	Sets the subnet mask.
Default gateway	Sets the IP address of the default gateway. This setting is not required when a default gateway is not used.
Primary DNS server	Sets the IP address of the primary DNS server.
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 a Page

Arrange Bit Lamp and Momentary Button Objects on a Page.

Each one is implemented with Lamp with color and transparent Button.

Green Button and Lamp   Yellow Button and Lamp   Red Button and Lamp

Global variables of HMI

Variable
new_Controller_0_SwGreen

Variable
new_Controller_0_SwYellow

Variable
new_Controller_0_SwRed

Bit Lamp Object: Expression
Momentary Button Object: Variable
It is specified as a variable
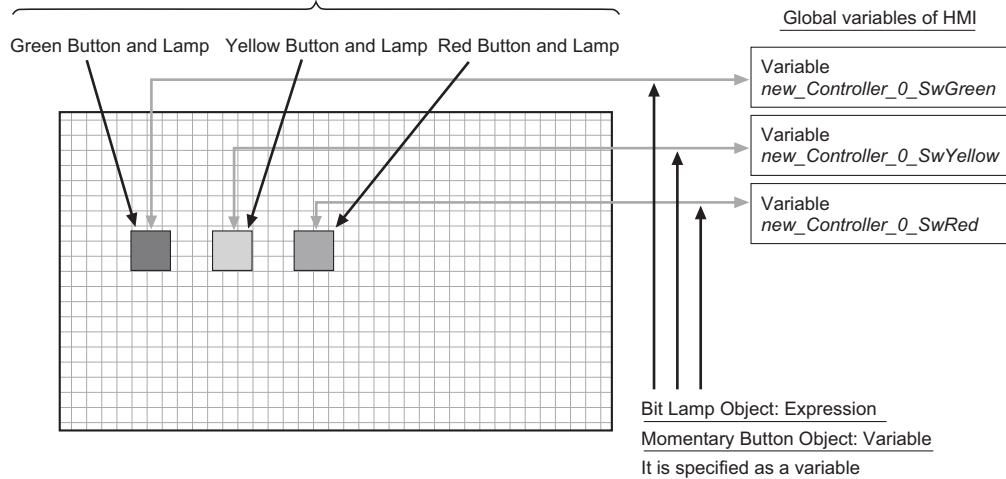
1 Double-click **HMI** – **Pages** – **Page0** in Multiview Explorer.

Or right-click the **HMI** – **Pages** – **Page0** and select **Edit** in the Menu.
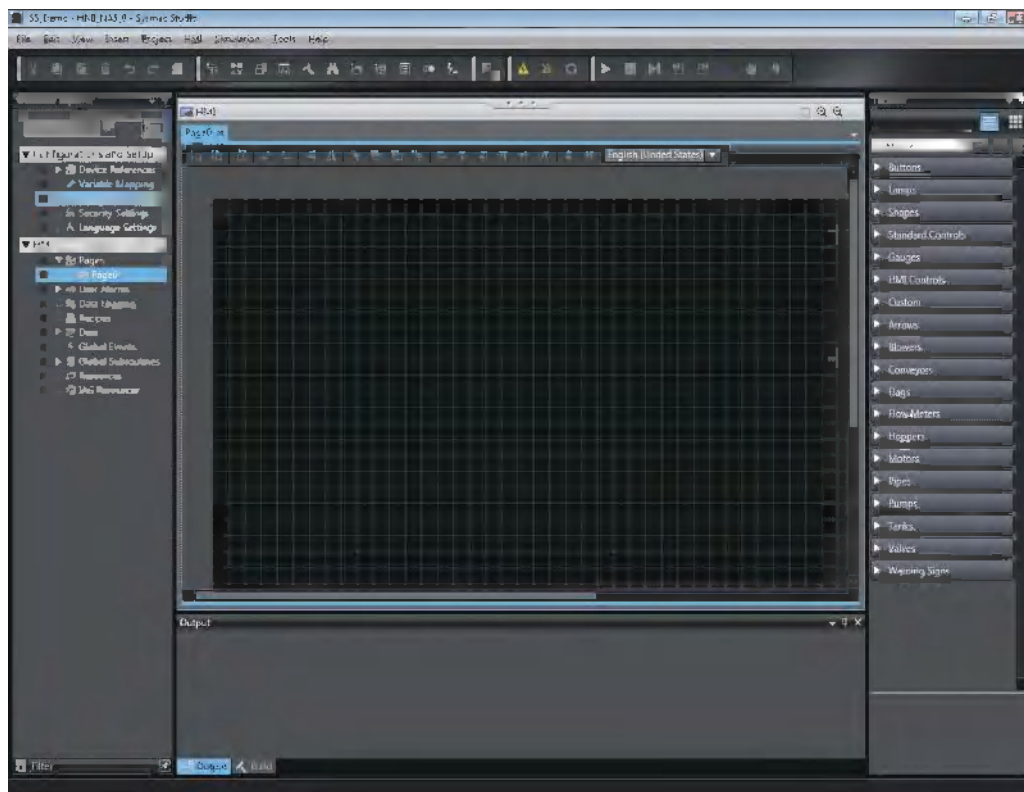
2 Overlay a Momentary Button Object on Bit Lamp Object to implement a physical Button.

Place a Bit Lamp Object from Toolbox into a Page with drag-and-drop.
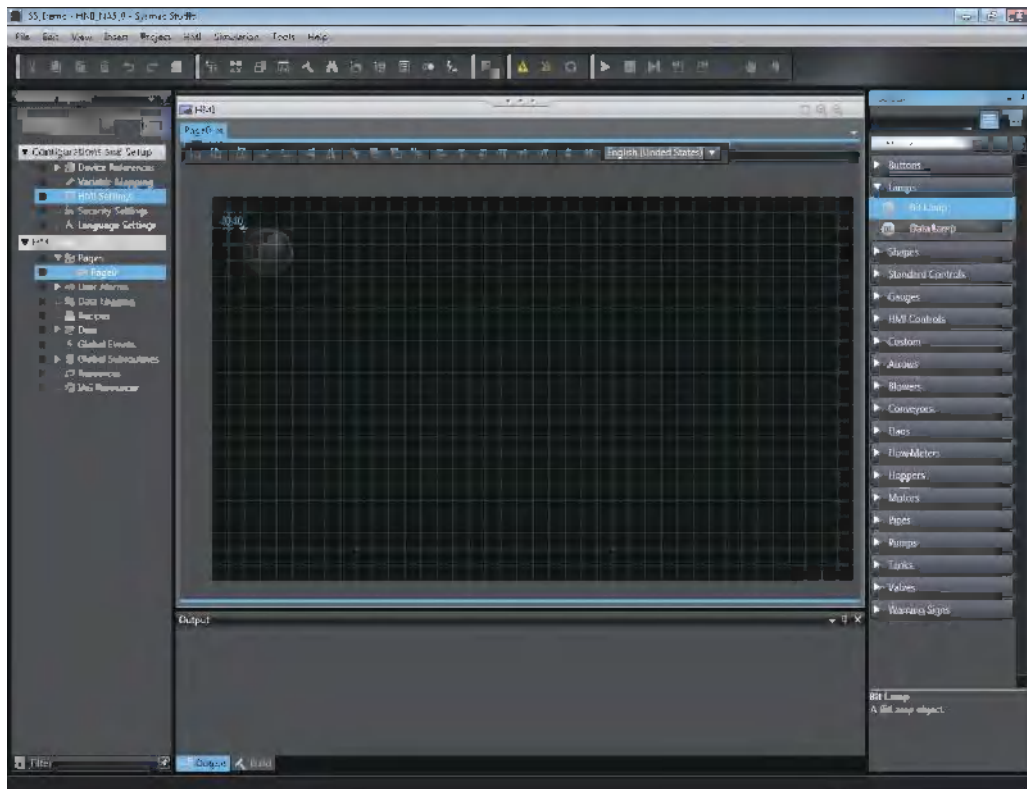
3 Set the properties of the Bit Lamp Object.

Right-click the arranged object and select *Properties* in the Menu.
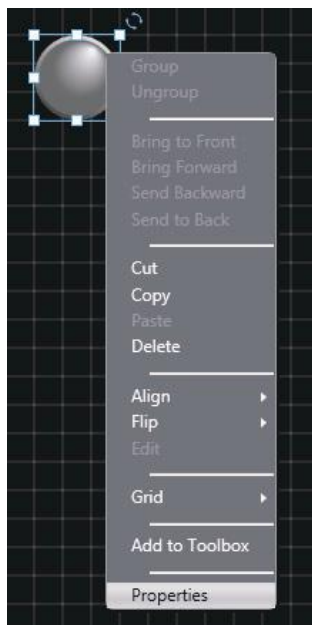
4   Set *LampColorOff* – *Appearance* to **DarkGreen** in Properties. Perform the same operations to set *LampColorOn* to **LightGreen**.
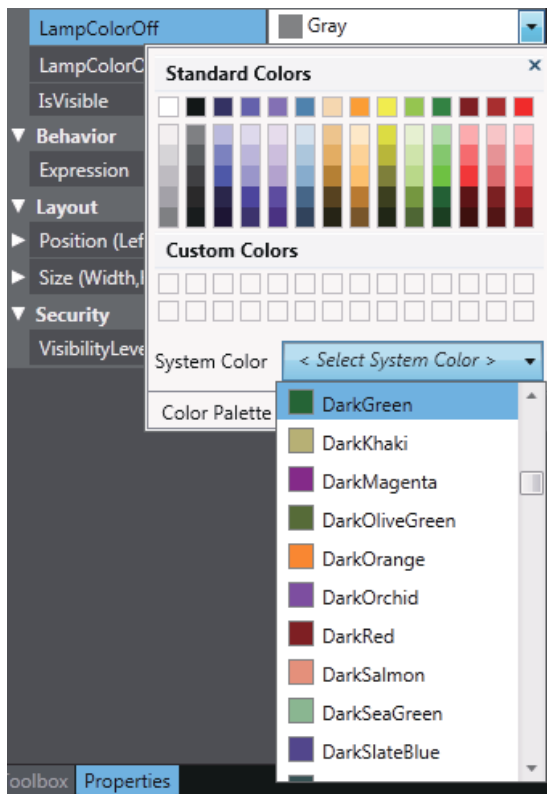
5   Assign a variable to the object. Set *Expression* – *Behavior* in Properties to *new_Controller_0_SwGreen*.

6   Follow the same procedures to create red and yellow lamps. The settings are shown as follow.

- Yellow Lamp

- Red Lamp

7   Drag-and-drop a Momentary Button Object from Toolbox into the Page as the button is overlaid on the Bit Lamp Object.
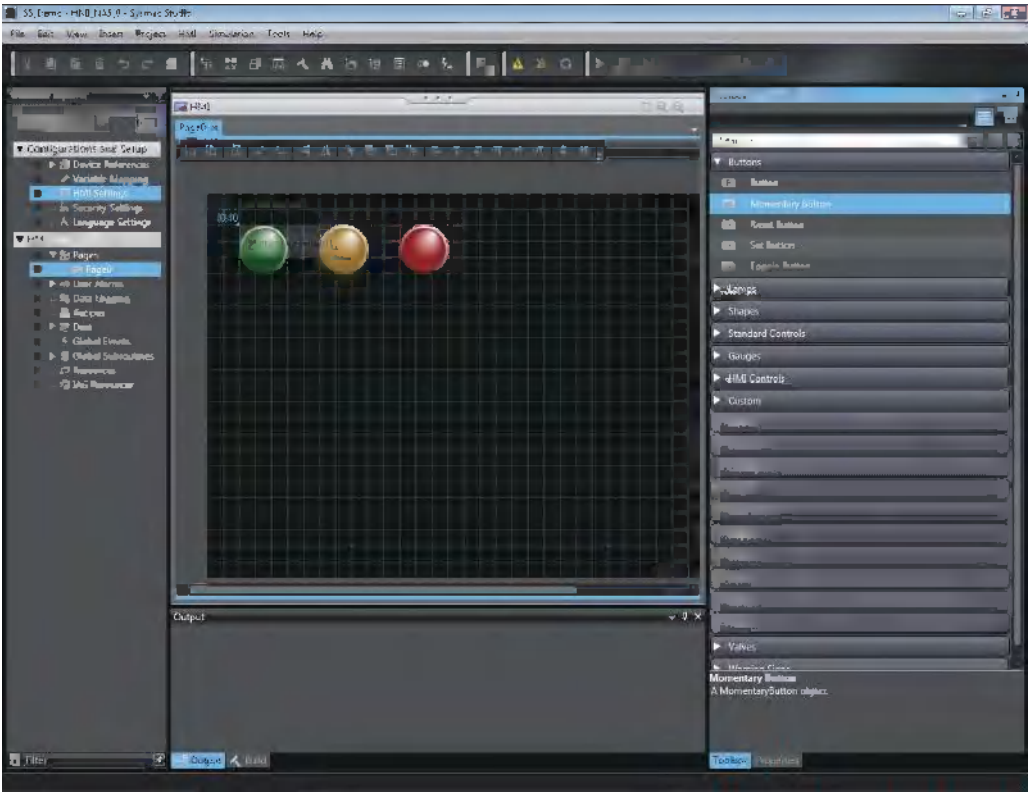
8   Match the size of the Momentary Button Object with the one of the Bit Lamp Object.
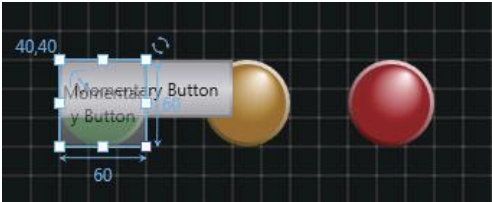
9   As the text is disused, remove the items on the list. Set *TextButtonUp(Default)* – *Appearance* to be a blank. Also set the *TextButtonDown(Default)* to be a blank.

TextButtonUp (Default)	
TextButtonDown (Default)	

10 As the Momentary Button Object should not be displayed, set the color to transparent. Select the tab of solid color in *BackgroundColorButtonUp* – *Appearance* and set System color to **Transparent.** Set another colors, such as **BackgroundColorButtonDown**, **BorderColorButtonUp** and **BorderColorButtonDown** in the same procedure.
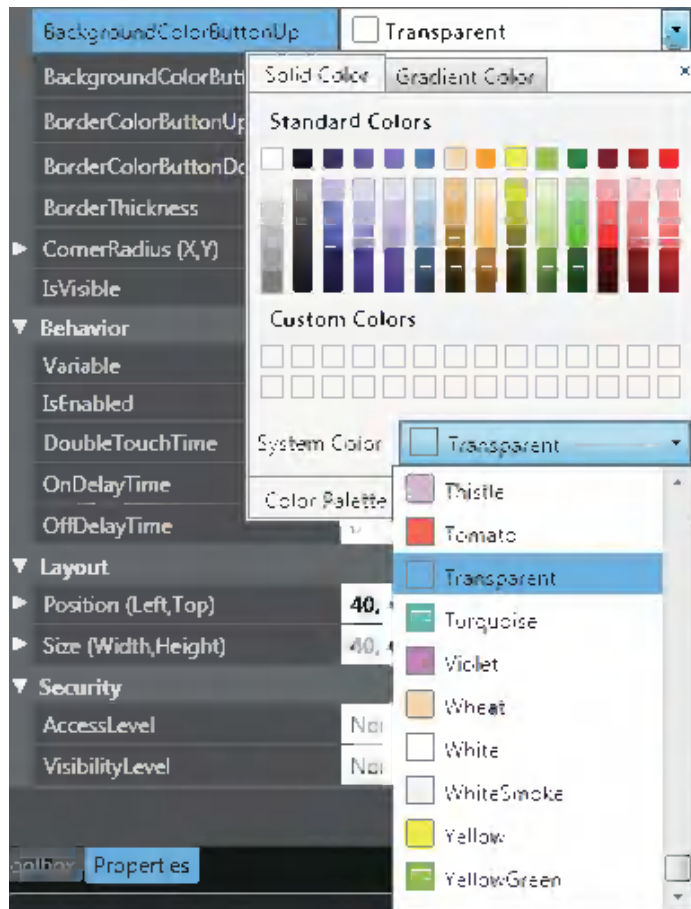
11 Assign a variable to the Momentary Button Object. Set *Variable* – *Behavior* in Property to *new_Controller_0_SwGreen*.

Variable	new_Controller_0_SwGreen

12 Create buttons corresponding to the red and yellow lamps. The settings are shown as follows.
   • Yellow Button

TextButtonUp (Default)	
TextButtonDown (Default)	

BackgroundColorButtonUp	☐ Transparent ▼
BackgroundColorButtonDown	☐ Transparent ▼
BorderColorButtonUp	☐ Transparent ▼
BorderColorButtonDown	☐ Transparent ▼

Variable	new_Controller_0_SwYellow

• Red Button

TextButtonUp (Default)	
TextButtonDown (Default)	

BackgroundColorButtonUp	☐ Transparent ▼
BackgroundColorButtonDown	☐ Transparent ▼
BorderColorButtonUp	☐ Transparent ▼
BorderColorButtonDown	☐ Transparent ▼

Variable	new_Controller_0_SwRed

Now the Page is completed.

4-8   Debugging the HMI Applications

The NA-series Programmable Terminal is implemented with the function that the operations can be verified on the simulator of the Sysmac Studio. The function is referred as Offline Debugging. When debugging should be performed without a Unit, the operations are verified through the Offline Debugging. The Offline Debugging includes a method that executes HMI project and verifies only single operation and the other method that combines the Controller's simulator.

> **Additional Information**
>
> When the operation is checked only with HMI simulator, the operation of objects can be checked. However, the debugging of the function that operates according to the value of the Controller is not available. If you need to perform debugging such a function, connect with the simulator of the Controller.

4-8-1   Preparations for Online Debugging

Execute a build as preparations for Online Debugging.

1 Select **Build HMI** – **Project** in Menu.
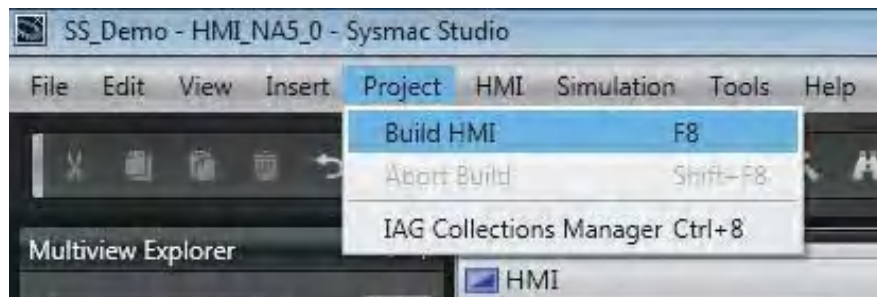
Result of the build will be displayed on the build window. If you find an error, modify the program.

Convenient Function:
When you click a line includes an error, you can jump to the corresponding rung.
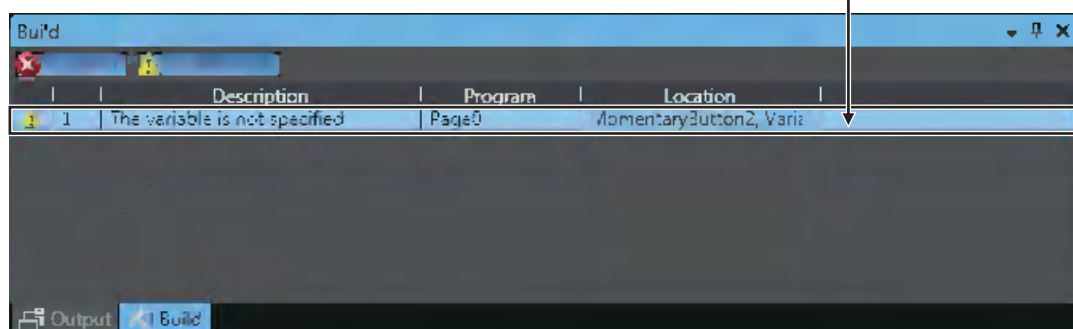
Online Connection

1   Turn ON the power supply of the HMI.

2   Connect Online with either of methods shown as follow.

Method1: Select *HMI* – *Online* in Main Menu.

Method2: Click 🔺 in Toolbar.

Method3: Press Ctrl Ctrl key + W W key.

It enters into online connection status.

Being into Online Connection, a bar in Edit Window is displayed in yellow.

The HMI status is displayed.

Transfer Project

Transfer the project to HMI. In order to transfer the project, use "Synchronization" function. By the "Synchronization" function of the Sysmac Studio, the data on PC and the data on the HMI are collated automatically and transferred to the HMI.

1   Display a Synchronization window with either of the methods shown as follows.

Method 1: Select ***Synchronization*** – ***HMI***.
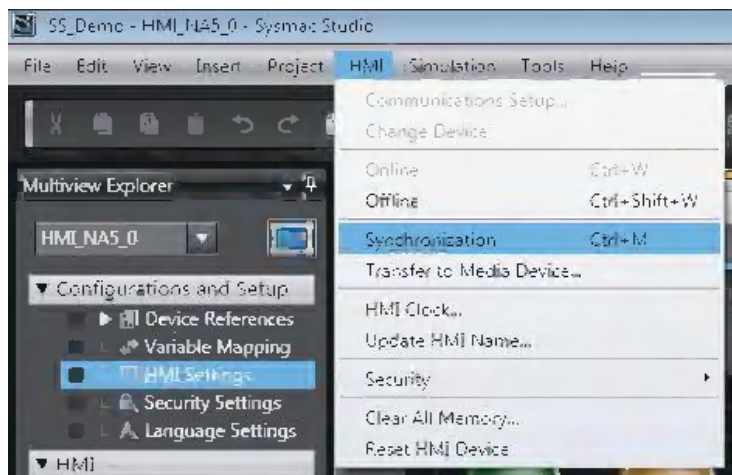
Method 2: Click ▮ in Toolbar.
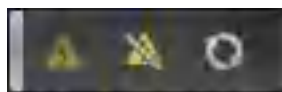
Method 3: Press ⌨ Ctrl key + ⌨ W key.

The collation the data on PC and the data on the HMI will be begun. When the collation is completed, the result of collation will be displayed.

The collation result of the data on PC and the data on the HMI is displayed.
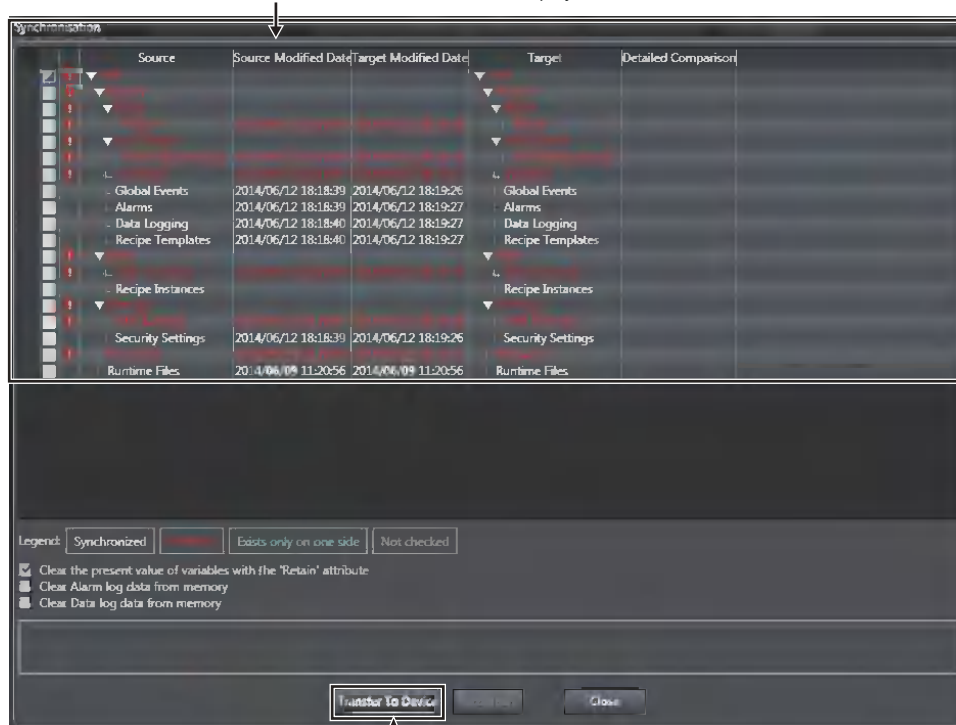
Click the button when the project is transferred from PC to the HMI.

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

Click .
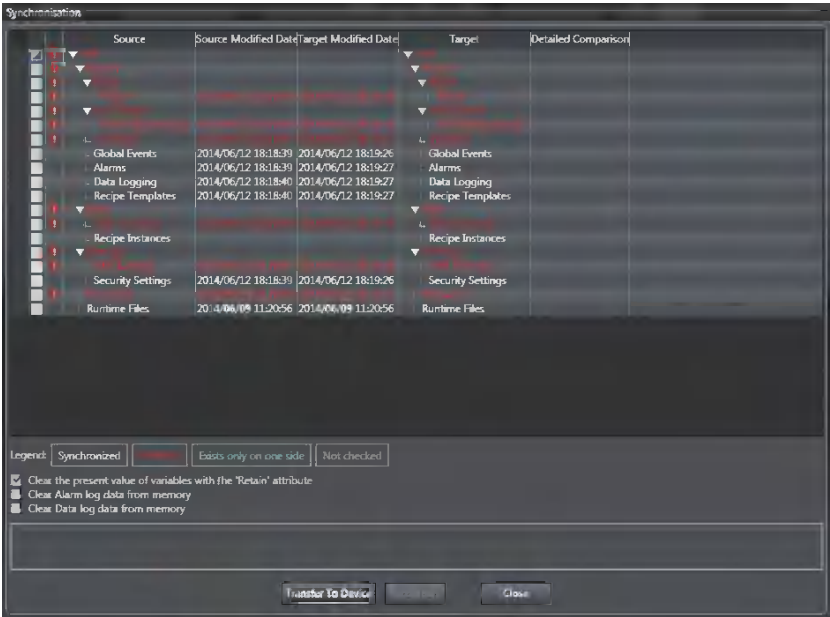
It is begun to transfer the project to the HMI. During the transfer, progress rate is displayed in Synchronization Window.
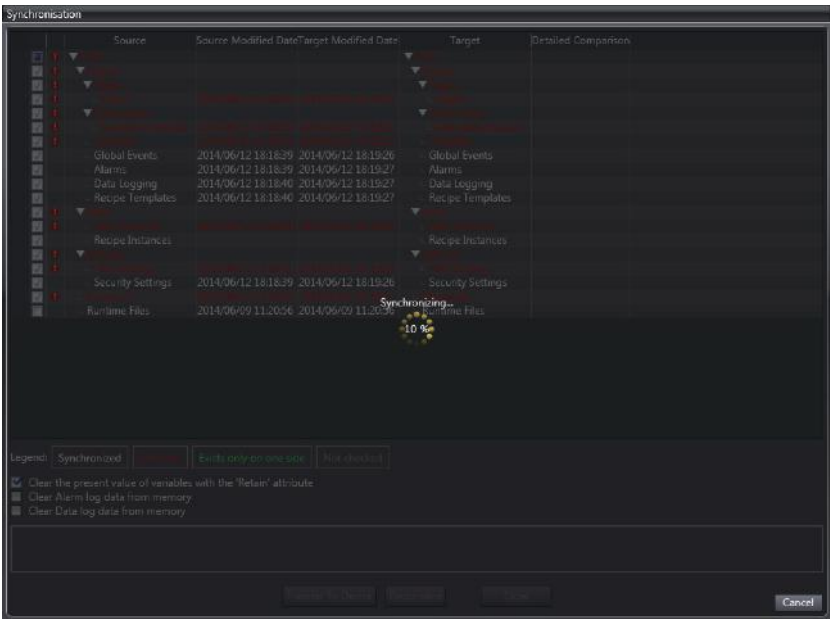
3 When the transfer is completed, the HMI automatically is restarted.

> **4** Click **Close** in right bottom on Synchronization Window.
>
> Click [Close] .
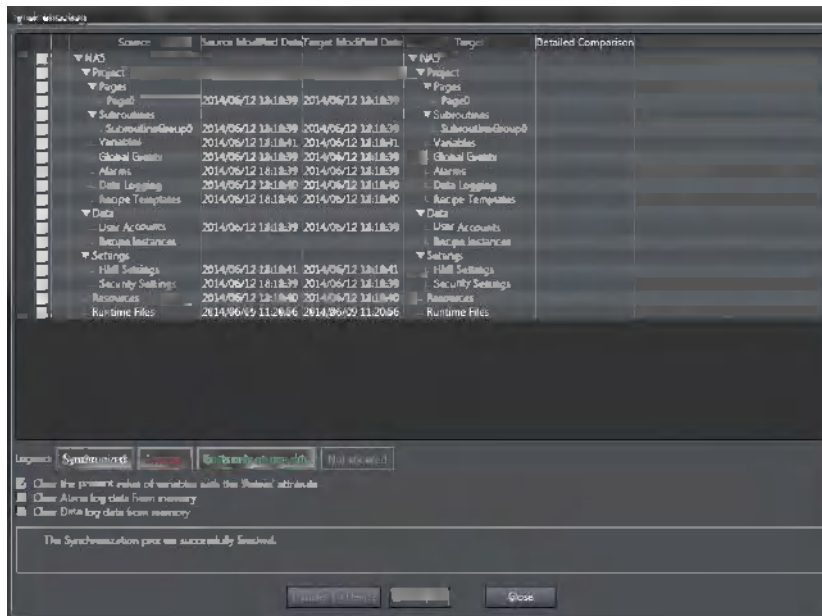
The Synchronization Window is closed.

4-8-2 Preparations for Offline Debugging

Execute a build and startup the HMI Simulator as preparations for Offline Debugging.

Execute a Build

> **1** Select [Build HMI] – [Project] in Menu.
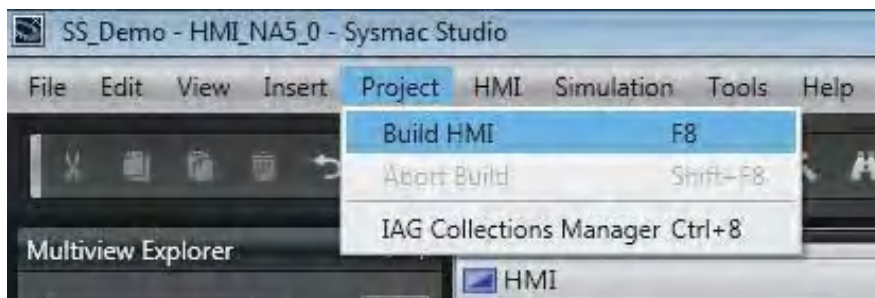
Result of the Build is displayed in Build window. When you find an error, modify applicable parts of the source.

Startup the Simulator

1   Select *Start NA Simulation* – *Simulation* in Menu.
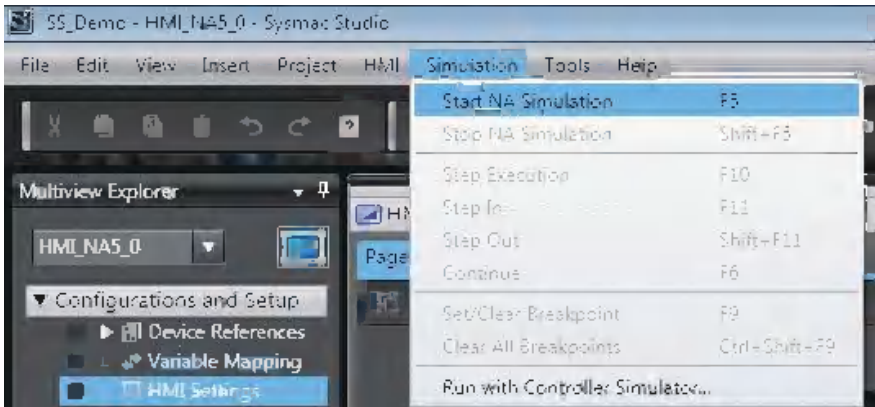
Simulation Window is displayed.
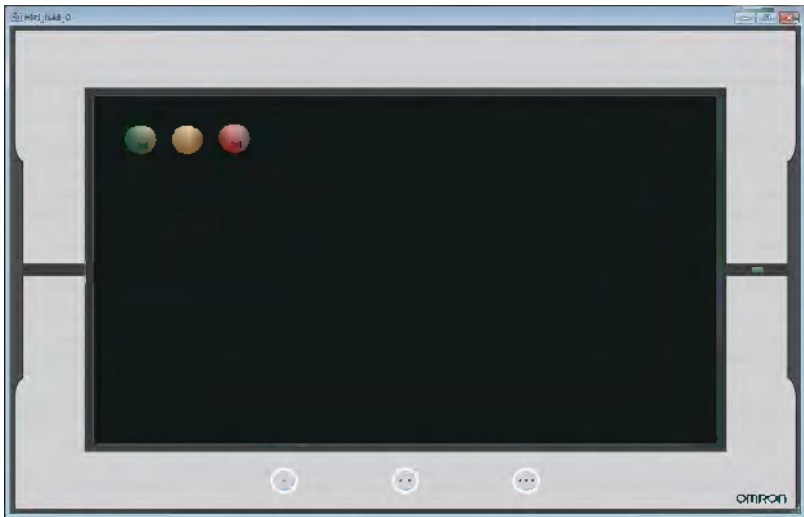
Now the Simulator is completed to be started up.

📓 **Additional Information**

The simulator is not fully compatible with actual Unit. Final confirmation is necessary on the actual Unit.

4-8-3   Debugging

Debug the project whether the created project operates correctly just as intended.

Confirm whether values are set to the Controller correctly and lamps are displayed properly when each button is pressed, using the simulator.

1   Switch the device to the Controller.
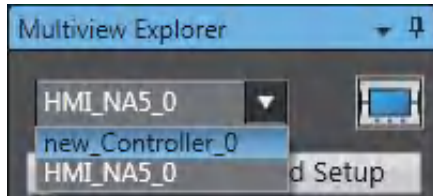
2   Open the Global Variables table and register *SwGreen*, *SwRed* and *SwYellow* to Watch Window.
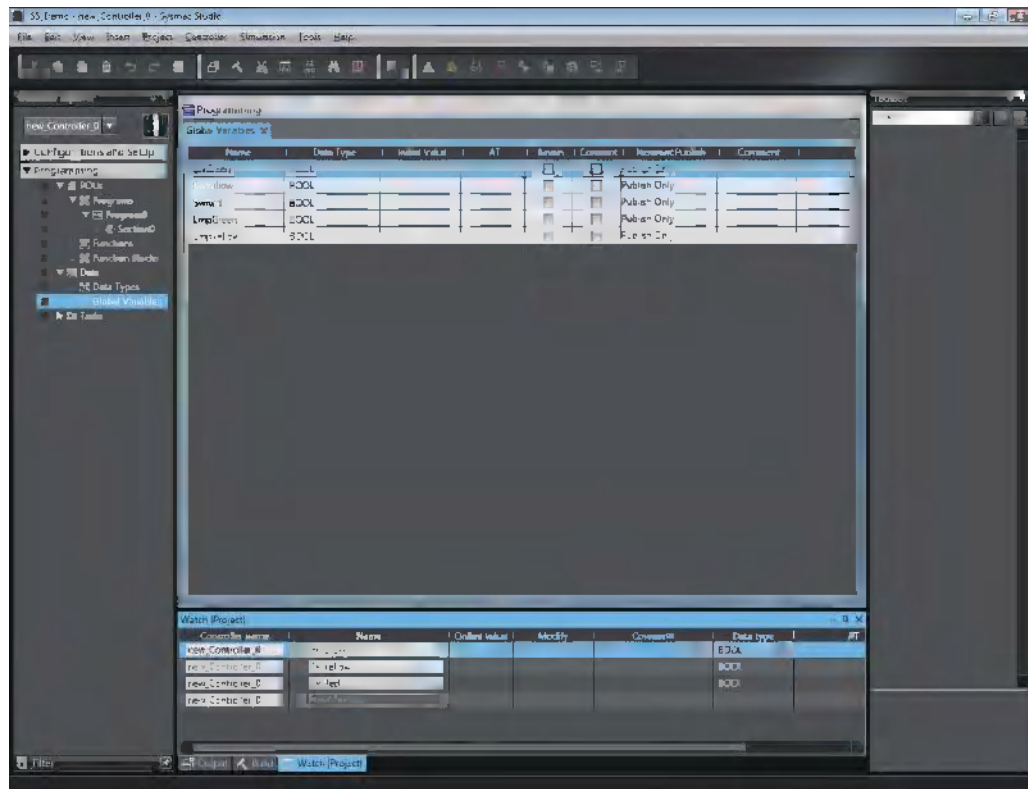
3   Select *Run with NA Simulator* – *Simulation* in Menu.
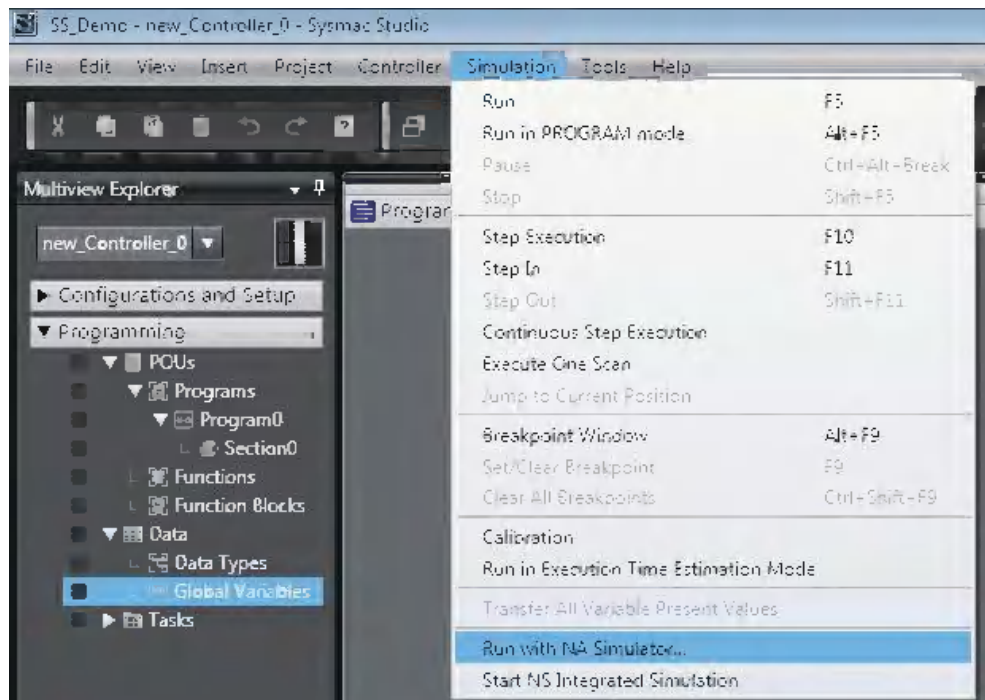
4   Click **OK**.
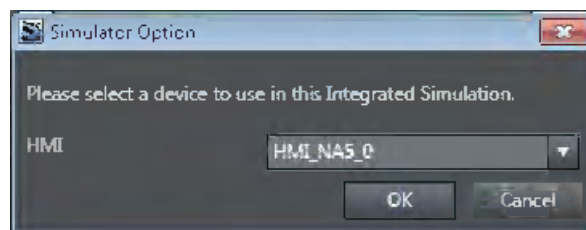
5   Confirm whether the value of the Controller variable when pressing the button on the Page. In the similar way, confirm whether the variation of the value on Watch Window should be applied to the Page.

5
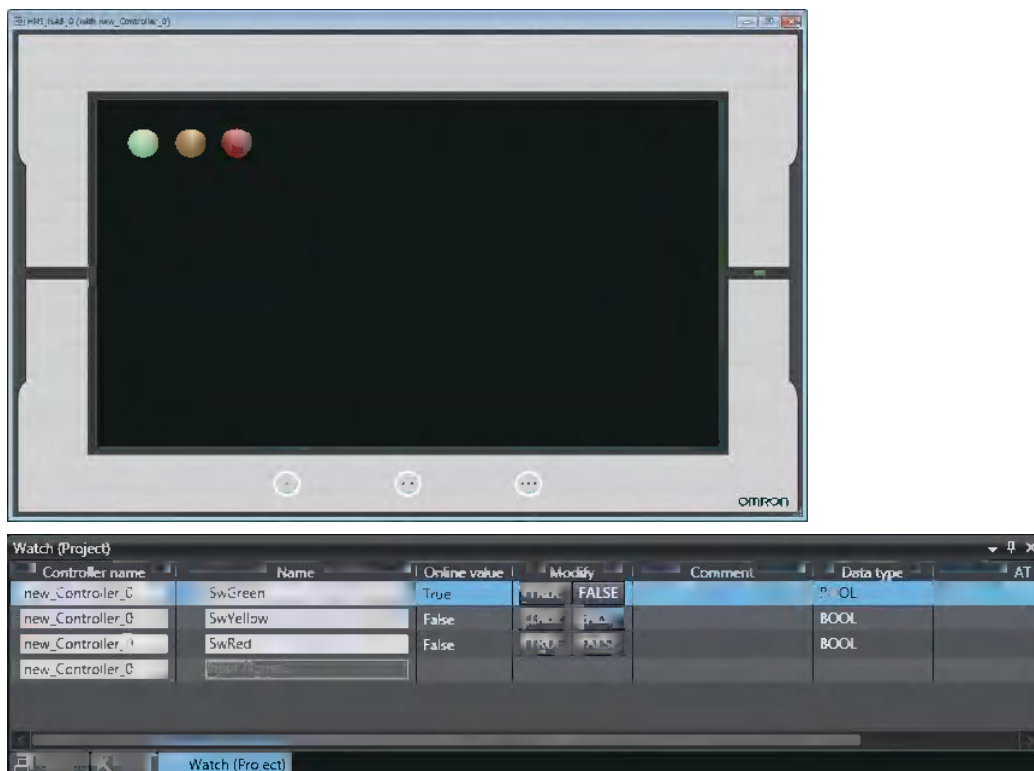
Useful Functions

This section describes useful functions when using the NA-series Programmable Terminal and the Sysmac Studio.

5

5-1   Global Event

The Global Event allows the user to execute a specific operation when a certain condition is established for whole the project. When a specific page should be displayed if the value of device reaches a certain value during the monitoring or when operation should be specified if a corresponding function key is pressed.

This section describes an example that realizes function of green button with a function key.

1   Double-click *Global Event – HMI* in Multiview Explorer. Or, right-click *Global Event – HMI* and select **Edit** in Menu.
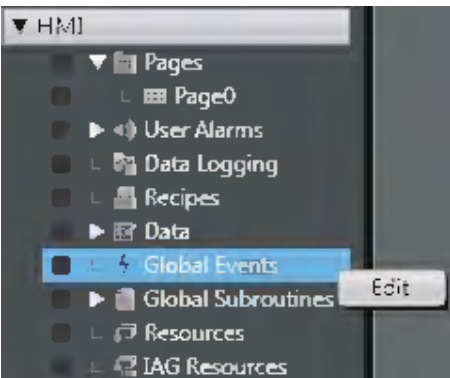
2   Select **F1KeyPress** in the **Events**.
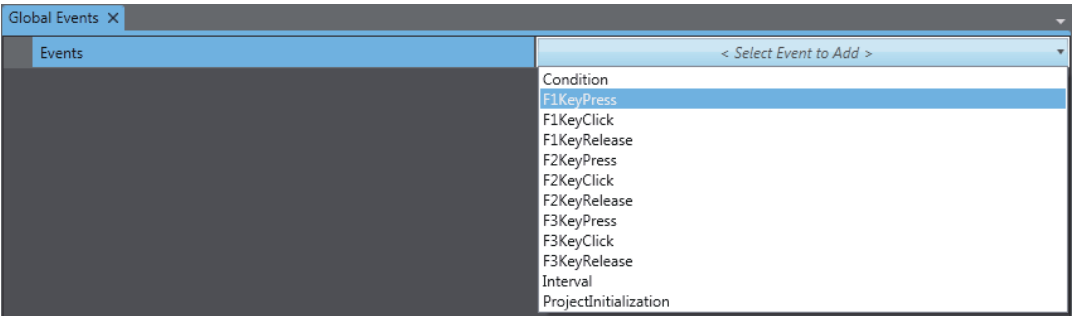
3 Select **SetVariable** in the **Actions**.
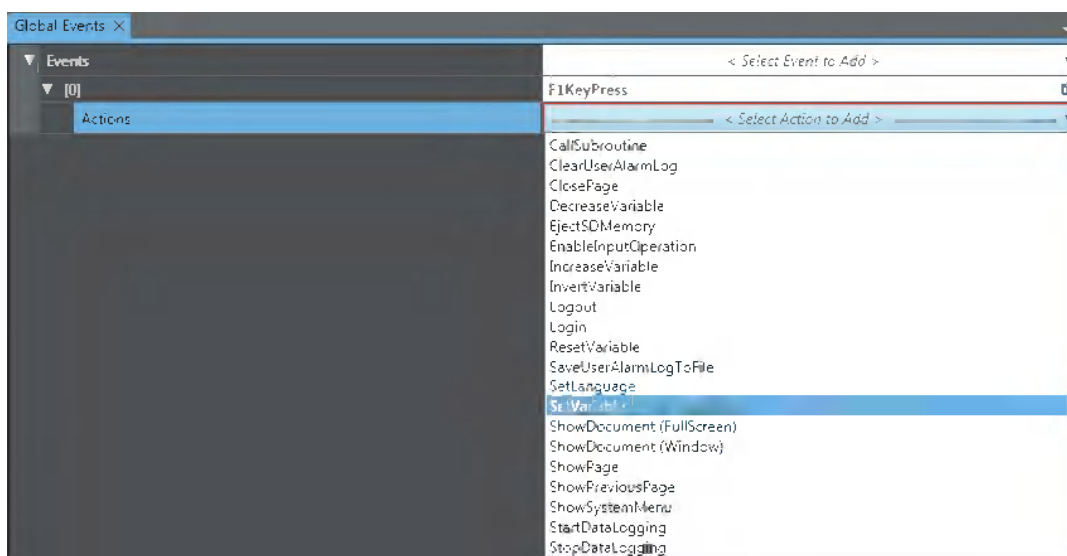
4 Set Variable to *new_Controller_0_SwGreen* and set **Value** to **True**.
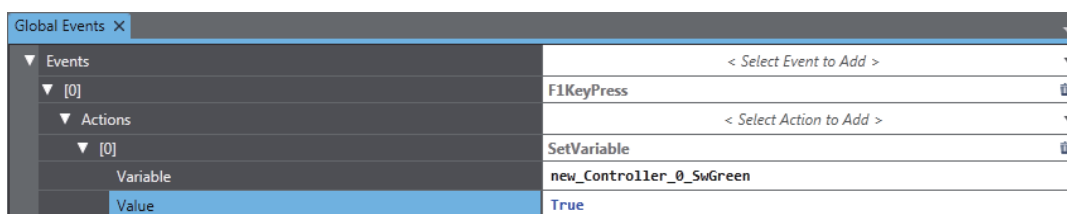
5 Select *F1KeyRelease* in the **Events**.
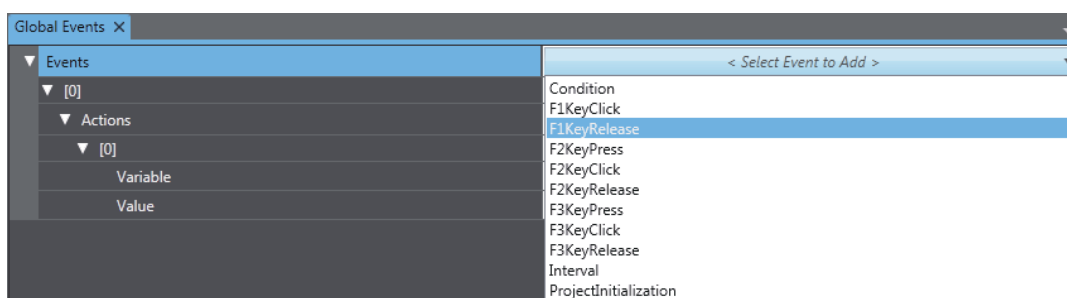
6 Select **SetVariable** in the **Actions**.
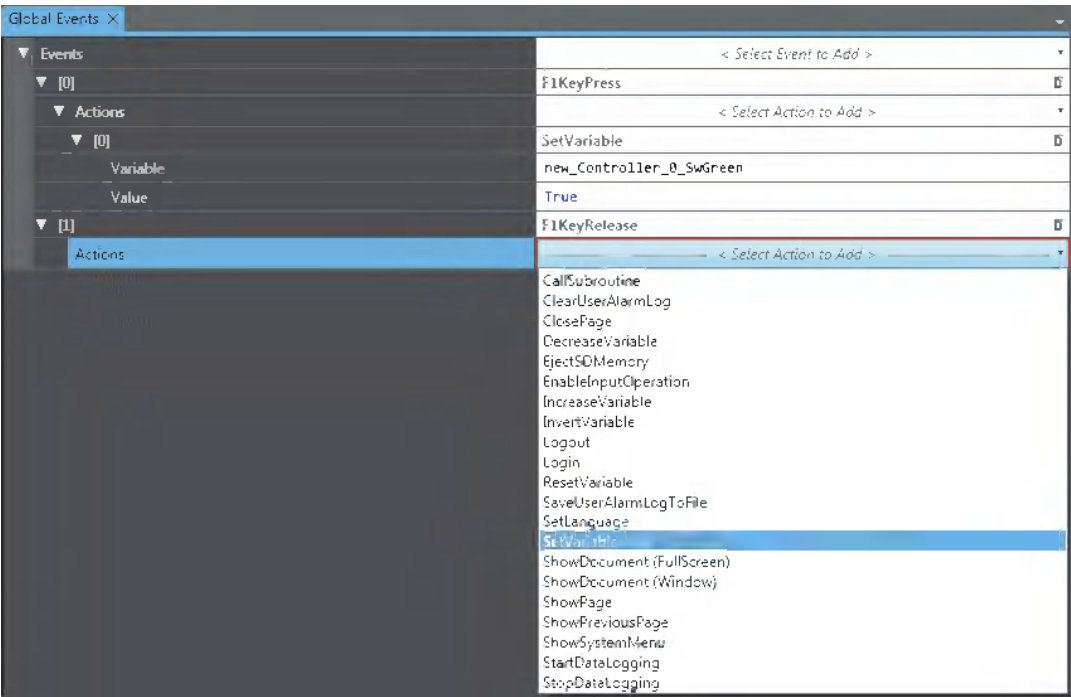
7 Set Variable to *new_Controller_0_SwGreen* and set **Value** to **False**.
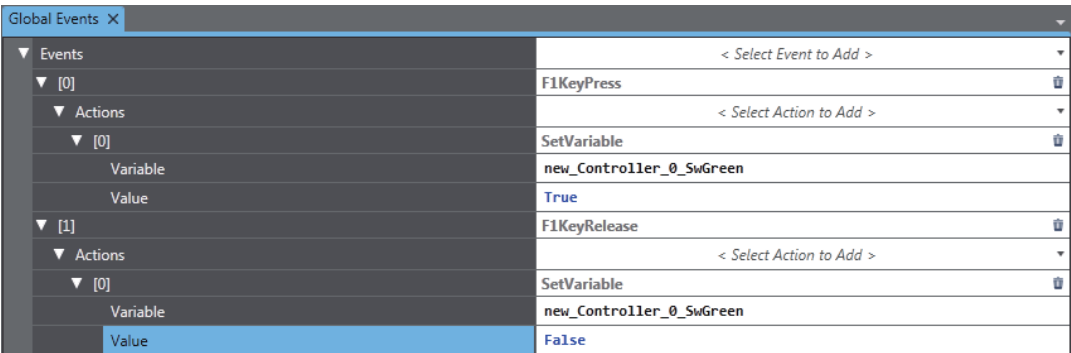
5-2   Protecting User Program Assets

Utilizing security allows the user to protect User Program Assets. The security includes functions as follows. This section describes overview of the Security Functions.

Security Functions	Purpose
Overall Project File Protection	Preventing theft of asset
Operation Rights Validation	Preventing incorrect operation
Write Protection	
HMI Device names	Preventing incorrect connection

📓 **Additional Information**

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

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