MITSUBISHI ELECTRIC

Changes for the Better

Numerical Control (CNC)

PLC Development Manual

M800/M80/E80 Series

IB-1501270(ENG)-M

Introduction

This manual explains the PLC development environment.
Be sure to keep this manual always at hand.

Peripheral development environment
The user PLC development environment using the Mitsubishi Electric FA engineering software MELSOFT Series (GX Developer/GX Works2) which is the PLC development tool for Mitsubishi Electric PLC MELSEC Series, mainly the usage specific to Mitsubishi Electric CNC, is described.

Built-in edit function (PLC On-board)
Operations related to the PLC carried out with the Mitsubishi Electric CNC unit are described.
The M800/M80/E80 Series PLC On-board is easy to use as it retains the operation system from the M700V/M70V Series. It also provides enhanced support for working together with the MELSEC Series PLC development tool (GX Developer/GX Works2), a robust ladder monitoring function as well as improved ladder editing operation.
Refer to "PLC Interface Manual" for the various signal interfaces and functions of the NC unit required when creating Mitsubishi Electric CNC sequence programs (built-in PLC).
Supported models are as follows:

Supported models	Abbreviations in this manual
M800W Series	M850W, M830W
M800S Series	M850S, M830S
M80W Series	M80W
M80 Series	M80 TypeA, M80 TypeB
E80 Series	E80 TypeA, E80 TypeB

Abbreviations in this manual are as follows:

Abbreviations	Supported models
M800, M800 Series	M800W Series/M800S Series
M80, M80 Series	M80W Series/M80 Series
M800/M80, M800/M80 Series	M800W Series/M800S Series/M80W Series/M80 Series
M8, M8 Series	M800W Series/M800S Series/M80W Series/M80 Series/E80 Series

⚠ CAUTION

⚠ **An effort has been made to describe special handling of this machine, but items that are not described must be interpreted as "not possible".**

⚠ **This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.**

⚠ **Some screens and functions may differ depending on each NC system (or version), and some functions may not be possible. Please confirm the specifications before starting to use.**

⚠ **To protect the availability, integrity and confidentiality of the NC system against cyber-attacks including unauthorized access, denial-of-service (DoS) (*1) attack, and computer virus from external sources via a network, take security measures such as firewall, VPN, and anti-virus software.**
(*1) Denial-of-service (DoS) refers to a type of cyber-attack that disrupts services by overloading the system or by exploiting a vulnerability of the system.

⚠ **Mitsubishi Electric assumes no responsibility for any problems caused to the NC system by any type of cyber-attacks including DoS attack, unauthorized access and computer virus.**

MTB: Machine tool builder
Also refer to the manuals on "Manual List" as necessary.

(Caution)

- The version numbers are current as of the editing of this manual, but may be updated in the future.
- GX Developer Version 8 (Model SW8D5C-GPPW) is the new name of the old "Windows Version GPP Function Software Package" (common name GPPW).
- GX Converter Version 1 (Model SW2D5C-CNVW) is the new name of the old "Windows Version Data Conversion Software Package" (common name CNVW).

Manual List

Manuals related to M800/M80/E80/C80 Series are listed as follows.
These manuals are written on the assumption that all optional functions are added to the targeted model.
Some functions or screens may not be available depending on the machine or specifications set by MTB. (Confirm the specifications before use.)
The manuals issued by MTB take precedence over these manuals.

Manual	IB No.	Purpose and Contents
M800/M80/E80 Series Instruction Manual	IB-1501274	• Operation guide for NC • Explanation for screen operation, etc.
C80 Series Instruction Manual	IB-1501453	• Operation guide for NC • Explanation for screen operation, etc.
M800/M80/E80/C80 Series Programming Manual (Lathe System) (1/2)	IB-1501275	• G code programming for lathe system • Basic functions, etc.
M800/M80/E80/C80 Series Programming Manual (Lathe System) (2/2)	IB-1501276	• G code programming for lathe system • Functions for multi-part system, high-accuracy function, etc.
M800/M80/E80/C80 Series Programming Manual (Machining Center System) (1/2)	IB-1501277	• G code programming for machining center system • Basic functions, etc.
M800/M80/E80/C80 Series Programming Manual (Machining Center System) (2/2)	IB-1501278	• G code programming for machining center system • Functions for multi-part system, high-accuracy function, etc.
M800/M80/E80 Series Alarm/Parameter Manual	IB-1501279	• Alarms • Parameters
C80 Series Alarm/Parameter Manual	IB-1501560	• Alarms • Parameters

Manuals for MTBs (NC)

Manual	IB No.	Purpose and Contents
M800/M80/E80/C80 Series Specifications Manual (Function)	IB-1501505	• Model selection • Outline of various functions
M800/M80/E80/C80 Series Specifications Manual (Hardware)	IB-1501506	• Model selection • Specifications of hardware unit
M800W/M80W Series Connection and Setup Manual	IB-1501268	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
M800S/M80/E80 Series Connection and Setup Manual	IB-1501269	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
C80 Series Connection and Setup Manual	IB-1501452	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
M800/M80/E80 Series PLC Development Manual	IB-1501270	• Electrical design • I/O relation (assignment, setting, connection), field network • Development environment (PLC on-board, peripheral development environment), etc.
M800/M80/E80 Series PLC Programming Manual	IB-1501271	• Electrical design • Sequence programming • PLC support functions, etc.
M800/M80/E80/C80 Series PLC Interface Manual	IB-1501272	• Electrical design • Interface signals between NC and PLC
M800/M80/E80 Series Maintenance Manual	IB-1501273	• Cleaning and replacement for each unit • Other items related to maintenance
C80 Series Maintenance Manual	IB-1501454	• Cleaning and replacement for each unit • Other items related to maintenance

Manuals for MTBs (drive section)

Manual	IB No.	Contents
MDS-E/EH Series Specifications Manual	IB-1501226	• Specifications for power supply regeneration type
MDS-E/EH Series Instruction Manual	IB-1501229	• Instruction for power supply regeneration type
MDS-EJ/EJH Series Specifications Manual	IB-1501232	• Specifications for regenerative resistor type
MDS-EJ/EJH Series Instruction Manual	IB-1501235	• Instruction for regenerative resistor type
MDS-EM/EMH Series Specifications Manual	IB-1501238	• Specifications for multi-hybrid, power supply regeneration type
MDS-EM/EMH Series Instruction Manual	IB-1501241	• Instruction for multi-hybrid, power supply regeneration type
DATA BOOK	IB-1501252	• Specifications of servo drive unit, spindle drive unit, motor, etc.

Manuals for MTBs (Others)

Manual	No.	Purpose and Contents
GOT2000 Series User's Manual (Hardware)	SH-081194ENG	• Outline of hardware such as part names, external dimensions, installation, wiring, maintenance, etc. of GOTs
GOT2000 Series User's Manual (Utility)	SH-081195ENG	• Outline of utilities such as screen display setting, operation method, etc. of GOTs
GOT2000 Series User's Manual (Monitor)	SH-081196ENG	• Outline of each monitor function of GOTs
GOT2000 Series Connection Manual (Mitsubishi Electric Products)	SH-081197ENG	• Outline of connection types and connection method between GOT and Mitsubishi Electric connection devices
GT Designer3 (GOT2000) Screen Design Manual	SH-081220ENG	• Outline of screen design method using screen creation software GT Designer3

■ For M800/M80/E80 Series

Manual	No.	Purpose and Contents
GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 1)	SH-081198ENG	• Explanation for connection types and connection method between GOT and other company's devices
GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 2)	SH-081199ENG	
GOT2000 Series Connection Manual (Microcomputers, MODBUS/ Fieldbus Products, Peripherals)	SH-081200ENG	• Explanation for connection types and connection method between GOT and microcomputers, MODBUS/fieldbus products, peripherals
GT SoftGOT2000 Version1 Operating Manual	SH-081201ENG	• Explanation for system configuration, screen configuration and operation method of monitoring software GT SoftGOT2000
GOT2000/GOT1000 Series CC-Link Communication Unit User's Manual	IB-0800351	• Explanation for handling CC-Link communication unit (for GOT2000 series/GOT1000 series)
GX Developer Version 8 Operating Manual (Startup)	SH-080372E	• Explanation for system configuration, installation, etc. of PLC development tool GX Developer
GX Developer Version 8 Operating Manual	SH-080373E	• Explanation for operations using PLC development tool GX Developer
GX Converter Version 1 Operating Manual	IB-0800004	• Explanation for operations using data conversion tool GX Converter
GX Works2 Installation Instructions	BCN-P5999-0944	• Explanation for the operating environment and installation method of GX Works2
GX Works2 Version 1 Operating Manual (Common)	SH-080779ENG	• Explanation for the system configuration of GX Works2 and the functions common to Simple project and Structured project such as parameter setting, operation method for the online function
GX Works2 Version 1 Operating Manual (Simple Project)	SH-080780ENG	• Explanation for methods for such as creating and monitoring programs in Simple project of GX Works2
GX Works2 Version 1 Operating Manual (Simple Project, Function Block)	SH-080984ENG	• Explanation for methods for such as creating function blocks, pasting function blocks to sequence programs, and operating FB library in Simple project of GX Works2
GX Works2 Version 1 Operating Manual (Structured Project)	SH-080781ENG	• Explanation for methods for such as creating and monitoring programs in Structured project of GX Works2
GX Works3 Installation Instructions	BCN-P5999-0391	• Explanation for the operating environment and installation method of GX Works3
MELSEC-Q CC-Link System Master/ Local Module User's Manual	SH-080394E	• Explanation for system configuration, installation, wiring, etc. of master/local modules for CC-Link system

■ For C80 Series

Manual	No.	Purpose and Contents
MELSEC iQ-R Module Configuration Manual	SH-081262	• Outline of system configuration, specifications, installation, wiring, maintenance, etc.
MELSEC iQ-R CPU Module User's Manual (Startup)	SH-081263	• Outline of specifications, procedures before operation, troubleshooting, etc. for CPU module
MELSEC iQ-R CPU Module User's Manual (Application)	SH-081264	• Outline of memory, functions, devices, parameters, etc. for CPU module
MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)	SH-081259	• Explanation for functions, parameter settings, programming, troubleshooting, etc. of the CC-Link IE Field Network function
QCPU User's Manual (Hardware Design, Maintenance and Inspection)	SH-080483	• Outline of specifications, necessary knowledge to configure the system and maintenance-related descriptions for Q series CPU module, etc.
GX Works3 Operating Manual	SH-081215	• Outline of functions, programming, etc.

Reference Manual for MTBs

Manual	No.	Purpose and Contents
M800/M80 Series Smart safety observation Specification manual	BNP-C3072-022	• Explanation for smart safety observation function
C80 Series Smart safety observation Specification manual	BNP-C3077-022	
M800/M80 Series Interactive cycle insertion (Customization) Specification manual	BNP-C3072-121-0003	• Explanation for interactive cycle insertion
M800/M80 Series Synchronous Control Specifications manual	BNP-C3072-074	• Explanation for synchronous control
M800/M80 Series Multiple-Axis Synchronization Control Specifications manual	BNP-C3072-339	• Explanation for multiple-axis synchronization control
M800/M80 Series GOT Connection Specifications manual	BNP-C3072-314	• Explanation for GOT connection
M800/M80 Series PROFIBUS-DP Specification manual	BNP-C3072-118	• Explanation for PROFIBUS-DP communication function
M800/M80 Series EtherNet/IP Specifications manual	BNP-C3072-263	• Explanation for EtherNet/IP
M800/M80 Series FL-net Specifications manual	BNP-C3072-368	• Explanation for FL-net
M800/M80 Series CC-Link (Master/Local) Specification manual	BNP-C3072-089	• Explanation for CC-Link
M800/M80 Series CC-Link IE Field (Master/local) Specifications manual	BNP-C3072-283	• Explanation for CC-Link IE Field
M800/M80 Series CC-Link IE Field Basic Specifications manual	BNP-C3072-337	• Explanation for CC-Link IE Field Basic

Precautions for Safety

Always read the specifications issued by the machine tool builder, this manual, related manuals and attached documents before installation, operation, programming, maintenance or inspection to ensure correct use.
Understand this numerical controller, safety items and cautions before using the unit.
This manual ranks the safety precautions into "DANGER", "WARNING" and "CAUTION".

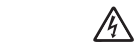
⚠ **DANGER** **When there is a great risk that the user could be subject to fatalities or serious injuries if handling is mistaken.**
⚠ **WARNING** **When the user could be subject to fatalities or serious injuries if handling is mistaken.**
⚠ **CAUTION** **When the user could be subject to injuries or when physical damage could occur if handling is mistaken.**

Note that even items ranked as " ⚠ CAUTION", may lead to major results depending on the situation. In any case, important information that must always be observed is described.

The following signs indicate prohibition and compulsory.

⃠	**This sign indicates prohibited behavior (must not do).** **For example, ⃠ indicates "Keep fire away".**
●	**This sign indicates a thing that is compulsory (must do).** **For example, ⏚ indicates "it must be grounded".**

The meaning of each pictorial sign is as follows.

⚠ CAUTION	 CAUTION rotated object	 CAUTION HOT	 Danger Electric shock risk	 Danger explosive
⃠ Prohibited	 Disassembly is prohibited	 KEEP FIRE AWAY	 General instruction	 Earth ground

For Safe Use

Mitsubishi Electric CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes.

Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

⚠ DANGER

Not applicable in this manual.

⚠ WARNING

Not applicable in this manual.

⚠ CAUTION

1. Items related to product and manual

⚠ **For items described as "Restrictions" or "Usable State" in this manual, the instruction manual issued by the machine tool builder takes precedence over this manual.**

⚠ **An effort has been made to describe special handling of this machine, but items that are not described must be interpreted as "not possible".**

⚠ **This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.**

⚠ **Refer to the Instruction Manual issued by each machine tool builder for details on each machine tool.**

⚠ **Some screens and functions may differ depending on each NC system (or version), and some functions may not be possible. Please confirm the specifications before starting to use.**

⚠ **To protect the availability, integrity and confidentiality of the NC system against cyber-attacks including unauthorized access, denial-of-service (DoS) (*1) attack, and computer virus from external sources via a network, take security measures such as firewall, VPN, and anti-virus software.**
(*1) Denial-of-service (DoS) refers to a type of cyber-attack that disrupts services by overloading the system or by exploiting a vulnerability of the system.

⚠ **Mitsubishi Electric assumes no responsibility for any problems caused to the NC system by any type of cyber-attacks including DoS attack, unauthorized access and computer virus.**

2. Items related to start up and maintenance

⚠ **Read this manual carefully and confirm the safety enough before executing the operation of the program change, forced output, RUN, STOP, etc. during operation. Operation mistakes may cause damage of the machine and accidents.**

3. Items related to program development

⚠ **Always observe the cautions before development to develop a program.**

⚠ **If the data transferred does not follow the file name rule, unexpected operations will occur.**
E.g. PLC program erasure

⚠ **Do not read a sequence program on which a conversion error occurred into the GX Developer/GX Works2. The file may include unexpected contents to result an illegal operation.**

⚠ **When an error occurred at GX Developer/GX Works2 On-line function, the error message may not explain exactly the state in the CNC side. Always refer to the error list.**

Disposal

(Note) This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury (0.0005%), Cd: cadmium (0.002%), Pb: lead (0.004%)
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Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!

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Handling of our product

(English)
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

본 제품의 취급에 대해서

(한국어 /Korean)
이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정외의 지역에 서 사용하는 것을 목적으로 합니다 .

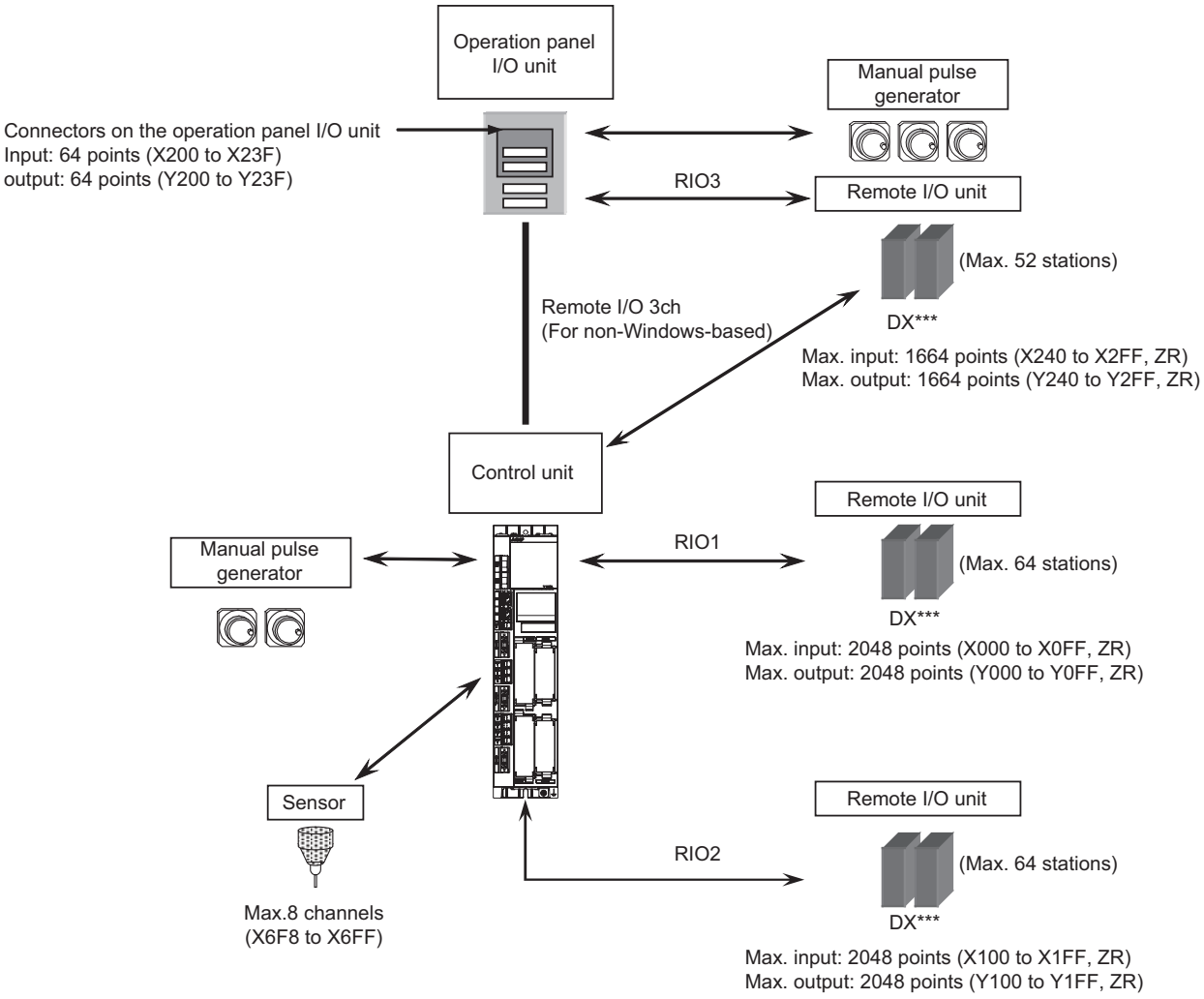
Contents

1

System Configuration of H/W

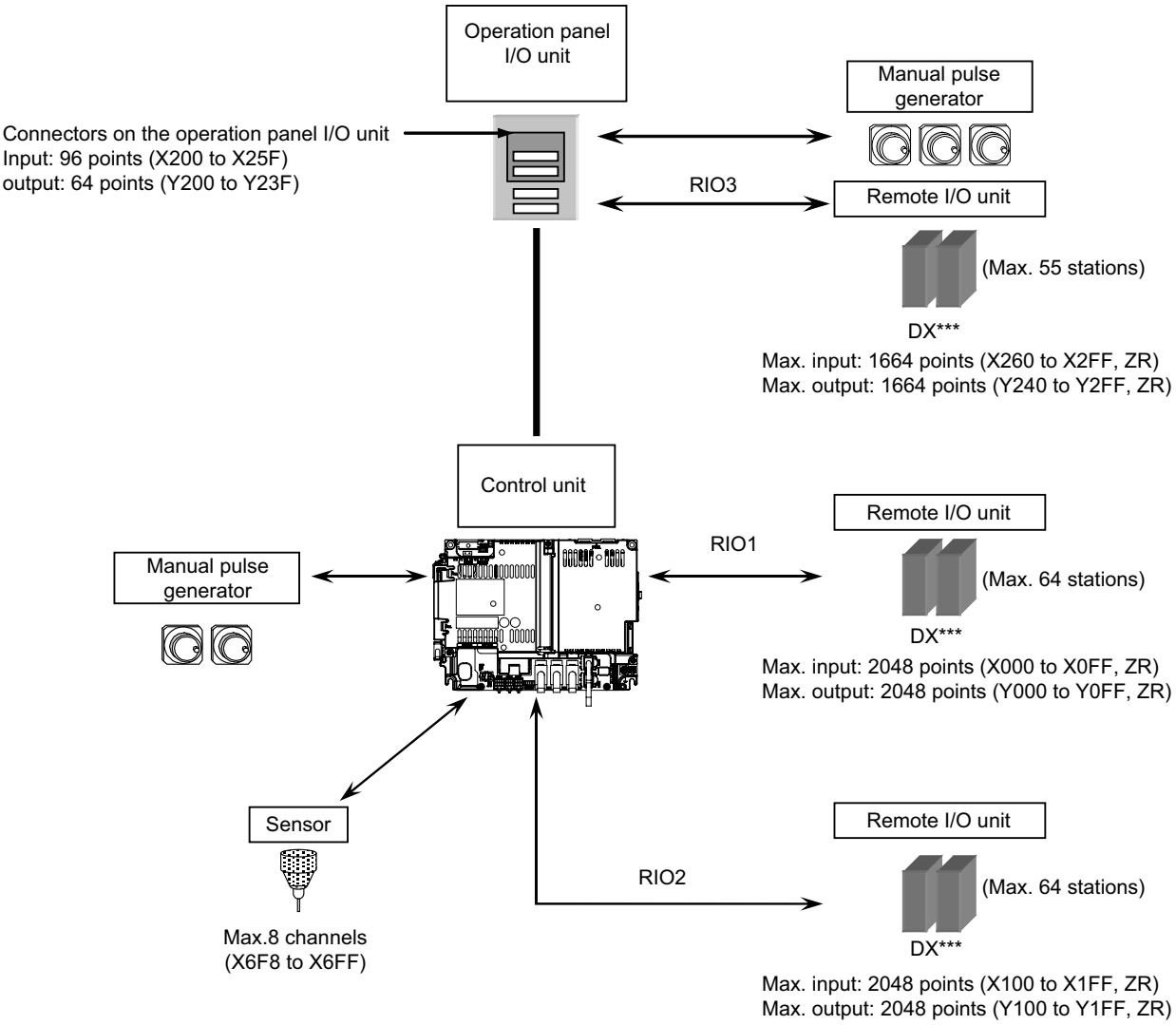
1.1 System Configuration

[M800W/M80W]



It is possible to connect up to three manual pulse generators.
Refer to "1ST HANDLE AXIS SELECTION CODE m (HS11 to 116)" in "PLC Output Signals (Bit Type: Y***)" for the connection point of the manual pulse generator and the handle No.
Digital signals (DI/DO) can be arbitrarily assigned to PLC devices with the parameters.
Refer to "PLC Device Assignment of Digital Signal (DI/DO)" for details.

[M800S/M80/E80]



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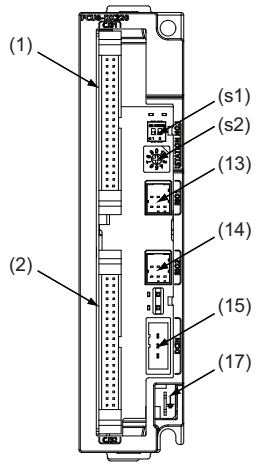
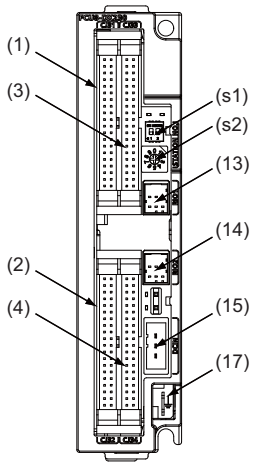
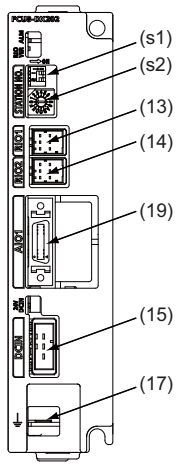
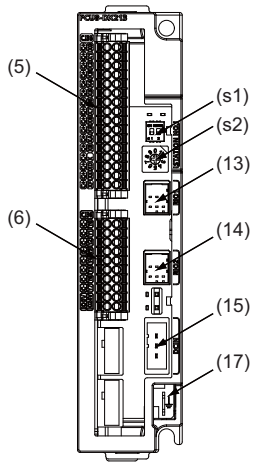
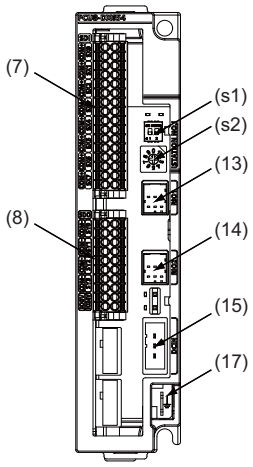
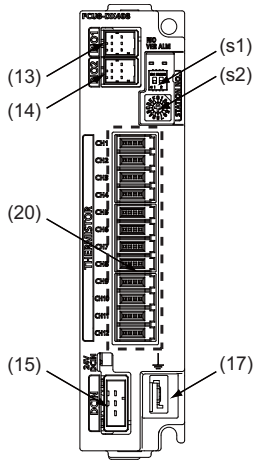
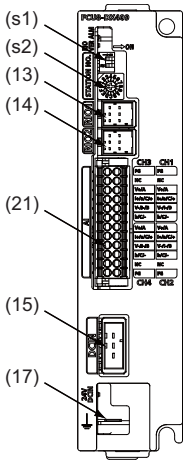
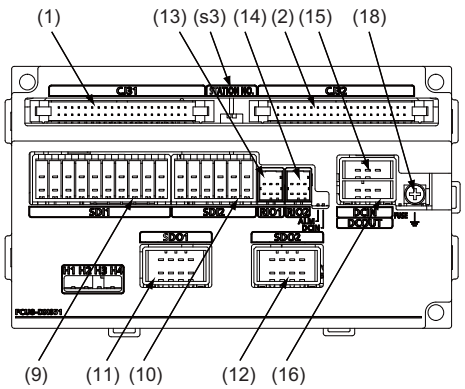
Digital signals (DI/DO) can be arbitrarily assigned to PLC devices with the parameters.
Refer to "PLC Device Assignment of Digital Signal (DI/DO)" for details.

1.2 Relation of RIO Unit and Devices

1.2.1 Outline of the Remote I/O Unit

The specification varies for each remote I/O unit. Each unit has one or two rotary switch(es) for unit No. setting, which links the device Nos. (with X/Y).

FCU8-DX220	FCU8-DX230 / DX231	FCU8-DX202	FCU8-DX213 / DX213-1	FCU8-DX654 / DX654-1
				

FCU8-DX408	FCU8-DX409	FCU8-DX651
		

No.	Connector name	Function
(1)	CJ31	Machine signal input
(2)	CJ32	Machine signal output
(3)	CJ33	Machine signal input
(4)	CJ34	Machine signal output
(5)	CJ35	Machine signal input
(6)	CJ36	Machine signal output
(7)	SDI	Safety machine signal input
(8)	SDO	Safety machine signal output
(9)	SDI1	Safety DI input
(10)	SDI2	Safety DI input
(11)	SDO1	Safety relay output

No.	Connector name	Function
(12)	SDO2	Safety relay output
(13)	RIO1	Remote I/O 2.0 communication
(14)	RIO2	Remote I/O 2.0 communication
(15)	DCIN	24VDC input
(16)	DCOUT	24VDC output
(17)	FG	FG terminal
(18)	FG	FG terminal (M4 screw)
(19)	AIO1	Analog input Analog output
(20)	THERMISTOR	Thermistor input
(21)	AI	Multi-analog input

No.	Switch name	Function
(s1)	STATION No.	Station No. group setting switch
(s2)		Station No. setting switch
(s3)		Station No. setting switch

Unit type	Machine control signals that can be handled	Total	Number of occupied stations
FCU8-DX220	Digital input signal (DI)	32 points	1
	Digital output signal (DO)	32 points	
FCU8-DX230	Digital input signal (DI)	64 points	2
	Digital output signal (DO)	48 points	
FCU8-DX231	Digital input signal (DI)	64 points	2
	Digital output signal (DO)	48 points	
	Analog output (AO)	1 point	
FCU8-DX202	Analog input signal (AI)	4 points	1
	Analog output signal (AO)	1 point	
FCU8-DX213 / DX213-1	Digital input signal (DI)	16 points	1
	Digital output signal (DO)	8 points	
FCU8-DX654 / DX654-1	Safety digital input signal (DI)	8 points	2
	Safety digital output signal (DO)	4 points	
FCU8-DX651	Digital input signal (DI)	32 points	3
	Digital output signal (DO)	32 points	
	Safety digital input signal (DI)	8 points	
	Safety digital output signal (DO)	4 points	
FCU8-DX408	Thermistor input (THERMISTOR)	12 points	3
FCU8-DX409	Multi-analog input (Multi AI)	4 points	4

1.2.2 PLC Device Assignment of Digital Signal (DI/DO)

The input/output signals (analog signal, DI/DO, etc.) are assigned to the PLC devices, and the digital signals (DI/DO) can be assigned to the arbitrary PLC devices by the parameters.
Either "Fixed device assignment" which automatically assigns the signals to fixed PLC devices defined by the system or "Arbitrary device assignment" which user can assign the signals the arbitrary PLC devices by the parameters can be selected by setting the RIO assignment parameter "#53001 RIO dev assign" (selection of RIO device assignment method).

[Fixed device assignment]: Parameter "#53001 RIO dev assign" is set to "0".
Settings are not required because the assignment to the fixed PLC devices are automatically performed.
Refer to "Fixed Device Assignment" for details.

[Arbitrary device assignment]: Parameter "#53001 RIO dev assign" is set to "1".
Set the PLC devices which are assigned to the DI/DO of each remote I/O unit station by the parameters.
Refer to "Arbitrary Device Assignment" for details.

1.2.2.1 Fixed Device Assignment

(1) By setting the parameter "#53001 RIO dev assign" to "0", the PLC device assignment method, which is to be used for input/output of each remote I/O unit station, will be the fixed device assignment.

(2) PLC devices assigned for each remote I/O unit station at the time of the fixed device assignment are as follows:

		Station No.							
Channel No.		1	2	…	8	9	…	63	64
RIO1	Input device	X0000 to X001F	X0020 to X003F	…	X00E0 to X00FF	ZR5000 / ZR5001	…	ZR5108 / ZR5109	ZR5110 / ZR5111
	Output device	Y0000 to Y001F	Y0020 to Y003F	…	Y00E0 to Y00FF	ZR6000 / ZR6001	…	ZR6108 / ZR6109	ZR6110 / ZR6111
RIO2	Input device	X0100 to X011F	X0120 to X013F	…	X01E0 to X01FF	ZR5200 / ZR5201	…	ZR5308 / ZR5309	ZR5310 / ZR5311
	Output device	Y0100 to Y011F	Y0120 to Y013F	…	Y01E0 to Y01FF	ZR6200 / ZR6201	…	ZR6308 /ZR6309	ZR6310 / ZR6311
RIO3	Input device	X0200 to X021F	X0220 to X023F	…	X02E0 to X02FF	ZR5400 / ZR5401	…	ZR5508 / ZR5509	ZR5510 / ZR5511
	Output device	Y0200 to Y021F	Y0220 to Y023F	…	Y02E0 to Y02FF	ZR6400 / ZR6401	…	ZR6508 / ZR6509	ZR6510 / ZR6511

(Note) Do not use the input/output signals of the system-occupied stations of RIO3 and operation panel I/O unit-connected channels.

(3) A part of PLC devices assigned for each station of remote I/O units can input/output signals with PLC high speed by setting the high-speed input/output specification parameters or R registers.
   (a) The devices for inputting/outputting signals with PLC high speed can be set individually for the high-order and the low-order per 16 points for DI and DO of each remote I/O unit station.
   (b) Only devices of the first to eighth stations for each remote I/O channel can input/output signals with PLC high speed. The devices of the ninth to 64th stations input/output with PLC medium speed.
   (c) The parameter and R register numbers for the high-speed input/output designation are as follows:

		Station No.			
Channel No.		1 to 4		5 to 8	
		Parameter No.	R register No.	Parameter No.	R register No.
RIO1	High-speed input specification	# 6457	R7828 low-order	# 6458	R7828 high-order
	High-speed output specification	# 6461	R7830 low-order	# 6462	R7830 high-order
RIO2	High-speed input specification	# 6459	R7829 low-order	# 6460	R7829 high-order
	High-speed output specification	# 6463	R7831 low-order	# 6464	R7831 high-order
RIO3	High-speed input specification	# 6465	R7832 low-order	# 6466	R7832 high-order
	High-speed output specification	# 6473	R7836 low-order	# 6474	R7836 high-order

(Note 1) The above parameters are invalid when the devices have been assigned arbitrarily.
(Note 2) Refer to "PLC Programming Manual" for details of the setting method.

1.2.2.2 Arbitrary Device Assignment

Parameter setting for device arbitrary assignment

(1) By setting the parameter "#53001 RIO dev assign" to "1", the assignment method for PLC devices to be used for input/output of each remote I/O unit station becomes arbitrary device assignment.

(2) For arbitrary device assignment, set the PLC devices for input and output to DI/DO (32 points) of each remote I/O unit station by the parameters. Also, set the assignment of the operation panel I/O unit.

(3) Turn the power OFF and ON to enable arbitrary device assignment after the parameter settings.

(4) Set the input/output device assignment and high-speed input/output specification by the parameters for each station of all remote units which have DI/DO function (except safety DI/DO). If all stations have not been set, the alarm "Y05 Initial parameter error" will be issued when the power turns ON.

	Parameter set No. (Note 1)								
Name	#1	…	#64	#65	…	#128	#129	…	#182
Target channel No. #n	#53011	…	#53641	#53651	…	#54281	#54291	…	#54821
Target station No. #n (Note 2)	#53012	…	#53642	#53652	…	#54282	#54292	…	#54822
DI device name #n	#53013	…	#53643	#53653	…	#54283	#54293	…	#54823
DI device No. #n	#53014	…	#53644	#53654	…	#54284	#54294	…	#54824
DO device name #n	#53015	…	#53645	#53655	…	#54285	#54295	…	#54825
DO device No. #n	#53016	…	#53646	#53656	…	#54286	#54296	…	#54826
High-speed input specification #n	#53017	…	#53647	#53657	…	#54287	#54297	…	#54827
High-speed output specification #n	#53018	…	#53648	#53658	…	#54288	#54298	…	#54828

(Note 1) A set of RIO assignment parameters consists of eight parameters (from target channel number to high-speed output specification) for one station.

(Note 2) Arbitrary device assignment cannot be performed for the system-occupied stations of RIO3 and operation panel I/O unit-connected channels.

(5) The PLC devices that are valid for arbitrary device assignment are as follows:

PLC device	Word/Bit	Input	Output	Assignable range	PLC device No. format
X	Bit	○	-	X0000 to X05FF However, X400 to X5FF is invalid when PROFIBUS specification is added.	Hexadecimal
Y	Bit	-	○	Y0000 to Y05FF However, Y400 to Y5FF is invalid when PROFIBUS specification is added.	Hexadecimal
ZR	Word	○	○	ZR5000 to ZR5999 (for input) ZR6000 to ZR6999 (for output)	Decimal

(Note 1) Duplication check is not performed between the PLC devices which are set with machine input/output signal other than the remote I/O such as CC-Link or PROFIBUS and PLC devices which are set with arbitrary device assignment. If the PLC devices have duplicated, NC or PLC ladder can not be carried out correctly. When using machine input/output signal other than the remote I/O, make sure to confirm that the PLC devices do not duplicate the PLC devices set with arbitrary device assignment.

(Note 2) Assignment cannot be performed for the devices corresponding to the system-occupied stations of RIO3. If you connect the operation panel to any channel other than RIO3, assignment is also disabled for the devices corresponding to the system-occupied stations of the said channel.

(6) Even when the RIO assignment parameters are set in the remote I/O unit stations which have the analog input/output and safety DI/DO functions, the input/output is not carried out to the set PLC devices.

(7) Up to 24 stations can be specified for high-speed input/output specification each for input and output. If 25 or more stations are specified, the alarm "Y05 Initial parameter error" will be issued.

(8) High-speed input/output specification can be set by R registers below as well as the RIO assignment parameters.

		Station No.							
Channel No.		1 to 8	9 to 16	17 to 24	25 to 32	33 to 40	41 to 48	49 to 56	57 to 64
RIO1	High-speed input specification	R30544 low-order	R30544 high-order	R30545 low-order	R30545 high-order	R30546 low-order	R30546 high-order	R30547 low-order	R30547 high-order
	High-speed output specification	R30560 low-order	R30560 high-order	R30561 low-order	R30561 high-order	R30562 low-order	R30562 high-order	R30563 low-order	R30563 high-order
RIO2	High-speed input specification	R30548 low-order	R30548 high-order	R30549 low-order	R30549 high-order	R30550 low-order	R30550 high-order	R30551 low-order	R30551 high-order
	High-speed output specification	R30564 low-order	R30564 high-order	R30565 low-order	R30565 high-order	R30566 low-order	R30566 high-order	R30567 low-order	R30567 high-order
RIO3	High-speed input specification	R30552 low-order	R30552 high-order	R30553 low-order	R30553 high-order	R30554 low-order	R30554 high-order	R30555 low-order	R30555 high-order
	High-speed output specification	R30568 low-order	R30568 high-order	R30569 low-order	R30569 high-order	R30570 low-order	R30570 high-order	R30571 low-order	R30571 high-order

(Note 1) Turn the power OFF and ON after the R register settings to enable the settings.

(Note 2) One bit of each R register is equivalent to one station. The high-speed input/output specification can be performed by turning ON the R register bits of the stations to be input or output with PC high speed. To output the 10th station of RIO1 at high speed, for instance, turn bit9 of R30544 ON.

(Note 3) High-speed input/output designation is disabled for the system-occupied stations of RIO3 and operation panel I/O unit-connected channels. Even when the bit6 to bitD of R30552 and R30568 are turned ON, they will be invalid.

(Note 4) The above settings are invalid with fixed device assignment.

(9) In the following cases, the alarm "Y05 Initial parameter error" will be issued when the power is turned ON. The number of the RIO assignment parameter with illegal setting state will be displayed.

(a) The value outside the range of setting has been set to the RIO assignment parameter (except "#53001 RIO dev assign").

(b) Two or more stations of the target channel No. and the target station No. are set redundantly to the RIO assignment parameters.

(Example)

The power is turned ON in a state where the 1st and 2nd station of RIO1 are set redundantly to the RIO assignment parameter #1 to #5 as shown in the table below. (Both the 1st and 2nd stations are connected to NC control unit.)

Parameter set No.#n	Target channel No. #n (parameter No.)	Target station No. #n (parameter No.)	Setting state
1	1 (#53011)	0 (#53012)	RIO1 1st station is set
2	1 (#53021)	1 (#53022)	RIO1 2nd station is set
3	1 (#53031)	1 (#53032)	RIO1 2nd station is set
4	1 (#53041)	0 (#53042)	RIO1 1st station is set
5	1 (#53051)	0 (#53052)	RIO1 1st station is set

Result:

The parameter number (53031) of "Target channel #3" will be displayed on the alarm "Y05 Initial parameter error". Duplication error of RIO1 second station will be detected first because the RIO assignment parameter is checked from the top. Between the parameter set #2 and #3 to which second station of RIO1 are set, parameter set #3 which is the latter will be displayed as the alarm.

(c) A PLC device outside the assignable range has been set to the RIO assignment parameter.

(d) 25 or more stations have been specified with the high-speed input or output with the RIO assignment parameters.

(e) The RIO assignment parameters have not been specified to the remote I/O unit stations with DI/DO functions (except safety DI/DO) that are connected to NC.

(f) Two or more stations of the PLC devices are set redundantly to the RIO assignment parameters.

(Note) However, these (a) to (f) will not be issued with the alarm "Y05 Initial parameter error" in the following cases:

- "0" has been set to the target channel.
- Remote I/O unit with DI/DO function are not connected to the station which has been specified with the target channel and station number.
- The parameter "#1238 set10/bit3" is ON (the input from RIO is ignored).

(Example)

The power is turned ON in a state where the X100 and X200 of PLC device are set redundantly to the RIO assignment parameter #1 to #5 as shown in the table below. (All stations which has been set to the RIO assignment parameters #1 to #5 are connected to NC control unit.)

Parameter set No. #n	DI device name #n (parameter No.)	DI device No. #n (parameter No.)	Setting state
1	X (#53013)	100 (#53014)	X100 is set
2	X (#53023)	200 (#53024)	X200 is set
3	X (#53033)	200 (#53034)	X200 is set
4	X (#53043)	100 (#53044)	X100 is set
5	X (#53053)	100 (#53054)	X100 is set

Result:

The parameter number (53034) of "DI device No. #3" will be displayed on the alarm "Y05 Initial parameter error". Duplication error of X200 will be detected first because the RIO assignment parameter is checked from the top. Between the parameter set #2 and #3 to which the X200 are set, parameter set #3 which is the latter will be displayed as the alarm.

Operating parameter setting screen

(1) RIO assignment parameter setting rule

(a) For arbitrary device assignment, assign PLC devices to all stations which are connected to the remote units with DI/DO function. Devices can be assigned in random order for arbitrary device assignment. It is unnecessary to assign in order of the target channels, target station numbers, PLC devices, etc.

(b) Set the PLC device numbers after setting the PLC device names. A setting error occurs if PLC number is input when the PLC device name is in the unset (blank) state. When a PLC device name is changed, PLC device number of the same parameter set number is cleared to zero.

(c) When setting the bit devices, set the DI and DO device numbers in increments of 32 points. A setting error occurs if device number is not a multiple of 32 (20 for hexadecimal).

(d) When setting the word devices, set the DI and DO device numbers in increments of two words (32 bits). A setting error occurs if the device number is odd.

(e) Set the target channels to "0" for the parameter sets which are not set for device assignment. The setting state of the parameter sets to which "0" has been set for the target channel will not be checked.

(f) The RIO assignment parameter setting values are retained even when the fixed device assignment and arbitrary device assignment are switched.

(2) RIO assignment parameter setting state check

(a) The RIO assignment parameter setting state can be checked without rebooting the power by setting the RIO assignment parameter "Device Setting Check" to "1" when performing the arbitrary device assignment.
The RIO assignment parameter setting state will not be checked at the fixed device assignment.

(b) The RIO assignment parameter settings cannot be valid only by inputting "1" to "Device Setting Check". To enable the arbitrary device assignment, turn the power OFF and ON after the RIO assignment parameter settings.

(c) The value of "Device Setting Check" goes back to "0" after the check for the RIO parameter setting state is completed.

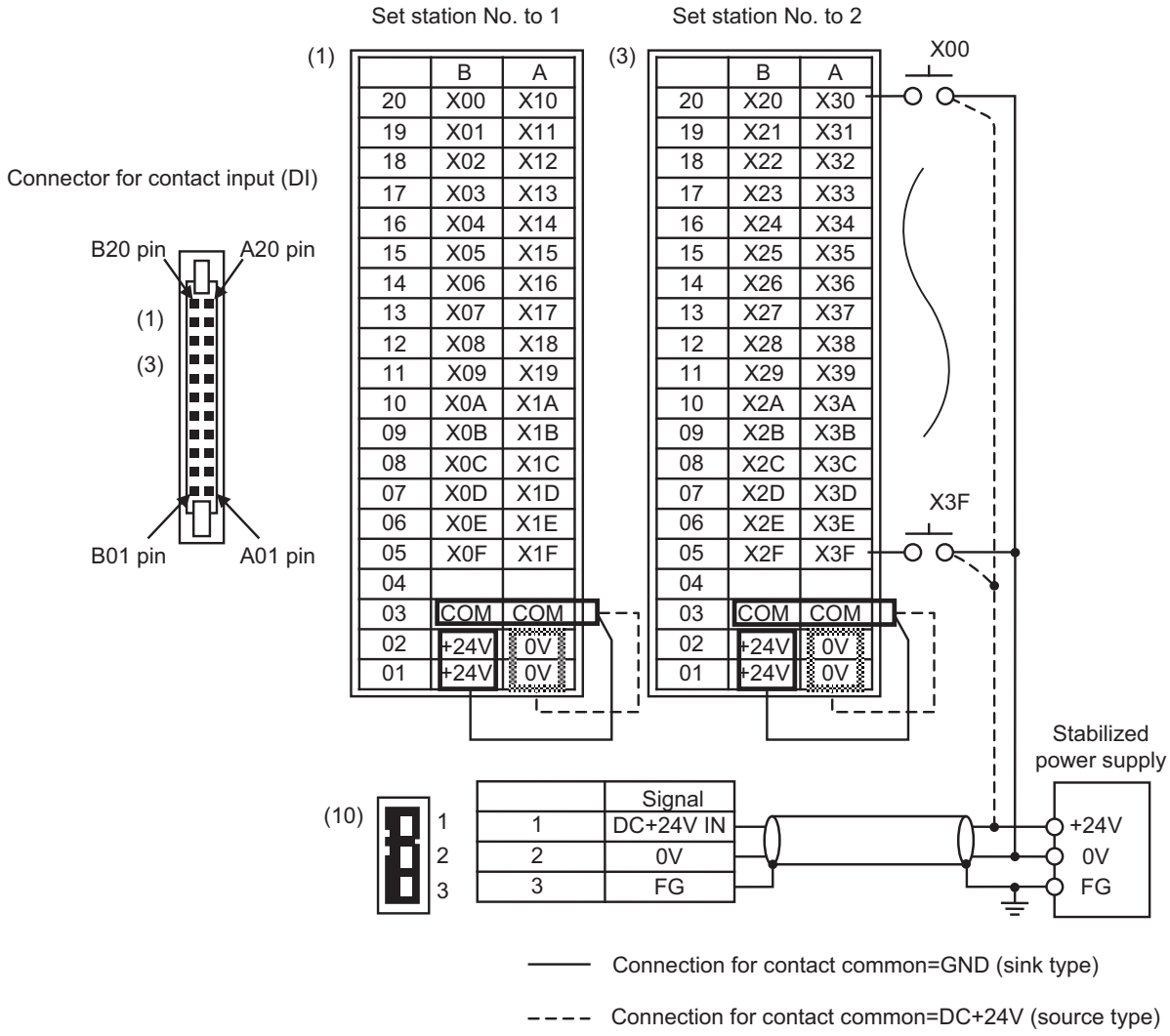
(d) The RIO assignment parameter setting state of each remote I/O unit station with the analog input/output and safety DI/DO functions will not be checked.

(e) The setting state of the parameter set which has been set as the station unconnected to the NC control unit will not be checked.

(f) The setting state of the parameter sets of which the target channel number has been set to "0" will not be checked.

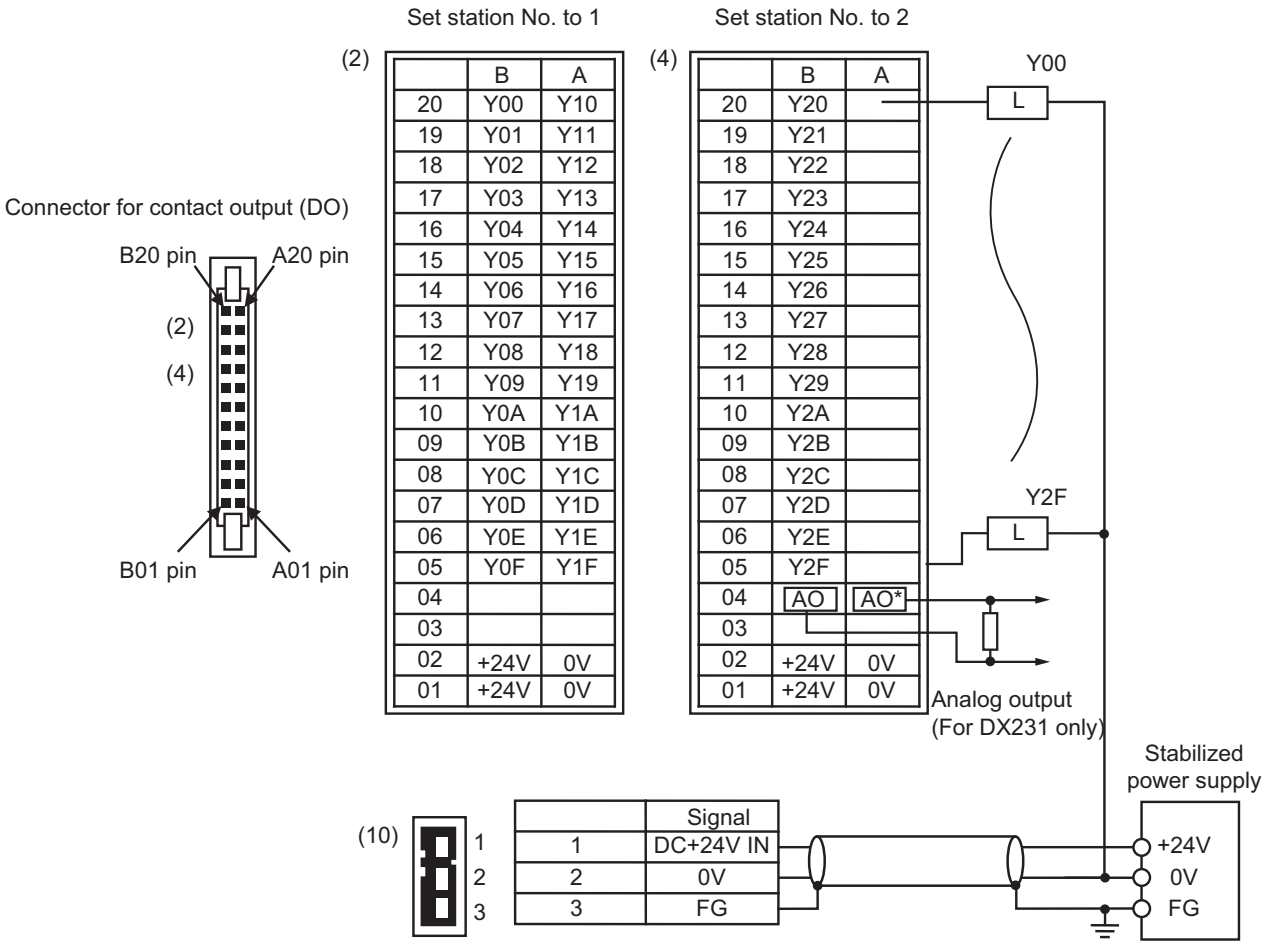
1.2.3 Relation of Connector Pins and Device

(1) Input (DI) signal



(Note 1) The No. of points (devices) will differ according to the RIO unit type.
(Note 2) The devices shown here show an example for when the station No. of RIO unit is set to "1" and set to "2".

(2) Output (DO) signal



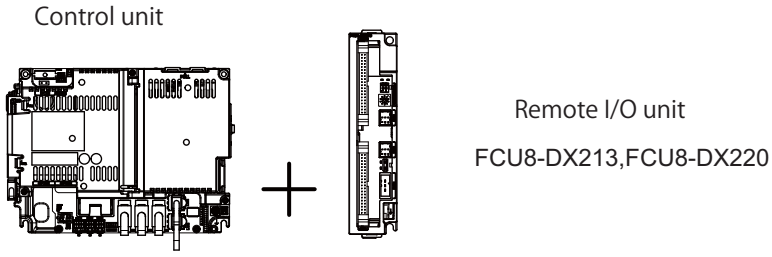
(Note 1) The No. of points (devices) will differ according to the RIO unit type.

(Note 2) The devices shown here show an example for when the station No. of RIO unit is set to "1" and set to "2". Refer to the section "Rotary Switch for Channel No. Setting" for details on the relation of the rotary switch and device No.

(Note 3) The A04 and B04 pin analog output (AO, AO*) in the output connector (7) is found only on the RIO unit DX231. Refer to the section "Outline of Analog Signal Input Circuit " for details on DX220/DX230 connector.

1.2.4 Setting Example When Connecting Directly to the Control Unit

(Note) For fixed device assignment



When connecting to RIO 1

Rotary switch setting		 0	 1	...	 7	 8	...	 F
Group 1	Station No.	1	2	...	8	9	...	16
	Input device	X0000 to X001F	X0020 to X003F	...	X00E0 to X00FF	ZR5000 to ZR5001	...	ZR5014 to ZR5015
1: OFF 2: OFF	Output device	Y0000 to Y001F	Y0020 to Y003F	...	Y00E0 to Y00FF	ZR6000 to ZR6001	...	ZR6014 to ZR6015
Group 2	Station No.	17	...	...	...	...	...	32
	Input device	ZR5016 to ZR5017	...	...	...	...	...	ZR5046 to ZR5047
1: OFF 2: ON	Output device	ZR6016 to ZR6017	...	...	...	...	...	ZR6046 to ZR6047

When connecting to RIO 2

Rotary switch setting		 0	 1	...	 7	 8	...	 F
Group 1	Station No.	1	2	...	8	9	...	16
	Input device	X0100 to X011F	X0120 to X013F	...	X01E0 to X01FF	ZR5200 to ZR5201	...	ZR5214 to ZR5215
1: OFF 2: OFF	Output device	Y0100 to Y011F	Y0120 to Y013F	...	Y01E0 to Y01FF	ZR6200 to ZR6201	...	ZR6214 to ZR6215
Group 2	Station No.	17	...	...	...	...	...	32
	Input device	ZR5216 to ZR5217	...	...	...	...	...	ZR5246 to ZR5247
1: OFF 2: ON	Output device	ZR6216 to ZR6217	...	...	...	...	...	ZR6246 to ZR6247

1.3 Fixed Signals

The connector pin Nos. in the input signals that are fixed are shown below.
Note that using the methods below can ignore fixed signals and change the allocations.

Signal name	Device	Signal name	Device
Emergency stop	EMG of main unit	Stroke end -1	X20
Stroke end +1	X28	Stroke end -2	X21
Stroke end +2	X29	Stroke end -3	X22
Stroke end +3	X2A	Stroke end -4	X23
Stroke end +4	X2B	Stroke end -5	X64
Stroke end +5	X6C	Stroke end -6	X65
Stroke end +6	X6D	Stroke end -7	X66
Stroke end +7	X6E	Stroke end -8	X67
Stroke end +8	X6F		
Reference position return near-point detection 1	X18		
Reference position return near-point detection 2	X19		
Reference position return near-point detection 3	X1A		
Reference position return near-point detection 4	X1B		
Reference position return near-point detection 5	X5C		
Reference position return near-point detection 6	X5D		
Reference position return near-point detection 7	X5E		
Reference position return near-point detection 8	X5F		

(Note) When using the multi-part system and the 1st part system has 2 axes and the 2nd part system has 1 axis, the 1st axis in the 2nd part system will correspond to the 3rd axis above.

1.3.1 Ignoring Fixed Signals

The fixed signals can be used as other signals by ignoring them with file registers R248 and R272.

1.3.2 Changing the Addresses of Fixed Signals

The fixed devices can be allocated arbitrarily with the following parameters.

The parameters #2073 to #2075 are valid when "#1226 aux10/bit 5" is set to "1".
When the parameters #2073 to #2075 are valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal (R248, R272) that ignores the fixed signal is input.

When the arbitrary allocation is valid, the fixed signals can be used as other signals.

#	Items		Details	Setting range (unit)
1226	aux10 (bit5)	Arbitrary allocation of dog signal	Specify whether to enable the arbitrary allocation parameter for the origin dog and H/W OT. 0: Disable arbitrary allocation. (Fixed device) 1: Enable arbitrary allocation. (Device specified by the parameter)	0/1
2073	zrn_dog	Origin dog	Under the standard specifications, the origin dog signal is assigned to a fixed device. When it is desired to assign the origin dog signal to a position other than the fixed device, specify the input device in this parameter. This parameter is enabled in the following conditions. NC axis: When "#1226 aux10/bit5" is set to "1". PLC axis: When "#1246 set18/bit7" is set to "1". - When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the near-point dog signal (R272) is input.	0000 to 02FF (HEX)
2074	H/W_OT+	H/W OT+	Under the standard specifications, the OT (+) signal is assigned to a fixed device. When it is desired to assign the OT (+) signal to a position other than the fixed device, specify the input device in this parameter. This parameter is enabled in the following conditions. NC axis: When "#1226 aux10/bit5" is set to "1". PLC axis: When "#1246 set18/bit7" is set to "1". - When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the OT signal (R248) is input.	0000 to 02FF (HEX)
2075	H/W_OT-	H/W OT-	Under the standard specifications, the OT (-) signal is assigned to a fixed device. When it is desired to assign the OT (-) signal to a position other than the fixed device, specify the input device in this parameter. This parameter is enabled in the following conditions. NC axis: When "#1226 aux10/bit5" is set to "1". PLC axis: When "#1246 set18/bit7" is set to "1". - When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the OT signal (R248) is input.	0000 to 02FF (HEX)

1.4 PLC I/F Axis Random Device Assignment

PLC I/F axis random device assignment (hereinafter referred to as random device assignment) function assigns the PLC input/output signals (CNC control and CNC status signals) of each axis to any desired axes. Using the random device assignment parameter allows you to reduce the change in ladder when you use a ladder programmed for a different axis configuration system.

The PLC input/output signals for 32 axes are available (8 axes per part system x 4 part systems).
For the system which has 5 or more part systems or 9 axes in the part system, the setting of "#1603 PLCdev_no" is required.

(Example) When a ladder for the system with 5 axes in the part system is used for the said system from which the 4th axis is deleted

When you use a ladder in the axis configuration that is different from that for which the ladder was originally programmed, the device Nos. in the ladder need to be corrected; however, you can use the ladder for 5-axis control almost as is simply by assigning the 5th device No. to the 4th axis.

[Setting parameter of device assignment function]

Axis number	1	2	3	4	5	6	7	8	9
#1603 PLCdev_no	1	2	3	5	9	10	11	12	13

Axis number	$1	$2	$3	$4
1	PC01	PC09	PC17	PC25
2	PC02	PC10	PC18	PC26
3	PC03	PC11	PC19	PC27
4	PC04	PC12	PC20	PC28
5	PC05	PC13	PC21	PC29
6	PC06	PC14	PC22	PC30
7	PC07	PC15	PC23	PC31
8	PC08	PC16	PC24	PC32

[Fixed device assignment of PLC input/output signal]

Axis number	$1	$2	$3	$4
1	PC01	PC09		
2	PC02	PC10		
3	PC03	PC11		
4	PC05	PC12		
5		PC13		
6				
7				
8				

[PLC input/output signal after device assignment]

(PC** indicates the device number of PLC input/output signal.)

1.4.1 Function Enabling Conditions

(1) When enabling device assignment

Set the device numbers (1 to 32) to assign to each axis of the parameter "#1603 PLCdev_no". Even when the assignment is not changed as the 1st to 3rd axes in the table below, the setting is required for all valid axes.

[Setting parameter of device assignment function]

Axis number	1	2	3	4	5	6	7	8	9
#1603 PLCdev_no	1	2	3	5	9	10	11	12	13

(2) When disabling device assignment

Set the parameter "#1603 PLCdev_no" of all axes to an invalid value (0).

1.4.2 Random Assignment of Bit-type Device

For bit-type PLC input/output signals, random device assignment is performed as follows:

(Example) Servo OFF (Y7A0 to Y7BF)

[Setting example of random device assignment parameter]

Axis number	1	2	3	4	5	6	7	8	9
#1603 PLCdev_no	1	2	3	***5***	9	10	11	***4***	13

Axis number	$1	$2	$3	$4
1	Y7A0	Y7A8	Y7B0	Y7B8
2	Y7A1	Y7A9	Y7B1	Y7B9
3	Y7A2	Y7AA	Y7B2	Y7BA
4	***Y7A3***	Y7AB	Y7B3	Y7BB
5	***Y7A4***	Y7AC	Y7B4	Y7BC
6	Y7A5	Y7AD	Y7B5	Y7BD
7	Y7A6	Y7AE	Y7B6	Y7BE
8	Y7A7	Y7AF	Y7B7	Y7BF

[Fixed device assignment of servo OFF signal]

Axis number	$1	$2	$3	$4
1	Y7A0	Y7A8		
2	Y7A1	Y7A9		
3	Y7A2	Y7AA		
4	***Y7A4***	***Y7A3***		
5		Y7AC		
6				
7				
8				

[Random device assignment example of Servo OFF signal]

1.4.3 Example Usage

The following is an example of random device assignment for the axis configuration with 2 part systems from which Y axis is removed.

[Example of axis configuration before change]

Axis number	1	2	3	4	5
Axis names of the 1st part system	X1	Z1	C1	Y1	B1
Axis names of the 2nd part system	X2	Z2	C2	Y2	B2

[Example of axis configuration after change]

Axis number	1	2	3	4	5
Axis names of the 1st part system	X1	Z1	C1	B1	
Axis names of the 2nd part system	X2	Z2	C2	B2	

[Random device assignment setting before change (the same settings as when axis configuration is invalid)]

Axis number	1	2	3	4	5	6	7	8	9	10
#1013 axname	X1	Z1	C1	Y1	B1	X2	Z2	C2	Y2	B2
#1603 PLCdev_no	1	2	3	4	5	9	10	11	12	13

Set the parameters as follows:

(1) Set the 4th axis of "#1603 PLCdev_no" to "5" because B1 axis is changed from the 5th axis to the 4th axis.
(2) Set the 5th to 7th axes of "#1603 PLCdev_no" to "9" to "11" because the part system-common axis numbers of X2, Z2 and C2 axes are shifted.
(3) Set the 8th axis of "#1603 PLCdev_no" to "13" because B2 axis is changed from the 10th axis to the 8th axis.
(4) Also set X1, Z1 and C1 axes of "#1603 PLCdev_no" although their axis numbers are unchanged, because assignment is required for all axes.

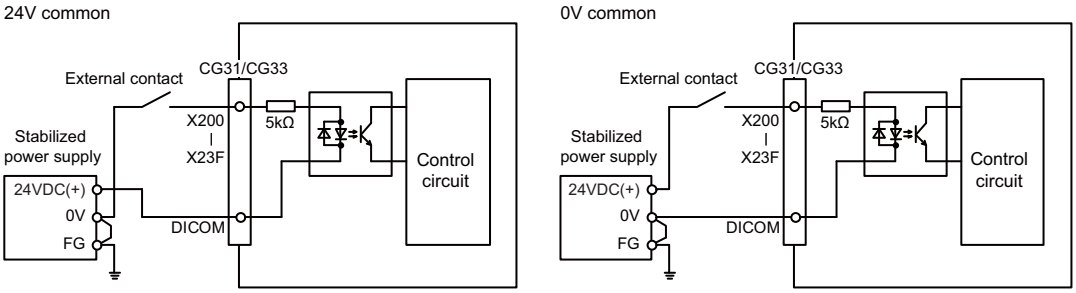
[Setting example of random device assignment after change]

Axis number	1	2	3		4	5	6	7		8
#1013 axname	X1	Z1	C1		B1	X2	Z2	C2		B2
#1603 PLCdev_no	1	2	3		5	9	10	11		13

1.5 Outline of Digital Signal Input Circuit

Both 24V common and 0V common connections are allowed in the digital signal input circuit.
Follow the wiring diagram below for each type.

Input circuit

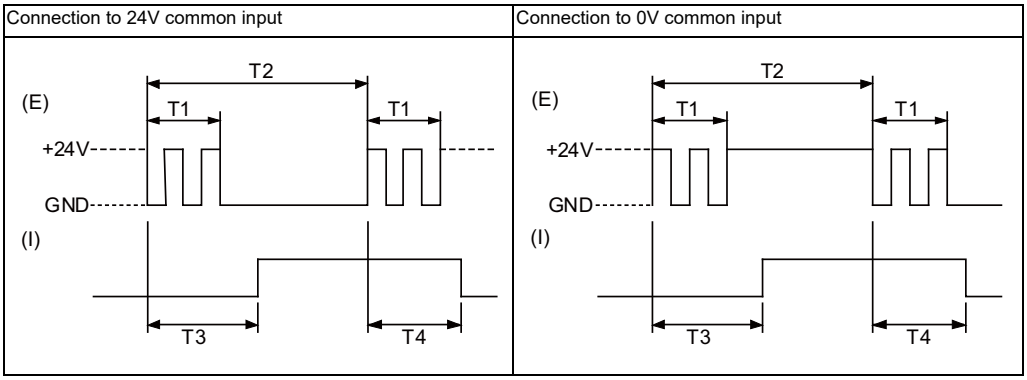


Input conditions

The input signals must be used within the following condition ranges.

		24V common	0V common
1	**Input voltage at external contact ON**	6V or less	18V or more, 25.2V or less
2	**Input current at external contact ON**	3mA or more	
3	**Input voltage at external contact OFF**	20.2V or more, 25.2V or less	3.8V or less
4	**Input current at external contact OFF**	0.7mA or less	
5	**Input resistance**	5kΩ	
6	**Tolerable chattering time (T1)**	3ms	
7	**Input signal holding time (T2)**	40ms or more (*1)	
8	**input circuit operation delay time (T3 and T4)**	3ms to 16ms	
9	**Machine side contact capacity**	30V or more, 16mA or more	

(*1) Input signal holding time: The guide is 40ms or more. The input signal will not be recognized unless it is held for the ladder processing cycle time or longer.



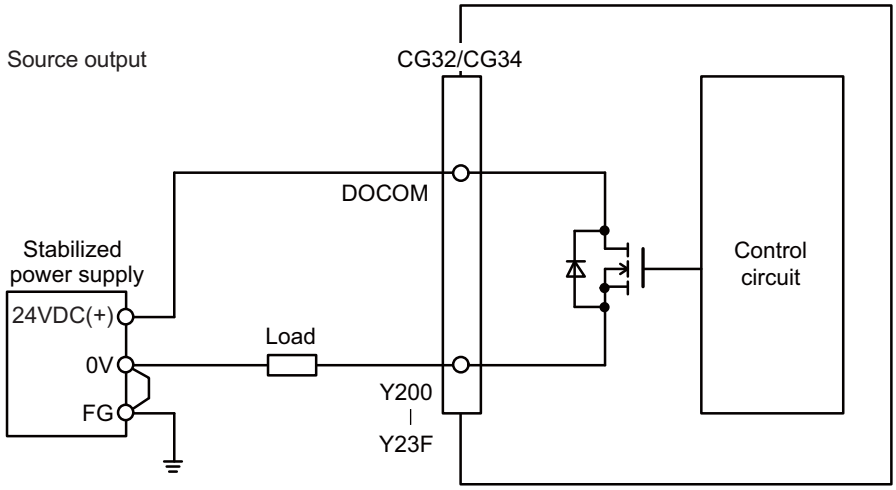
(E) : External signal, (I):Internal signal

1.6 Outline of Digital Signal Output Circuit

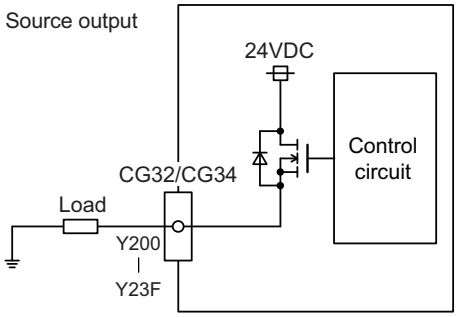
Use within the specification ranges shown below.

Output circuit

[FCU8-DX830 / FCU8-DX837 / FCU8-DX730]



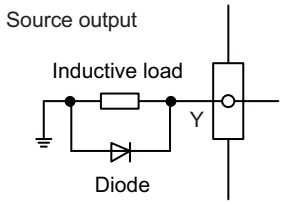
[FCU8-DX834]



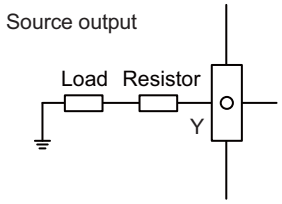
Output conditions

Insulation method	Non-insulation
Rated load voltage	24VDC
Max. output current	0.2A/point 3.8A or less in the unit
Output delay time	40μs

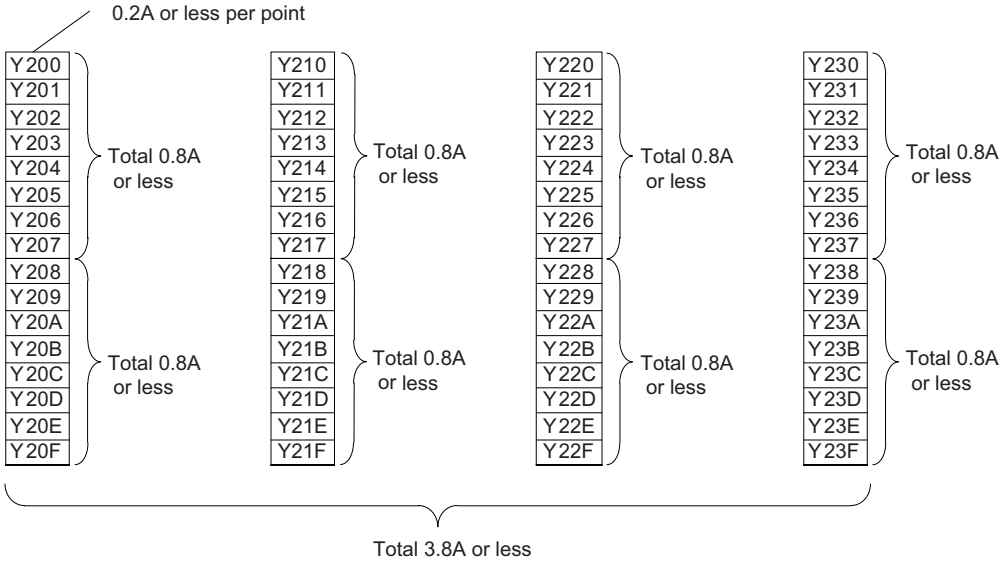
(Note1) When using an inductive load such as a relay, always connect a diode (voltage resistance 100V or more, twice or more the load current) in parallel to the load.



(Note2) When the rush current exceeds the maximum output current, always connect a protective resistor (R=150Ω) serially to the load to suppress rush currents. Make sure that the current is less than the maximum output current including the momentary current.



(Note3) Always keep the total sum of output current of each Y200 to Y207, Y208 to Y20F, Y210 to Y217, Y218 to Y21F, Y220 to Y227, Y228 to Y22F, Y230 to Y237 and Y238 to Y23F less than 0.8A.



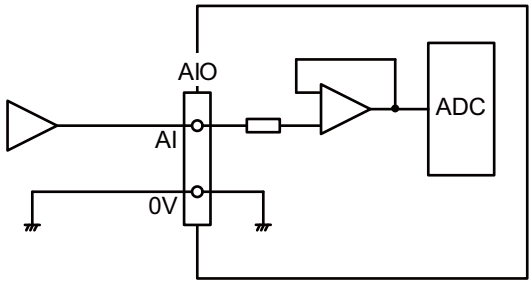
⚠ CAUTION

1. When using an inductive load such as a relay, always connect a diode in parallel to the load to prevent a counter-electromotive force.

2. When the rush current exceeds the maximum output current, always connect a protective resistor serially to the load to suppress rush currents.

1.7 Outline of Analog Signal Input Circuit

Input circuit



Input conditions

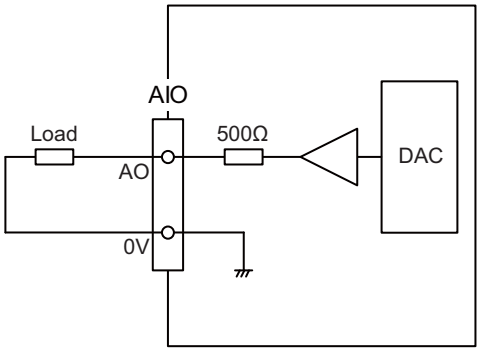
Analog input voltage	-10 to 10V
Max. input rating (Note 1)	±15V
Resolution	|-10 to +10V| / 4095 = 4.88mV
Repeatability	Within ± 25mV (Note 2)
Tolerance	±0.35V

(Note 1) This indicates the input voltage which must not exceed even in an instant.

(Note 2) Except when the accuracy is affected by the noise.

1.8 Outline of Analog Signal Output Circuit

Output circuit



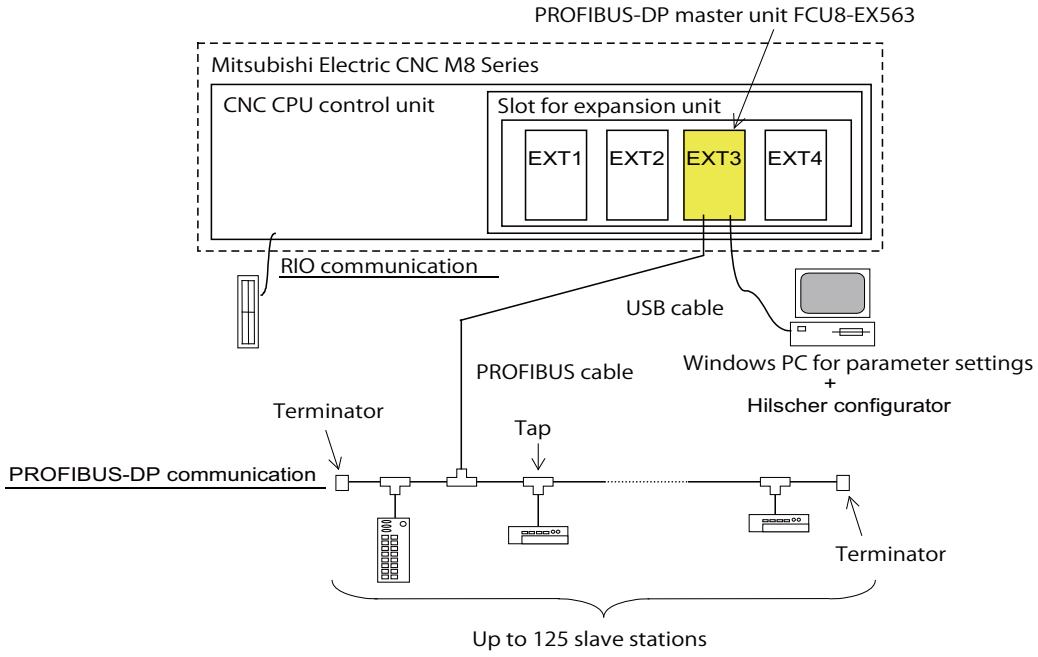
Output conditions

Analog output voltage	-10 to 10V (±5%)
Resolution	10V / 4095 = 2.44mV
Load conditions	10kΩ load resistance
Output resistance value	500Ω

1.9 Outline of I/O Assignment with PROFIBUS-DP

By installing the PROFIBUS-DP master unit FCU8-EX563 and connecting the slave stations compatible with PROFIBUS-DP communication to M8 Series expansion slot, NC can input/output the devices to/from the slave stations as the master station for PROFIBUS-DP communication. However, it is not possible to use the NC with two units of FCU8-EX563 installed at a time. If two units of FCU8-EX563 are installed at a time, both units stop their operation and the error occurs.
Hilscher's Fieldbus communication control unit (COM module) is mounted on FCU8-EX563, and parameters are set using Hilscher configurator "SYCON.net". Up to 125 slave stations can be connected.
Inputs/outputs of the devices from NC's PLC are all handled as bit device data. Up to 512 points can be input/output.
Maximum number of inputs/outputs for NC remote I/O unit is 768, whether or not FCU8-EX563 is installed.

<PROFIBUS-DP connection outline (M800W)>

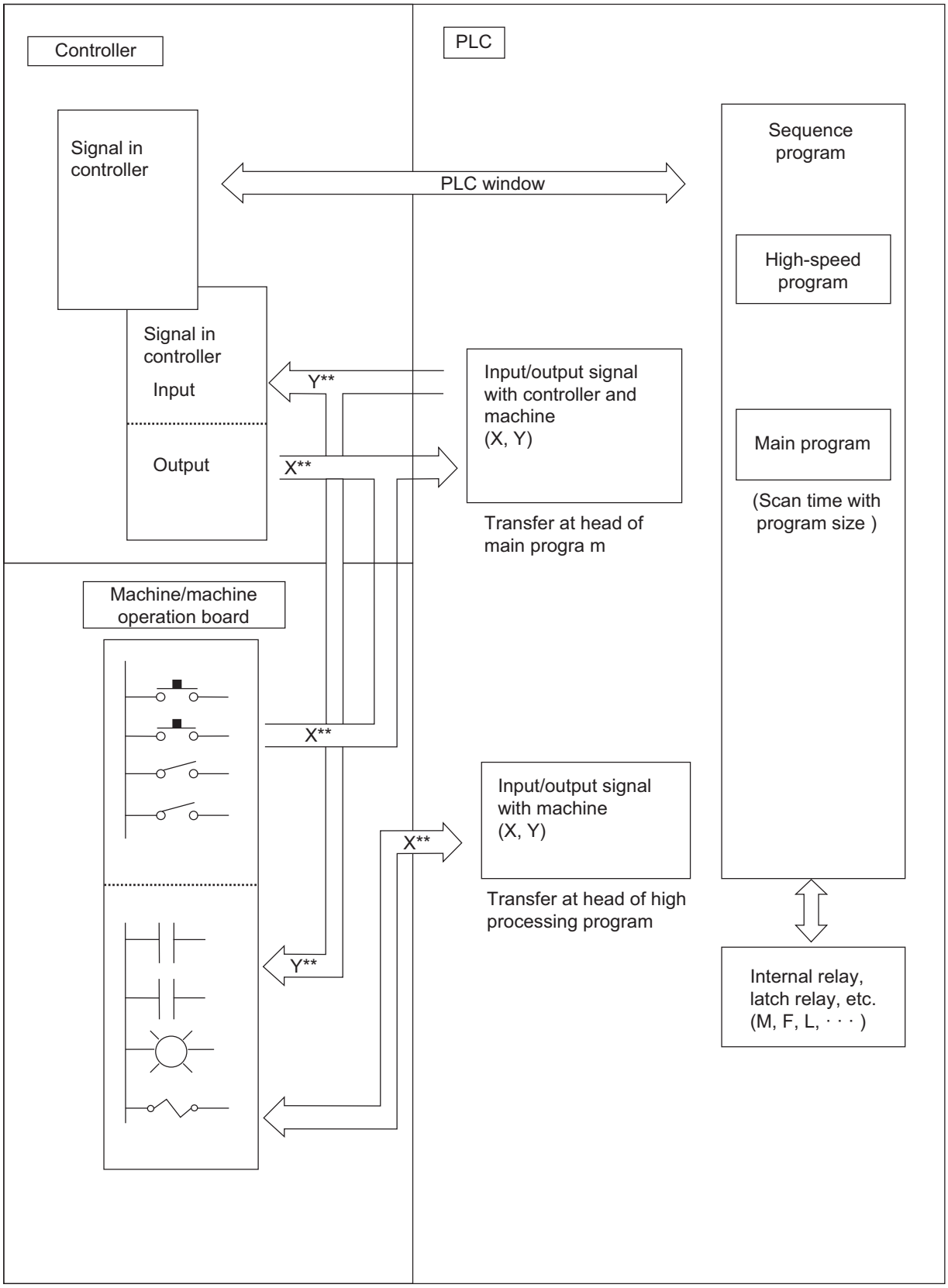


Machine input/output signal allocation

Input/output device allocation when FCU8-EX563 is mounted is as shown below.

	RIO communication only			With PROFIBUS-DP communication			
	RIO1	**RIO2**	**RIO3**	**RIO1**	**RIO2**	**RIO3**	**PROFIBUS-DP communication**
Input	X00 to XFF	X100 to X1FF	X200 to X2FF	X00 to XFF	X100 to X1FF	X200 to X2FF	X400 to X5FF
Output	Y00 to YFF	Y100 to Y1FF	Y200 to Y2FF	Y00 to YFF	Y100 to Y1FF	Y200 to Y2FF	Y400 to Y5FF

1.10 Flow of Signals



1.11 List of Devices

The device range in the following table is the default number of device points set in the project 1 when the multi-project setting or the setting of the number of device points is not performed.

[M8]

Device	Device No.	Unit	Details
X*	X0 to X1FFF (8192 points)	1 bit	Input signal to PLC, Machine input, etc.
Y*	Y0 to Y1FFF (8192 points)	1 bit	Output signal from PLC, Machine output, etc.
M	M0 to M61439 (61440 points)	1 bit	Temporary memory
F	F0 to F2047 (2048 points)	1 bit	Temporary memory (Alarm message interface)
L	L0 to L1023 (1024 points)	1 bit	Latch relay (back up memory)
SM	SM0 to SM2047 (2048 points)	1 bit	Special relay
V	V0 to V511 (512 points)	1 bit	Edge relay
SB	SB0 to SB3FF (1024 points)	1 bit	Special relay
B	B0 to BDFFF (57344 points)	1 bit	Link relay
SW	SW0 to SW3FF (1024 points)	16 bits	Special register
SD	SD0 to SD2047 (2048 points)	16 bits	Special register
T	T0 to T2047 (2048 points)	1 bit/16 bits	Timer (The variable/fixed boundary is set with a parameter.) (Note 2)
ST	ST0 to ST127 (128 points)	1 bit/16 bits	Integrated timer (100ms unit)
C	C0 to C511 (512 points)	1 bit/16 bits	Counter (The variable/fixed boundary is set with a parameter.)
D	D0 to D4095 (4096 points)	16 bits/32 bits	Data register (Register for calculation)
R*	R0 to R32767 (32768 points)	16 bits/32 bits	File register (CNC word interface)
ZR*	ZR0 to ZR13311 (13312 points)	16 bits/32 bits	File register (Input/output signals with the PLC, Machine input/output, etc.)
W	W0 to W2FFF (12288 points)	16 bits/32 bits	Link register
Z	Z0 to Z13 (14 points)	16 bits	Address index
N	N0 to N7 (8 points)	-	Master controller nesting level
P*	P0 to P4095 (4096 points)	-	Label for conditional jump, subroutine call command
K	K-32768 to K32767	-	Decimal constant for 16-bit command
	K-2147483648 to K2147483647	-	Decimal constant for 32-bit command
H	H0 to HFFFF	-	Hexadecimal constant for 16-bit command
	H0 to HFFFFFFFF	-	Hexadecimal constant for 32-bit command

(Note 1) Devices marked with "*" in the device column have designated applications. Do not use devices other than those corresponding to the input/output signals with the machine side (input/output signals of the remote I/O unit), even if it is an undefined vacant device.

(Note 2) Distinction of 10ms timer and 100ms timer is performed by command.
(10ms timer is performed by OUTH command, 100ms timer is performed by OUT command.)

1.11.1 Device Range Setting at Multi-project

Each device will be categorized to either the common device among projects (common device among projects) or the independent device for each projects (independent device among projects) when using the multi-project function.

(a) Common device among projects
Device is influenced by the access from the multiple projects.
The number of device points is fixed without being affected by the number of projects.
For example, the X/Y/R devices are common devices among projects.

(b) Independent device among projects
Device can be used independently in the multiple projects.
In addition, Independent device among projects are categorized into variable points or fixed points device.
- Independent device among projects (Fixed points)
  The number of device points is fixed without being affected by the number of projects.
  For example, the SM/SD/Z devices are independent devices among projects (fixed points)
- Independent device among projects (Variable points)
  The maximum number of project is allocated to each project and used.
  For example, the M/L/SB devices are independent devices among projects (variable points)

The list of device categories is as follows.

(1) Category explanation

Category	Details
Common	Common device among projects
Independent (fixed)	Independent device among projects (fixed points)
Independent (variable)	Independent device among projects (variable points)
Common/independent	Independent device among projects (variable points) However, it is possible to set as the common device among projects from the top.

(2) List of categories

Device	Category	Number of device points (Maximum number of projects)
X	Common	8192 points
Y	Common	8192 points
M	Common/Independent	61440 points (122880 points)
L	Independent (Variable)	1024 points (2048 points)
F	Common	2048 points
SB	Independent (Variable)	1024 points (2048 points)
B	Independent (Variable)	57344 points (114688 points)
SM	Independent (Fixed)	2048 points
V	Independent (Variable)	256 points (1024 points)
SW	Independent (Variable)	1024 points (2048 points)
SD	Independent (Fixed)	2048 points
T	Independent (Variable)	2048 points (4096 points)
ST	Independent (Variable)	128 points (256 points)
C	Independent (Variable)	512 points (1024 points)
D	Common/Independent	4096 points (8192 points)
R	Common	32768 points
ZR	Common	13312 points
W	Independent (Variable)	12288 points (24576 points)
Z	Independent (Fixed)	14 points
N	Independent (Fixed)	15 points
P	Independent (Fixed)	4096 points

* When the additional specification of "Number of PLC projects: 6" is valid, the number of device points in "( )" (parentheses) becomes valid.

Refer to "PLC Programming Manual" for details on the independent device among projects and the common device among projects.

1.12 File Register General Map

Device	Details
R00000 to R00199	System common data (NC -> PLC)
R00200 to R00499	System common data (PLC -> NC)
R00500 to R00699	1st part system data (NC -> PLC)
R00700 to R00899	2nd part system data (NC -> PLC)
R00900 to R01099	3rd part system data (NC -> PLC)
R01100 to R01299	4th part system data (NC -> PLC)
R01300 to R01499	5th part system data (NC -> PLC)
R01500 to R01699	6th part system data (NC -> PLC)
R01700 to R01899	7th part system data (NC -> PLC)
R01900 to R02099	8th part system data (NC -> PLC)
R02100 to R02397	Pallet program data (Drive unit -> PLC) [M8]
R02398 to R02499	System reserve
R02500 to R02699	1st part system data (PLC -> NC)
R02700 to R02899	2nd part system data (PLC -> NC)
R02900 to R03099	3rd part system data (PLC -> NC)
R03100 to R03299	4th part system data (PLC -> NC)
R03300 to R03499	5th part system data (PLC -> NC)
R03500 to R03699	6th part system data (PLC -> NC)
R03700 to R03899	7th part system data (PLC -> NC)
R03900 to R04099	8th part system data (PLC -> NC)
R04100 to R04103	Pallet program data (PLC -> Drive unit) [M8]
R04104 to R04499	System reserve
R04500 to R05683	Axis data (NC -> PLC)
R05684 to R05699	System reserve
R05700 to R06371	Axis data (PLC -> NC)
R06372 to R06499	User macro (NC -> PLC: 64 point, PLC -> NC: 64 point)
R06500 to R06549	1st spindle data (NC -> PLC)
R06550 to R06599	2nd spindle data (NC -> PLC)
R06600 to R06649	3rd spindle data (NC -> PLC)
R06650 to R06699	4th spindle data (NC -> PLC)
R06700 to R06749	5th spindle data (NC -> PLC)
R06750 to R06799	6th spindle data (NC -> PLC)
R06800 to R06849	7th spindle data (NC -> PLC)
R06850 to R06899	8th spindle data (NC -> PLC)
R06900 to R06999	System reserve
R07000 to R07049	1st spindle data (PLC -> NC)
R07050 to R07099	2nd spindle data (PLC -> NC)
R07100 to R07149	3rd spindle data (PLC -> NC)
R07150 to R07199	4th spindle data (PLC -> NC)
R07200 to R07249	5th spindle data (PLC -> NC)
R07250 to R07299	6th spindle data (PLC -> NC)
R07300 to R07349	7th spindle data (PLC -> NC)
R07350 to R07399	8th spindle data (PLC -> NC)
R07400 to R07499	System reserve
R07500 to R07949	PLC constants
R07950 to R07999	System reserve
R08000 to R08099	PLC axis indexing
R08100 to R08259	System reserve
R08260 to R08289	Option status export to PLC [M8]
R08290 to R08299	Optimum acceleration/deceleration (Spindle)
R08300 to R09799	User backed up area
R09800 to R09899	User work area

Device	Details
R10000 to R10099	Remote I/O communication error information [M8]
R10181 to R10187	System reserve
R10188 to R10189	Base PLC mounting check
R10600 to R12759	ATC data, tool life management for M system / Tool life management I, II for L system
R12760 to R13999	System reserve
R14000 to R14499	EcoMonitorLight data (NC -> PLC) [M8]
R14500 to R14699	MES Interface (System common data) [M8]
R14700 to R14949	MES Interface (1st part system data) (PLC -> NC) [M8]
R14950 to R15199	MES Interface (2nd part system data) (PLC -> NC) [M8]
R15200 to R15449	MES Interface (3rd part system data) (PLC -> NC) [M8]
R15450 to R15699	MES Interface (4th part system data) (PLC -> NC) [M8]
R15700 to R15949	MES Interface (5th part system data) (PLC -> NC) [M8]
R15950 to R16199	MES Interface (6th part system data) (PLC -> NC) [M8]
R16200 to R16449	MES Interface (7th part system data) (PLC -> NC) [M8]
R16450 to R16699	MES Interface (8th part system data) (PLC -> NC) [M8]
R16700 to R17299	System reserve
R17300 to R18299	Modbus input/output device
R18300 to R19799	User backup area
R19800 to R19899	User work area
R19900 to R19999	System reserve
R20000 to R20199	System common data (NC -> PLC)
R20200 to R20499	System common data (PLC -> NC)
R20500 to R20699	1st part system data (NC -> PLC)
R20700 to R20899	2nd part system data (NC -> PLC)
R20900 to R21099	3rd part system data (NC -> PLC)
R21100 to R21299	4th part system data (NC -> PLC)
R21300 to R21499	5th part system data (NC -> PLC)
R21500 to R21699	6th part system data (NC -> PLC)
R21700 to R21899	7th part system data (NC -> PLC)
R21900 to R22099	8th part system data (NC -> PLC)
R22100 to R22499	System reserve
R22500 to R22699	1st part system data (PLC -> NC)
R22700 to R22899	2nd part system data (PLC -> NC)
R22900 to R23099	3rd part system data (PLC -> NC)
R23100 to R23299	4th part system data (PLC -> NC)
R23300 to R23499	5th part system data (PLC -> NC)
R23500 to R23699	6th part system data (PLC -> NC)
R23700 to R23899	7th part system data (PLC -> NC)
R23900 to R24099	8th part system data (PLC -> NC)
R24100 to R24499	System reserve
R24500 to R25683	Axis data (NC -> PLC)
R25684 to R26371	Axis data (PLC -> NC)
R26372 to R27499	System reserve
R27500 to R28299	PLC constants (prepared for specific machine tool builders)
R28300 to R29799	User backup area
R29800 to R29899	User work area
R29900 to R32767	System reserve

(Note) The system reserve is used for function expansion by Mitsubishi, and must not be used by the user.

2

Input/Output Signals with Machine

Classification of Machine Input/Output Signals

The signals handled by the PLC are classified as shown below.
When designing, refer to the section indicated below and make allocations according to the table in the respective section.

	Signal type		Explanation	Reference
Input	DI	Machine	(1) Allocated to device X. (2) Some connector pin allocations are determined. (a) Stroke end signal (+, -) (b) Reference point return near-point detection signal (3) The high-speed processing input is set with the parameters. (Read in at the head of the high-speed processing scan.)	"Input Signals from Machine"
	PLC switch input (Note)		(1) The switches can be substituted by the setting and display unit. (2) Allocated to device X. (3) The switch names displayed on the setting and display unit are user release switches, and can be created with the ladder message creation.	"PLC Switch/Sensor"
	Sensor input		(1) Differs from other DI signals, and is connected to the controller. This is only used for monitoring on the ladder side.	"PLC Switch/Sensor"
	AI (Analog Input)		(1) The connector pin allocation is determined. (2) Allocated to the file register (R).	"PLC Input Signals (Data Type: R***)"
Output	DO	Machine	(1) Allocated to device Y. (2) The high-speed processing output is set with the parameters.(Output at end of the high-speed processing scan.)	"Output Signals to Machine"
	PLC switch output (Note)		(1) Output used to show that setting and display unit PLC switch input is valid. (2) Allocated to device Y.	"PLC Switch"
	AO (Analog Output)		(1) The connector pin allocation is determined. (2) Data to be D/A converted and output can be output by reading it into the file register (R).	"PLC Out Signals (Data Type: R***)"

(Note) The PLC switches are not signals for directly inputting/outputting with the machine, and are hypothetical switches used by the user on the setting and display unit. When classified by property, they are as shown above.

2.1 Machine Input Signals

2.1.1 Input Signals from Machine

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X0			B20	X8			B12
X1			B19	X9			B11
X2			B18	XA			B10
X3			B17	XB			B09
X4			B16	XC			B08
X5			B15	XD			B07
X6			B14	XE			B06
X7			B13	XF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X10			A20	X18		* Reference position return near point detection 1	A12
X11			A19	X19		* Reference position return near point detection 2	A11
X12			A18	X1A		* Reference position return near point detection 3	A10
X13			A17	X1B		* Reference position return near point detection 4	A09
X14			A16	X1C			A08
X15			A15	X1D			A07
X16			A14	X1E			A06
X17			A13	X1F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X20		* Stroke end -1	B20	X28		* Stroke end +1	B12
X21		* Stroke end -2	B19	X29		* Stroke end +2	B11
X22		* Stroke end -3	B18	X2A		* Stroke end +3	B10
X23		* Stroke end -4	B17	X2B		* Stroke end +4	B09
X24			B16	X2C			B08
X25			B15	X2D			B07
X26			B14	X2E			B06
X27			B13	X2F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X30			A20	X38			A12
X31			A19	X39			A11
X32			A18	X3A			A10
X33			A17	X3B			A09
X34			A16	X3C			A08
X35			A15	X3D			A07
X36			A14	X3E			A06
X37			A13	X3F			A05

(Note 1) For the allocations of the reference position return near-point detection and stroke end signals, refer to the section "Fixed Signals".

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X40			B20	X48			B12
X41			B19	X49			B11
X42			B18	X4A			B10
X43			B17	X4B			B09
X44			B16	X4C			B08
X45			B15	X4D			B07
X46			B14	X4E			B06
X47			B13	X4F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X50			A20	X58			A12
X51			A19	X59			A11
X52			A18	X5A			A10
X53			A17	X5B			A09
X54			A16	X5C		* Reference position return near point detection 5	A08
X55			A15	X5D		* Reference position return near point detection 6	A07
X56			A14	X5E		* Reference position return near point detection 7	A06
X57			A13	X5F		* Reference position return near point detection 8	A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X60			B20	X68			B12
X61			B19	X69			B11
X62			B18	X6A			B10
X63			B17	X6B			B09
X64		* Stroke end -5	B16	X6C		* Stroke end +5	B08
X65		* Stroke end -6	B15	X6D		* Stroke end +6	B07
X66		* Stroke end -7	B14	X6E		* Stroke end +7	B06
X67		* Stroke end -8	B13	X6F		* Stroke end +8	B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X70			A20	X78			A12
X71			A19	X79			A11
X72			A18	X7A			A10
X73			A17	X7B			A09
X74			A16	X7C			A08
X75			A15	X7D			A07
X76			A14	X7E			A06
X77			A13	X7F			A05

(Note 1) For the allocations of the reference position return near-point detection and stroke end signals, refer to the section "Fixed Signals".

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X80			B20	X88			B12
X81			B19	X89			B11
X82			B18	X8A			B10
X83			B17	X8B			B09
X84			B16	X8C			B08
X85			B15	X8D			B07
X86			B14	X8E			B06
X87			B13	X8F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
X90			A20	X98			A12
X91			A19	X99			A11
X92			A18	X9A			A10
X93			A17	X9B			A09
X94			A16	X9C			A08
X95			A15	X9D			A07
X96			A14	X9E			A06
X97			A13	X9F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XA0			B20	XA8			B12
XA1			B19	XA9			B11
XA2			B18	XAA			B10
XA3			B17	XAB			B09
XA4			B16	XAC			B08
XA5			B15	XAD			B07
XA6			B14	XAE			B06
XA7			B13	XAF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XB0			A20	XB8			A12
XB1			A19	XB9			A11
XB2			A18	XBA			A10
XB3			A17	XBB			A09
XB4			A16	XBC			A08
XB5			A15	XBD			A07
XB6			A14	XBE			A06
XB7			A13	XBF			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XC0			B20	XC8			B12
XC1			B19	XC9			B11
XC2			B18	XCA			B10
XC3			B17	XCB			B09
XC4			B16	XCC			B08
XC5			B15	XCD			B07
XC6			B14	XCE			B06
XC7			B13	XCF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XD0			A20	XD8			A12
XD1			A19	XD9			A11
XD2			A18	XDA			A10
XD3			A17	XDB			A09
XD4			A16	XDC			A08
XD5			A15	XDD			A07
XD6			A14	XDE			A06
XD7			A13	XDF			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XE0			B20	XE8			B12
XE1			B19	XE9			B11
XE2			B18	XEA			B10
XE3			B17	XEB			B09
XE4			B16	XEC			B08
XE5			B15	XED			B07
XE6			B14	XEE			B06
XE7			B13	XEF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
XF0			A20	XF8			A12
XF1			A19	XF9			A11
XF2			A18	XFA			A10
XF3			A17	XFB			A09
XF4			A16	XFC			A08
XF5			A15	XFD			A07
XF6			A14	XFE			A06
XF7			A13	XFF			A05

2.1.2 PLC Switch/Sensor

PLC Switch Input

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X680		PLC switch #1	X688		PLC switch #9
X681		PLC switch #2	X689		PLC switch #10
X682		PLC switch #3	X68A		PLC switch #11
X683		PLC switch #4	X68B		PLC switch #12
X684		PLC switch #5	X68C		PLC switch #13
X685		PLC switch #6	X68D		PLC switch #14
X686		PLC switch #7	X68E		PLC switch #15
X687		PLC switch #8	X68F		PLC switch #16

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X690		PLC switch #17	X698		PLC switch #25
X691		PLC switch #18	X699		PLC switch #26
X692		PLC switch #19	X69A		PLC switch #27
X693		PLC switch #20	X69B		PLC switch #28
X694		PLC switch #21	X69C		PLC switch #29
X695		PLC switch #22	X69D		PLC switch #30
X696		PLC switch #23	X69E		PLC switch #31
X697		PLC switch #24	X69F		PLC switch #32

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X6A0		PLC switch #33	X6A8		PLC switch #41
X6A1		PLC switch #34	X6A9		PLC switch #42
X6A2		PLC switch #35	X6AA		PLC switch #43
X6A3		PLC switch #36	X6AB		PLC switch #44
X6A4		PLC switch #37	X6AC		PLC switch #45
X6A5		PLC switch #38	X6AD		PLC switch #46
X6A6		PLC switch #39	X6AE		PLC switch #47
X6A7		PLC switch #40	X6AF		PLC switch #48

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X6B0		PLC switch #49	X6B8		PLC switch #57
X6B1		PLC switch #50	X6B9		PLC switch #58
X6B2		PLC switch #51	X6BA		PLC switch #59
X6B3		PLC switch #52	X6BB		PLC switch #60
X6B4		PLC switch #53	X6BC		PLC switch #61
X6B5		PLC switch #54	X6BD		PLC switch #62
X6B6		PLC switch #55	X6BE		PLC switch #63
X6B7		PLC switch #56	X6BF		PLC switch #64

(Note) Device Nos. X6A0 to X6BF are assigned when 64 points are provided for the switches.

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X1C40		PLC switch #65	X1C48		PLC switch #73
X1C41		PLC switch #66	X1C49		PLC switch #74
X1C42		PLC switch #67	X1C4A		PLC switch #75
X1C43		PLC switch #68	X1C4B		PLC switch #76
X1C44		PLC switch #69	X1C4C		PLC switch #77
X1C45		PLC switch #70	X1C4D		PLC switch #78
X1C46		PLC switch #71	X1C4E		PLC switch #79
X1C47		PLC switch #72	X1C4F		PLC switch #80
Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X1C50		PLC switch #81	X1C58		PLC switch #89
X1C51		PLC switch #82	X1C59		PLC switch #90
X1C52		PLC switch #83	X1C5A		PLC switch #91
X1C53		PLC switch #84	X1C5B		PLC switch #92
X1C54		PLC switch #85	X1C5C		PLC switch #93
X1C55		PLC switch #86	X1C5D		PLC switch #94
X1C56		PLC switch #87	X1C5E		PLC switch #95
X1C57		PLC switch #88	X1C5F		PLC switch #96

(Note) Device Nos. X1C40 to X1C5F are assigned when 96 points are provided for the switches.

Sensor Input

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
X6F0			X6F8		Skip input 1
X6F1			X6F9		Skip input 2
X6F2			X6FA		Skip input 3
X6F3			X6FB		Skip input 4
X6F4			X6FC		Skip input 5
X6F5			X6FD		Skip input 6
X6F6			X6FE		Skip input 7
X6F7			X6FF		Skip input 8

2.2 Machine Output Signals

2.2.1 Output Signals to Machine

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y0			B20	Y8			B12
Y1			B19	Y9			B11
Y2			B18	YA			B10
Y3			B17	YB			B09
Y4			B16	YC			B08
Y5			B15	YD			B07
Y6			B14	YE			B06
Y7			B13	YF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y10			A20	Y18			A12
Y11			A19	Y19			A11
Y12			A18	Y1A			A10
Y13			A17	Y1B			A09
Y14			A16	Y1C			A08
Y15			A15	Y1D			A07
Y16			A14	Y1E			A06
Y17			A13	Y1F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y20			B20	Y28			B12
Y21			B19	Y29			B11
Y22			B18	Y2A			B10
Y23			B17	Y2B			B09
Y24			B16	Y2C			B08
Y25			B15	Y2D			B07
Y26			B14	Y2E			B06
Y27			B13	Y2F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y30			A20	Y38			A12
Y31			A19	Y39			A11
Y32			A18	Y3A			A10
Y33			A17	Y3B			A09
Y34			A16	Y3C			A08
Y35			A15	Y3D			A07
Y36			A14	Y3E			A06
Y37			A13	Y3F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y40			B20	Y48			B12
Y41			B19	Y49			B11
Y42			B18	Y4A			B10
Y43			B17	Y4B			B09
Y44			B16	Y4C			B08
Y45			B15	Y4D			B07
Y46			B14	Y4E			B06
Y47			B13	Y4F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y50			A20	Y58			A12
Y51			A19	Y59			A11
Y52			A18	Y5A			A10
Y53			A17	Y5B			A09
Y54			A16	Y5C			A08
Y55			A15	Y5D			A07
Y56			A14	Y5E			A06
Y57			A13	Y5F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y60			B20	Y68			B12
Y61			B19	Y69			B11
Y62			B18	Y6A			B10
Y63			B17	Y6B			B09
Y64			B16	Y6C			B08
Y65			B15	Y6D			B07
Y66			B14	Y6E			B06
Y67			B13	Y6F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y70			A20	Y78			A12
Y71			A19	Y79			A11
Y72			A18	Y7A			A10
Y73			A17	Y7B			A09
Y74			A16	Y7C			A08
Y75			A15	Y7D			A07
Y76			A14	Y7E			A06
Y77			A13	Y7F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y80			B20	Y88			B12
Y81			B19	Y89			B11
Y82			B18	Y8A			B10
Y83			B17	Y8B			B09
Y84			B16	Y8C			B08
Y85			B15	Y8D			B07
Y86			B14	Y8E			B06
Y87			B13	Y8F			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
Y90			A20	Y98			A12
Y91			A19	Y99			A11
Y92			A18	Y9A			A10
Y93			A17	Y9B			A09
Y94			A16	Y9C			A08
Y95			A15	Y9D			A07
Y96			A14	Y9E			A06
Y97			A13	Y9F			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YA0			B20	YA8			B12
YA1			B19	YA9			B11
YA2			B18	YAA			B10
YA3			B17	YAB			B09
YA4			B16	YAC			B08
YA5			B15	YAD			B07
YA6			B14	YAE			B06
YA7			B13	YAF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YB0			A20	YB8			A12
YB1			A19	YB9			A11
YB2			A18	YBA			A10
YB3			A17	YBB			A09
YB4			A16	YBC			A08
YB5			A15	YBD			A07
YB6			A14	YBE			A06
YB7			A13	YBF			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YC0			B20	YC8			B12
YC1			B19	YC9			B11
YC2			B18	YCA			B10
YC3			B17	YCB			B09
YC4			B16	YCC			B08
YC5			B15	YCD			B07
YC6			B14	YCE			B06
YC7			B13	YCF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YD0			A20	YD8			A12
YD1			A19	YD9			A11
YD2			A18	YDA			A10
YD3			A17	YDB			A09
YD4			A16	YDC			A08
YD5			A15	YDD			A07
YD6			A14	YDE			A06
YD7			A13	YDF			A05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YE0			B20	YE8			B12
YE1			B19	YE9			B11
YE2			B18	YEA			B10
YE3			B17	YEB			B09
YE4			B16	YEC			B08
YE5			B15	YED			B07
YE6			B14	YEE			B06
YE7			B13	YEF			B05

Device	Abbrev.	Signal name	Connector	Device	Abbrev.	Signal name	Connector
YF0			A20	YF8			A12
YF1			A19	YF9			A11
YF2			A18	YFA			A10
YF3			A17	YFB			A09
YF4			A16	YFC			A08
YF5			A15	YFD			A07
YF6			A14	YFE			A06
YF7			A13	YFF			A05

2.2.2 PLC Switch

PLC Switch Output

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y680		PLC switch reversed display #1	Y688		PLC switch reversed display #9
Y681		PLC switch reversed display #2	Y689		PLC switch reversed display #10
Y682		PLC switch reversed display #3	Y68A		PLC switch reversed display #11
Y683		PLC switch reversed display #4	Y68B		PLC switch reversed display #12
Y684		PLC switch reversed display #5	Y68C		PLC switch reversed display #13
Y685		PLC switch reversed display #6	Y68D		PLC switch reversed display #14
Y686		PLC switch reversed display #7	Y68E		PLC switch reversed display #15
Y687		PLC switch reversed display #8	Y68F		PLC switch reversed display #16

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y690		PLC switch reversed display #17	Y698		PLC switch reversed display #25
Y691		PLC switch reversed display #18	Y699		PLC switch reversed display #26
Y692		PLC switch reversed display #19	Y69A		PLC switch reversed display #27
Y693		PLC switch reversed display #20	Y69B		PLC switch reversed display #28
Y694		PLC switch reversed display #21	Y69C		PLC switch reversed display #29
Y695		PLC switch reversed display #22	Y69D		PLC switch reversed display #30
Y696		PLC switch reversed display #23	Y69E		PLC switch reversed display #31
Y697		PLC switch reversed display #24	Y69F		PLC switch reversed display #32

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6A0		PLC switch reversed display #33	Y6A8		PLC switch reversed display #41
Y6A1		PLC switch reversed display #34	Y6A9		PLC switch reversed display #42
Y6A2		PLC switch reversed display #35	Y6AA		PLC switch reversed display #43
Y6A3		PLC switch reversed display #36	Y6AB		PLC switch reversed display #44
Y6A4		PLC switch reversed display #37	Y6AC		PLC switch reversed display #45
Y6A5		PLC switch reversed display #38	Y6AD		PLC switch reversed display #46
Y6A6		PLC switch reversed display #39	Y6AE		PLC switch reversed display #47
Y6A7		PLC switch reversed display #40	Y6AF		PLC switch reversed display #48

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6B0		PLC switch reversed display #49	Y6B8		PLC switch reversed display #57
Y6B1		PLC switch reversed display #50	Y6B9		PLC switch reversed display #58
Y6B2		PLC switch reversed display #51	Y6BA		PLC switch reversed display #59
Y6B3		PLC switch reversed display #52	Y6BB		PLC switch reversed display #60
Y6B4		PLC switch reversed display #53	Y6BC		PLC switch reversed display #61
Y6B5		PLC switch reversed display #54	Y6BD		PLC switch reversed display #62
Y6B6		PLC switch reversed display #55	Y6BE		PLC switch reversed display #63
Y6B7		PLC switch reversed display #56	Y6BF		PLC switch reversed display #64

(Note) Device Nos. Y6A0 to Y6BF are assigned when 64 points are provided for the switches.

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y1C40		PLC switch reversed display #65	Y1C48		PLC switch reversed display #73
Y1C41		PLC switch reversed display #66	Y1C49		PLC switch reversed display #74
Y1C42		PLC switch reversed display #67	Y1C4A		PLC switch reversed display #75
Y1C43		PLC switch reversed display #68	Y1C4B		PLC switch reversed display #76
Y1C44		PLC switch reversed display #69	Y1C4C		PLC switch reversed display #77
Y1C45		PLC switch reversed display #70	Y1C4D		PLC switch reversed display #78
Y1C46		PLC switch reversed display #71	Y1C4E		PLC switch reversed display #79
Y1C47		PLC switch reversed display #72	Y1C4F		PLC switch reversed display #80
Common for part systems	**Abbrev.**	**Signal name**	**Common for part systems**	**Abbrev.**	**Signal name**
Y1C50		PLC switch reversed display #81	Y1C58		PLC switch reversed display #89
Y1C51		PLC switch reversed display #82	Y1C59		PLC switch reversed display #90
Y1C52		PLC switch reversed display #83	Y1C5A		PLC switch reversed display #91
Y1C53		PLC switch reversed display #84	Y1C5B		PLC switch reversed display #92
Y1C54		PLC switch reversed display #85	Y1C5C		PLC switch reversed display #93
Y1C55		PLC switch reversed display #86	Y1C5D		PLC switch reversed display #94
Y1C56		PLC switch reversed display #87	Y1C5E		PLC switch reversed display #95
Y1C57		PLC switch reversed display #88	Y1C5F		PLC switch reversed display #96

(Note) Device Nos. Y1C40 to Y1C5F are assigned when 96 points are provided for the switches.

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6C0		PLC switch for reverse #1	Y6C8		PLC switch for reverse #9
Y6C1		PLC switch for reverse #2	Y6C9		PLC switch for reverse #10
Y6C2		PLC switch for reverse #3	Y6CA		PLC switch for reverse #11
Y6C3		PLC switch for reverse #4	Y6CB		PLC switch for reverse #12
Y6C4		PLC switch for reverse #5	Y6CC		PLC switch for reverse #13
Y6C5		PLC switch for reverse #6	Y6CD		PLC switch for reverse #14
Y6C6		PLC switch for reverse #7	Y6CE		PLC switch for reverse #15
Y6C7		PLC switch for reverse #8	Y6CF		PLC switch for reverse #16

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6D0		PLC switch for reverse #17	Y6D8		PLC switch for reverse #25
Y6D1		PLC switch for reverse #18	Y6D9		PLC switch for reverse #26
Y6D2		PLC switch for reverse #19	Y6DA		PLC switch for reverse #27
Y6D3		PLC switch for reverse #20	Y6DB		PLC switch for reverse #28
Y6D4		PLC switch for reverse #21	Y6DC		PLC switch for reverse #29
Y6D5		PLC switch for reverse #22	Y6DD		PLC switch for reverse #30
Y6D6		PLC switch for reverse #23	Y6DE		PLC switch for reverse #31
Y6D7		PLC switch for reverse #24	Y6DF		PLC switch for reverse #32

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6E0		PLC switch for reverse #33	Y6E8		PLC switch for reverse #41
Y6E1		PLC switch for reverse #34	Y6E9		PLC switch for reverse #42
Y6E2		PLC switch for reverse #35	Y6EA		PLC switch for reverse #43
Y6E3		PLC switch for reverse #36	Y6EB		PLC switch for reverse #44
Y6E4		PLC switch for reverse #37	Y6EC		PLC switch for reverse #45
Y6E5		PLC switch for reverse #38	Y6ED		PLC switch for reverse #46
Y6E6		PLC switch for reverse #39	Y6EE		PLC switch for reverse #47
Y6E7		PLC switch for reverse #40	Y6EF		PLC switch for reverse #48

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y6F0		PLC switch for reverse #49	Y6F8		PLC switch for reverse #57
Y6F1		PLC switch for reverse #50	Y6F9		PLC switch for reverse #58
Y6F2		PLC switch for reverse #51	Y6FA		PLC switch for reverse #59
Y6F3		PLC switch for reverse #52	Y6FB		PLC switch for reverse #60
Y6F4		PLC switch for reverse #53	Y6FC		PLC switch for reverse #61
Y6F5		PLC switch for reverse #54	Y6FD		PLC switch for reverse #62
Y6F6		PLC switch for reverse #55	Y6FE		PLC switch for reverse #63
Y6F7		PLC switch for reverse #56	Y6FF		PLC switch for reverse #64

(Note) Device Nos. Y6E0 to Y6FF are assigned when 64 points are provided for the switches.

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y1C60		PLC switch for reverse #65	Y1C68		PLC switch for reverse #73
Y1C61		PLC switch for reverse #66	Y1C69		PLC switch for reverse #74
Y1C62		PLC switch for reverse #67	Y1C6A		PLC switch for reverse #75
Y1C63		PLC switch for reverse #68	Y1C6B		PLC switch for reverse #76
Y1C64		PLC switch for reverse #69	Y1C6C		PLC switch for reverse #77
Y1C65		PLC switch for reverse #70	Y1C6D		PLC switch for reverse #78
Y1C66		PLC switch for reverse #71	Y1C6E		PLC switch for reverse #79
Y1C67		PLC switch for reverse #72	Y1C6F		PLC switch for reverse #80

Common for part systems	Abbrev.	Signal name	Common for part systems	Abbrev.	Signal name
Y1C70		PLC switch for reverse #81	Y1C78		PLC switch for reverse #89
Y1C71		PLC switch for reverse #82	Y1C79		PLC switch for reverse #90
Y1C72		PLC switch for reverse #83	Y1C7A		PLC switch for reverse #91
Y1C73		PLC switch for reverse #84	Y1C7B		PLC switch for reverse #92
Y1C74		PLC switch for reverse #85	Y1C7C		PLC switch for reverse #93
Y1C75		PLC switch for reverse #86	Y1C7D		PLC switch for reverse #94
Y1C76		PLC switch for reverse #87	Y1C7E		PLC switch for reverse #95
Y1C77		PLC switch for reverse #88	Y1C7F		PLC switch for reverse #96

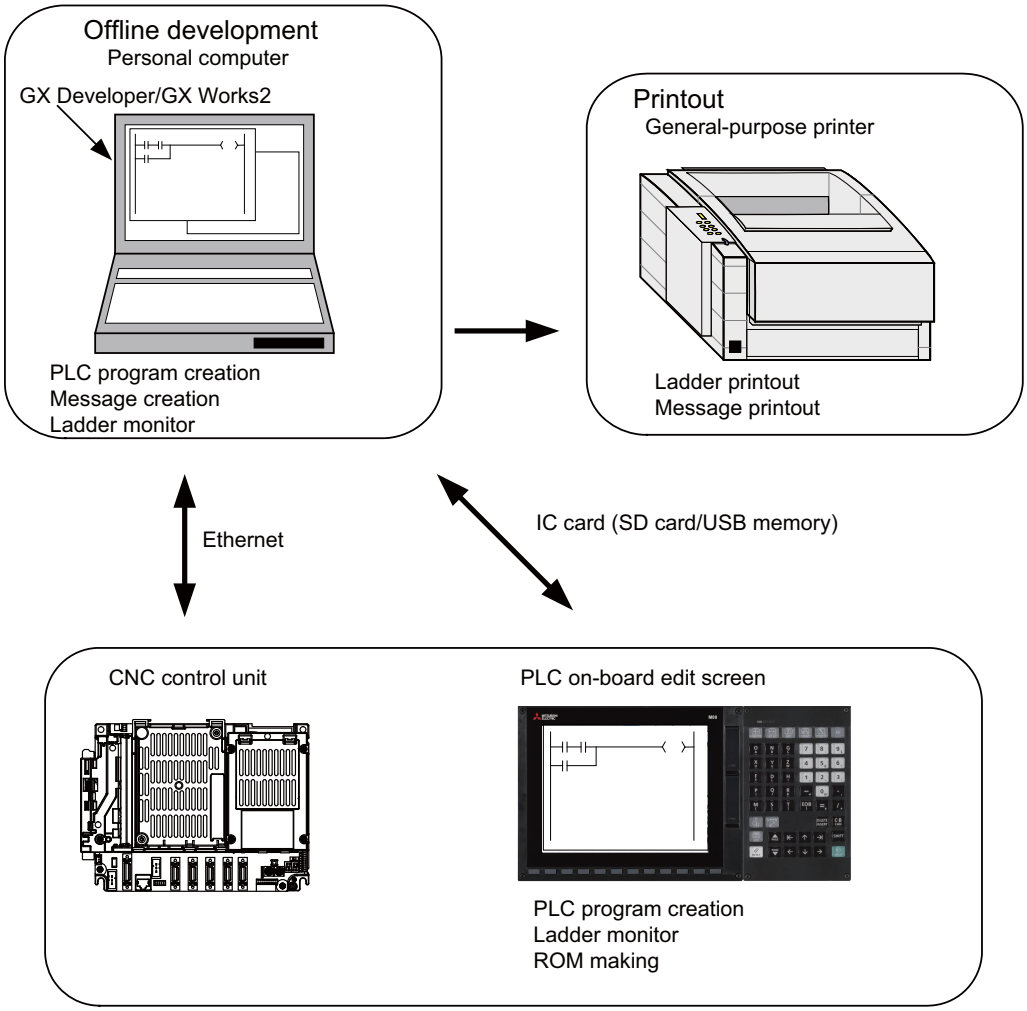
(Note) Device Nos. Y1C60 to Y1C7F are assigned when 96 points are provided for the switches.

3

System Configuration of Development Environment

3.1 System Configuration for PLC Development

The general configuration of the development environment is shown below.
Most of the development work is carried out with "GX Developer" or "GX Works2", which runs on a personal computer.
GX Developer/GX Works2 and the CNC control unit are connected with Ethernet at this time.
On the CNC unit PLC on-board edit screen, it is possible to use the data saved with GX Developer/GX Works2 or develop PLC programs, as well. Note that some functions may be limited. (Print output, Japanese input, etc.)
(Note) Do not use GX Developer/GX Works2 simultaneously when several PCs are connected with NC.



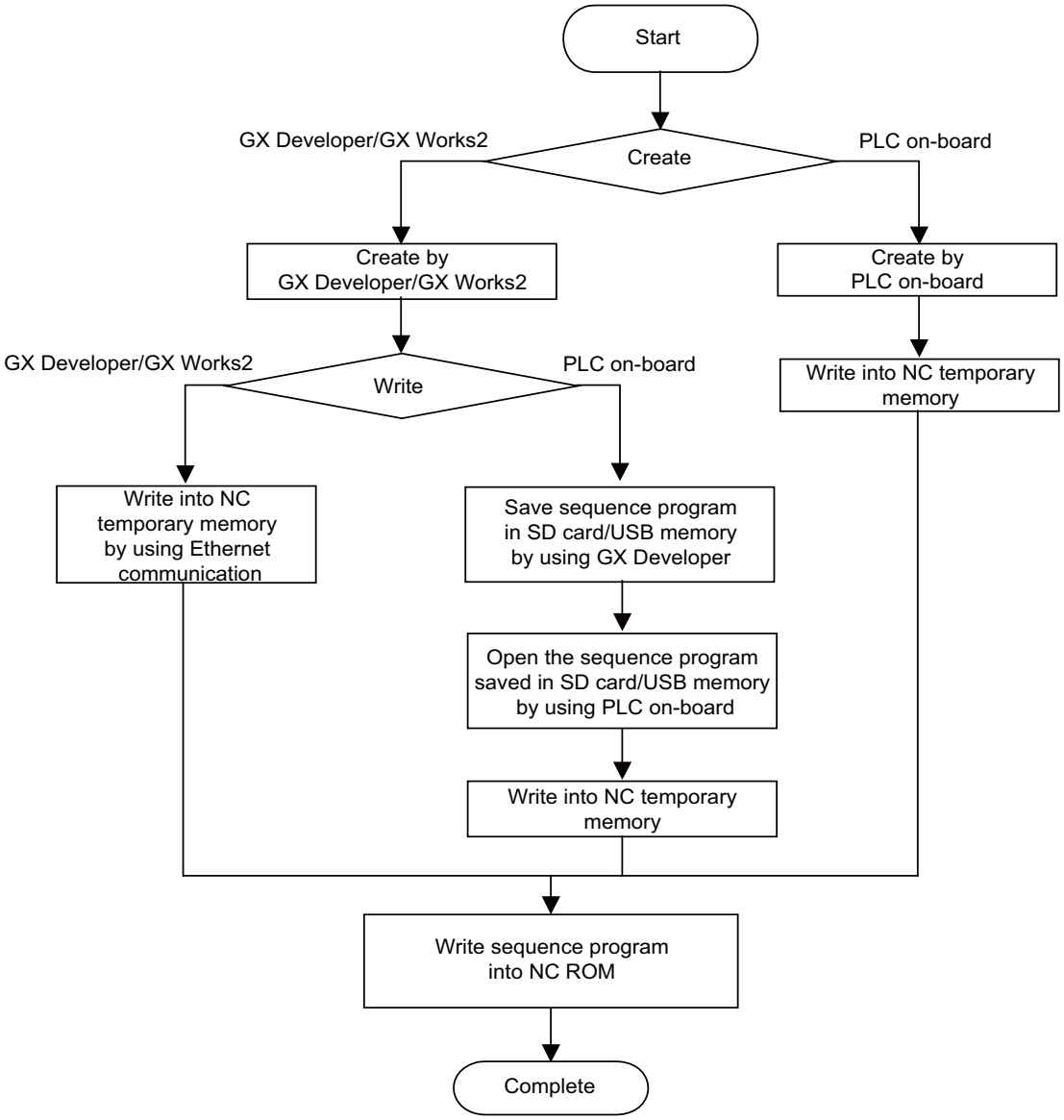
General configuration of development environment

Note the following points when using the SD card or USB memory.

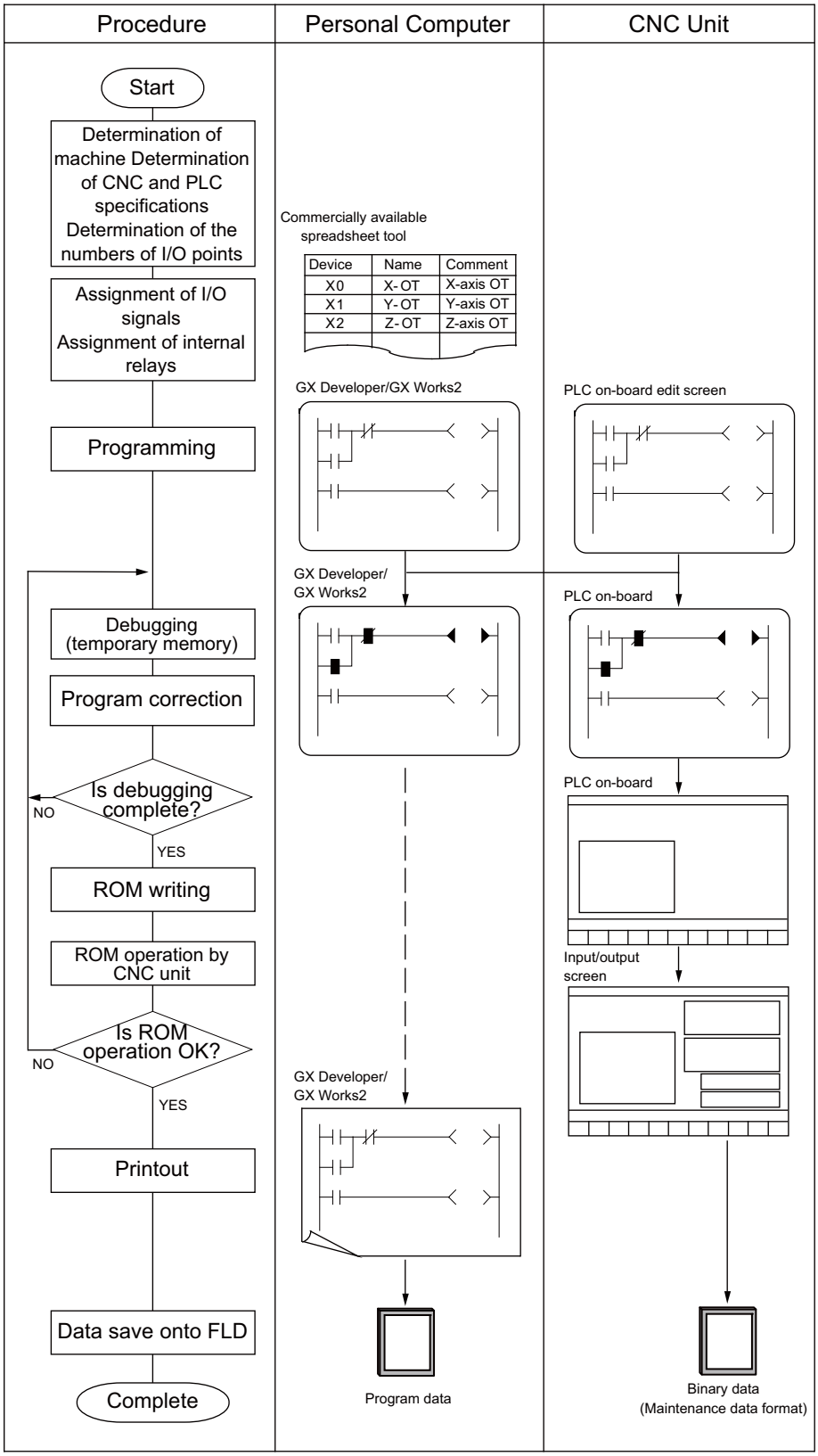
(1) Do not remove the SD card/USB memory during reading data.
(2) If a card must be inserted and removed while the power is ON, make sure to take sufficient time (approve. ten seconds or more) between the insertion and removal.
(3) Do not pull out the card or turn OFF the power during access to the SD card. Failure to observe this could cause the memory contents to be erased.
(4) Do not connect devices other than USB memory (including extension cable and USB hub).
(5) It is recommended to use genuine SD cards. MITSUBISHI is unable to guarantee the machine operation when a commercially available SD card/USB memory is used. In that case, performance check must be made carefully by machine tool builder.

3.2 User PLC (Ladder) Development Procedure

User PLC programs can be created and input by means of either GX Developer/GX Works2 installed in the external PC or PLC on-board edit screen.
Procedures for creating/inputting PLC programs with either method are shown below.



Next, procedures for creating sequence programs are shown below.



It is recommended to use genuine SD cards.
MITSUBISHI is unable to guarantee the machine operation when a commercially available SD card is used.
In that case, performance check must be made carefully by machine tool builder.

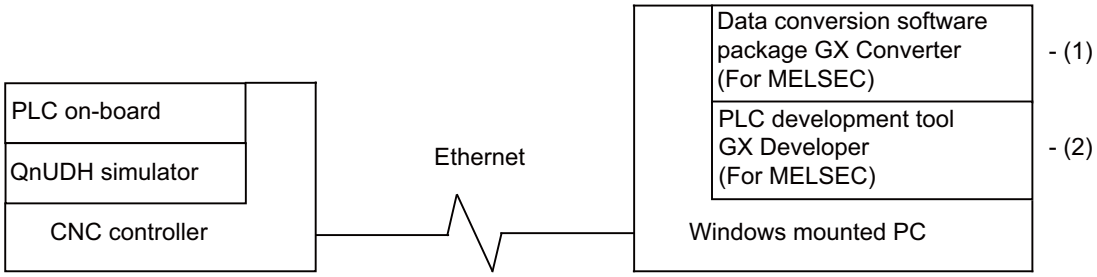
4

Peripheral Development Environment (GX Developer)

4.1 Outline

This CNC supports the user PLC development environment which uses the Mitsubishi Electric FA engineering software MELSOFT Series (GX Developer), which is the PLC development tool for the Mitsubishi PLC MELSEC Series.
This manual explains user PLC development environment using GX Developer, mainly usage specific to Mitsubishi Electric CNC.
This is used to create the machine sequence and user safety sequence of Mitsubishi Electric CNC.
The following shows the difference between the machine sequence and the user safety sequence.
Machine sequence: Control circuit created to control the machine tools (ladder circuit)
User safety sequence: Control circuit of the safety-related I/O observation created with the smart safety observation function (ladder circuit)
For the smart safety observation function, refer to "M800/M80 Series Smart safety observation Specification manual".
(Note 1) Do not connect GX Developer while displaying PLC on-board.
(Note 2) Do not use GX Developer simultaneously when several PCs are connected with NC.
Refer to "5 Peripheral Development Environment (GX Works2)" for explanation of user PLC development environment using GX Works2.

4.1.1 Software Configuration



(1) GX Converter (data conversion software package)

The GX Converter is a tool that carries out file conversion of GX Developer data files and the following:
GX Converter is an add-on tool of GX Developer and is started from the GX Developer menu.
- Alarms and operator messages created by the text editor
- Data files of commercially available spreadsheet software, word processors and editors

This tool is a software package for various MELSEC support. GX Converter Version 2.25B (SW2D5C-CNVW) needs to be used with the versions following GX Developer Version 6.01B. Refer to "GX Developer Operating Manual" for function details.

(2) GX Developer (PLC development software package)

GX Developer is a programming software package (model name: SW8D5C-GPPW) designed for Mitsubishi Electric's MELSEC Series programmable logic controllers. By performing operations similar to those of the MELSEC Series, you can develop user PLC ladders for the Mitsubishi Electric CNC Series. Note that some functions specific to the "MELSEC Series" may not be available.
For Mitsubishi Electric CNC Series sequence program development, we recommend you to use GX Developer Version 8.114U (SW8D5C-GPPW) or later. For function details, refer to "GX Developer Operating Manual".

4.1.2 Operating Environment

The tools that make up the development environment can be used with the personal computer that satisfies the following operating environment of GX Developer.
The following are the specifications of the "GX Developer Version 8.114U" operating environment. For the specifications of different versions, check them in the respective Operating Manuals (startup).

Item		Contents
Peripheral device	Personal computer	Personal computer in which Windows operates.
Personal computer main body	CPU	See "Applicable operating system and the corresponding required PC performance" shown below.
	Required memory	
Available hard disk space		200 MB or more
Disk drive		CD-ROM drive (if using CD-ROM media)
Monitor		Resolution 800x600 pixels or higher *1
Communication interface		Ethernet port
Operating system *2		・Windows 10 (Home, Pro, Enterprise, Education) *2 ・Windows 8.1, Windows 8.1 (Pro, Enterprise) ・Windows 8, Windows 8 (Pro, Enterprise) ・Windows 7 (Starter, Home Premium, Professional, Ultimate, Enterprise) ・Windows Vista (Home Basic, Home Premium, Ultimate, Business, Enterprise) *3

*1: Resolution 1024 × 768 pixels or higher is recommended for Windows Vista or later.
*2: When using GX Developer on Windows 10, please use Version 8.503Z or later.
*3: 64-bit Windows Vista is not supported.

Applicable operating system and the corresponding required PC performance.

Item	Required PC performance	
	CPU	Required memory
Windows Vista	Pentium 1 GHz or higher	1 GB or more
Windows 7, Windows 8, Windows 8.1	Pentium 1 GHz or higher	1 GB or more (32-bit Windows 7)
		2 GB or more (64-bit Windows 7)
Windows 10	Intel Core 2Duo 2 GHz or higher	1 GB or more (32-bit Windows 8)
		2 GB or more (64-bit Windows 8)

4.2 GX Developer Functions Supported by Mitsubishi Electric CNC

The GX Developer functions explained here are those supported by this CNC in the "offline functions" operated with the GX Developer independently, and the "online functions" carried out in connection with the CNC controller. Refer to the GX Developer Operating Manual for function details.

4.2.1 Function Support Conditions (General Section)

The GX Developer outline functions supported by this CNC are listed below.

The ○ mark indicates functions that can be used with this CNC. The × mark indicates that the function cannot be used because it is related to "MELSEC Series" characteristic functions. The function details during on-line are described in the next section.

The following shows the difference between the machine sequence and the user safety sequence.

Machine sequence : Control circuit created to control the machine tools (ladder circuit)

User safety sequence: Control circuit of the safety-related I/O observation created with the smart safety observation function (ladder circuit)

List of general section functions (1) ○ : Possible, Δ : Limitedly possible, × : Not possible

Program type	Machine sequence support	User safety sequence support	Remarks
Ladder	○	○	
List	○	○	
SFC	×	×	
MELSAP-L	×	×	
Function block	△	×	Not supported on the ladder monitor (PLC on-board)
ST	×	×	
Label programming	△	×	Not supported on the ladder monitor (PLC on-board)

Function	Menu	Sub menu	Machine sequence support	User safety sequence support	Remarks
Project	New project		○	○	
	Open project		○	○	
	Close project		○	○	
	Save		○	○	
	Save as		○	○	
	Delete project		○	○	
	Verify		○	○	
	Copy		○	○	
	Edit Data	New	○	○	
		Copy	○	○	
		Delete	○	○	
		Rename	○	○	
		Change program type	×	×	
	Change PLC type		△	△	Q26UDH fixed
	Import file	Import from GPPQ format file	×	×	
		Import from GPPA format file	×	×	
		Import from FXGP(WIN) format file	×	×	
		Import from FXGP(DOS) format file	×	×	
		Import from TEXT, CSV format file	○	○	
	Export file	Export to GPPQ format files	×	×	
		Export to GPPA format files	×	×	
		Export to FXGP(WIN) format file	×	×	
		Export to FXGP(DOS) format file	×	×	
		Export to TEXT, CSV format file	○	○	
	Macro	Registration macros	○	○	
		Macro utilize	○	○	
		Delete macros	○	○	
		Macro reference path	○	○	
	Function block	Utilize	○	○	
		Change FB name	○	○	
		Set unit head I/O No.	×	×	
	Security operation	User management	×	×	
		Set waiting time	×	×	
		Operation lock	×	×	
	Printer setup		○	○	
	Print		○	○	
	Start new GX Developer session		○	○	
	Exit GX Developer		○	○	

List of general section functions (2) ○ : Possible, Δ : Limitedly possible, × : Not possible

Function	Menu	Sub menu	Machine sequence support	User safety sequence support	Remarks
Edit	Undo		○	○	
	Restore after ladder conversion		○	○	
	Cut		○	○	
	Copy		○	○	
	Paste		○	○	
	Insert line		○	○	
	Delete line		○	○	
	Insert row		○	○	
	Delete row		○	○	
	Insert NOP batch		○	○	
	Delete NOP batch		○	○	
	Draw line		○	○	
	Delete line		○	○	
	Change TC setting		○	○	
	Read mode		○	○	
	Write mode		○	○	
	Read mode (all windows)		○	○	
	Write mode (all windows)		○	○	
	Ladder symbol	Open contact	○	○	
		Close contact	○	○	
		Open branch	○	○	
		Close branch	○	○	
		Coil	○	○	
		Application instruction	○	○	
		Vertical line	○	○	
		Horizontal line	○	○	
		Delete vertical line	○	○	
		Delete horizontal line	○	○	
		Rising pulse	○	○	
		Falling pulse	○	○	
		Rising pulse open branch	○	○	
		Falling pulse close branch	○	○	
		Rising pule negation	×	×	
		Falling pulse negation	×	×	
		Rising pulse OR negation	×	×	
		Falling pulse OR negation	×	×	
		Invert operation results	○	○	
		Convert operation results to rising pulse	○	○	
		Convert operation results to falling pulse	○	○	
	Documentation	Comment	○	○	
		Statement	○	○	
		Note	○	○	
		Statement/Note block edit	○	○	

List of general section functions (3) ○ : Possible, Δ : Limitedly possible, × : Not possible

Function	Menu	Sub menu	Machine sequence support	User safety sequence support	Remarks
Find/Replace	Find device		○	○	
	Find instruction		○	○	
	Find step no.		○	○	
	Find character string		○	○	
	Find contact or coil		○	○	
	Find comment		○	○	
	Replace device		○	○	
	Batch replacement of device		○	○	
	Replace instruction		○	○	
	Change open/close contact		○	○	
	Replace character string		○	○	
	Change module start address		×	×	
	Replace statement/note type		○	○	
	Cross reference list		○	○	
	List of used devices		○	○	
Convert	Convert		○	○	
	Convert (All programs being edited)		○	○	
	Convert (All program)		○	○	
	Convert (Online change)		○	×	Refer to "#6455"

List of general section functions (4) ○ : Possible, Δ : Limitedly possible, × : Not possible

Function	Menu	Sub menu	Machine sequence support	User safety sequence support	Remarks
View	Comment		○	○	
	Statement		○	○	
	Note		○	○	
	Alias		○	○	
	Device		○	○	
	Macro instruction format display		○	○	
	Current value monitor row		○	○	
	Comment format	4*8 characters	○	○	
		3*5 characters	○	○	
	Alias format display	Replace device name and display	○	○	
		Arrange with device and display	○	○	
	Device format display	Upper/lower split	○	○	
		Right/left split	○	○	
	Device comment row	1 row	○	○	
		2 rows	○	○	
		3 rows	○	○	
		4 rows	○	○	
	Toolbar		○	○	
	Status bar		○	○	
	Zoom	50%	○	○	
		75%	○	○	
		100%	○	○	
		150%	○	○	
		Specify	○	○	
		Auto	○	○	
	Project data list		○	○	
	Project data format	No sorting	○	○	
		Data name ascending sort	○	○	
		Data name descending sort	○	○	
	Instruction list		○	○	
	Set the contact	9 contacts	○	○	
		11 contacts	○	○	
	Elapsed time		×	×	
	Display step synchronization		×	×	
Online	Refer to "List of on-line section functions"	Refer to "2.2 Function Support Conditions (Online Section)"			
Diagnostics	PLC diagnostics		△	△	Limited partly
	Ethernet diagnostics		×	×	
	CC IE Control diagnostics		×	×	
	MELSECNET diagnostics		×	×	
	CC-Link/CC-Link/LT		×	×	
	System monitor		×	×	
	Online module change		×	×	

List of general section functions (5) ○ : Possible, Δ : Limitedly possible, × : Not possible

Function	Menu	Sub menu	Machine sequence support	User safety sequence support	Remarks
Tools	Check program		○	○	
	Calculate memory capacity		×	×	
	Merge data		○	○	
	Check parameter		×	×	
	Transfer ROM	Read	×	×	
		Write	×	×	
		Verify	×	×	
		Write to file	×	×	
	Delete unused comments		○	○	
	Clear all parameters		×	×	
	IC memory card	Read IC memory card	×	×	
		Write IC memory card	×	×	
		Read image data	×	×	
		Write image data	×	×	
	Start ladder logic test		×	×	
	Set TEL data	Connection	×	×	
		Disconnection	×	×	
		TEL data	×	×	
		AT command	×	×	
		Call book	×	×	
	Start LCPU logging setting tool		×	×	
	Intelligent function utility	Utility list	×	×	
	Customize keys		○	○	
	Change display color		○	○	
	Options		△	△	Limited partly
	Create start-up setting file		○	○	
Window	Cascade		○	○	
	Tile vertically		○	○	
	Tile horizontally		○	○	
	Arrange icons		○	○	
	Close all windows		○	○	
Help	CPU error		×	×	
	Special relay/register		×	×	
	Key operation list		○	○	
	Product information		○	○	
	Connect to MELFANSweb		○	○	
	Connect to setting guidance		×	×	

4.2.2 Function Support Conditions (Online Section)

The GX Developer functions supported by this CNC are listed below.
The ○ mark indicates functions that can be used currently with this CNC. The × mark indicates that the function cannot be used because it is related to "MELSEC Series" characteristic functions.

List of online section functions (1) ○ : Possible, Δ : Limitedly possible, ×: Not possible

Menu	Sub menu	Detailed function	Machine sequence support	User safety sequence support	Remarks
Transfer setup		PC side I/F	○	○	
		PLC side I/F	△	△	Only for QnUDHCPU
		Other station	×	×	
		Network route	×	×	
		Co-existence network route	×	×	
		Specify multi CPU	△	△	CNC unique specification (multi-project)
Read from PLC		Target memory	○	○	
		Title	○	○	
		File selection	○	○	
		Device data	×	×	
		Program	×	×	
		Common	×	×	
		Local	×	×	
		Refresh view	○	○	
		Free space volume	○	○	
		Create title	×	×	
Write to PLC		Target memory	△	△	
		Title	○	○	
		File selection	○	○	
		Device data	×	×	
		Program	×	×	
		Common	×	×	
		Local	×	×	
		Free space volume	○	○	
		Create title	×	×	
Verify with PLC		Target memory	○	○	
		Title	○	○	
		File selection	○	○	
		Program	×	×	
		Refresh view	○	○	
		Free space volume	○	○	
		Create title	×	×	
Write to PLC (Flash ROM)	Write the program memory to ROM		○	×	
	Write to PLC (Flash ROM)		×	×	
Delete PLC data		Target memory	○	○	
		Title	○	○	
		File selection	○	○	
		Refresh view	○	○	
		Free space volume	○	○	
		Create title	×	×	
Change PLC data attributes			×	×	
PLC user data	Read PLC user data		×	×	
	Write PLC user data		×	×	
	Delete PLC user data		×	×	

List of online section functions (2) ○ : Possible, Δ : Limitedly possible, ×: Not possible

Menu	Sub menu	Detailed function	Machine sequence support	User safety sequence support	Remarks
Monitor	Monitor mode/Start/Stop	ON/OFF state	○	○	
		Scan time display	○	○	
		CPU state display	○	○	
	Monitor [Write mode]		×	×	
	Start monitor [All windows]		○	○	
	Stop monitor [All windows]		○	○	
	Change current value monitor [Decimal]		○	○	
	Change current value monitor [Hexadecimal]		○	○	
	Local device monitor		×	×	
	Device batch	Device	○	○	
		Connect	○	○	
		Coil	○	○	
		Setting value	○	○	
		Current value	○	○	
		Monitor format : Bit & word	○	○	
		Monitor format : Bit	○	○	
		Monitor format : word	○	○	
		Display : 16-bit integer	○	○	
		Display : 32-bit integer	○	○	
		Display : Real number (single-precision/double-precision)	×	×	
		Display : ASCII character	×	×	
		Value : DEC	○	○	
		Value : HEX	○	○	
		T/C set value Reference program	○	○	
		Device test	○	○	
	Entry data monitor	Device	○	○	
		ON/OFF/Current	○	○	
		Setting value	○	○	
		Connect	○	○	
		Coil	○	○	
		Display : 16-bit integer	○	○	
		Display : 32-bit integer	○	○	
		Display : Real number (single-precision/double-precision)	×	×	
		Display : ASCII character	×	×	
		Value : DEC	○	○	
		Value : HEX	○	○	
		T/C setting value, Local label Reference program	○	○	
		Device test	○	○	
	Buffer memory batch		×	×	
	Monitor condition setup	Device	○	○	
		Step No.	○	○	
	Monitor stop condition setup	Device	○	○	
		Step No.	○	○	
	Program monitor list		×	×	
	Interrupt program monitor list		×	×	
	Scan time measurement		×	×	
	Entry ladder monitor		○	○	
	Delete all entry ladder		○	○	

List of online section functions (3) ○ : Possible, Δ : Limitedly possible, ×: Not possible

Menu	Sub menu	Detailed function	Machine sequence support	User safety sequence support	Remarks
Debug	Device test	FORCE ON	○	○	
		FORCE OFF	○	○	
		Toggle force	○	○	
		Device	○	○	
		Forced input output registration/cancellation	×	×	
		Buffer memory	×	×	
	Debug		×	×	
	Skip execution		×	×	
	Partial execution		×	×	
	Step execution		×	×	
Trace	Sampling trace	Wizard setting/execution	○	○	
		Individual setting/execution	○	○	
		Trace data storage destination	○	○	
		No. of traces	○	○	
		Trigger position	○	○	
		Trace additional information	△	△	
		Trace point setup	○	○	
		Trigger point setup	△	△	
		Device point setup	△	△	
		Trace operation	○	○	
		Trace status	○	○	
		Trace result	○	○	
		CSV file creation	○	○	
		Trace settings file operation	○	○	
		Trace settings PLC operation	○	○	
		Data retention at power OFF	×	×	
Remote operation		PLC status	○	○	
		RUN	○	○	
		STOP	○	○	
		PAUSE	×	×	Use when writing into ROM
		STEP-RUN	×	×	
		Reset	×	×	
		Operation during RUN	×	×	
		Specify execution destination	×	×	
Password setup	Register		○	○	
	Delete		○	○	
	Disable		○	○	
Clear PLC memory			×	×	
Format PLC memory		Target memory	△	△	
		Format Type	×	×	
Arrange PLC memory			×	×	
Set time		YY MM DD Hr. Min. Sec.	△	△	Only read
		Day of week	×	×	
		Specify execution destination	×	×	

4.2.3 Function Support Conditions (NC Special Function)

Function	Machine sequence support	User safety sequence support	Remarks
Multi-project	○	×	

4.3 Preparation

4.3.1 Installing the Tools

In this CNC's PLC development environment, it is assumed that the various tools are used with a Windows mounted personal computer. Prepare each tool so that it is compatible with Windows mounted personal computer.
Refer to "GX Developer Operating Manual" for the setup and start procedures of each tool.

4.3.2 Preparation for Ethernet Communication

Procedures for preparing for Ethernet communication is as follows. Refer to each respective instruction manual for details.

(1) Confirm IP address of the CNC unit.
(2) Confirm inhibiting GX Developer/GX Works2 connection setting on the CNC unit.
(3) Set IP address for the personal computer side.
(4) Connect the Ethernet cable.
(5) Set the connection target of GX Developer.

4.3.2.1 Confirming IP Address of the CNC Unit

Confirm the IP address set in the CNC unit. IP address is set in the parameters below.

Base common parameter	Item	Details	Setting example
#1926	Global IP address	IP address of the CNC unit looking from outside	192.168.200.1
#1927	Global Subnet mask	Subnet mask of #1926	255.255.255.0

Example given here is the case where "192.168.200.1" is set as the initial value after SRAM clear.

4.3.2.2 Confirming Inhibiting GX Developer/GX Works2 Connection Setting on the CNC Unit

Confirm inhibiting GX Developer/GX Works2 connection setting set on the CNC unit. Inhibiting GX Developer/GX Works2 connection setting is set in the following parameter. When inhibiting GX Developer/GX Works2 connection setting is set to "Block the connection", the connection cannot be made from GX Developer.

Base common parameter	Item	Details	Setting range
#11094	GX Restriction	Select whether to block the connection from GX Developer/GX Works2.	0: Allow the connection 1: Block the connection

4.3.2.3 Setting IP Address for the Personal Computer Side

For the personal computer for which GX Developer is available, IP address has to be set within the same subnet mask as NC unit.
In the case of the above mentioned "Confirming IP Address of the CNC Unit", set the address other than "192.168.200.1", using from "192.168.200.1" to "192.168.200.254".
Note that when other CNC and devices are connected on the same network, be careful not to duplicate the address with other CNC and devices.

4.3.2.4 Connecting the Ethernet Cable

Connect the Ethernet cable to the connector LAN1 (or LAN) of the control unit. If the connector is already connected, connect the cable to the HUB of the connection target, etc.

4.3.2.5 Setting the Connection Target

The connection target must be specified before performing online operations from GX Developer to the CNC controller.
The following TCP connection method is supported when connecting with Ethernet.

- TCP protocol: Connection type used with typical networks. The communication amount is high so the speed is not as fast, but the reliability is high. (A resend request is made when there is a lapse in communication.)

Perform the following operation with GX Developer to start the setting screen.

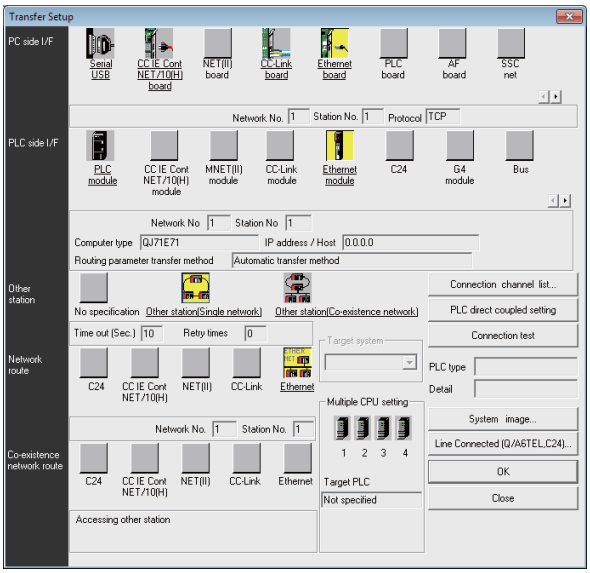
[Online] -> [Transfer Setup]

[For the machine sequence]
Set the following items in order.

Setting item		Setting content	Remark
PC side I/F		Ethernet board	
	Network No.	1	*1
	Station No.	1	*1
	Protocol	TCP	*1
PLC side I/F		Ethernet unit	
	Type name	QJ71E71	*2
	Station No.	1	*2
	IP address	IP address of CNC	*2
	Routing parameter conversion method	Automatic conversion method	*2
Other station		Other station (single network)	
	Time out check (sec.)	Arbitrary time (approximately 10 sec. or more)	*3
	Number of retry	0	*3
Network communication path		Ethernet	
	Access to the Ethernet unit that is set with PLC side I/F		*4

*1: The setting items are displayed by double-clicking the Ethernet board selection field.
*2: The setting items are displayed by double-clicking the Ethernet unit selection field.
*3: The setting items are displayed by double-clicking the other station (single network) selection field.
*4: The setting items are displayed by double-clicking the Ethernet unit selection field.

■SW8D5C-GPPW setting screen



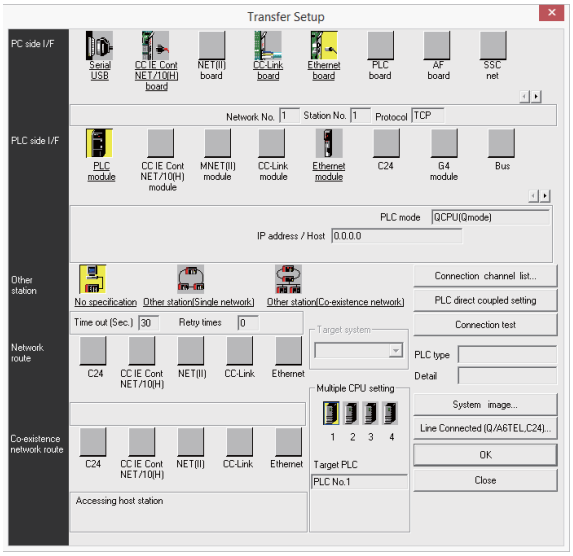
After setting the connection, press [Connection Test].
If communication is successful, the message "Connected with Q26UDHCPU" is displayed with the multi-CPU connection status below the message. This indicates the connection status of each project.

[For the user safety sequence]
Set the following items in order.

Setting item		Setting content	Remark
PC side I/F		Ethernet board	
	Network No.	1	(*1)
	Station No.	1	(*1)
	Protocol	TCP	(*1)
PLC side I/F		CPU unit	
	CPU mode	QCPU (Q mode)	(*2)
	Ethernet port direct connection	Not check	(*2)
	IP address	IP address of CNC	(*2)
Other station		No specification	
	Time out check (sec.)	Arbitrary time (approximately 10 sec. or more)	(*3)
	Number of retry	0	(*3)
Multi CPU			
	For the user safety sequence 1, select No. 1.		
	For the user safety sequence 2, select No. 2.		

(*1): The setting items are displayed by double-clicking the Ethernet board selection field.
(*2): The setting items are displayed by double-clicking the CPU unit selection field.
(*3): The setting items are displayed by double-clicking the other station (single network) selection field.

■SW8D5C-GPPW setting screen



After setting the connection, press [Connection Test].
If connection is successful, the message "Connected with Q26UDHCPU" is displayed with the multi-CPU connection status below the message. This indicates the connection status of each project.

4.4 Common Items

4.4.1 Precautions before Development

Pay careful attention to the following items before developing sequence programs using the GX Developer.

> **⚠ CAUTION**
>
> **Always observe the following precautions during work.**

(1) PLC Type Selection

The PLC type must be set when newly creating programs, etc. Select the following CPU type when requested to select the PLC type by the GX Developer. An error will occur during transfer of the sequence program to the CNC controller if another PLC type is selected.

> **⚠ CAUTION**
>
> **Select "Q26UDH" for CPU type.**

(2) Device Setting

The number of device points must always be set when developing the sequence program for the CNC controller. The sequence program will not be transferred to the CNC controller correctly if it is developed with the setting values given later.

> **⚠ CAUTION**
>
> **Always set the number of devices.**

(3) PLC Instructions

MELSEC-specific PLC instructions cannot be used in the sequence program development for the CNC controller. The format, etc., are changed with some instructions.

> **⚠ CAUTION**
>
> **MELSEC-specific PLC instructions cannot be used.**

(4) Saving the sequence program

The sequence program transferred from the GX Developer or PLC on-board to the CNC controller is stored in the temporary memory. The temporary memory is erased when the power is turned OFF. (This is because the sequence program stored in the ROM in CNC is validated when the power is turned ON again.)
Thus, if the sequence program is to be held even when the power is turned ON again, always write it to the ROM in CNC.

> **⚠ CAUTION**
>
> **Sequence programs that are not saved in the ROM in CNC are not held when the power is turned OFF.**

4.4.2 Multi-project Function

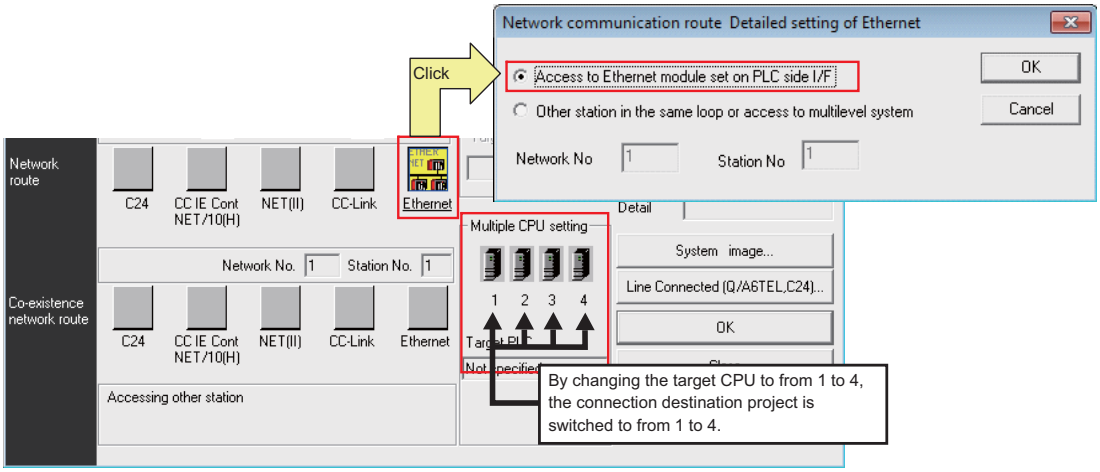
Multi CPU configuration of MELSEC PLC is mounted as CNC specification. This function enables the projects to be divided by each machine sequence and the divided multiple projects to be independently controlled/started by one CNC. Refer to "PLC Programming Manual" for details. For the user safety sequence, the multi-project cannot be used.
To enable multi-project, set the multi-project parameter and then the power needs to be turned ON again.

4.4.2.1 Switching access destination of project

Switch the access destination of the project in CNC. If this setting is not carried out, it will be connected to the project 1.
The No. of projects that can be connected differs depending on the maximum project No. parameter of the multi-project parameter.

(1) How to connect to projects 1 to 4
The following is the method to connect to the projects from 1 to 4.

Screen specifying the connection target



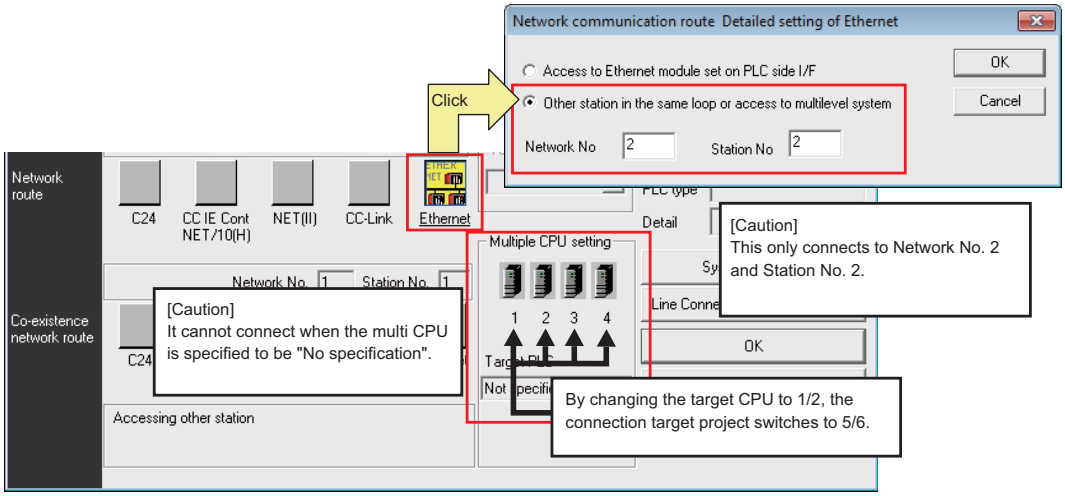
Setting items		Setting contents	Remarks
Network communication path		Ethernet	
	Access to the Ethernet unit that is set with PLC side I/F		*1
Multi CPU setting			
	Machine 1 to 4	Switches to multi-project 1 to 4	

*1: The setting items are displayed by double-clicking the Ethernet unit.

(2) How to connect to projects 5/6

The following is the method to connect to the projects 5/6.

Screen specifying the connection target

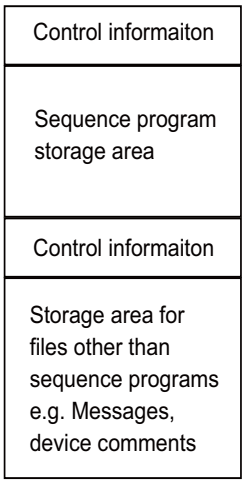


Setting item			Setting contents	Remarks
Network communication path			Ethernet	
	Accessing other stations in the same loop or multi-level system			*1
		Network No	2	
		Station No.	2	
Multi CPU setting				
	Machine 1/2		Switch to multi-project 5/6	

*1: The setting items are displayed by double-clicking the Ethernet unit.

4.4.3 PLC Data Storage Areas

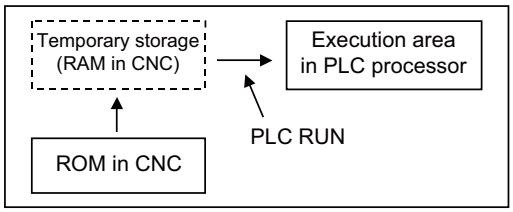
The M8 Series stores the PLC data in the ROM in CNC. The following shows the storage area structure. (Refer to "PLC Programming Manual" on data size.)
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".



4.4.3.1 Executing Sequence Program

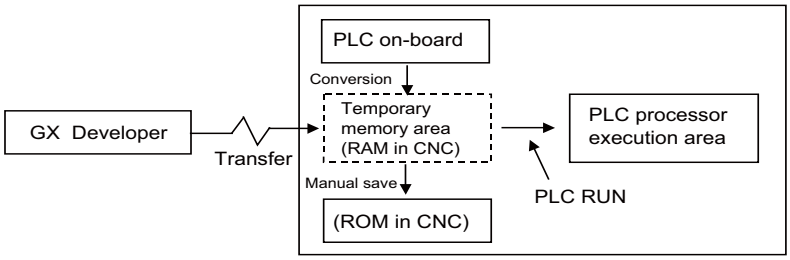
The sequence program transferred from GX Developer or PLC on-board is executed with the following path.

(1) At the power ON
The data is transferred from the ROM in CNC to the PLC processor execution area via the temporary memory (RAM in CNC), and is then executed.



However, by setting "1" to the rotary switch 2 of the CNC unit ("0" is set as default), it turns to the mode "PLC RUN is not executed".)

(2) During PLC development
The sequence program transferred from the GX Developer or PLC on-board is stored in the volatile RAM for the temporary memory. The sequence program is transferred to the PLC processor execution area before PLC execution, and is then executed.
The temporary memory area (RAM in CNC) is not held when the power is turned OFF. If the data needs to be held even after the power is turned OFF, it must be stored in the the ROM in CNC. (Refer to "Sequence Program Development: Writing the Sequence Program to the ROM in CNC")



When a sequence program is transfered from the temporary storage area to the execution area, the program execution format is converted to that of the sequence program. Although the execution area of the PLC processor has twice the capacity of the temporary storage area, PLC cannot be executed if the capacity exceeds the allowable range.

4.4.3.2 Relationship between the areas in CNC and the areas that can be selected on GX Developer

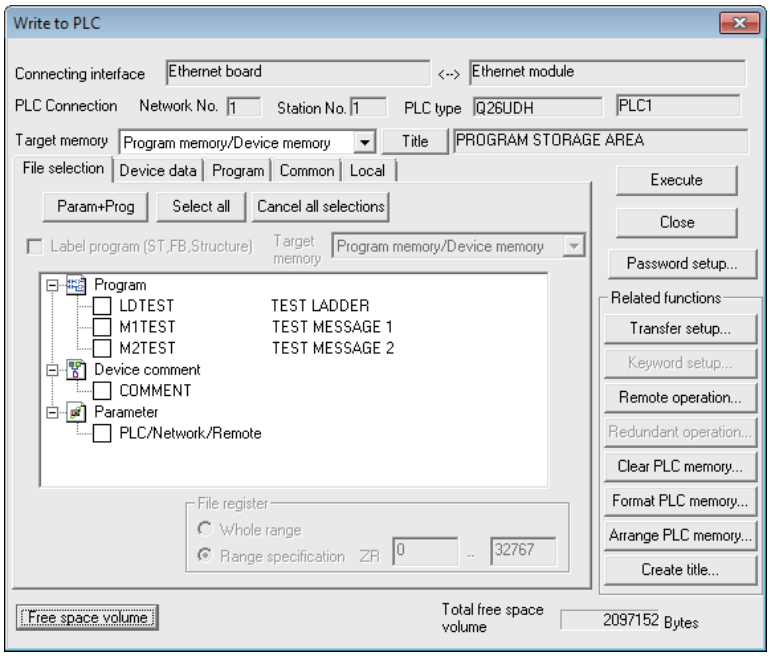
The following table indicates the relationship between the PLC data storage area in CNC and the storage areas that can be selected on GX Developer.
Refer to "PLC Programming Manual" for the data which can be stored in each area.

PLC data which can be stored from GX Developer	Target memory which can be selected on GX Developer	PLC data storage area in CNC
Sequence program Parameter	Program memory/Device memory	Sequence program storage area / temporary memory area (RAM in CNC)
Device comment PLC message Symbolic information *	Program memory/Device memory Memory card (RAM)	Data storage area/ Storage area (ROM in CNC)

* This is the file to be written to NC at the time of label programming.

4.4.3.3 Display of storage area on GX Developer

Any of the storage areas that can be selected for the online functions of GX Developer can be specified as a [Target memory] item on the corresponding operation screen. Also, pressing the [Title] button displays the comment of that storage area if PLC data exists. It is not displayed if the storage memory is not fitted or the data does not exist.
When the user safety sequence is connected, the comments of memory card (RAM) and standard RAM are not displayed.



The free space in the area selected at [Target memory] will appear when the "Free space volume" button is pressed.

The following table indicates the relationships between the [Target memory] items and storage areas.

Target memory	Meaning in M800 series	Title indication	Free area indication
Program memory / Device memory	Sequence program storage area(temporary memory area (RAM in CNC))	PROGRAM STORAGE AREA	Total free space volume: Free space in sequence program storage area
Memory card (RAM)	Data storage area(Storage area (ROM in CNC))	DATA STORAGE AREA	Total free space volume: Free space in data storage area
Memory card (ROM)	Not used (cannot be selected)	None	
Standard RAM	Checking execution step No.	LAD. EXEC. SIZE AREA	Not used
Standard ROM	Not used (cannot be selected)	None	

4.4.4 File Name

The PLC related data, such as the sequence programs and message data, are controlled and stored with the following categories in this CNC. Therefore, they are also developed in the same categories.

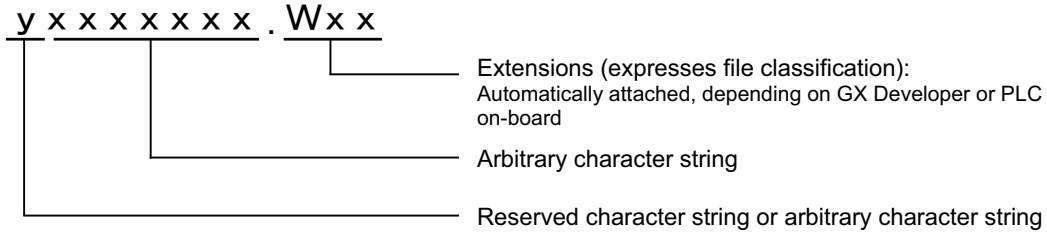
⚠ CAUTION

If the data transferred does not follow the file name rule, unexpected operations will occur.

E.g. PLC program erasure

4.4.4.1 File Name Rule for Sequence Program, Parameter, and Device Comment

File name rule (Sequence program, parameter, device comment)



When storing data with GX Developer or PLC on-board, the data type is identified with the file name. Up to 8 one-byte alphanumeric characters (excluding the extension), hyphen (-) and underline (_) can be used to the file name. The extension is automatically attached and expresses classification of the file.
Note that the first character may be reserved for expressing the data type.

[Caution] Reserved file names
The file name is reserved on the NC side if the following head character is used.
- "H"

Do not use file name in combination with this head character.

List of sequence program, parameter, and device comment

	Data class	Data type	File name	Storage quantity	Remarks
1	Sequence program	High-speed process	H+[Arbitrary character string].WPG	Total 120 programs *2	Execution type (scan) *1
		Main process	[Arbitrary character string].WPG		Execution type (scan) *1
		Initialization process	[Arbitrary character string].WPG		Execution type (initialization) *1
		Standby process	[Arbitrary character string].WPG		Execution type (wait/low-speed) *1
2	Parameter	PLC parameters	PARAM.WPA (fixed)	6 parameters *2	
		Network parameters			
3	Device comment	Common comment	COMMENT.WCD (fixed)	Total 80 comments *2,*3	Common for all sequence programs
		Comment for each program	[Arbitrary character string].WCD		For sequence programs having same name

"Arbitrary character string" means a character string consisted of up to 8 one-byte alphanumeric characters, hyphen (-) and underline (_).

*1: The execution type is the sequence program operation type designated with the parameters.

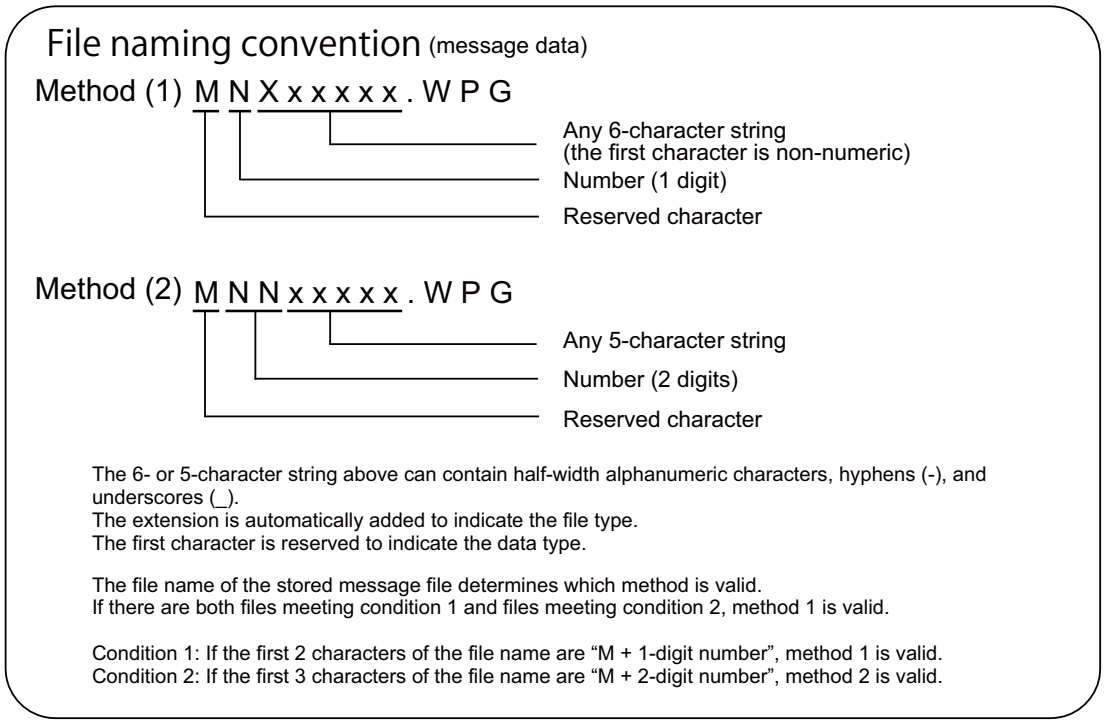
*2: This quantity will be the total number of all projects when the multi-project function is enabled.

*3: This quantity will be the total number of device comment, message and symbolic information files.

4.4.4.2 File Name Rule for Message Data

There are two methods for the message data language selection. Method 2 (Method linked with language selection on the setting and display screen) is recommended although both methods are available.
For the user safety sequence, the message file cannot be used.

(Method 1) Specify with 3 bits of bit selection parameter #6453 bit0 to bit2.
(Language selection method using PLC alone)
(Method 2) Specify with display language selection parameter. (Base specifications parameter #1043)
(Method linked with language selection on the setting and display screen)



(1) Method 1

Language is specified with 3 bits of the bit selection parameter #6453 bit0 to bit2, and the No. corresponds to the No. used in message file name.

List of message file name (Method 1)

Data class	Bit selection parameter #6453 bit0 to bit2	Data type	File name	Storage quantity	Storage quantity
Message (Method 1)	0	1st language	M1Xxxxxx.WPG	One for each language Total 80 languages *2,*3,*4	It is not possible to store multiple files having the same language Nos. even if their names are different.A message confirming overwriting the same language No. is displayed.
	1	2nd language	M2Xxxxxx.WPG		
	2	3rd language	M3Xxxxxx.WPG		
	3	4th language	M4Xxxxxx.WPG		
	4	5th language	M5Xxxxxx.WPG		
	5	6th language	M6Xxxxxx.WPG		
	6	7th language	M7Xxxxxx.WPG		
	7	8th language	M8Xxxxxx.WPG		

*1: "Xxxxxx" part of a file name consists of up to 6 arbitrary alphanumerical characters including hyphen (-) and underline (_). Note that however, the third character "X" has to be other than numerical character. (To avoid confusion with method 2.)
*2: One for each language can be stored in each project when the multi-project function is enabled.
*3: This quantity will be the total number of all projects when the multi-project function is enabled.
*4: This quantity will be the total number of device comment, message and symbolic information files.

(2) Method 2

Language is specified with the language parameter #1043 on the setting and display screen, and the No. corresponds to the 2-digit No. used in message file name.

When no corresponding message file for a certain language parameter is stored, an English language display file (M00xxxxx.WPG) is referred to as an alternative file. Thus, message data file for the English language display must be stored.

List of message file name (Method 2)

Data class	Language parameter (Base specifications parameter #1043)	File name	Storage quantity	Remarks
Message (Method 2)	0 (English) [mandatory]	M00xxxxx.WPG	One for each language Total 80 languages *1,*2,*3	When no corresponding file for a certain language parameter is stored, an English language display file (M00xxxxx.WPG), if stored, is referred to as an alternative file. It is not possible to store multiple files having the same language Nos. even if their names ("xxxxx" part) are different. A message confirming overwriting the same language No. is displayed.
	1 (Japanese)	M01xxxxx.WPG		
	11 (German)	M11xxxxx.WPG		
	12 (French)	M12xxxxx.WPG		
	13 (Italian)	M13xxxxx.WPG		
	14 (Spanish)	M14xxxxx.WPG		
	15 (Chinese -traditional-)	M15xxxxx.WPG		
	16 (Korean)	M16xxxxx.WPG		
	17 (Portuguese)	M17xxxxx.WPG		
	18 (Dutch)	M18xxxxx.WPG		
	19 (Swedish)	M19xxxxx.WPG		
	20 (Hungarian)	M20xxxxx.WPG		
	21 (Polish)	M21xxxxx.WPG		
	22 (Chinese -simplified-)	M22xxxxx.WPG		
	Other than above;up to 99	If the message for a corresponding No. exists, it is displayed. If not, an English file (M00xxxxx.WPG) is displayed.		
	Other than above;above 100	An English file (M00xxxxx.WPG) is displayed.		

*1: One for each language can be stored in each project when the multi-project function is enabled.

*2: This quantity will be the total number of all projects when the multi-project function is enabled.

*3: This quantity will be the total number of device comment, message and symbolic information files.

(3) Precautions

- Even if the file is made with the conventional specifications method 1, when the third character of the file name is a numerical character, it may be identified as method 2 (language selection parameter.
  (Example) "M1720V02.WPG", "M750MESS.WPG", "M65S-MES.WPG", etc.

- Files having the same No. and different arbitrary names are identified as the same files and will be overwritten.
  (Example) "M1TEST.WPG" and "M1JAPAN.WPG", "M00ENG01.WPG" and "M00ENG02.WPG", etc.

- Files having the same arbitrary name ("xxxxx" part) and different method types are not identified as the same files and will not be overwritten. If method 1 and 2 exist together, method 1 will be valid.
  (Example) "M1TEST.WPG" and "M01TEST.WPG", "M1JAPAN.WPG" and "M01JAPAN.WPG", etc.

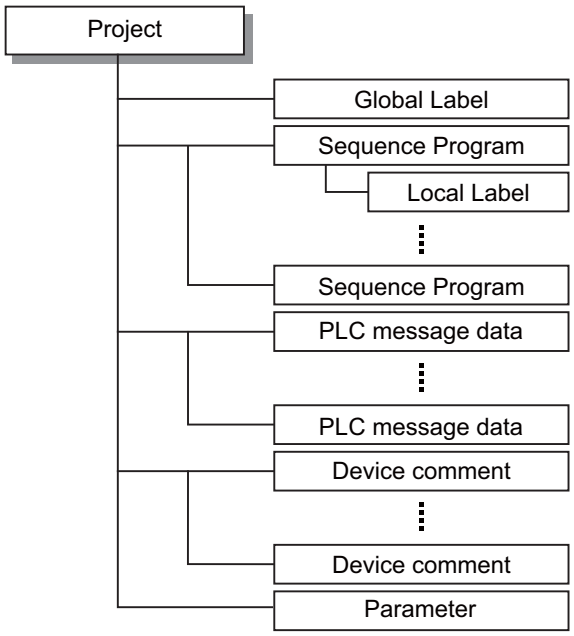
- Files that are not applied to condition 1 and 2 are not identified as a message file. They are identified as a sequence program (ladder), instead.
  (Example) "M0TEST.WPG", "M9MESS.WPG", "M0-1TEST.WPG", "M-01JPN.WPG", "MM00ENG.WPG", etc.

4.4.5 Creating a Project

GX Developer treats PLC related data such as sequence program and message data collectively as a "project".
In this section, the method of creating a project is explained.

4.4.5.1 Project

Project is a collection of sequence program, device comment, PLC message data and parameters. Usually, data is controlled by the project level per machine type or version.



Item	Details
Sequence program	Sequence program for Mitsubishi Electric CNC (User PLC)
PLC message data	This defines PLC messages such as alarm message and PLC switch.
Device comment	This is the comment for a sequence program device. There are "common comment" which is common for a project and "comment by program" which is particular for each program.
Parameter	This sets the device range and execution order of the sequence program.
Global label (Only for label program)	The label variable which is enabled for the all sequence programs when creating a number of sequence programs in a project.
Local label (Only for label program)	The label variable which is enabled only for in an individual sequence program. This is one-on-one setting with an individual sequence program.

(1) One project per GX Developer
Only one project can be edited with a GX Developer. Therefore, if two or more projects are to be edited, multiple GX Developers must be operated.

(2) Device comment

Comment type	Number to be created	Details
Common comment	1	Common device comment for all the programs existed in the project.
Comment by program	Same as the number of programs	Device comment set for each program. Always set the same name as that of program.

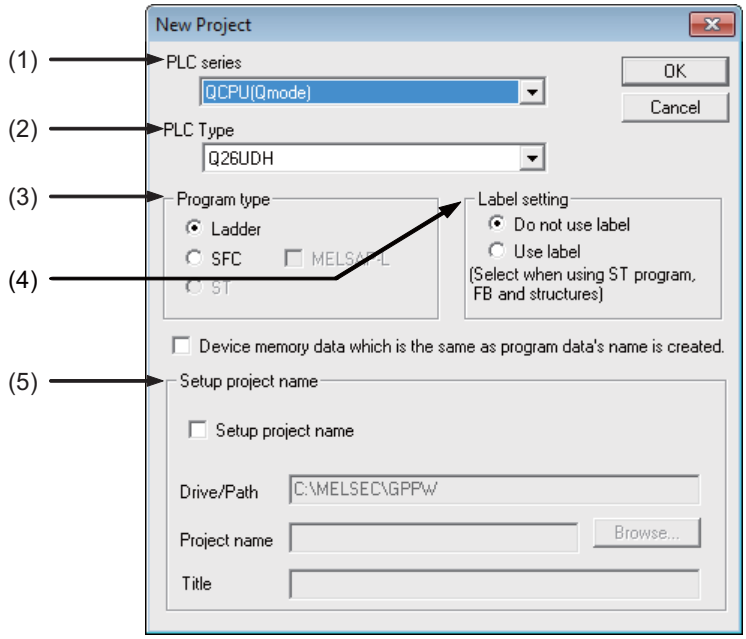
(3) Maximum number of ladder files and PLC message files available on one project of GX Developer
Maximum number of ladder files and PLC message files available on one project of GX Developer is as follows: number of ladder files + number of PLC message files < 125. (An error occurs when creating the 125th file, and it cannot be created.)
If the total of ladder files and PLC message files exceeds 125, develop the project in either of the following methods:
- Create a project dedicated to PLC messages, apart from those for ladder files.
- Use the multi-project function to reduce the number of files per project to 124 or less.

4.4.5.2 Operating Procedures

Perform the following operation from GX Developer to start the operation screen.

[Project] -> [New Project]

Set the PLC series, PLC type and project name required to create a new project with the screen below.



Set the following items on the "New Project" screen, and press "OK".

(1) PLC series
Sets the series name of PLC (Programmable controller). Select "QCPU (Q mode)" here.

(2) PLC type
Set the PLC type. Set "Q26UDH" here.

(3) Program type
Default values are set for these items. Refer to GX Developer Operating Manual for details.

(4) Label setting
Select "Use label" when executing label programming. Refer to GX Developer Operating Manual for details.
* Even when labels are used, the built-in PLC (built-in edit function) displays an unlabeled actual ladder (ladder with labels and functional blocks compiled).

(5) Project name / Title
Set drive/path+project name (8 or more characters can be set) with up to 154 one-byte alphanumerical characters together. Title must be set with up to 32 one-byte characters.
Refer to GX Developer Operating Manual for details on the available characters.
When inputting/outputting built-in PLC editing function (PLC on-board function) and project data by turns, consider the following restrictions and set.

PLC on-board function	Alphanumerical display	Alphanumerical input	Japanese display	Japanese input	Number of characters
Project name	○	○	○	×	18 (abbreviated hereafter)
Title	×	○	×	×	32

4.4.6 Setting the Parameters

The GX Developer parameters must be set before the CNC controller sequence program can be developed with GX Developer. The required parameter settings are shown below.
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

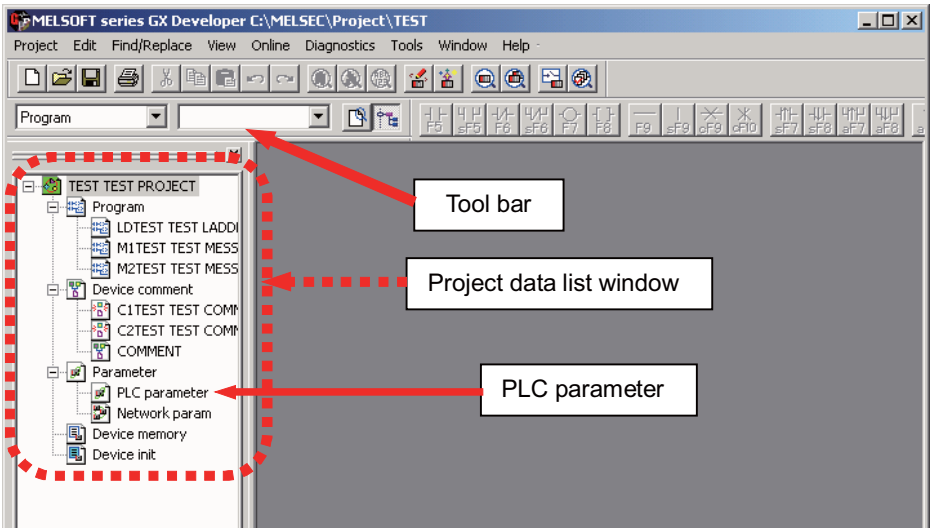
- Setting the number of device points
- Setting the number of common pointer points
- Setting the program execution order

4.4.6.1 Parameter Setting Screen

(1) Displaying the project data list and Parameter Setting screen

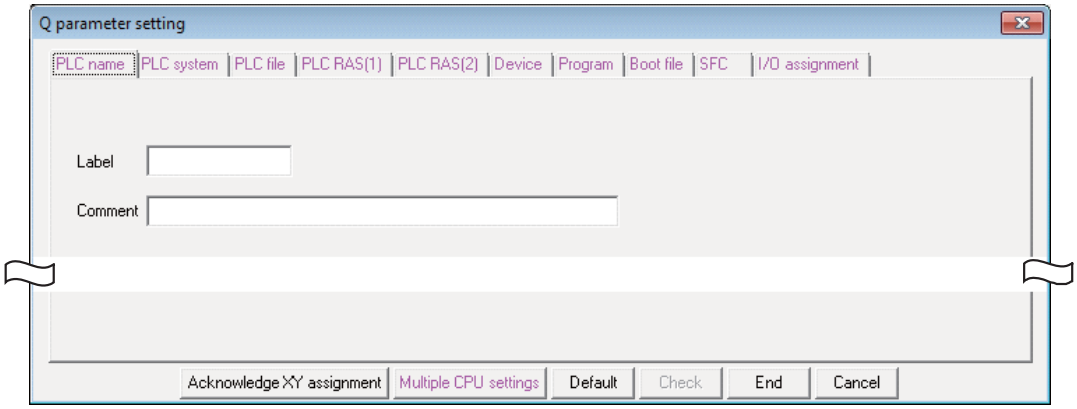
Open the "Project data list" window with the following operations. Double-click on "PLC parameter" to open the parameter setting screen. The same operation can be completed by designating the data type "Parameter" and data name "PLC parameter" from the tool bar.

Select [View] - [Project data list], then double-click on "PLC parameter".



(2) Displaying the parameter setting screen

If the characters on the tab are "red", the default values are set.



4.4.6.2 Setting the Number of Device Points

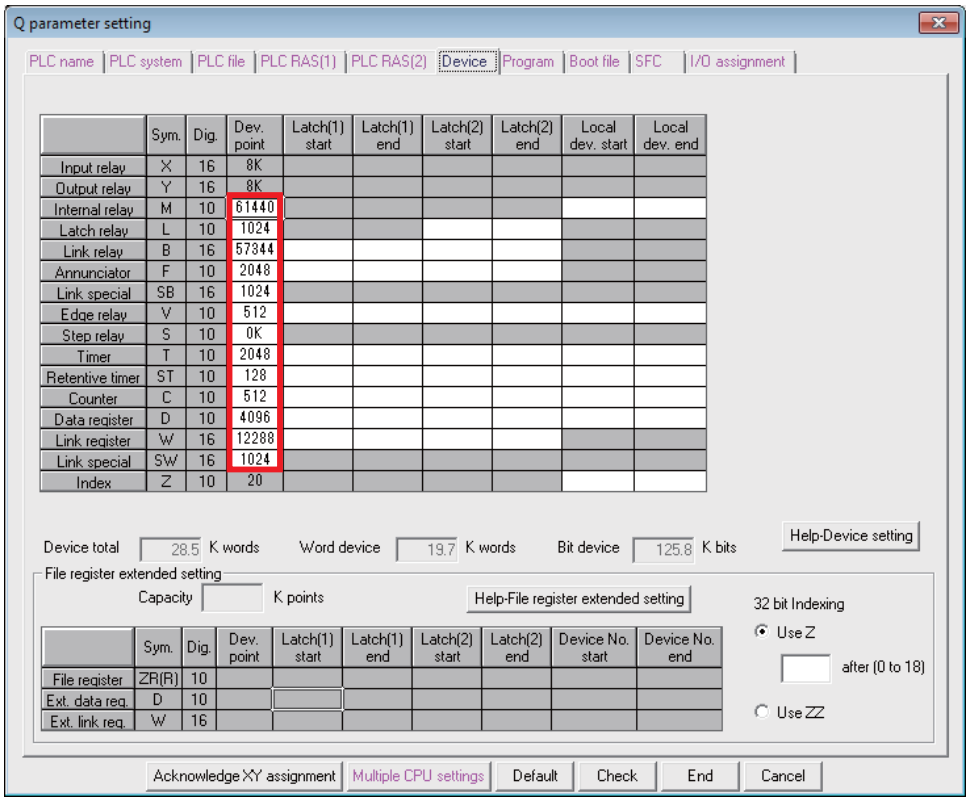
After creating the area (project) for controlling the sequence program, the number of devices used in that project must be set first. This operation must be carried out each time a new project is created.
For details on each setting item, refer to the "PLC Programming Manual".
[Caution] An error will occur if the sequence program is downloaded to the CNC controller without completing this operation.

Select the [Device] tab

The range of device, which each project can use, changes under the multi-project environment. For the number of device points to set to parameter, input the "number of device points + common number of points" that are set at "device setting screen of built-in PLC (built-in edit function)". Setting wrong device points incurs an error.

Set the value for the number of device points on the following screen, and then click on [End].

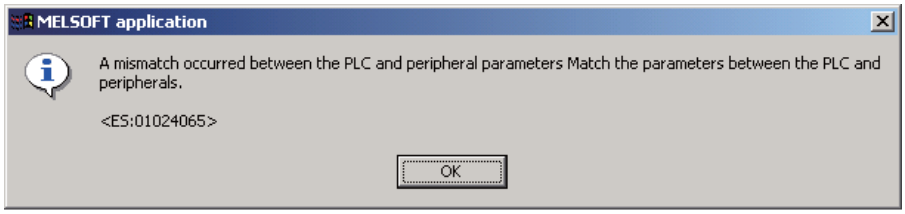
Set the number of device points that matches the currently connected project in the section in red square below. When the setting for the number of device points is completed, press "End" button to finish the edit.



[Note] If a non-designated value is set, an error will occur when downloading to the CNC controller.

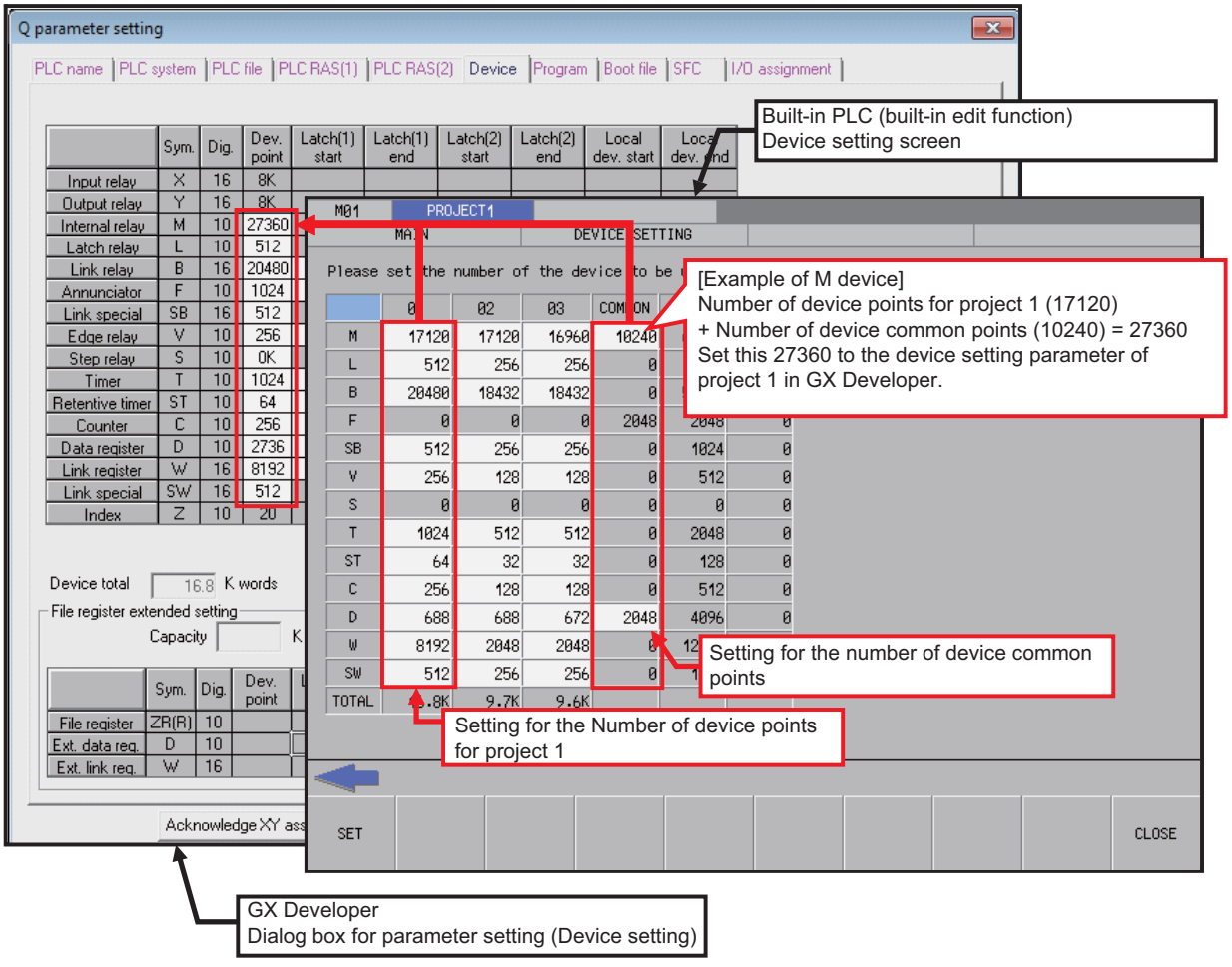
(1) When device setting value is illegal

If there is a problem with the device setting value, the following error dialog will appear when writing the sequence programs to the CNC controller. Set the number of device points as explained above in this case.



(2) Setting example of the number of device points (Project 1)

The setting example of the number of device points for the project 1 is described below.Follow this example and set the "Number of device points for project 1 + number of device common points", which is set to the built-in PLC (built-in edit function), to the device setting parameter of GX Developer.

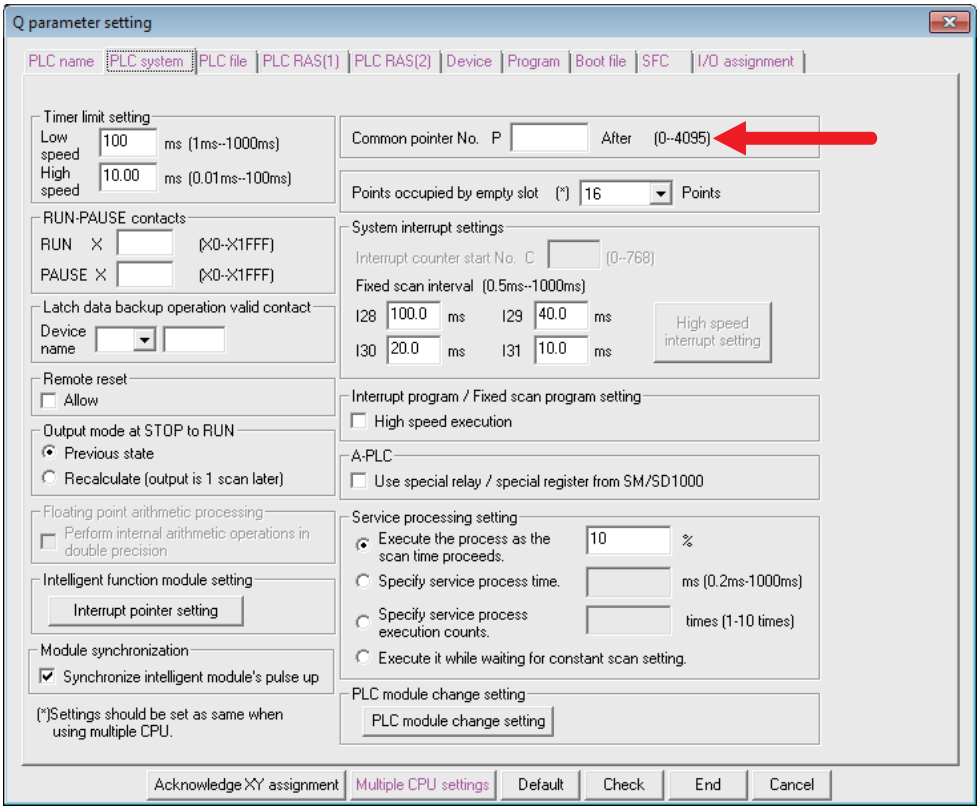


4.4.6.3 Setting Common Pointer No.

When creating the sequence programs with the multi-program method, the number of common pointers must be set for each sequence program. This operation must be carried out each time a new project is created and the parameter file is written to the CNC controller.
[Note] When not set, Common Pointer No. is set as "P1800".

Select the [PLC System] tab

Set the "Common pointer No." value on the following screen, and then click on [End].

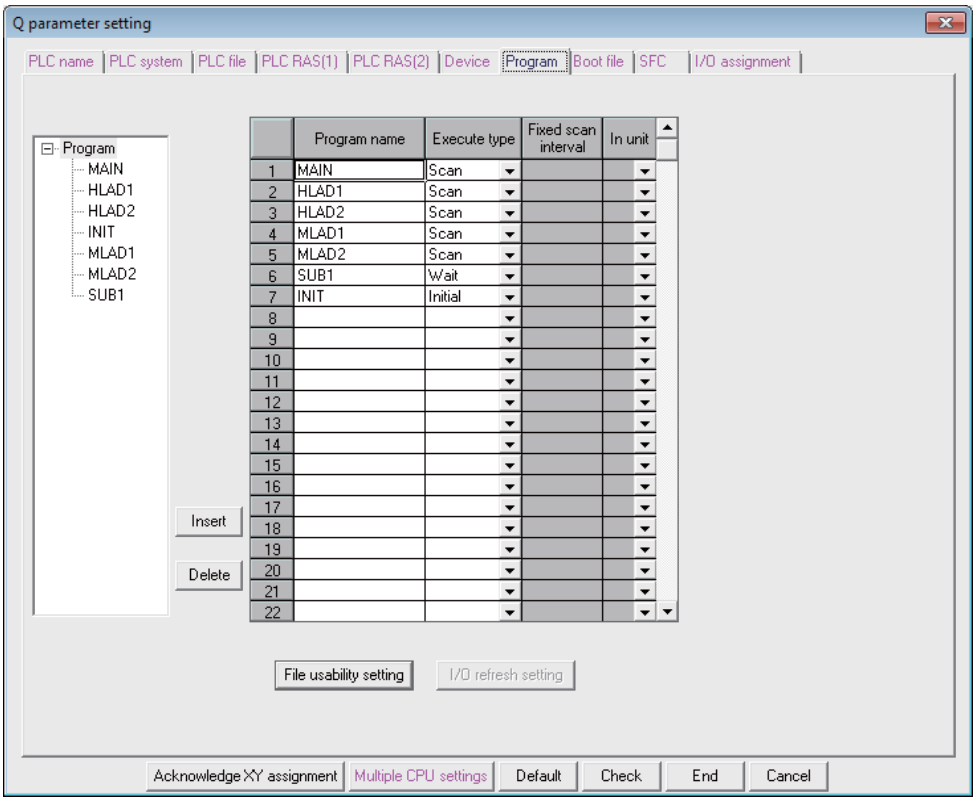


4.4.6.4 Setting the Program Execution Order

When creating the sequence programs with the multi-program method, the execution method and execution order of each sequence program must be set. This operation is carried out before the sequence program is executed with the CNC controller. The parameter file must be written to the CNC controller.
For details on each setting item, refer to the "PLC Programming Manual".
[Note] If this operation is not done when using the multi-program method, an error will occur when RUN is executed in the sequence program.

Select the [Program] tab

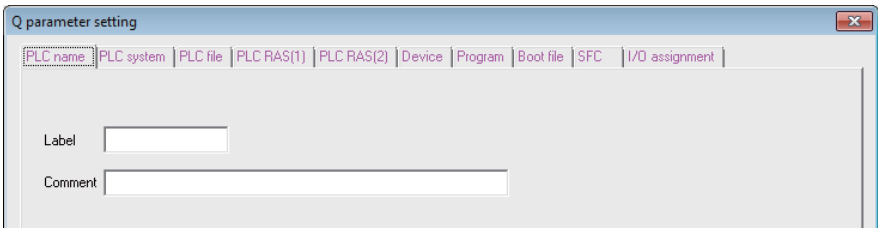
Select the sequence program name to be registered for execution from the program list on the left of the following screen, and then press the "Insert" button. Select the execution mode from the registration program list on the right side. After registering all sequence programs to be executed, click on [End].



4.4.6.5 Setting the label/comment for each project

To clarify the function of the operating program etc. in each project, the label/comment for each project can be set.The label/comment can be set using the GX Developer or the built-in edit function in the built-in PLC.

The below is the setting screen on GX Developer.



The table below shows the setting details of the above screen.

Parameter name	Tab name	Setting item	No. of characters	Setting details
PC parameter	PC name	Label	10 (one-byte alphanumeric)	Label for project
		Comment	64 (one-byte alphanumeric)	Comment for project

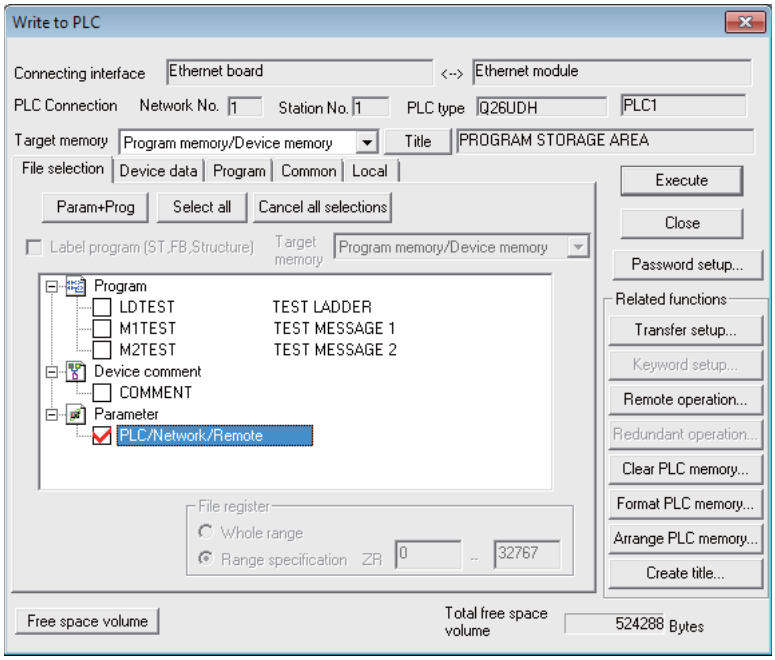
4.4.6.6 Writing and Reading Parameters to and from the CNC Controller

When creating the sequence programs with the multi-program method, the parameter file must be written to the CNC controller. The parameter file can also be read from the CNC controller and used with GX Developer.
The operation methods are the same as reading and writing the sequence programs.

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Write to PLC]/[Read from PLC]

On the following screen, choose the parameter [PLC/Network/Remote password] file to be written to or read from the [File selection] tab and click [Execute]. RUN/STOP of PLC can be specified from the [Remote operation] of [Related functions].



[Note] As [Target memory], only "Program memory/Device memory" is valid.
Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].

4.4.7 Starting/Stopping the PLC

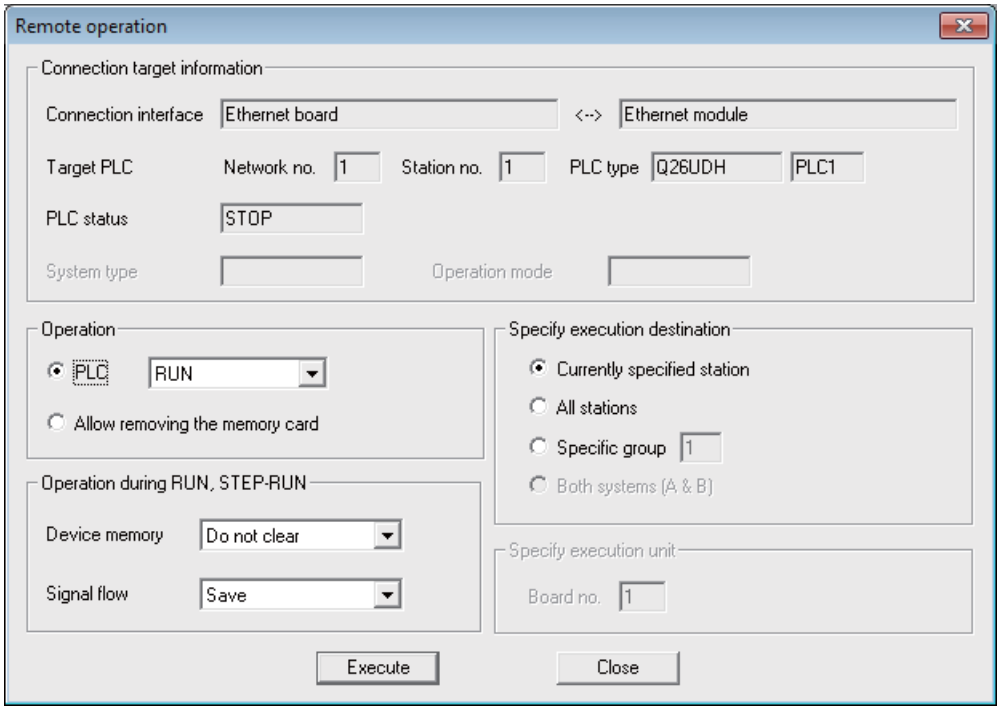
Before writing a sequence program, you must stop the PLC of the CNC controller.
PLC stop and restart, which is generally confirmed before and after the operation requiring PLC stop, can be done in advance by the following procedures.

4.4.7.1 Operation Procedure

Perform either of the following operations from GX Developer to start the operation screen.

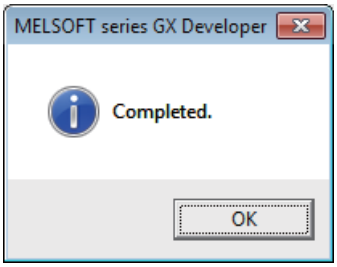
- Select [Online] - [Remote operation].
- Press "Alt" and "6" keys simultaneously.

On the following screen, set "STOP" or "RUN" in the [PLC] under [Operation] and click [Execute]. The current status is displayed in [PLC status] under [Connection target information].



[Note] Operations other than RUN and STOP cannot be executed.

The operation is completed when the following dialog appears. Click [OK]. The status after completion appears in [PLC status] on the remote operation screen displayed behind. If the status does not change, check whether an alarm is displayed or not on the CNC controller side.



4.5 Sequence Program Development

The sequence program development procedures are explained in this section focusing on usage methods unique to Mitsubishi Electric CNC.

For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

4.5.1 Development Procedures

Develop sequence programs with GX Developer.

4.5.1.1 Creating New Sequence Programs with GX Developer

Procedure		Description	Reference
1	Start GX Developer		
2	Create a new project		"Common Items: Creating a project"
3	Set connection with CNC controller		"Preparation: Setting the Connection Target"
4	Set parameters	Program setting of PLC parameters, the number of device points in CNC, and the number of device points in GX Developer must be consistent.	"Common Items: Setting the Parameters"
5	Edit sequence programs		
6	Write sequence programs and parameters into CNC RAM	Sequence programs are written into temporary memory (CNC RAM).	"Common Items: Writing and Reading Parameters to and from the CNC Controller" "Sequence Program Development: Writing the Sequence Program to the CNC Controller"
7	Monitor (debug) sequence programs	Return to procedure 5 if any bug is found.	
8	Write sequence programs into CNC ROM	Sequence programs in temporary memory (CNC RAM) is transferred to CNC ROM.	

4.5.2 Writing the Sequence Program to the CNC Controller

The following section explains how to write sequence programs from GX Developer to the CNC controller (especially the restrictions and CNC-specific operations.)

(Note) In this operation, data is written to the temporary memory in the CNC (CNC RAM). The data in the temporary memory (CNC RAM) is not held after the power is turned OFF. To hold the data after the power is turned OFF, write the sequence program to the CNC ROM by following the procedure shown in the section "Sequence Program Development: Writing the Sequence Program to the CNC Controller".

4.5.2.1 Operation Procedure

(1) Operation procedure for a project "without labels"

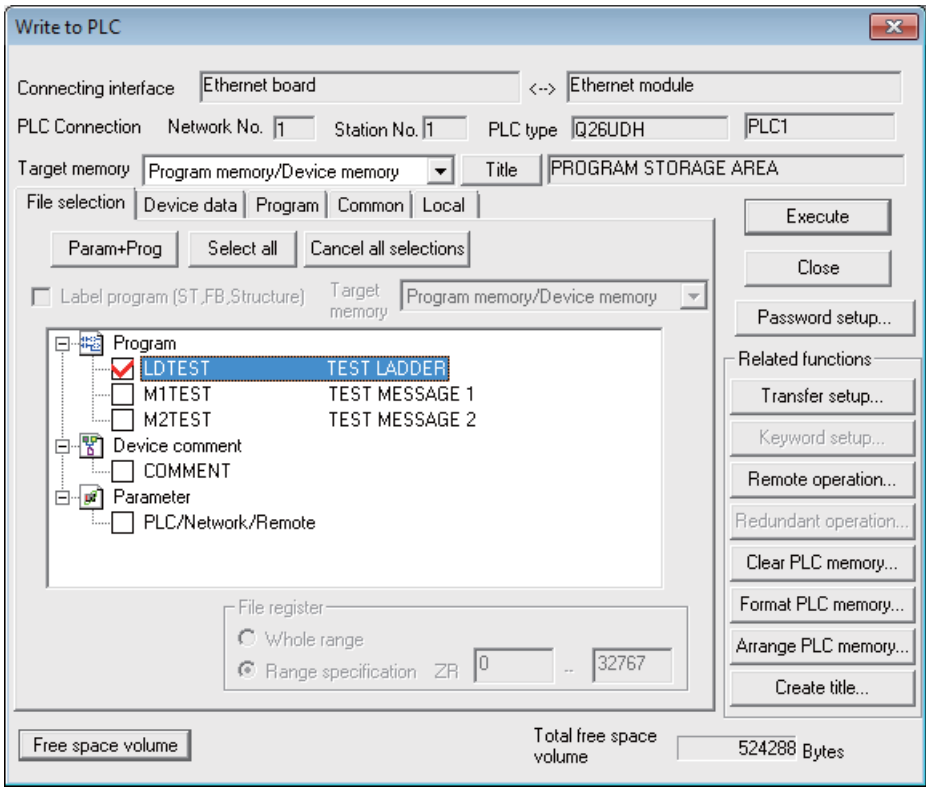
The following is the operation procedure for a project in which labels are not used.

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Write to PLC]

On the following screen, choose the sequence program file to be written from the [File selection] tab and click [Execute].

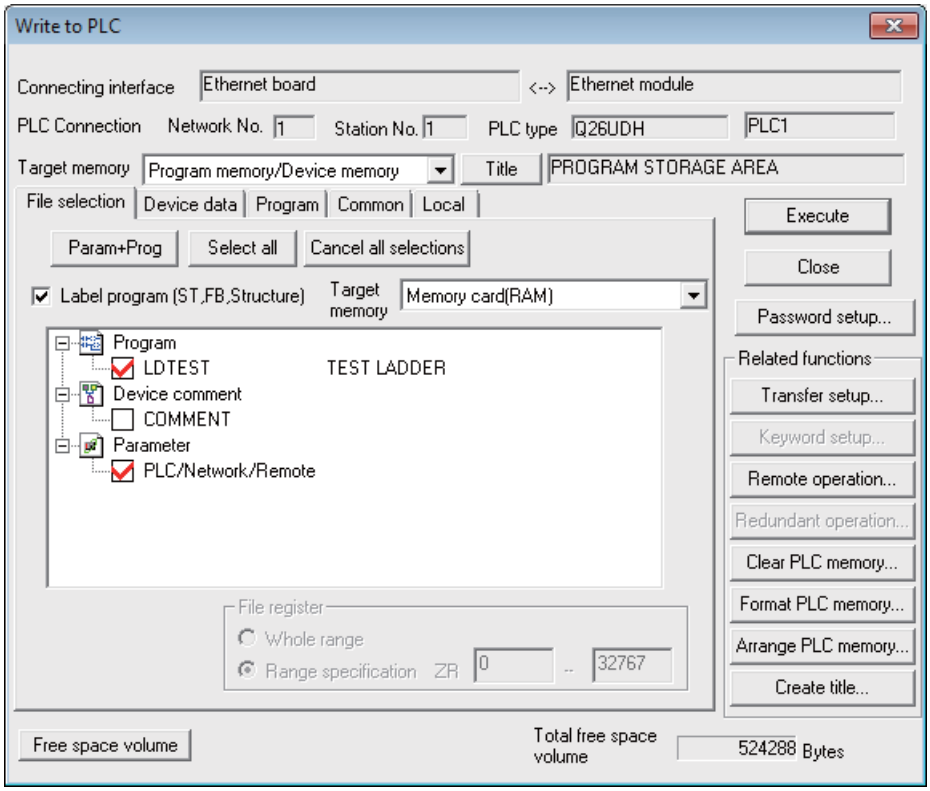
You can command RUN/STOP of the PLC using [Remote operation] under [Related functions].



[Note] As [Target memory], only "Program memory/Device memory" is valid.
Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].

(2) Operation procedure for a project "with labels"
The following is the operation procedure for label programming.

Perform the following operation from GX Developer to start the operation screen.
[Online] -> [Write to PLC]
On the following screen, choose the sequence program file to be written from the [File selection] tab and click [Execute].
PLC RUN/STOP can be commanded with [Remote operation] under "Related functions".



[Note 1] As [Target memory] for writing sequence programs, only "Program memory/Device memory" is valid.
[Note 2] Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].
[Note 3] As [Target memory] for writing label programs, only "Program memory/Device memory" or "Memory card(RAM)" is valid.
When writing label programs, one "symbolic information file" is written to NC.

4.5.2.2 Writing Operation

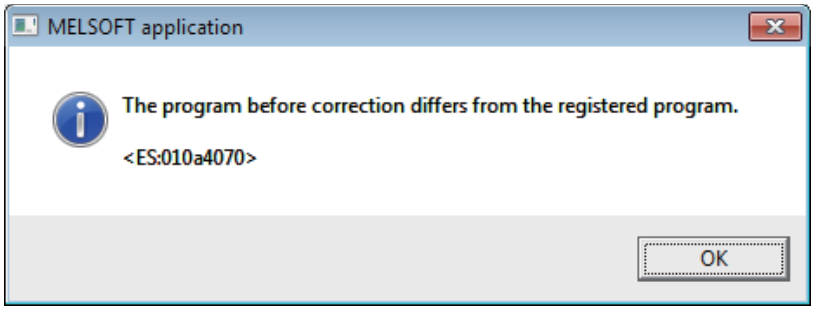
As soon as a ladder is written from GX Developer to the CNC controller, the CNC controller converts it into the CNC-specific ladder machine code.
A conversion error occurs if any of the devices and instruction formats not supported by the CNC controller side is used. The writing will not stop even if a conversion error occurs. The instruction causing an error is converted into a "NOP instruction" (no process instruction), and the sequence program is transferred up to the last step.

[Note] A ladder resulting in an error cannot be RUN for safety purposes.

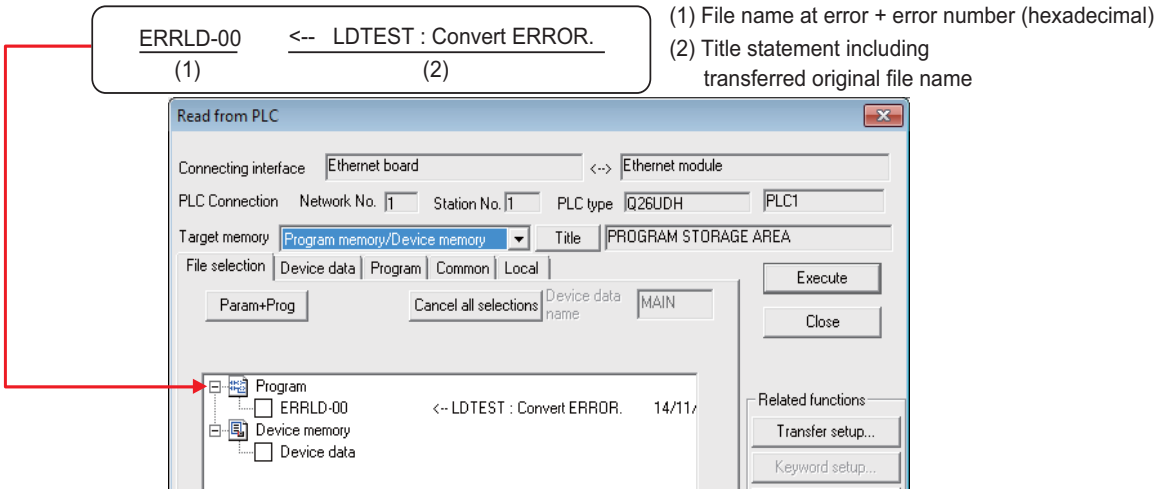
4.5.2.3 Operations and Check Items at Conversion Error

(1) Operations at conversion error

The following dialog appears on the GX Developer screen when a conversion error occurs.



If you execute RUN the PLC as-is, an alarm occurs on the CNC side and the PLC does not RUN.
If the ladder file resulting in a conversion error is selected with the [File Selection] tab on the [Read from PLC] screen, the file name and title will change and be displayed as shown below.
If this ladder file is read out to the GX Developer, it will be stored under the file name "ERRLD-00" ("00" is a hexadecimal number given to the error file in the order starting from "0".).



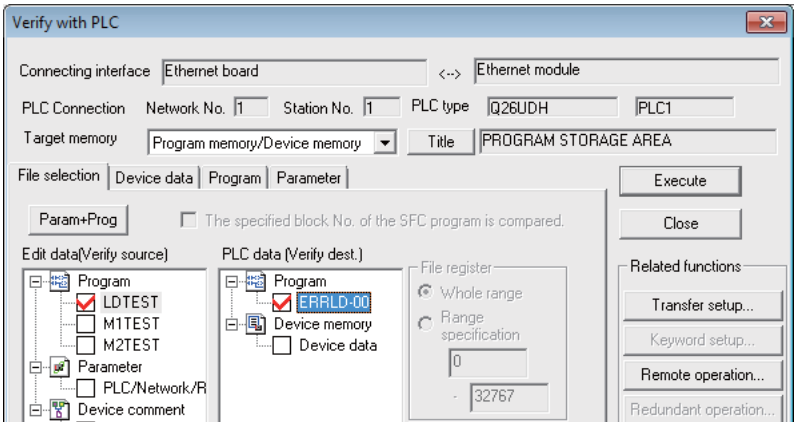
⚠ CAUTION

Do not read out a ladder file resulting in a conversion error to the GX Developer and use it. It may contain unexpected data, and result in incorrect operations.

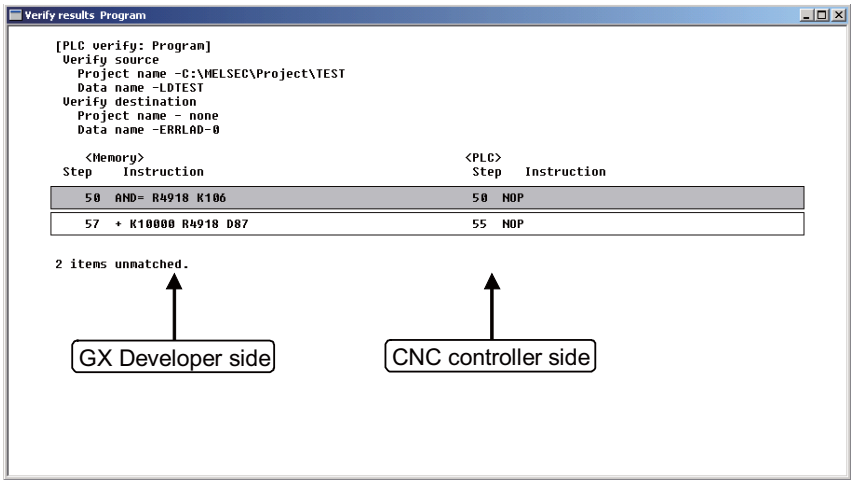
(2) How to confirm the conversion error step No.

The PLC verification function can be used to confirm the error step. For details of the PLC verification function, refer to "Sequence Program Development: Verifying the Sequence Programs".

Verify source: Select the ladder file (source file) on the GX Developer side
Verify dest.: Select the file resulting in an error "ERRLD-00" on the CNC controller side



When PLC verification is executed, the mismatching details will appear as shown in the following example. The NOP instruction section in the CNC controller side is the step with the conversion error. Double-click the mismatch to display and to edit the corresponding part of the GX Developer side.
"<Memory>" indicates the GX Developer side, and "<PLC>" the CNC controller side.



4.5.2.4 Operations and Check Items at the Other Errors

(1) Other errors

Some of the popular errors that would occur in writing sequence programs are given below.

Note that the description of the dialogue message may be applicable only to the MELSEC PLC, and the precise description of the error may not be available for the CNC side. The last 4 digits of display No. are indicated in "Status".

For the other errors, refer to "Troubleshooting:List of Errors During GX Developer Online Operations".

Status	Message	Cause	Remedy
4005 (Note 1)	Writing of data which exceeds the capacity of the PLC was attempted. Execute again within the capacity of the PLC.	The maximum number of steps that can be executed with NC has been exceeded.	Check the size of execution area. (Refer to (2) of this section.) Reduce the number of steps for the sequence program to be executed according to that value.
4010	Cannot write because the PLC is executing a RUN command. Stop the PLC, then execute again.	The PLC of the NC is running.	After stopping the PLC of the NC, start execution again.
4021	The applicable drive is not ready. Check the applicable drive, then execute again.	The specified target memory does not exist or is not in a usable status.	Change the target memory.
4029	Insufficient file capacity. Execute again after deleting unnecessary files.	An attempt was made to write a file that exceeds the storage capacity.	Examine the file structure so that the data falls within the limited capacity.
4052	The file is write protected. Change the file attributes to enable writing to the file.	The specified target memory is a write-disabled device (CNC ROM).	Specify “Program memory/Device memory” as the target memory.
4065	A mismatch occurred between the PLC and peripheral parameters Match the parameters between the PLC and peripherals.	There is a problem in the device setting value.	Set the number of device points. (Refer to "Common Items: Setting the Parameters".)
4070	The program before correction differs from the registered program.	A ladder instruction outside the specification is included.	Perform verification to identify the instruction that is the cause of the problem. (Refer to "Writing the Sequence Program to the CNC Controller: Operations and Check Items at Conversion Error".)

(2) How to confirm the size of execution area

Confirm the size of execution area in the following manner when "error status (4005): Execution area size over" (See (Note 1) in the list of errors above.) occurs. Refer to "PLC Programming Manual" for details on execution area.

When [Target memory] Standard RAM is selected with "Read from PLC" operation, the file name and title are changed and displayed as follows.

(a) indicates the settings of target memory. (Regular reading from PLC is executed with "Program memory/device memory".)

(b) indicates the number of steps at execution when the title section is replaced.

An alphabet before the number of steps at execution represents the state of parameter designation.

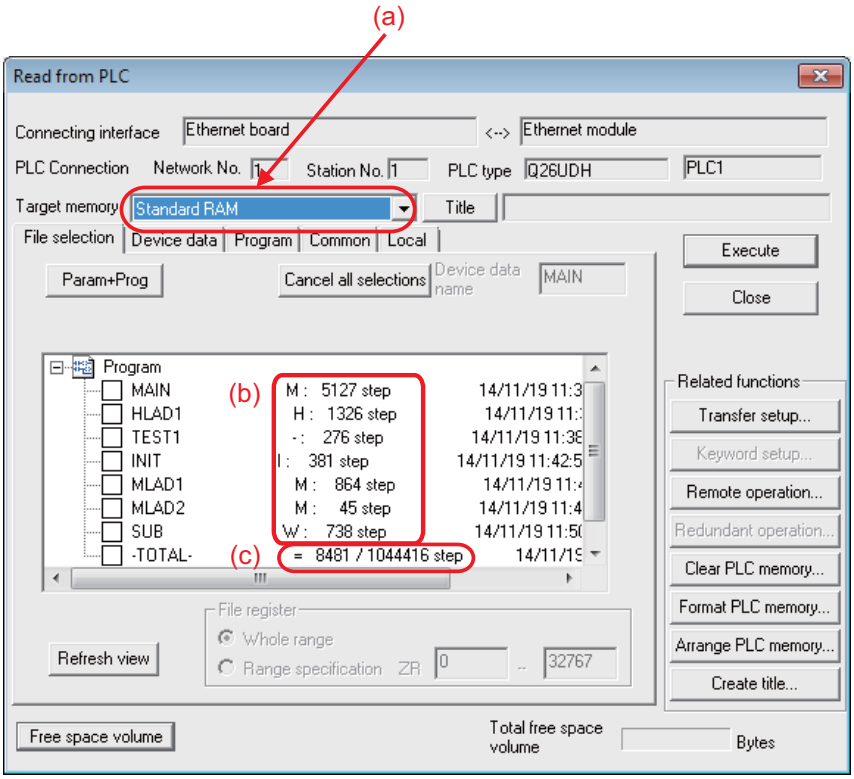
I: Initial H: High speed M: Medium speed W: Wait

-: No parameters or parameters not stored.

(c) indicates the total number of steps at execution. (Total of "initial", "high speed", "medium speed" and "wait to be executed.)

The denominator indicates the maximum size of the execution area.

When there is no parameter, the single program method is applied and "TOTAL" will not be displayed.



In the screen example above, the sequence program size must be adjusted so that the total number of steps at execution of (c) (8481) is smaller than the maximum size of the denominator's execution area (1044416).

4.5.3 Reading the Sequence Program from the CNC Controller

The following indicates how to read a sequence program from the CNC controller to GX Developer.

4.5.3.1 Operation Procedure

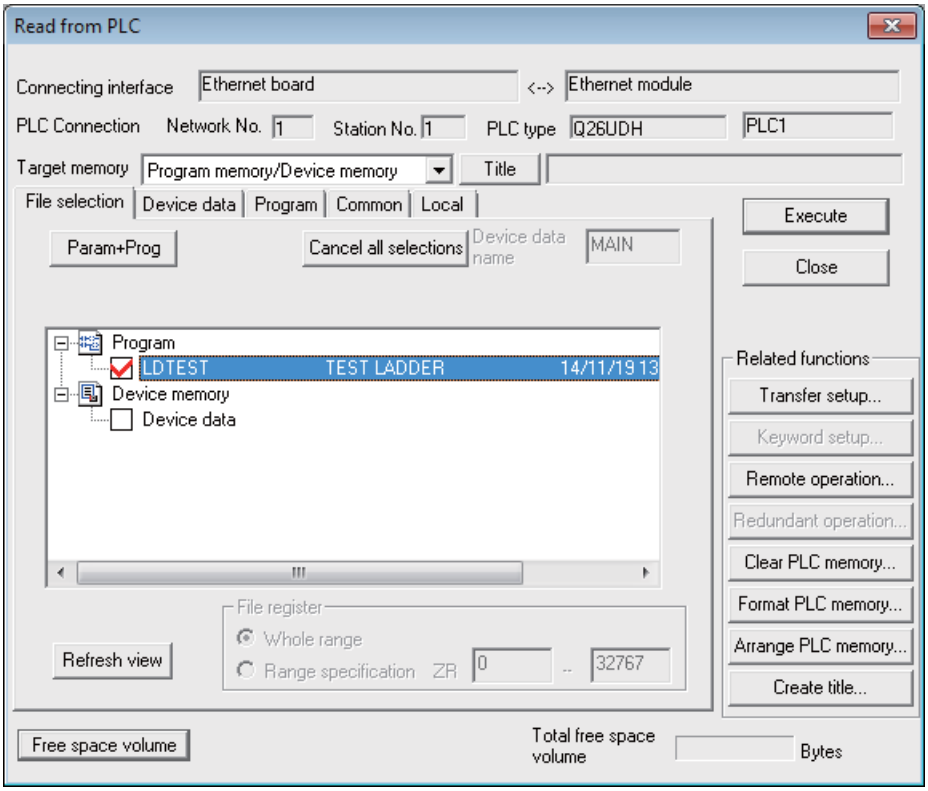
(1) Operation procedure for a project "without labels"

The following is the operation procedure for a project in which labels are not used.

Perform the following operation from GX Developer to start the operation screen.

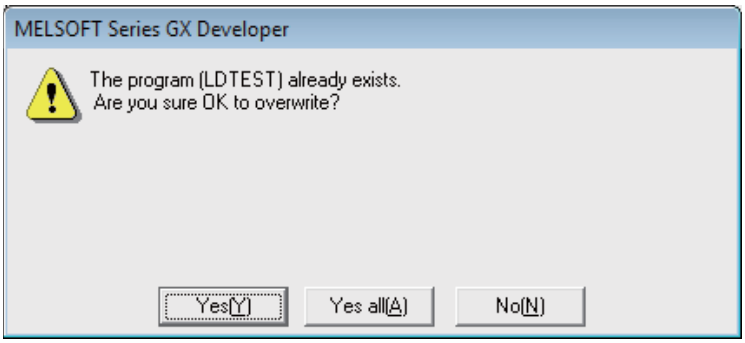
[Online] -> [Read from PLC]

On the following screen, choose the sequence program file to be read after clicking [Refresh view] from the [File selection] tab, and click [Execute].



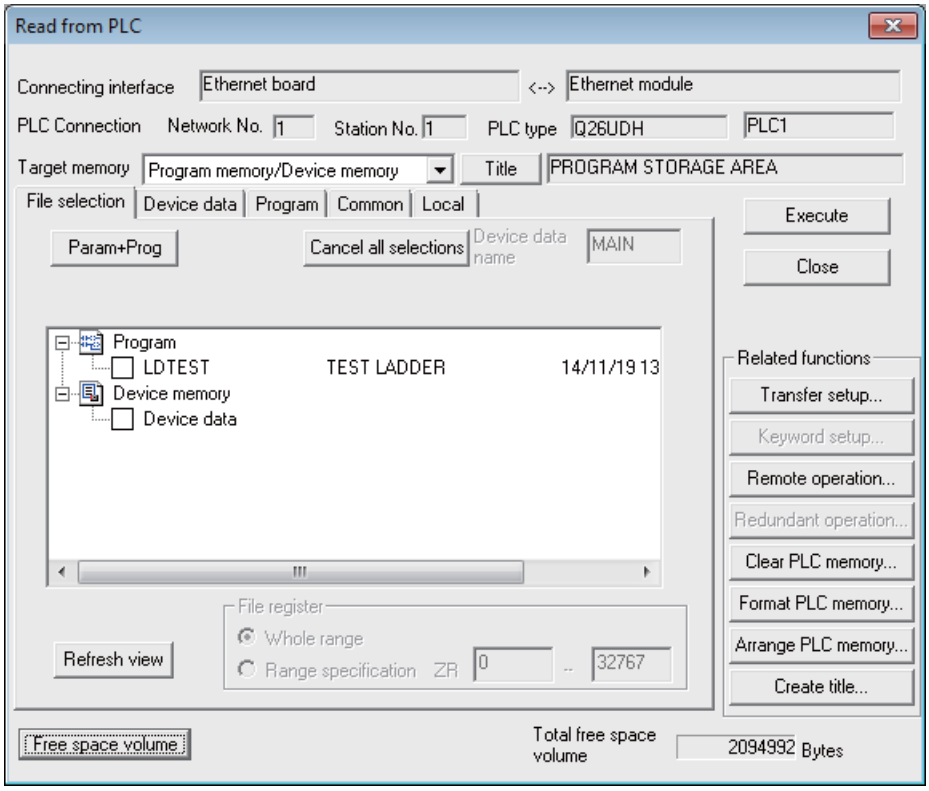
[Note] As [Target memory], only "Program memory/Device memory" is valid.
Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].
Always click [Refresh view] before reading sequence programs.

If a sequence program file with the same name already exists in the GX Developer side, following dialogue will appear.



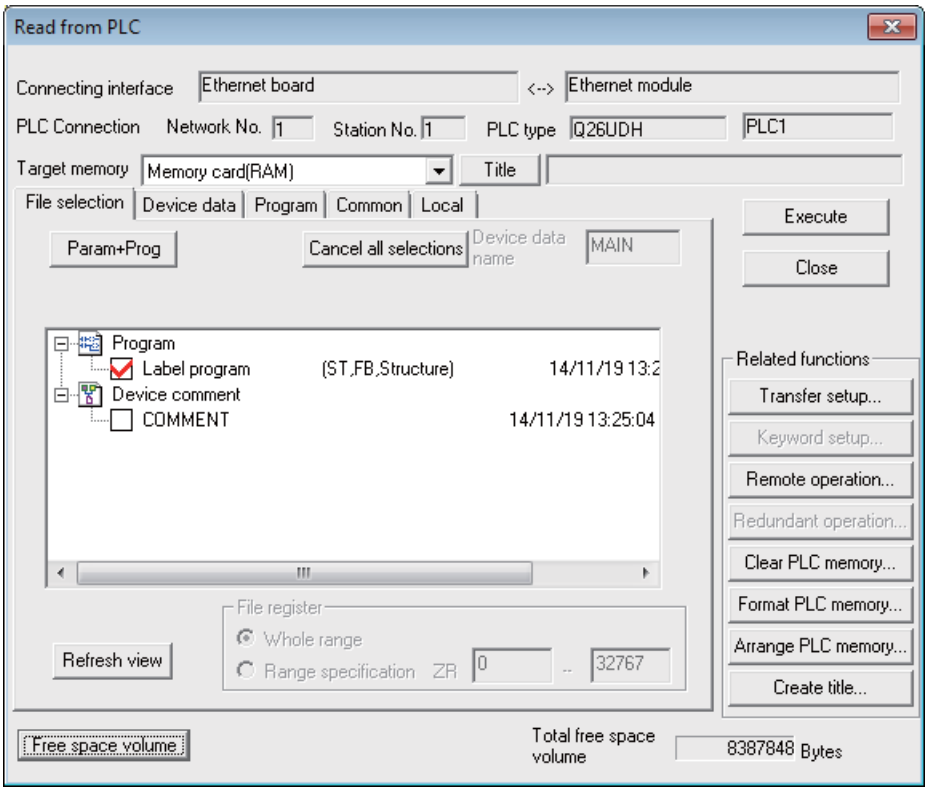
[Note] Choosing [Yes (Y)] in the dialogue will overwrite the GX Developer side sequence program file. The file before overwriting will be erased. Confirm the file enough before choosing [Yes (Y)].

The "Read from PLC" screen can also be used as a CNC controller side file listing function. Move the scroll bar of the [File selection] tab to the right to display the write date and size of each file. Click [Free space volume] to display the free area of the target memory.



(2) Operation procedure for a project "with labels"
The following is the operation procedure for label programming.

Perform the following operation from GX Developer to start the operation screen.
[Online] -> [Write to PLC]
On the following screen, choose the sequence program file to be read from the [File selection] tab after clicking [Refresh view]. Click [Execute].



[Note 1] As [Target memory], only "Program memory/Device memory" or "Memory card(RAM)" is valid.
[Note 2] Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].
[Note 3] Always click [Refresh view] before reading sequence programs and labels.
[Note 4] Refer to "4.4.6.6 Writing and Reading Parameters to and from the CNC Controller", and always read parameters before reading sequence programs and labels.

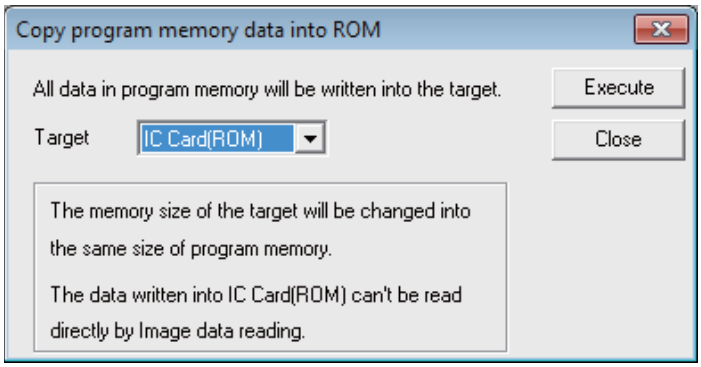
4.5.4 Writing Sequence Programs to CNC ROM

The sequence program transferred from the GX Developer or built-inPLC edit function to the CNC controller is stored in the temporary memory.The temporary memory is erased when the power is turned OFF. (Thisis because the sequence program stored in the internal flash ROMis validated when the power is turned ON again.)
If the sequence program is to be held even when the power is turnedON again, transfer it to the CNC ROM using the following steps.
The following steps show how to use GX Developer to transfer sequenceprograms in the temporary memory to the ROM in the CNC controller.
For the user safety sequence, ROM write operation is not required.

(Note)The "ROM-Write incomplete" error occurs if an updated sequence program in the temporary memory (CNC RAM) is not written to the CNC ROM.

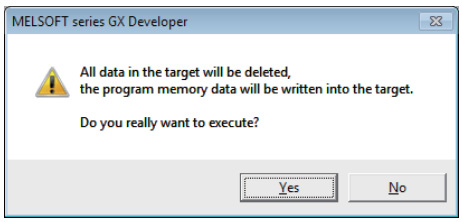
4.5.4.1 Operation Procedure

Perform the following operation from GX Developer to start the operation screen.
[Online] -> [Write to PLC (Flash ROM)] -> [Copy program memory data into ROM]

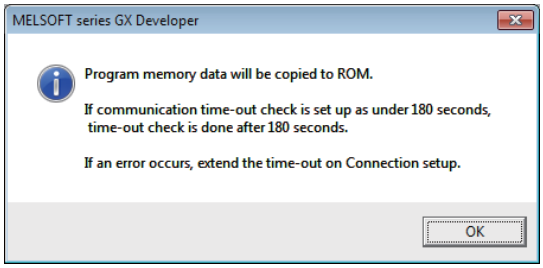


(Note) Only "IC Card (ROM)" is valid for "Target".

The following dialog appears if you click [Execute].

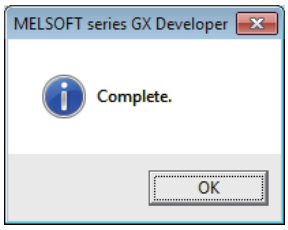


The following dialog appears if you click [Yes].



(Note) If you select [OK] in the dialog, the sequence programs in the ROM of CNC controller are deleted and overwritten. Confirm well before you click [OK].

The following dialog appears when the operation is completed. Click [OK].



4.5.5 Verifying the Sequence Programs

The following indicates how to verify sequence program between the CNC controller and GX Developer.

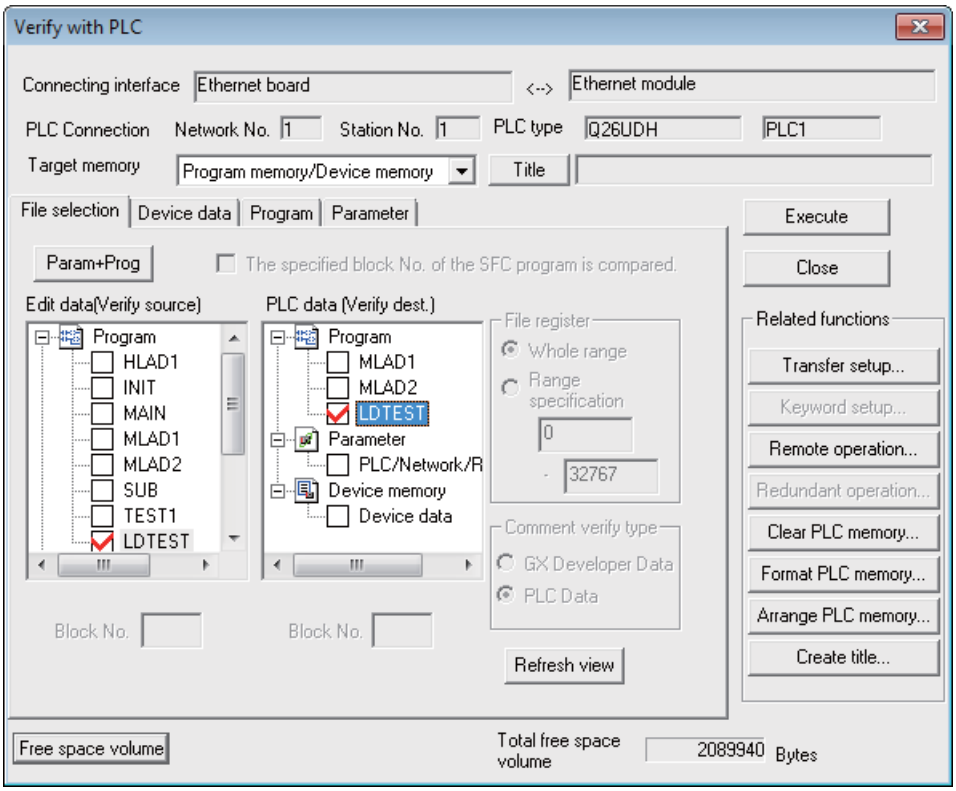
4.5.5.1 Operation Procedure

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Verify with PLC]

On the following screen, choose the sequence program files to be verified from the [File selection] tab, and click [Execute].

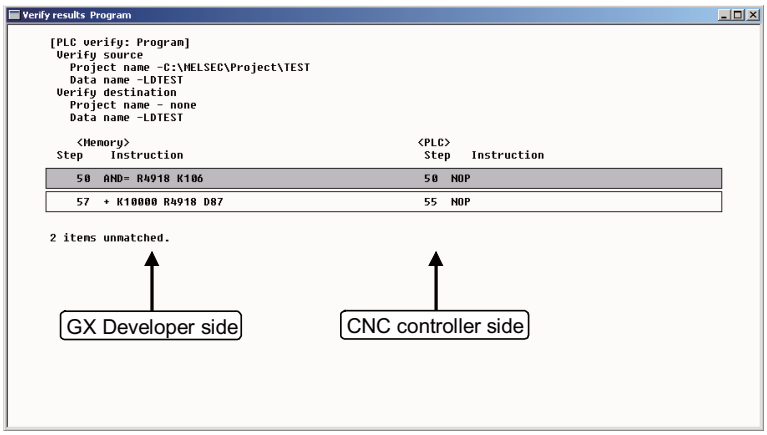
[Verify source]: GX Developer side, [Verify dest]: CNC side



[Note] As [Target memory], the mounted memory is valid.

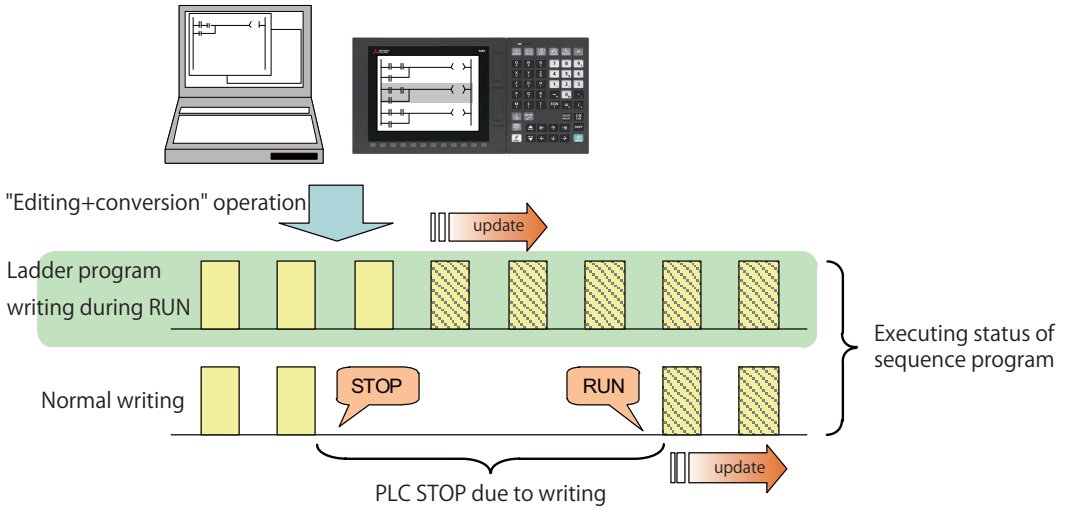
Do not set the other tab ([Program], [Device data]) than [File selection].

If verification mismatches occur, the following mismatch screen appears. Double-click the mismatch to display the corresponding part of the GX Developer side file.



4.5.6 Executing Ladder Program Writing during RUN

Ladder program writing during RUN (or RUN write/online change) enables to edit and change the sequence program from either GX Developer or built-in PLC (built-in edit function) without stopping PLC operation.
For the user safety sequence, ladder program writing during RUN cannot be used.



⚠ CAUTION

Only the person who knows well about sequence programs can execute sequence program writing during RUN.
When the RUN write is enabled, the modification will be immediately effective after the data editing and conversion.
The machine might operate in unexpected way when the sequence program is incomplete.
Consider well the influence of the modification in advance. Also, always make sure that the system's safe operation with the sequence programs.

4.5.6.1 Execution Procedures of Ladder Program Writing during RUN

Ladder program writing during RUN is executed in the following procedure.

Execution procedures		Description	Reference
1	Set parameters of CNC	By setting the bit selection parameter of CNC, enable the ladder program writing during RUN.	
2	Set the options of GX Developer		4.5.6.7 Operation method on the GX Developer [Setting Ladder Program Writing during RUN before Executing "Conversion"]
3	Read out the sequence programs	The sequence programs are read out from CNC to GX Developer	4.5.3 Reading the Sequence Program from the CNC Controller
4	Edit the sequence programs		GX Developer Operating Manual
5	Write the sequence programs during RUN	The sequence programs are written to CNC during RUN.	4.5.6.7 Operation method on the GX Developer

4.5.6.2 Setting Ladder Program Writing during RUN

Turn ON the corresponding bit selection parameter and turn the power ON again to enable ladder program writing during RUN.

(1) Bit selection parameter

# No.	Bit	Item	Details	Setting range	Standard value
6455	Bit 6	Enable ladder program writing during RUN (in high-speed processing)	Select whether to permit ladder program writing during RUN to built-in PLC (in high-speed processing). 0: Not permit ladder program writing during RUN 1: Permit ladder program writing during RUN	0,1	0
6455	Bit 7	Enable ladder program writing during RUN	Select whether to permit ladder program writing during RUN to built-in PLC (except in high-speed processing). 0: Not permit ladder program writing during RUN 1: Permit ladder program writing during RUN	0,1	0

(2) Precautions

- These parameters will be enabled after the power is turned ON again.
- When the multi-project function is enabled, the enabled or disabled status of ladder program write during RUN is switched for all the projects.
- Turning ON "#6455 Bit6 (Enable ladder program writing during RUN (in high-speed processing))" alone does not take effect.
  When setting "#6455 bit 6" to "1", also set "#6455 bit 7 (Enable ladder program writing during RUN)" to "1".
- When "Enable ladder program writing during RUN (in high-speed processing)" is set to "1", a high-speed processing program will use 8,000 steps of execution area. Thus, if the program size before the setting change is close to the maximum, the error of insufficient execution area may occur after the setting change.

4.5.6.3 PLC Data Available for Ladder Program Writing during RUN

The following shows the PLC data which can be stored in CNC controller and available for ladder program writing during RUN.

Data type available for RUN write

Data class	Data type	GX Developer	Built-in PLC (built-in edit function)
Sequence program (independent program method)	-	×	×
Sequence program (Multi-program method) (Note1)	High-speed process	○ (Note2)	○ (Note2)
	Main process	○	○
	Initialization process	○	○
	Standby process	○	○
Parameters device comments message data	-	×	×

(Note1) Only the program whose execution order has been registered in the parameter is available.
(Note2) There are some restrictions on the contents of high-speed processing programs.
(For details, refer to later precautions in this chapter.)

4.5.6.4 Data Unit for Writing

The following table shows the available data units for the ladder program writing during RUN and specifications of an upper limit of each writing are as follows. Ladder blocks are written at the conversion after edited. When the ladder program writing during RUN is executed from the ladder edit screen, either the single block or the multiple blocks will be written in the ladder program. The writing method to be executed is automatically determined based on the standard stated in (*1) below the table; therefore, the method cannot be selected by users. The ladder program cannot be written to PLC on a file basis with the operation such as selecting [Online] - [Write to PLC].

Available data units for the ladder program writing during RUN

Data units for writing	GX Developer	PLC editing using on-board
Ladder program writing during RUN of single block	○ 512 steps	○ 512 steps
Ladder program writing during RUN of multiple blocks (*1)	○ 64 blocks Total 1024 steps	×
Ladder program writing during RUN in file units	×	×

(*1) For GX Developer, when you edit the definition of FB where an instance exists, multiple-block writing in ladder program during RUN will be applied. When you add or delete FB instance, single-block writing in ladder program during RUN will be applied.

4.5.6.5 Available Number of Steps for Writing

Ladder program writing during RUN is available until the total number of steps needed for executing the sequence program set in the parameter reaches the maximum number of steps of the program execution area. (For the maximum number of steps in the sequence program execution area, refer to the "PLC Programming Manual".)
Note that when RUN write in high-speed processing is enabled, the number of steps in the sequence program execution area will be as shown below.

[When the multi-project function is disabled]
The maximum number of executable steps in a high-speed processing is fixed to 4,000. If this number is exceeded, NC will show an alarm and RUN write will be disabled.
In addition, the maximum number of executable steps in a main processing program decreases by 8,000 steps.
The following shows the relation between the settings and available number of steps for RUN write.

Settings and available number of steps

Setting of "Enable ladder program writing during RUN"		Number of steps available for execution	
High-speed process	Main process	High-speed processing program	Main processing program
ON	ON	High-speed processing program ≦ 4,000 steps	Main processing program ≦ (Number of execution area steps - 8,000 steps.)
OFF	ON	(Total number of steps in high-speed processing program and main processing program) ≦ Number of steps in execution area	
OFF	OFF		

[When the multi-project is enabled]
The maximum number of executable steps in a high-speed processing program is fixed to 4,000 in total of all the projects, regardless of the multi-project parameters. If the number of steps exceeds 4,000, NC will show an alarm and RUN write will be disabled.
In addition, the whole sequence program execution area decreases by 8,000 steps.
The number of steps of sequence program storage area per project is calculated by subtracting 8,000 steps from the total size.
The following shows the relation between the settings and available number of steps for RUN write.

Settings and available number of steps

<table>
<tr><th colspan="2">Setting of "Enable ladder program writing during RUN"</th><th colspan="2">Number of steps available for execution</th></tr>
<tr><th>High-speed process</th><th>Main process</th><th>High-speed processing program</th><th>Main processing program</th></tr>
<tr><td>ON</td><td>ON</td><td>[total of whole project]
High-speed processing program ≦ 4,000 steps</td><td>[per project]
Main processing program ≦ ((Number of execution area steps - 8,000 steps) x project percentage)</td></tr>
<tr><td>OFF</td><td>ON</td><td colspan="2" rowspan="2">[per project]
(Total number of steps in high-speed processing program and main processing program) ≦ (Number of steps in execution area multiplied by project ratio)</td></tr>
<tr><td>OFF</td><td>OFF</td></tr>
</table>

If high-speed processing program does not need to be written during RUN, the execution steps for a sequence program in main processing program can be increased by setting OFF the bit selection parameter "Enable ladder program writing during RUN (in high-speed processing)".

4.5.6.6 RUN Write Target Storage Area

The following table indicates the available storage areas for RUN write.
The operation target of RUN write is temporary memory storage. The RUN write is reflected in the PLC processor execution area at the same time and is carried out.
A write to the storage area (in CNC) needs to be done separately using the ROM write operation.
ROM writing operation is available while PLC is running.

RUN write target storage area

<table>
<tr><th></th><th colspan="2">RUN write availability for each development environment</th></tr>
<tr><th>Storage area</th><th>GX Developer</th><th>Built-in PLC (built-in edit function)</th></tr>
<tr><td>Temporary memory storage (RAM in CNC)</td><td>○ (when converted)</td><td>○ (when converted)</td></tr>
<tr><td>Storage for execution</td><td>○ (when converted)</td><td>○ (when converted)</td></tr>
<tr><td>Storage area (ROM in CNC)</td><td>× (Note1)</td><td>× (Note1)</td></tr>
</table>

(Note1) Storage area is not updated at the time of conversion.
A write to the storage area (in CNC) needs to be done separately using the ROM write operation.

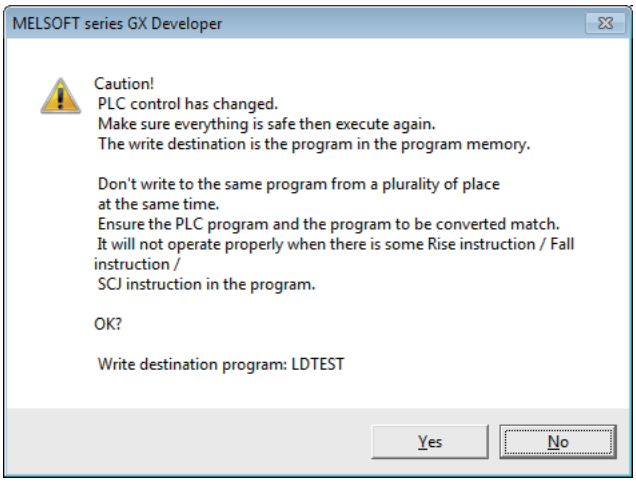
4.5.6.7 Operation method on the GX Developer

There are three ways to execute ladder program writing during RUN with GX Developer.
- Executing "Convert (Online change)"
- Set the options for RUN write in "Options" window before executing conversion.
- Execute conversion in "Monitor (write mode)" window.

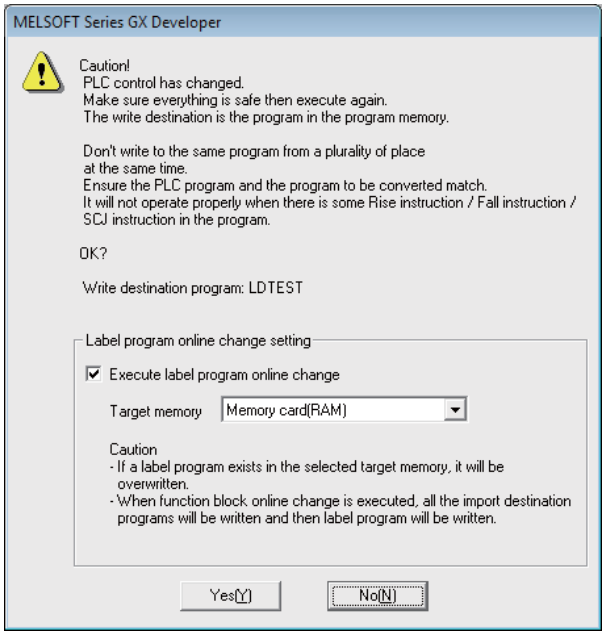
Common Conversion Operation

Conversion procedure in RUN write is the same in any methods. Regardless of PLC status, either "RUN" or "STOP", operation procedure is the same. When "Conversion" is executed, the following dialog box will be displayed.

The dialog displayed for a project "without labels"



The dialog displayed for a project "with labels"

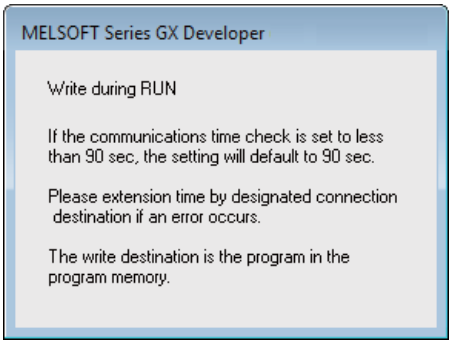


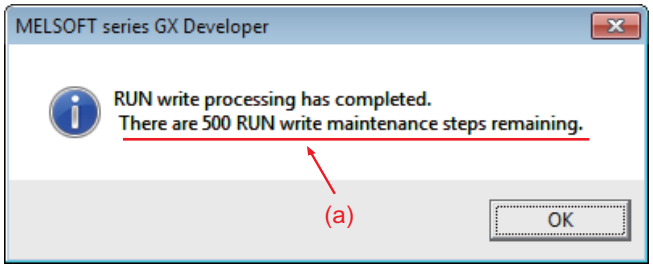
(Note1) As [Target memory] for writing label programs, only "Program memory/Device memory" or "Memory card(RAM)" is valid.

(Note2) The labels must be written together with sequence programs during RUN. Otherwise, a mismatch occurs between labels and sequence programs when "Read from PLC" is executed.

(1) Pressing [Yes] button executes the RUN write, displaying the following dialog box.

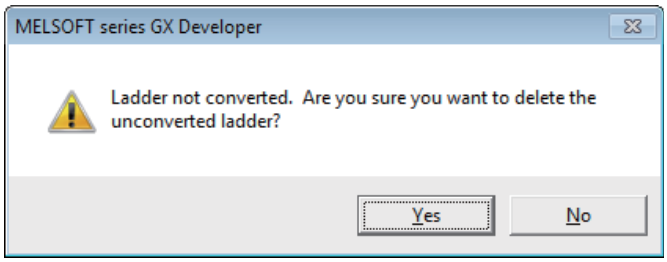
Processing time of RUN write depends on the total number of steps used in the ladder programs and the points where the steps are written in.





Ignore the message "There are xxx RUN write maintenance steps remaining." indicated by (a) in the completion dialog box. CNC does not use such kind of steps.

(2) Pressing [No] button cancels the conversion and the RUN write, displaying the following dialog box.



If you click [Yes], the unconverted ladder is canceled and the previous ladder display returns.
If you click [No], the unconverted ladder is retained.

Executing "Convert (Online Change)"

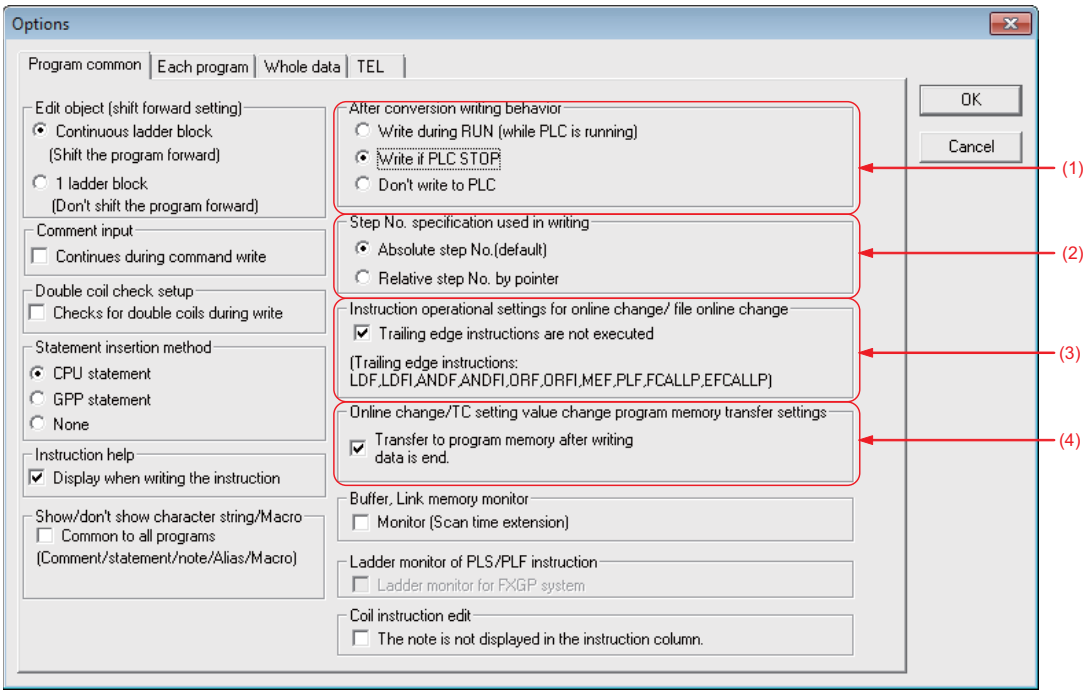
"Convert (online change)", dedicated to conversion writing, is provided separately from common conversion. After editing ladder program as usual, do either of the following operations for conversion. Further operation is the same as that in "Common Conversion Operation".

- Select [Convert] - [Convert (Online change)].
- Press "shift" and "F4" keys simultaneously.

Setting Options for Ladder Program Writing during RUN before Executing Conversion

The following explains how to change the settings to execute ladder program writing during RUN instead of common conversion.

Set (1) to (4) in [Options (Program common)] tab, and click [OK]. After setting these items, ladder program writing during RUN can be executed with the normal conversion operation. The operation after conversion writing is the same as described in the section "Common "Conversion" Operation".



(1) Select "Write during RUN (while PLC is running)" in "After conversion writing behavior".

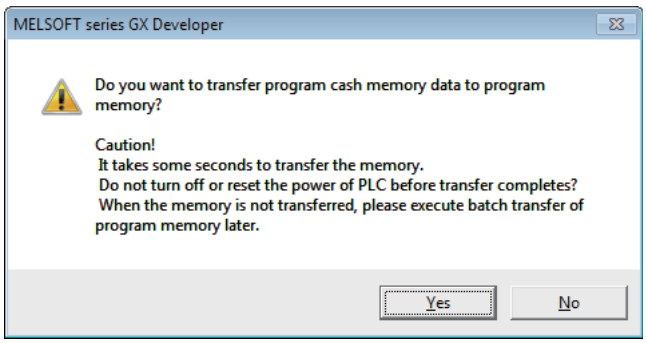
(Note) If "Write if PLC STOP" is selected, the ladder program will be written to the temporary memory concurrently with the conversion only when the PLC is STOP state.
If "Don't write to PLC" is selected, the program will not be written to the temporary memory when it is converted.

(2) Select "Absolute step No. (default)" in "Step No. specification used in writing".

(Note) "Relative step No. by pointer" is not supported. Do not select "Relative step No. by pointer" as this is not supported.
If selected and when a pointer (P) is included in the ladder block to be written during RUN, an error will occur.

(3) "Instruction operational setting for online change/ file online change" is not supported. This is invalid.

(4) "Online change / TC setting value change program memory transfer settings" is not supported.
Check "Transfer to program memory after writing data is end".
If no item is checked, the following dialog is displayed during RUN write operation.



CNC performs RUN write only regardless of whether you choose "Yes" or "No".

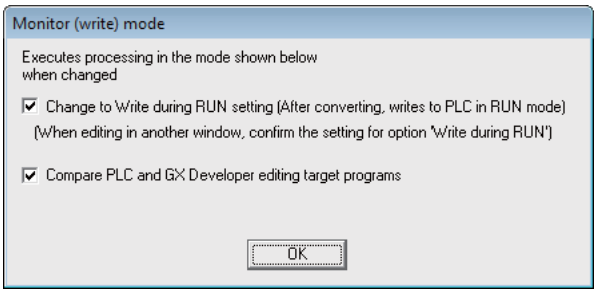
Executing Conversion in "Monitor (Write mode)"

"Monitor (Write mode)" is the mode that enables editing, conversion, and conversion writing while executing ladder monitor.

Do either of the following operations:

- Select [Online] - [Monitor] - [Monitor (Write mode)].
- Press "Shift" and "F3" keys simultaneously.

The following confirmation dialog box will be displayed. Clicking [OK] starts the preparation for the monitor (write mode): compares the program on the GX Developer ladder screen with the stored files in NC.



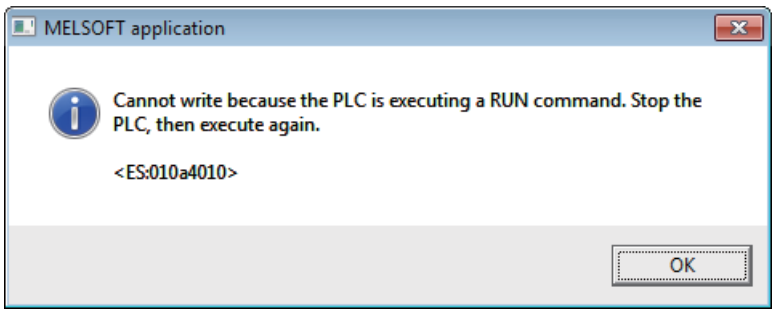
After the comparison, ladder editing can be executed on the ladder monitoring screen. RUN write can also be executed with the common conversion operation. Further operation is the same as described in the section "Common "Conversion" Operation".

Operation when Ladder Program Writing during RUN is Disabled

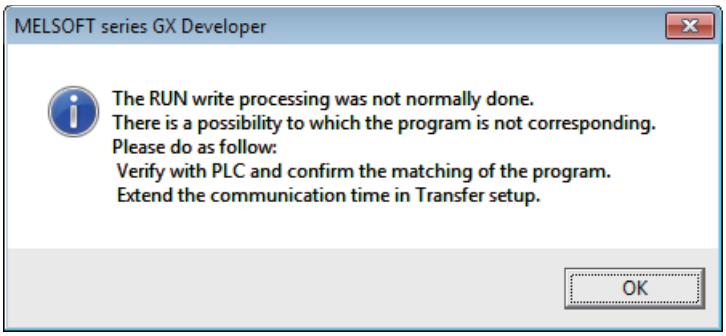
Without settings for enabling ladder program writing during RUN, the following error dialog box appears at the RUN write execution.

When RUN write is executed with the CNC system which does not support the function, the same dialog box appears.

After any operation of "Executing "Convert (Online Change)", "Setting Options for Ladder Program Writing during RUN before Executing Conversion" or "Executing Conversion in "Monitor (Write mode)", when "Yes" is pressed on the confirmation dialog box described in the section "Common Conversion Operation", the following error dialog box appears.



Pressing [OK] displays another error dialog box as follows.



4.5.6.8 Precautions

Limitations on Program Configuration

(1) Limitations on independent program method

Ladder program writing during RUN is not available for the sequence program in independent program method. Bit selection parameter setting is not available. Still, program execution is available.

(2) Limitations on high-speed processing program

If you set the bit selection parameter to enable “ladder program writing during RUN (in high-speed processing)”, a write to a high-speed processing program is enabled during RUN. However, the following limitations are imposed:

(a) Available execution steps

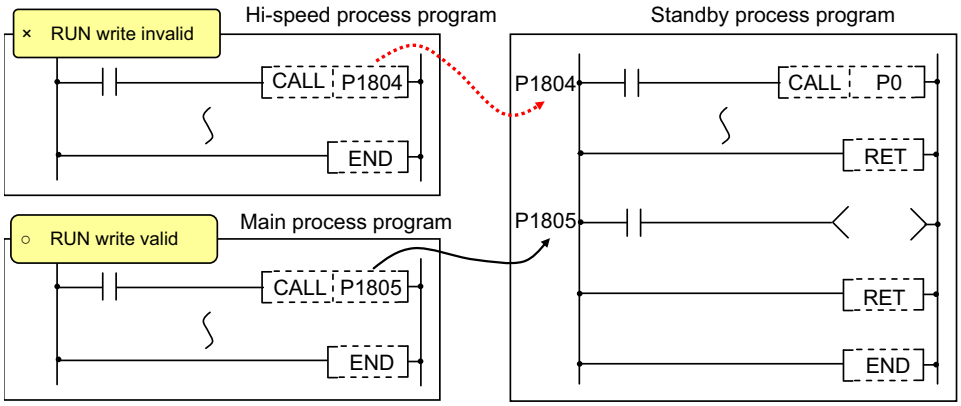
The following is the maximum number of available execution steps for a high-speed processing program.
If the number has been exceeded during RUN write, an error will occur.
- The maximum number of available execution steps is 4,000.
  (When the multi-project function is enabled, the total number of steps for all projects will be 4,000).
- 8,000 steps of execution area will be used regardless of the size of high-speed processing program.

(b) Available number of local labels

The following is the number of available local labels in a high-speed processing program.
If the number has been exceeded during RUN write, an error will occur.
- The maximum number of local labels is 256.
  (When the multi-project function is enabled, the maximum number of local labels will be 256 per project.)
- If the number of local labels is set to 256 or less, the set number will be the maximum number of local labels.

(c) Use of common pointers in high-speed processing program

RUN write is disabled when the common pointer is used in a high-speed processing program. In this case, the bit selection parameter for enabling RUN write will be disabled. Still, program execution is available.
If you perform RUN write for a high-speed processing program, use a local pointer only. The following is an example of the use of common pointer for subroutine call from standby processing program.



(3) Limitations when the multi-project function is enabled

RUN write cannot be performed to different projects through multiple development tools at the same time.
If attempted simultaneously, an error will occur. Try RUN write again after shifting the timing.

Precautions for Command Operation in Ladder Programming Writing during RUN

(1) When commanding rising/ falling edge

When rising or falling edge is commanded in ladder program writing during RUN, the following action will be taken after the command. The rising/falling edge may not always be executed in the first processing cycle due to the change of operation path such as subroutine call or jump junction.

	The first execution after change	The second execution after change
Rising/falling commands in contact system LDP, LDF, ANDP, …, MEP, MEF, … PLS, PLF, FF, MOVP, ～P, …	Command status is OFF	Normal execution

(2) When a device is deleted in the program

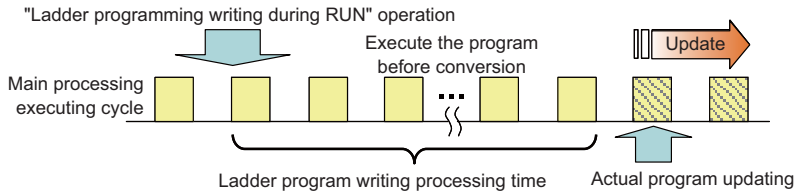
If an output command is deleted in the program, the output status of the device designated by the command will be kept as before the deletion.

(3) When a program error occurs in RUN write

When a program error occurs in the process of RUN write, the display of the error step may be inaccurate regardless of the relation of the command and the error point.

(4) Actual updating timing of program in RUN write

An updated program may not be executed in the cycle right after the RUN write (after executing the ladder conversion). The actual execution of the updated program may be delayed by a few or a few dozens cycles, because the processing time of RUN write depends on the total number of steps used in the sequence programs and the points where the steps are written in.

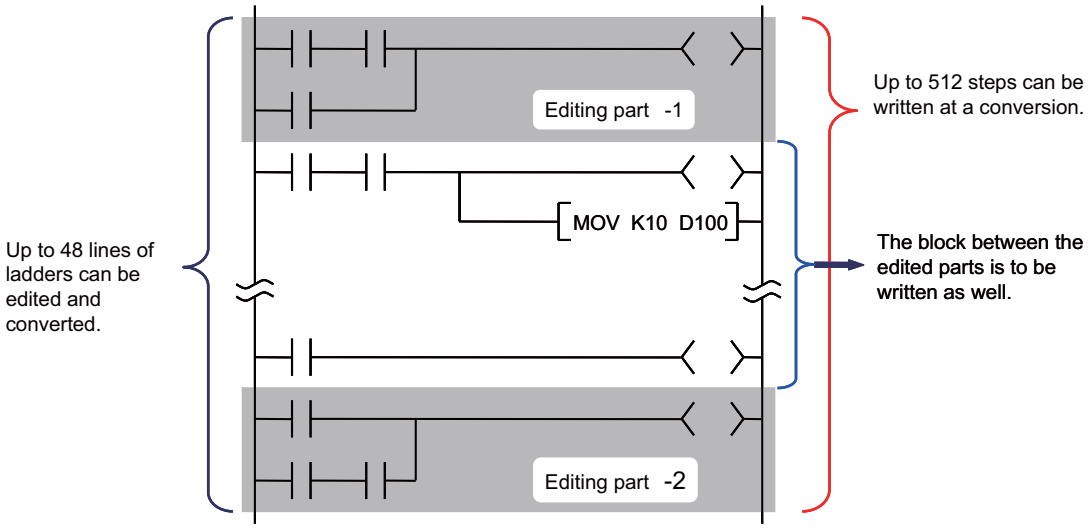


Other Precautions

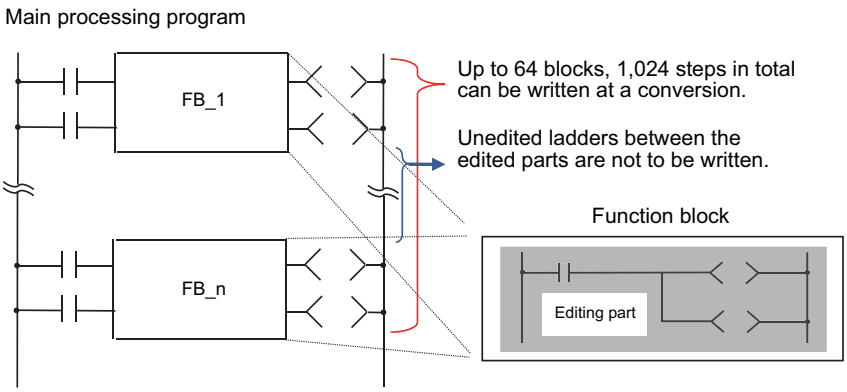
(1) Number of steps that can be written during RUN

Up to 48 lines of ladders can be edited and converted in GX Developer and PLC on-board edit function.
For the single-block writing in ladder program during RUN, ladder blocks to be written at a conversion include the block between the edited ones. Up to 512 steps can be written during RUN at a conversion.
For the multiple-block writing in ladder program during RUN, when the two edited program blocks are apart from each other, the block(s) between the two blocks will not be written. Up to 64 blocks can be written during RUN at a conversion and up to 1,024 steps can be written in the total number of the blocks.
For GX Developer, when you write FB instance during RUN, the multiple-block writing in ladder program during RUN is executed. In any other case, the single-block writing in ladder program during RUN is executed.

When editing two or more detached ladder blocks



When editing FB instance

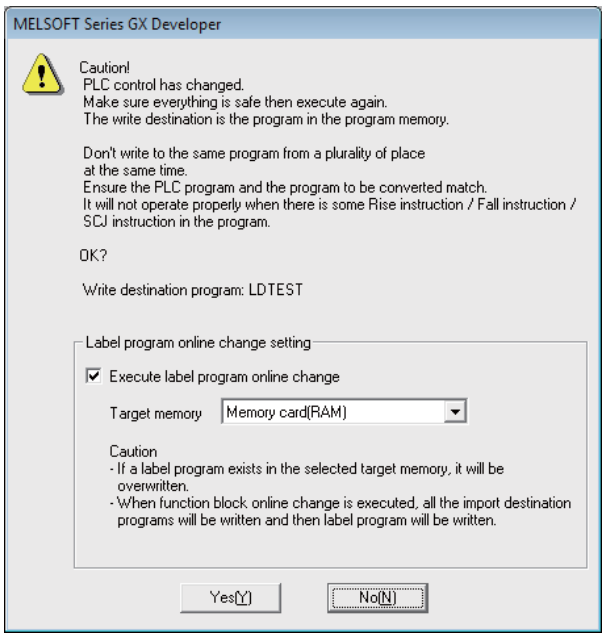


(2) Change of processing time in writing during RUN

The processing time until ladder program writing during RUN completion depends on the total number of steps used in the sequence programs and the points where the steps are written in.

(3) Writing to Label Program during RUN

To write to a label program when the ladder program writing during RUN function is being executed on a project with labels, check "Execute label program online change" option and select "Memory card(RAM)" for "Target memory".



Error Occurs at Ladder Program Writing during RUN

If an error occurs at ladder program writing during RUN, refer to "Troubleshooting:List of Errors During GX Developer Online Operations" to find out the causes and remedies.

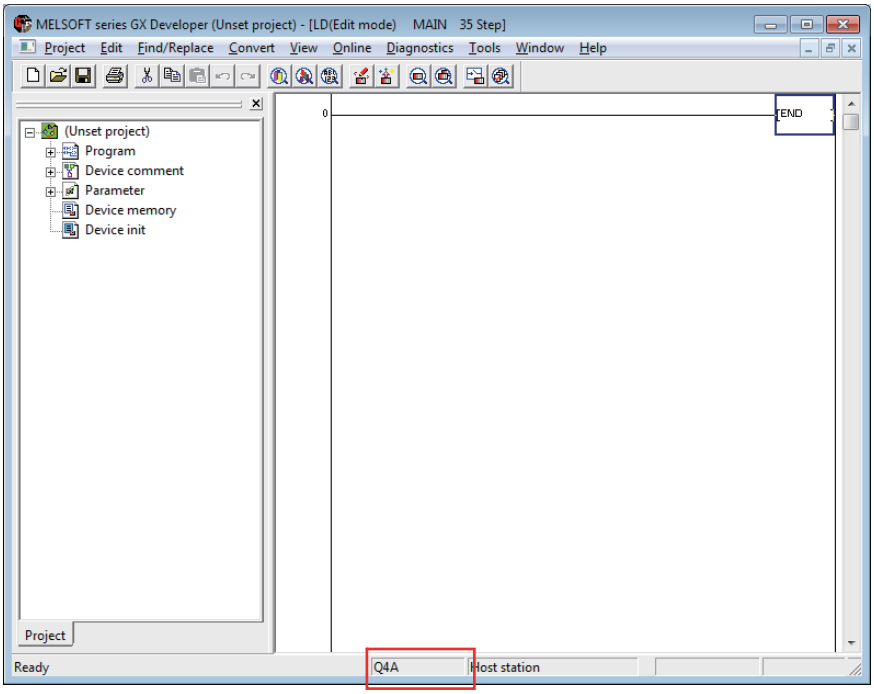
Check if the ladders match with the ones in GX Developer by selecting [Online] - [Verify with PLC], as the ladders in CNC may have changed. When they do not match, the ladder program writing during RUN cannot be executed. After reading ladders by selecting [Online] - [Read from PLC], reedit the ladders and then execute ladder program writing during RUN.

4.5.7 Using Sequence Programs Created for M700V/M70V/M700/M70 and E70 Series

In M700V/M70V/M700/M70 and E70 series, the PLC "CPU Q4A" was emulated. In M8 series, the emulation target was changed to "CPU Q26UDH". For this reason, the old project data that have been used with GX Developer are no more valid in M8 series. Using the following procedure, convert old project data to new ones so that it can be used with M8.

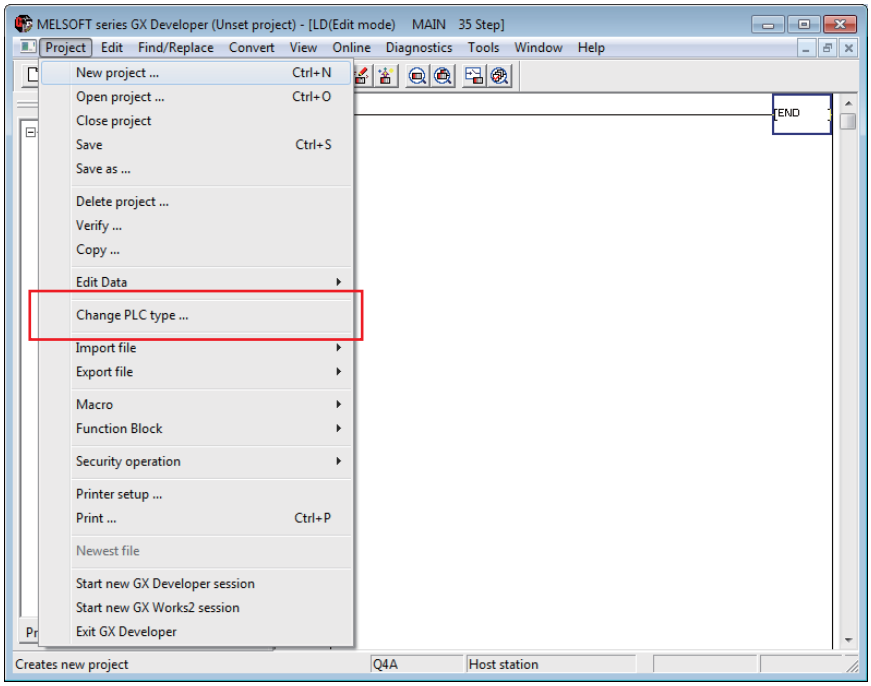
4.5.7.1 Opening Project Data to be Converted Using GX Developer

Open the project data (with PC type "Q4A") from GX Developer.

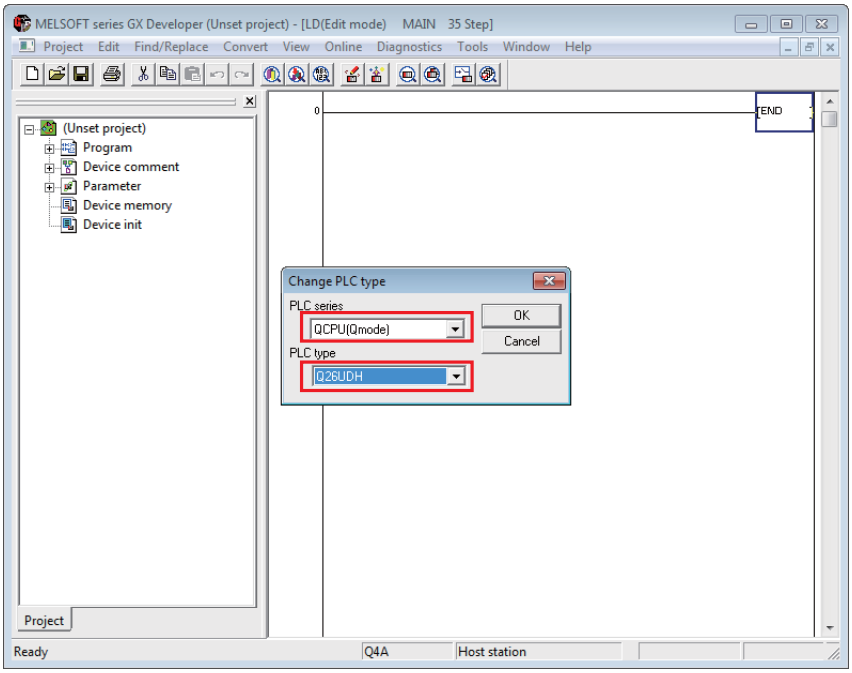


4.5.7.2 Changing PC Type

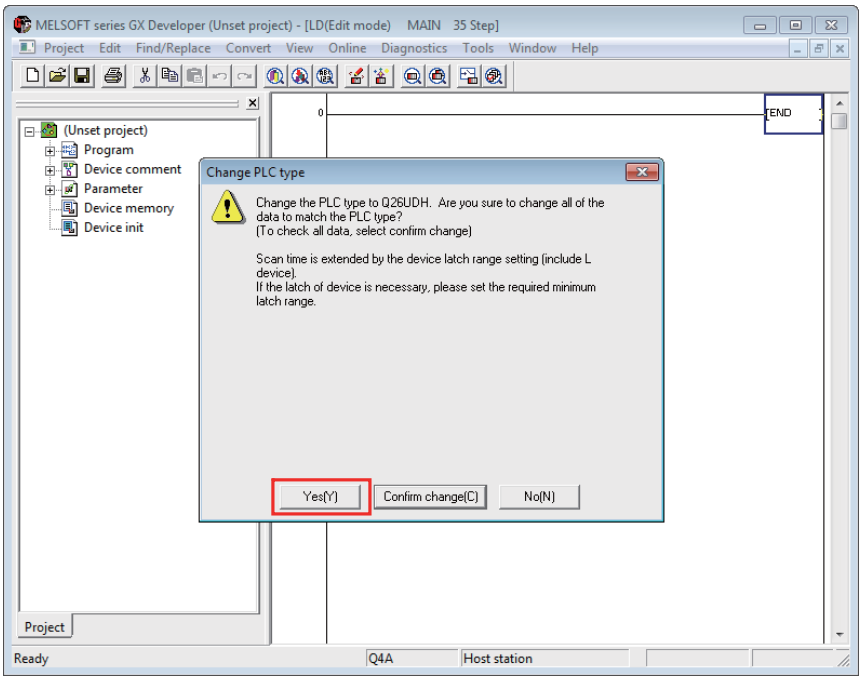
(1) From [Project], select "Change PLC type".



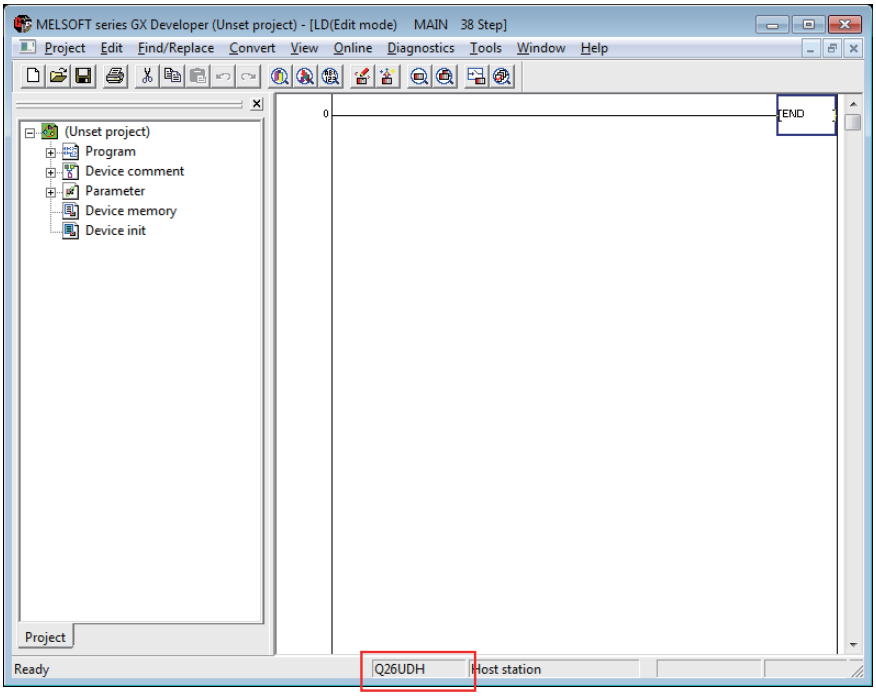
(2) Change the PC series to "QCPU (Q mode)" and select "Q26UDH" from the PC types. Click [OK].



(3) The confirmation dialog is displayed. Click [Yes].



(4) Confirm that the PC type is changed to Q26UDH.



Conversion is completed.
The settings of "Connection Setup" and "PC parameter" are reset when conversion is executed.
Set these items again by referring to "Setting the Connection Target" section in "Preparation: Preparation for Ethernet Communication" and "Common Items: Setting the Parameters".

The SM/SD device assignment is automatically changed at conversion. Using the following tables, re-examine the locations at which SM/SD devices are used.

Project data before conversion (Q4A) (M7 series)	Project data after conversion (Q26UDH) (M8 series)		Project data before conversion (Q4A) (M7 series)	Project data after conversion (Q26UDH) (M8 series)
SM54	SM1255		SD54	SD1255
SM212	SM1255		SD251	SD1255
SM251	SM1255		SD714	SD1255
SM711	SM1255		SD812	SD1255
SM712	SM1255		SD1000	SD60
SM714	SM1255		SD1001	SD1255
SM808	SM1255		SD1002	SD61
SM821	SM1255		SD1003	SD1255
SM822	SM1255		SD1004	SD1255
SM825	SM1255		SD1005	SD53
SM1000	SM60		SD1006	SD1255
SM1001	SM1255		SD1007	SD1255
SM1002	SM61		SD1008	SD0
SM1003	SM1255		SD1009	SD62
SM1004	SM1255		SD1010	SD1255
SM1005	SM53		SD1011	SD1255
SM1006	SM52		SD1012	SD1255
SM1007	SM51		SD1013	SD1255
SM1008	SM1		SD1014	SD1255
SM1009	SM62		SD1015	SD203
SM1010	SM1255		SD1016	SD1255
SM1011	SM56		SD1017	SD524
SM1012	SM700		SD1018	SD520
SM1013	SM1255		SD1019	SD526
SM1014	SM1255		SD1020	SD1255
SM1015	SM1255		SD1021	SD1255
SM1016	SM1255			
SM1017	SM1255			
SM1018	SM1255			
SM1019	SM1255			
SM1020	SM420			
SM1021	SM421			
SM1022	SM422			
SM1023	SM423			

4.5.8 Monitoring the Sequence Program

There are no Mitsubishi Electric CNC-specific operations to monitor a sequence program. Refer to GX Developer Operating Manual for the operation methods. For usable functions, refer to "GX Developer Functions Supported by Mitsubishi Electric CNC:Function Support Conditions (Online Section)". This section explains the operation procedure outline and precautions.

4.5.8.1 Operation Procedure

Perform the following operation from GX Developer to start monitoring.

(1) Display the sequence program to be monitored and move to the circuit part to be monitored.

(2) Perform either of the following operations to start monitoring.

- Select [Online] - [Monitor] - [Monitor mode].
- Press "F4" key.

(3) Perform either of the following operations to stop monitoring.

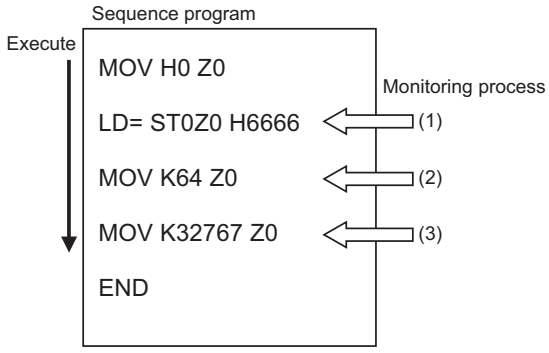
- Select [Online] - [Monitor] - [Stop monitor].
- Press "Alt" and "F3" keys simultaneously.

[Caution] If the sequence program being RUN with CNC controller differs from the sequence program displayed on GX Developer, monitoring will not result in an error but will appear to continue normally.
Confirm that the sequence program on the CNC controller side and GX Developer are the same before starting monitoring.

4.5.8.2 Precautions

The device values displayed in monitoring are not values after ladder execution, but values at the timing when the monitoring process asynchronous with the ladder is operated. (The timing is before, during or after ladder execution.) Therefore, when a device with index modification is monitored, the Z device value at the timing of the monitoring process is displayed as the reference destination value of the device with index modification. (When the same index register is used, the monitor value of the device with the index modification is not the device value at executing instruction.)

The following is an example where the reference destination of the device with index modification is changed depending on the timing of monitoring process.



The value to be displayed in ST0Z0 depends on the timing of monitoring process.

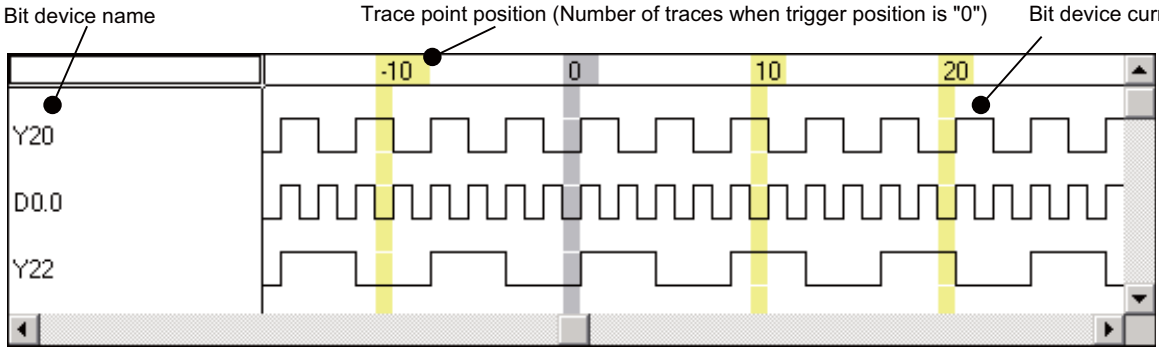
(1) ST0 monitor value
(2) ST64 monitor value
(3) 0 (Because a value out of the device range is referred to.)

4.5.9 Executing Sampling Trace on Device

Status of various devices that are used for the CNC controller external signals and for the user ladder can be traced by using GX Developer. Trace result at an arbitrary point will be read out from CNC controller and displayed on a screen or output in a CSV file format.

[Example of trace result display for bit devices]

Current value of bit device per sampling point is displayed.



Example of bit device trace result display

[Example of trace result display for word devices]

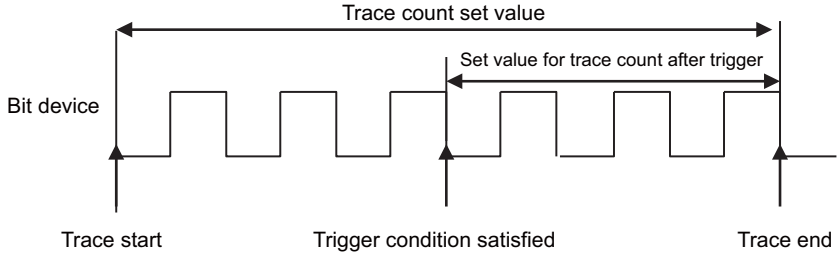
Current value of word device per sampling point is displayed.

Word device name | Trace point position (Number of traces when trigger position is "0".) | Word device current value

	-2	-1	0	1	2	3
D10	56	52	48	44	40	36
R1200	500	250	125	62	31	15
R1210	185	100	57	35	23	17
K4Y20	3	2	2	7	7	6
D0	514	513	512	511	510	509
D1	-32767	-32767	-32767	-32767	-32767	-32767
D2	0	0	0	0	0	0

Example of word device trace result display

No. of traces, trace condition, trigger condition, and No. of traces after trigger can be set as trace setting.
Trace is executed when the trace condition is set.
After the trigger condition is set, execute "No. of traces after trigger" only and end trace. Sampling the status before and after the trigger is set is also possible.



From satisfacion of trigger condition to trace end

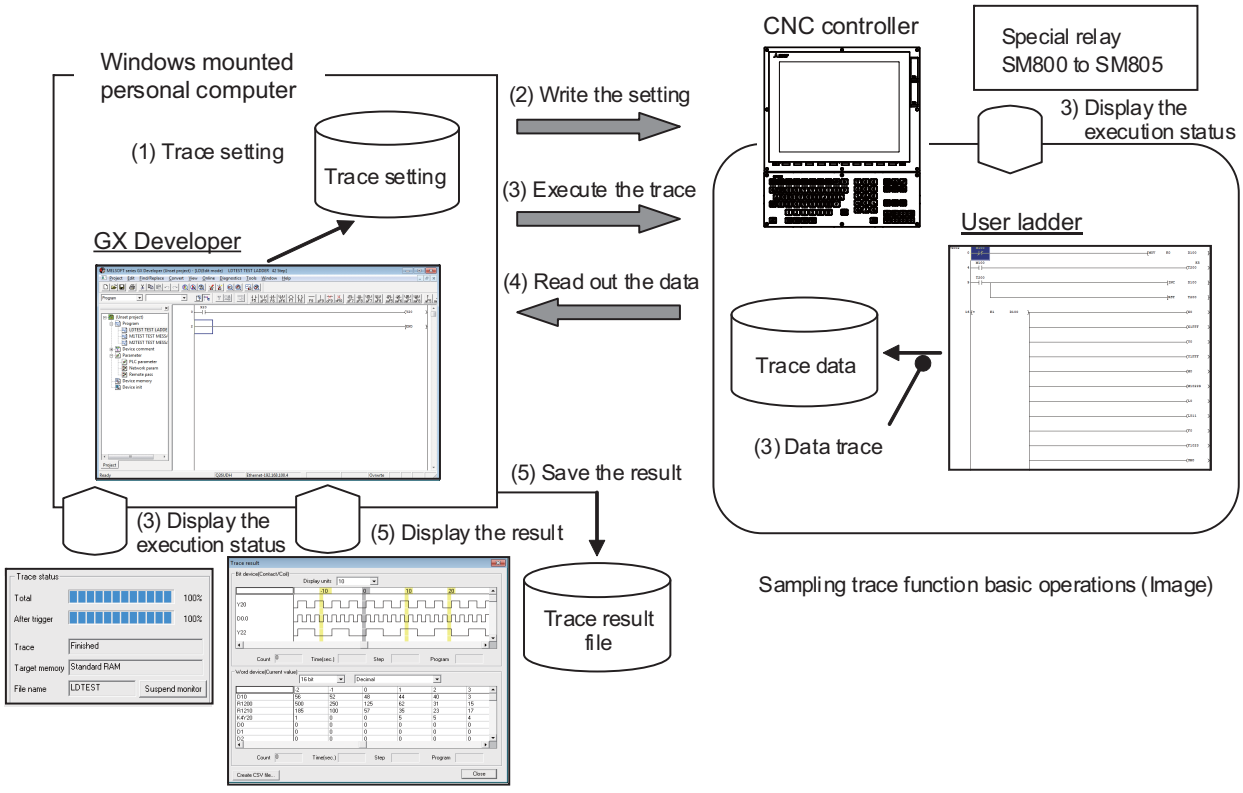
4.5.9.1 Basic Operation

Use GX Developer for operation. Execute sampling trace function, following the procedures below.
Refer to "4.5.9.4 Sampling Trace Operation Screen" for the actual operataion prosedure by GX Developer.
The sampling trace function can be executed for each project when the multi-project is enabled.

(1) Carry out trace setting.

Setting item	Setting details
No. of traces	Set the number of traces to be saved. The latest data is saved for the number of traces. If exceeds the number of traces, oldest data is erased in order.
No. of traces after trigger	Set the number of traces taken place after trigger has been established until sampling is completed.
Trace point	Set the data trace timing. "Each scan" and "Detail" can be selected. "Detail" enables the trace execution condition setting.
Trigger point	Set the trigger timing. When trigger is established, status of trace device is taken in. "At the time of trigger operation from GX Developer" and "Detail" can be selected. "Detail" enables the trigger establishment condition setting.
Trace device	Set the device for sampling.

(2) Write the trace settings into CNC controller.
(3) Execute tracing. CNC controller starts tracing the device. Tracing execution status can be checked with GX Developer tracing status display or CNC special relay SM800 to SM805. Tracing will be continued until the following conditions are set.
(a) Tracing is completed upon establishment of trigger.
(b) Stop tracing from GX Developer.
(c) Turn the CNC controller power OFF.
(d) PLC turns to STOP mode.
(4) Read trace data out from CNC controller.
(5) Display the result and output in a file format, if necessary.



Sampling trace function basic operations (Image)

*1: The trace settings done in (1) are retained even after the CNC power is turned OFF.
*2: The trace data acquired in (4) is deleted when the CNC power is turned OFF.
*3: The trace settings are retained in (2). If the CNC power is turned OFF before the write, the conditions changed before the write are not retained, but the previous trace settings are retained.

4.5.9.2 Basic Specifications

Basic specifications list

<table>
<tr><th>Item</th><th colspan="3">Specifications</th></tr>
<tr><td>Multi-project</td><td colspan="3">Sampling trace can be executed for each project.
Refer to (Note 6) for the timing of sampling when the multi-project is enabled.</td></tr>
<tr><td>No. of traces</td><td colspan="3">The number between 1 and 8192 can be set. Note that, however, the total trace data size has to be smaller than 220 kilobytes.
(The data size for a project depends on the number of usable projects.)
Refer to (Note 1) for trace data size calculation.</td></tr>
<tr><td>No. of traces after trigger</td><td colspan="3">Sets the number smaller than the No. of traces.</td></tr>
<tr><td rowspan="3">Trace point
(Two types of setting - "Each scan" and "Detail" - are available.)</td><td>Each scan</td><td colspan="2">Traces per scan of the main process.</td></tr>
<tr><td rowspan="2">Detail
(Refer to (Note 4) for precaution.)</td><td>Word device</td><td>Applicable device: Refer to (Note 2).
Setting condition: Sets the condition and the value to be used for judgment. Sets the value to be used for judgement. When the setting value becomes equal to the word device value, or when the value of the word device changes judgement will be effective and trigger is executed.</td></tr>
<tr><td>Bit device</td><td>Applicable device: Refer to (Note 2).
Setting condition: Sets ↑ or ↓ . When the setting condition is satisfied, trace is executed.</td></tr>
<tr><td rowspan="3">Trigger point
(Two types of setting - "At the time of trigger operation from GX Developer" and "Detail" are available.)</td><td>At the time of trigger operation from GX Developer</td><td colspan="2">Executes trigger by GX Developer operations.</td></tr>
<tr><td rowspan="2">Detail
(Refer to (Note 5) for precaution.)</td><td>Word device</td><td>Applicable device: Refer to (Note 2).
Setting condition: Sets the value to be used for judgement. When the setting value becomes equal to the word device value, judgement will be effective and trigger is executed.
Refer to (Note 5) for when writing to the device.</td></tr>
<tr><td>Bit device</td><td>Applicable device: Refer to (Note 2).
Setting condition: Sets ↑ or ↓ . When the setting condition is satisfied, trace is executed.</td></tr>
<tr><td>Trace device</td><td colspan="3">50 points of word device, 50 points of bit device can be set. Note that, however, the total trace data size has to be smaller than 220 kilobytes.
Refer to (Note 1) for trace data size calculation.
(The data size for a project depends on the number of usable projects.)
Refer to (Note 3) for applicable devices.</td></tr>
</table>

(Note 1) Calculation of trace data size

The size of trace data per project depends on the number of usable multi-project.

The size of trace data per project for different numbers of usable multi-project.

Usable projects	Maximum trace data capacity per project
6 projects	25 kilobytes
5 projects	32 kilobytes
4 projects	44 kilobytes
3 projects	64 kilobytes
2 projects	103 kilobytes
1 project	220 kilobytes
User safety sequence	220 kilobytes

For example, if the number of usable projects is 6, set the number of traces and the trace devices so that the trace data size is 25 kilobytes (25600 bytes) or smaller. Trace data size will be calculated as follows.

[Trace data size (byte)] = [Size required for one trace (byte)] x [Number of traces]

Size required for one trace is calculated from word device points and bit device points of the trace device and the size required for one trace of each device. When time information is added, 4 bytes per trace is required.

Size required for one trace of each device

Trace device type	Size (byte) required for one trace
Word device	2 bytes per point
Bit device	2 bytes per unit (1 unit = 16 points) 1 to 16 points -> 1 unit -> 2 bytes 17 to 32 points -> 2 units -> 4 bytes 33 to 48 points -> 3 units -> 6 bytes 49 to 50 points -> 4 units -> 8 bytes

The size of trace data can be calculated from the following equation.

[Trace data capacity (byte)]

= (([number of bit device units] + [number of word devices]) × [2 (byte)] + [4 (byte)*]) × [trace count]

*Only when time information is added

Calculation example for trace data size is shown below.

Trace data size calculation example (when three projects are being used)

No.	Bit device points	Word device points	Trace count	Trace data size	Sampling
1	16 (1 unit)	2	8192	((1+2)×2)x8192 = 49152 bytes	Possible
2	8 (1 unit)	8	1000	((1+8)×2)x1000 = 18000 bytes	Possible
3	50 (4 units)	50	606	((4+50)×2)x606 = 65448 bytes	Possible
4	50 (4 units)	50	607	((4+50)×2)x607 = 65556 bytes	Not possible

(Note 2) Applicable devices with trace/trigger point details setting

Applicable device
Bit device: X, Y, M, L, F, SB, V, B, SM, T(contact), ST(contact), C(contact) Word device: T(current value), ST(current value), C(current value), D, R, SW, SD, W, ZR Following qualifications are available for the above devices. - Bit device digit designation - Word device bit designation

Process following an inapplicable device setting will be an error occurrence at trace execution.

(Note 3) Applicable devices with device setting

Applicable device
Bit device: X, Y, M, L, F, SB, V, B, SM, T(contact), T(coil), ST(contact), ST(coil), C(contact), C(coil) Word device: T(current value), ST(current value), C(current value), D, R, SW, SD, W,ZR Following qualifications are available for the above devices. - Bit device digit designation - Word device bit designation

Process following an inapplicable device setting is as follows.

- If one or more applicable devices already exist, the setting of the inapplicable device will be ignored.
- If no applicable devices exist, an error will occur at trace execution.

(Note 4) Precautions for trace point details setting

- When trace point is set only with "Step No.", an error will occur at trace execution.
- When trace point is set with AND condition of "Step No." and "Device", "Step No." setting will be ignored and only "Device" setting will be effective.
- When only devices that are not corresponding to Mitsubishi Electric CNC are set for "Device", an error will occur at trace execution.

Operations at the time of trace point details setting are as shown in the table below.
List of operations at trace point details setting

Setting (○ : Yes, ×: No)		Operations
Device	Step No.	
○	○	Valid setting available in device -> Device
		Valid setting not available in device -> Error display
○	×	Valid setting available in device -> Device
		Valid setting not available in device -> Error display
×	○	Error display
×	×	Setting disabled (Error is displayed on GX Developer)

(Note 5) Precautions for trigger point details setting

- When trigger point is set only with "Step No.", an error will occur at trace execution.
- When trigger point is set only with "Step No.", the operation will be same as when trigger point is set to "At the time of trigger operation from GX Developer".
- When devices that are not corresponding to Mitsubishi Electric CNC are set for "Device", an error will occur at trace execution.

Operations at the time of trigger point details setting are as shown in the table below.
List of operations at trigger point details setting

Setting (○ : Yes, ×: No)				Operations
Device			Step No.	
○	Word device	Value matching	○	Valid setting available in device -> Device
				Valid setting not available in device -> Error display
		Writing to device	○	Error display
	Bit device		○	Valid setting available in device -> Device
				Valid setting not available in device -> Error display
○	Word device	Value matching	×	Valid setting available in device -> Device
				Valid setting not available in device -> Error display
		Writing to device	×	Error display
	Bit device		×	Valid setting available in device -> Device
				Valid setting not available in device -> Error display
×			○	Error display
×			×	Setting disabled (Error is displayed on GX Developer)

(Note 6) Precautions on multi-project function

When the multi-project is enabled, one scan is executed in the order specified by the user. Sampling is started after one scan is executed. Therefore, there may be some restrictions in operation depending on the settings.

Example 1: Three projects

Project execution order		1 -> 2 -> 3
Program (ladder) Device R: project-common Device D: project-specific	Project 1	Device R0 <- 1, Device D0 <- 1
	Project 2	Device R0 <- 2, Device D0 <- 2
	Project 3	Device R0 <- 3, Device D0 <- 3
Sampling trace (project 1 to 3) common		Trace point: Each scan Trace device: R0, D0
Sampling trace result (1 sampling extracted)	Project 1	R0: 3, D0: 1
	Project 2	R0: 3, D0: 2
	Project 3	R0: 3, D0: 3

In the above example, sampling is executed after the operation of project 3. Therefore, the result of update performed in project 3 is used as the sampling data for R0 (the device common to all projects) of all projects.

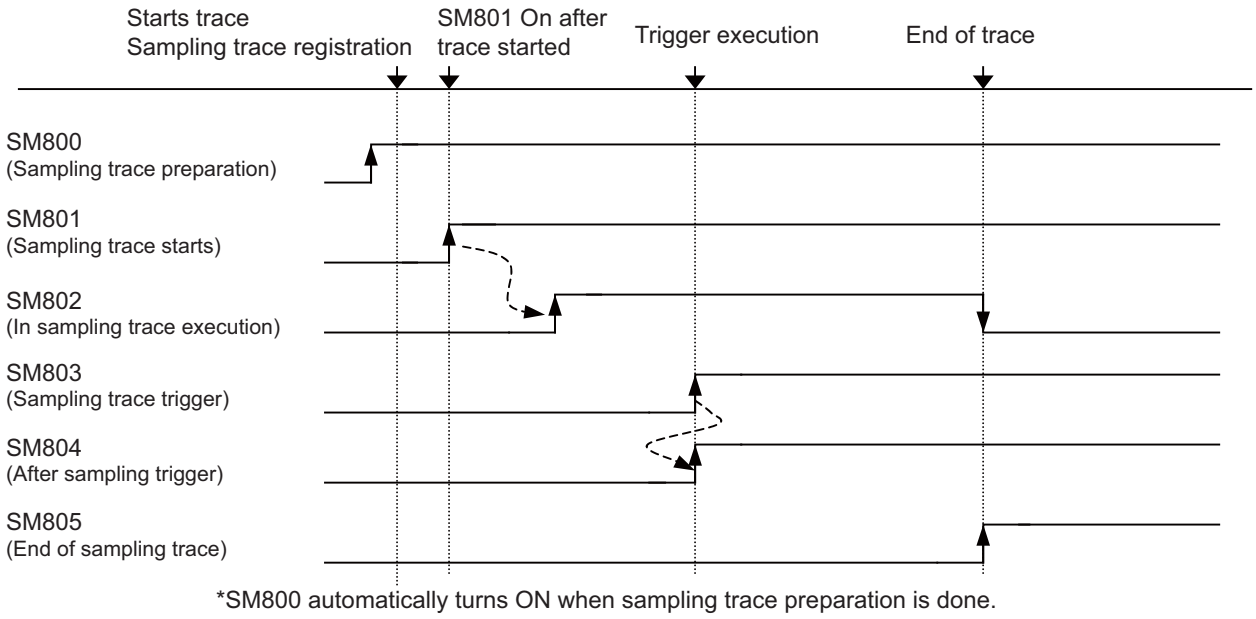
Example 2: Six projects

Project execution order		6 -> 1 -> 5 -> 2 -> 4 -> 3
Program (ladder) Device R: project-common Device D: project-specific	Project 1	Device R0 <- 1, Device D0 <- 1
	Project 2	Device R0 <- 2, Device D0 <- 2
	Project 3	Device R0 <- 3, Device D0 <- 3
	Project 4	Device R0 <- 4, Device D0 <- 4
	Project 5	Device R0 <- 5, Device D0 <- 5
	Project 6	Device R0 <- 6, Device D0 <- 6
Sampling trace	Project 1 to 3 common	Trace point: Each scan Trace device: R0, D0
	Project 4 to 6 Common	Trace point: Detailed setting Trace device: R0, D0 when device R0 is 5
Sampling trace result (1 sampling extracted)	Project 1	R0: 3, D0: 1
	Project 2	R0: 3, D0: 2
	Project 3	R0: 3, D0: 3
	Project 4	No trace
	Project 5	No trace
	Project 6	No trace

In the above example, sampling is executed after the operation of project 3. Therefore, the result of update performed in project 3 is used as the sampling data for R0 (the device common to all projects) of all projects.
For project 4 to 6 for which the trace point is specified as "when device R0 is 5", tracing is not performed because R0 is "3" at the sampling timing.

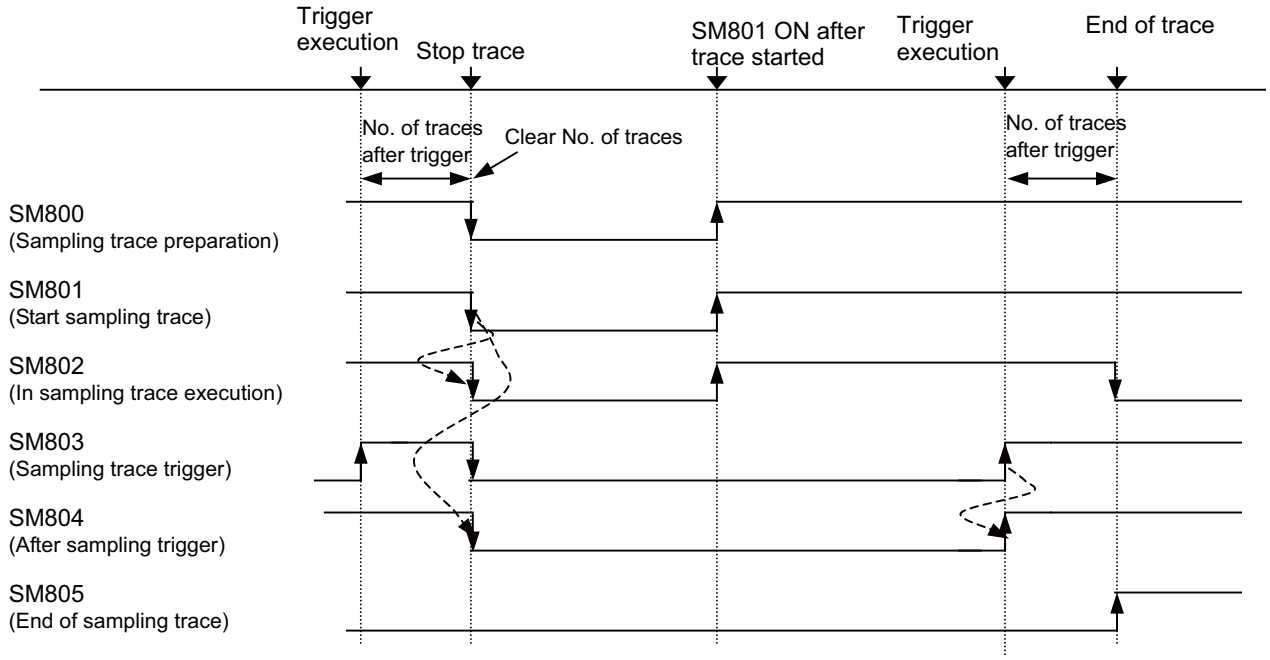
4.5.9.3 Status of Special Relay during Sampling Trace

Status during sampling trace function being executed can be checked by the status of SM device 800 to 805.



*SM800 automatically turns ON when sampling trace preparation is done.

Device status when trace execution operation is carried out.



Device status when trace stop operation is carried out

Specifications for SM800 to SM805 is as shown below.

Specifications list for the devices that are related with sampling trace function

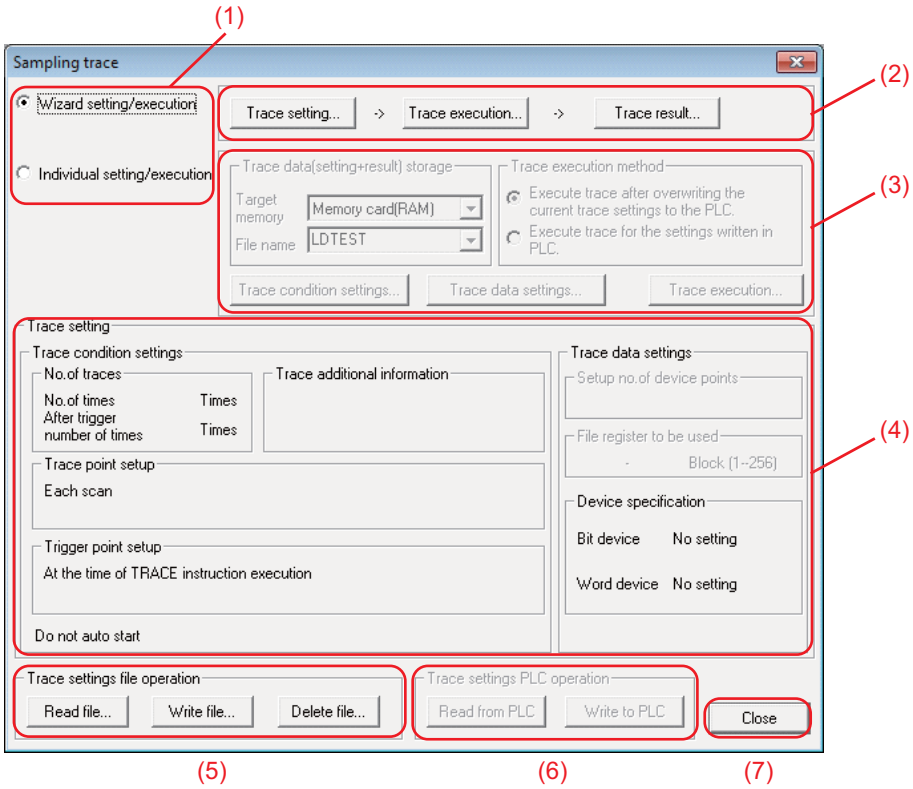
No.	Name	Details
SM800	Sampling trace preparation	OFF: Preparation not completed ON: Preparation completed
SM801	Starts sampling trace	OFF: Cancel ON: Start
SM802	In sampling trace execution	OFF: Cancel ON: Start
SM803	Sampling trace trigger	OFF -> ON : Trigger execution
SM804	After sampling trace trigger	OFF: Not after trigger ON: After trigger
SM805	End of sampling trace	OFF: Not completed ON: Completed

4.5.9.4 Sampling Trace Operation Screen

In this section, outline of the operation procedures and precautions are explained, using the case where wizard setting/execution is applied. Individual setting/execution is also available. For available functions, refer to "GX Developer Functions Supported by Mitsubishi Electric CNC: Function Support Conditions (Online Section)".
Refer to "GX Developer Version 8 Operating Manual (SW8D5C-GPPW-*)" for basic operations.

Sampling Trace Main Screen

Start the sampling trace main screen below by selecting [Online] - [Trace] - [Sampling trace]. All the operations for sampling trace functions are carried out on this main screen.



Sampling trace main screen

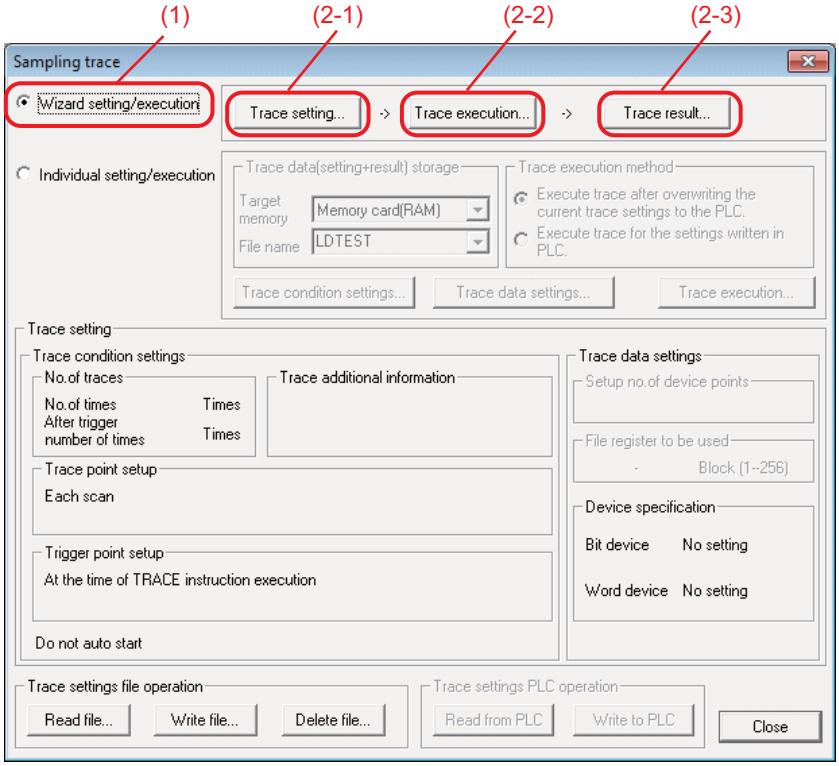
(1) Set the sampling trace execution method. Select either "wizard setting/execution" method or "Individual setting/execution" method. Necessary setting items are set in an order by using the wizard setting/execution method.
(2) This is the menu when the wizard setting/execution method is applied. Sampling trace execution method is valid when wizard setting/execution is applied. Click the button in the order of "Trace setting...", "Trace execution..." and "Trace result...".
(3) This is the menu when the individual setting/execution method is applied. Sampling trace execution method is valid when individual setting/execution is applied. Click the button in the order of "Trace condition setting", "Trace data setting" and "Trace execution". Setting details are same as when wizard setting/execution is applied. (except "Registry trace" of trace execution)
(4) Display the details of setting for the trace currently valid.
(5) This is the menu for trace setting file operation. Saving of the currently valid trace settings in the local area is possible, as well as reading and deleting of the saved file.
(6) This is the menu for trace setting PC operation. Currently valid trace settings can be written into CNC, and also the trace settings currently set in CNC can be read out.
(7) The [Close] button closes the "Sampling trace" screen. Tracing will continue even if the screen is closed during trace execution.

Wizard Setting/Execution Screen

Perform the following operation from GX Developer to start the sampling trace.

[Online] -> [Trace] -> [Sampling trace]

(1) Select wizard setting/execution with radio button.
(2) Click in the following order and operate according to the wizard.
(2-1) Trace setting: Refer to "Trace Setting" for details.
(2-1) Trace setting: Refer to "Trace Execution" for details.
(2-3) Trace result: Refer to "Trace Result" for details.

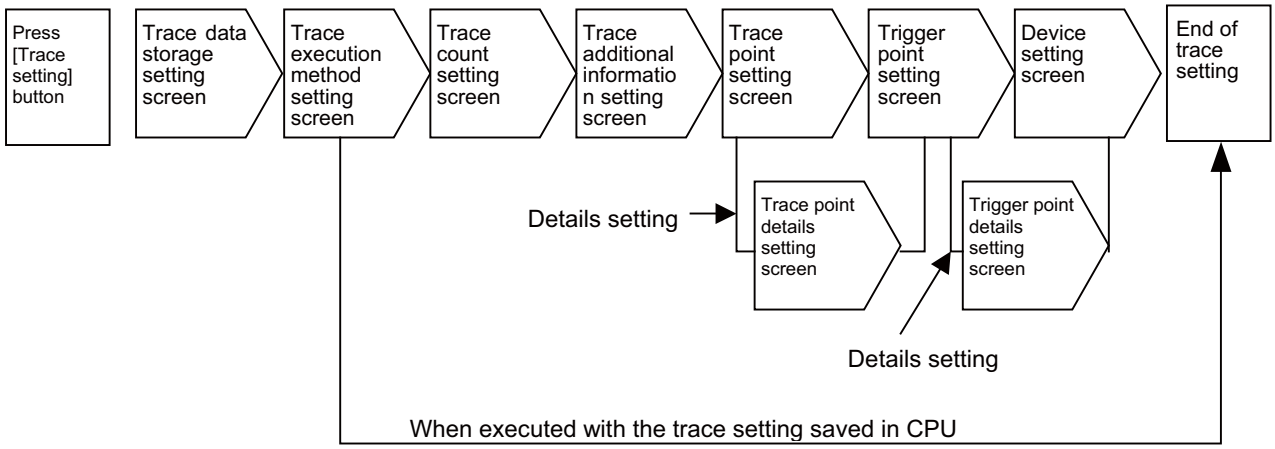


Explanation of wizard setting/execution

Trace Setting

Start "Sampling trace setting wizard" screen by clicking [Trace setting].
Set the conditions and data required for sampling trace according to the wizard.

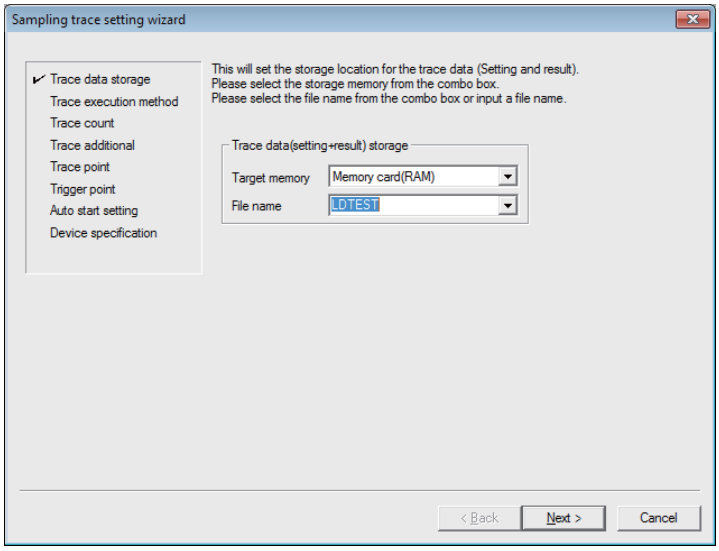
Screen transitions for trace setting is as shown below.



Trace setting screen transitions at wizard setting/execution

(1) Trace data (setting/result) storage setting screen

"Target memory" and "File name" cannot be set. Click [Next >] and proceed to the trace execution method setting screen.



[Note]

- Since "Target memory" is CNC RAM, trace data (result) will be deleted when the power is turned OFF.
- Trace data (setting+result) that can be saved on CNC controller is only one. Trace data result is overwritten every [Trace execution] execution.
- When file name is changed, the overwriting confirmation dialogue may not be dispalyed at PC write operation.
- When file name has been changed, trace result may not be displayed with [Trace result]. Read the data out from PLC, then click [Trace result] again.
- An error will occur at the start of tracing if "Memory card(RAM)" is selected as "Target memory".

(2) Trace execution method setting screen

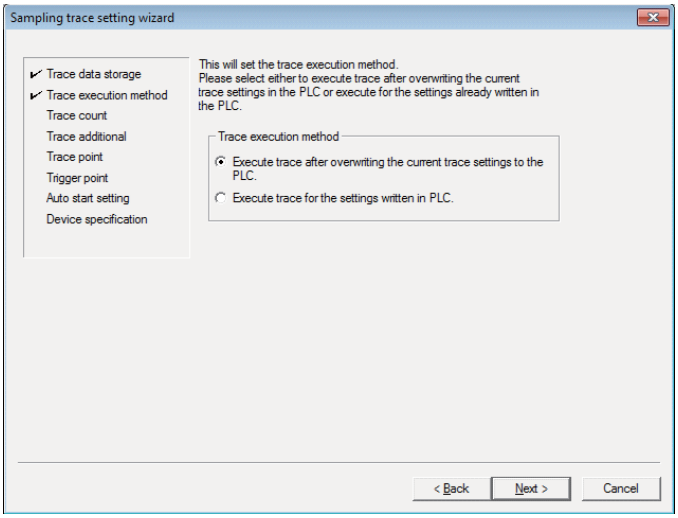
Select a trace execution method and click [Next >].

When "Execute trace after overwriting the current trace settings to the PLC" is selected:

Proceed to the trace count setting screen.

When "Execute trace for the settings written in PLC" is selected:

End "Sampling trace setting wizard" and return to the "Sampling trace" screen.

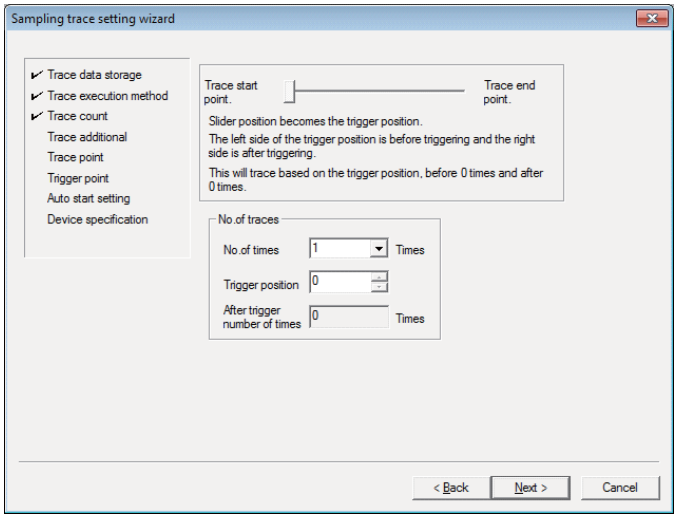


At wizard setting/execution - Sampling trace setting wizard - Trace additional information setting screen

(3) Trace count setting screen

Set the number of traces and trigger position, click [Next >] and proceed to the trace additional information setting screen.

Refer to "Basic Specifications" for details on trace count that can be set.

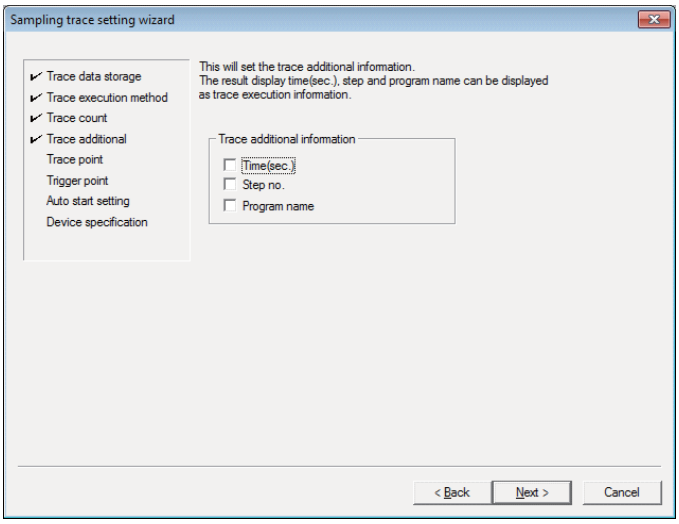


At wizard setting/execution - Sampling trace setting wizard - No. of traces setting screen

(4) Trace additional information setting screen

Only "Time" can add information. Put a check mark at "Time" to display time when the trace result is shown.

Click [Next >] and proceed to the trace point setting screen.



At wizard setting/execution - Sampling trace setting wizard - Trace additional information setting screen

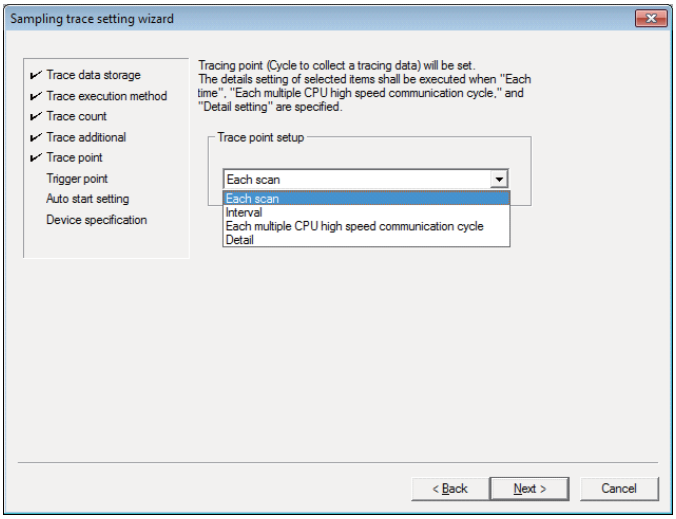
(5) Trace point setting screen

Select "Each scan" or "Detail" and click [Next >].

When "Detail" is selected, proceed to the trace point details setting screen. Set "Device" at [Trace point setting].

When "Detail" is selected, proceed to the trace point details setting screen. Set "Device" at [Trace point setting].

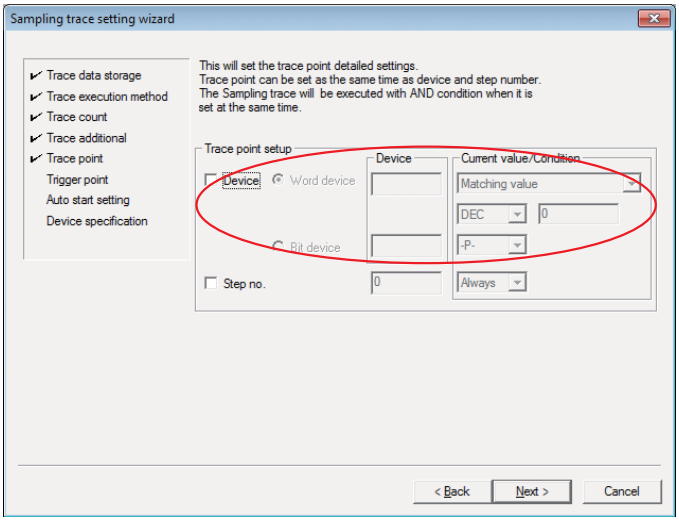
- "Each scan": Trace is executed after scanning the main process.
- "Detail": Trace is executed when the device set with trace point setting satisfies its condition after scanning the main process.



At wizard setting/execution - Sampling trace setting wizard - Trace point setting screen

[Note] Only "Each scan" and "Detail" are valid for trace point setting.

When "Interval" or "Each Multiple CPU high speed transmission cycle" is set, the movement will be the same as when "Each scan" is set.



At wizard setting/execution - Sampling trace setting wizard - Trace point setup - Details setting screen

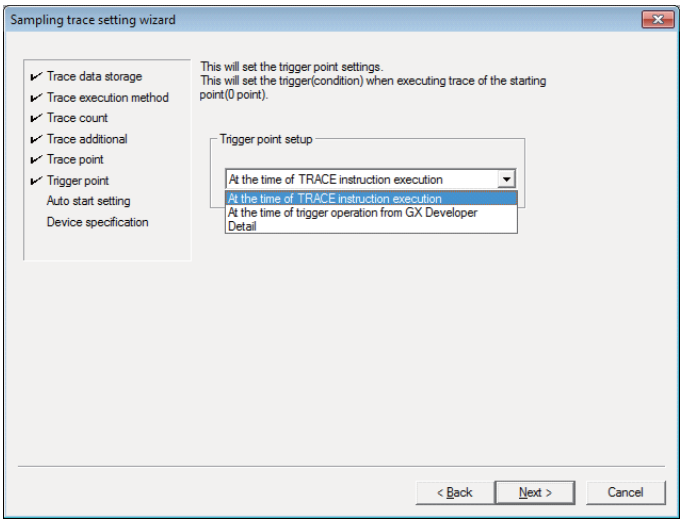
[Note] Only "Device" is valid for trace point setting.
Do not set "Step No.".
Refer to "Basic Specifications" for the devices that can be set.

(6) Trigger point setting screen

Select "At the time of trigger operation from GX Developer" or "Detail" and click [Next >].
When "At the time of trigger operation from GX Developer" is selected, proceed to the device setting screen.
When "Detail" is selected, set "Device" at [Trigger point setting].

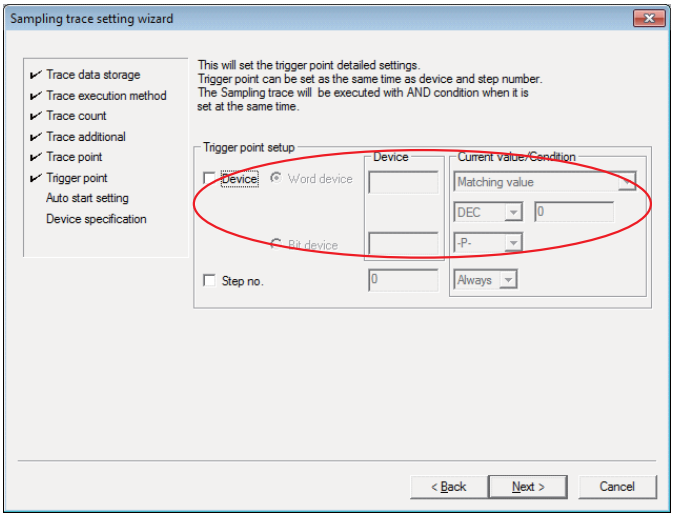
"At the time of trigger operation from GX Developer":
When executing trace, carry out "Execute trigger" from the "Sampling trace setting wizard execution" screen.
The data at the time of "Execute trigger" after scanning of the main process will be the start point (0 point).

"Detail":
Check trigger conditions after scanning of the main process. The data at the time of trigger condition establishment will be the start point (0 point). (Refer to "PLC Programming Manual" for explanation of 'Main process'.)



At wizard setting/execution - Sampling trace setting wizard - Trigger point setting screen

[Note] Only "At the time of trigger operation from GX Developer" and "Detail" are valid for trigger point setting.
When "At the time of TRACE instruction execution" is set, operation will be the same as when "At the time of trigger operation from GX Developer" is set.

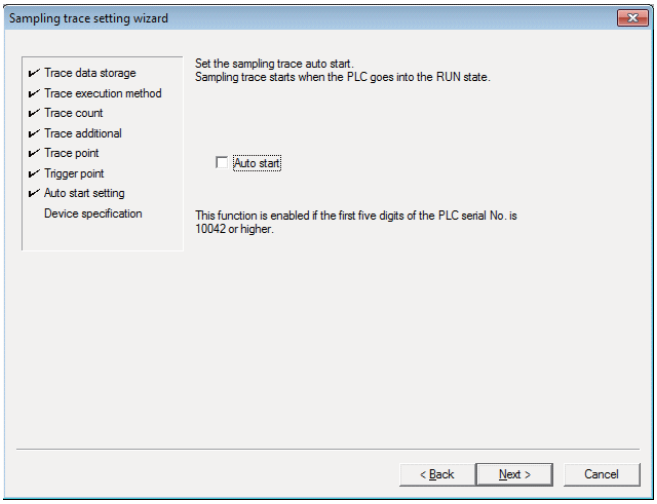


At wizard setting/execution - Sampling trace setting wizard - Trigger point setup - Details setting screen

[Note] Only "Device" is available for trigger point "Details" setting.
Do not set "Step No.".
Refer to "Basic Specifications" for the devices that can be set.

(7) Auto start setting screen

The auto-start setting is disabled.
Click [Next>] without checking "Auto start".



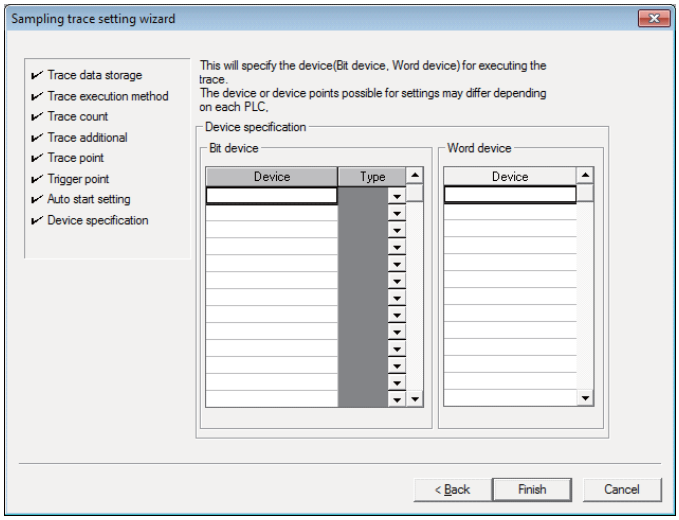
Wizard setting/execution - Sampling trace setting wizard - Auto start setting screen

(8) Device setting screen

Set the devices of which trace is executed and click [Next >].

After setting the device, click [Finish] and end the trace setting.

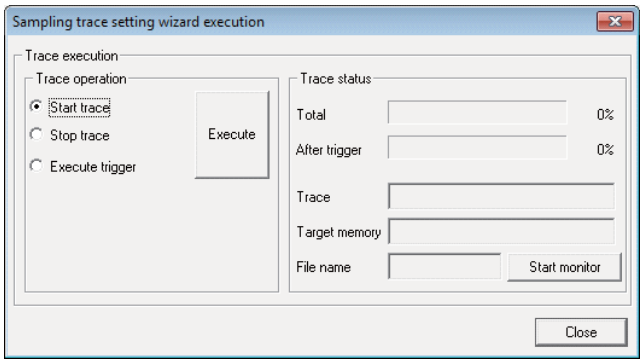
Refer to "Basic Specifications" for the devices that can be set.



At wizard setting/execution - Sampling trace setting wizard - Trigger point setting - Device setting screen

Trace Execution

Start the "Sampling trace setting wizard execution" screen below by clicking [Trace execution].
Carry out "Start trace", "Stop trace" and "Execute trigger".



At wizard setting/execution - Trace execution screen

(1) Starting trace

Select "Start trace" under [Trace operation] and click [Execute]. Trace begins.
Tracing progress can be checked at [Trace status].

Status of each device under tracing can be check with [Trace result].
Display the current status by clicking [Trace result] after closing the trace execution screen by clicking [Close].
Tracing will continue even after [Close] is clicked.

Once [Close] is clicked and display the trace execution screen again, click [Trace execution]. Since [Trace status] is hidden at this point, click [Start monitor].

[Note] Once trace is resumed, trace data up to the previous time will be deleted.
- From start to end of the trace execution, trace cannot be executed again.

(2) Trigger execution

Trigger can be executed at an arbitrary timing. Select "Execute trigger" and click [Execute].

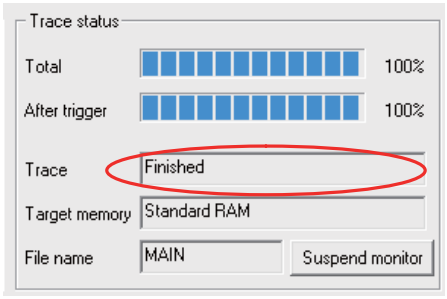
(3) Stopping trace

To stop tracing, select "Stop trace" and click [Execute].
To display the trace result before stop, click [Trace result] after pressing [Close].

[Note] Once "Stop trace" is executed, trace cannot be resumed.
When the trace information before stop is required, save the data in CSV file with [Trace result].
If "Start trace" is executed before saving the data, the data before "Stop trace" will be deleted.

(4) End of trace

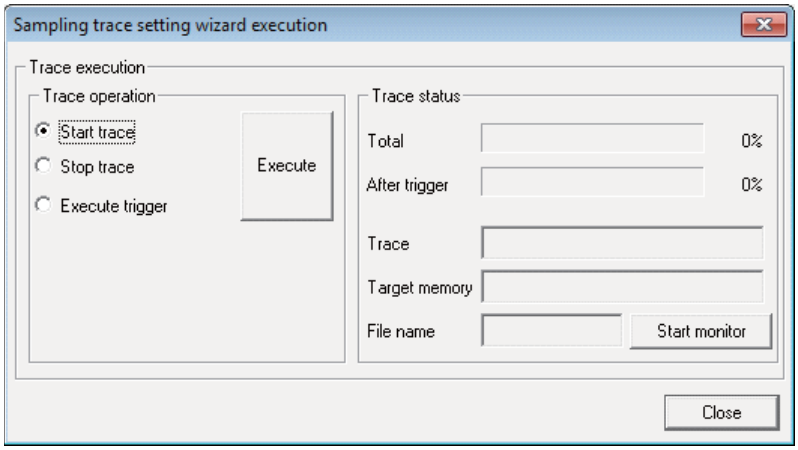
When trace after trigger has been completed after trigger execution, "Finished" is displayed on [Trace status], and then trace will be finished. Click [Close] upon completion of tracing and end the "Sampling trace setting wizard execution" screen.



At wizard setting/execution - Trace execution screen - Trace status display at trace "Finished"

(5) Trace registration

Start the "Execute sampling trace" screen by clicking [Trace execution] for the individual setting/execution.
On this screen, set the start trace, stop trace, execute trigger and registry trace. Operation concerning starting/stopping/executing trace is the same as that for the wizard setting/execution.



Individual setting/execution - Trace execution screen

Select "Registry trace" from [Trace operation], and click [Execute]. The trace setting is registered.
Use this function to control the device for start tracing (SM801) in the ladder.

(6) Trace status display

When trace status is being monitored, the button displays [Suspend monitor]. To stop monitoring, click the button.
When not monitoring, the button displays [Start monitor]. To start monitoring, click the button.

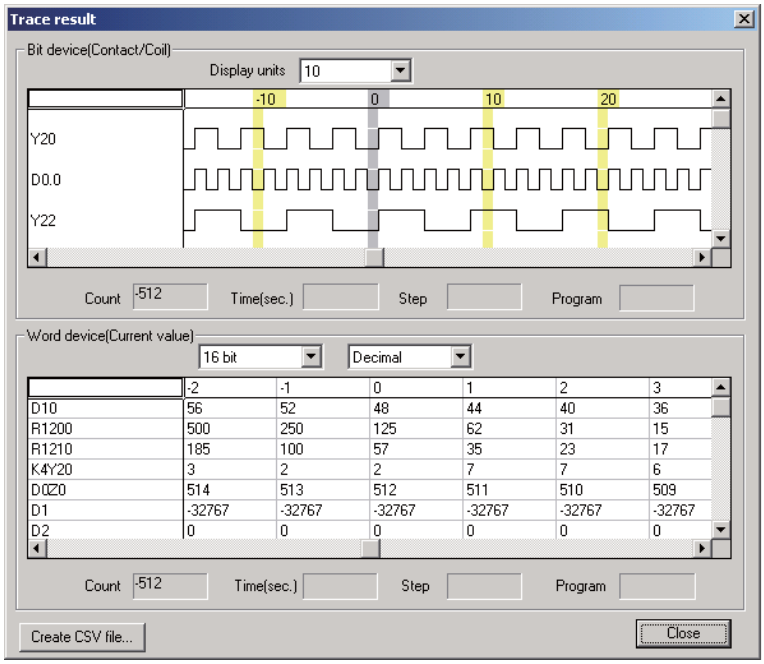
[Trace] within [Trace status] includes the following 6 display items.

Display	Status
Executing (waiting for trigger), Executing (after trigger)	Trace is being executed.
Suspend	Trace has been stopped.
Execution failed (not registered), Execution failed (registered)	Trace is not executed.
Finished	Trace has been completed.

Trace Result

Start the "Trace result" screen below by clicking [Trace result].

Trace result of bit device is chronologically shown in the upper section and word device in the lower section. Trace result can be saved in the CSV file format. Trace result can be displayed even during trace execution.



ON/OFF status of bit device is displayed per trace count

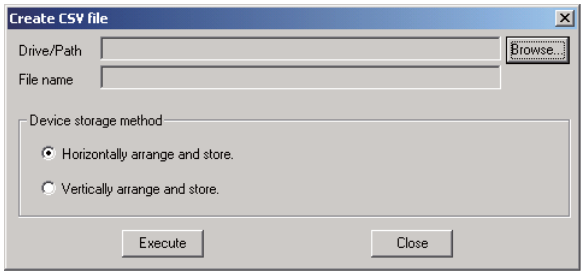
Value of word device is displayed per trace count

At wizard setting/execution – Trace result screen

"Count": Counts are displayed. (Trigger execution point is set as start point or 0 point)
"Time(sec.)": Time is displayed. (Head of trace data is set as standard or 0.000 sec.)
If trace interval exceeds 65 seconds, correct time will not be displayed.
"Step","Program": Not displayed.

[Create CSV file]

The following screen is displayed by clicking [Create CSV file].



At wizard setting/execution – Trace result screen – Create CSV file

Save the trace result data following the procedures (1) to (4) below.

(1) Click [Browse] and select the storage destination.
(2) Input the file name.
(3) Select [Device storage method].
(Refer to GX Developer Operating Manual for details on [Device storage method].)
(4) Click [Execute].

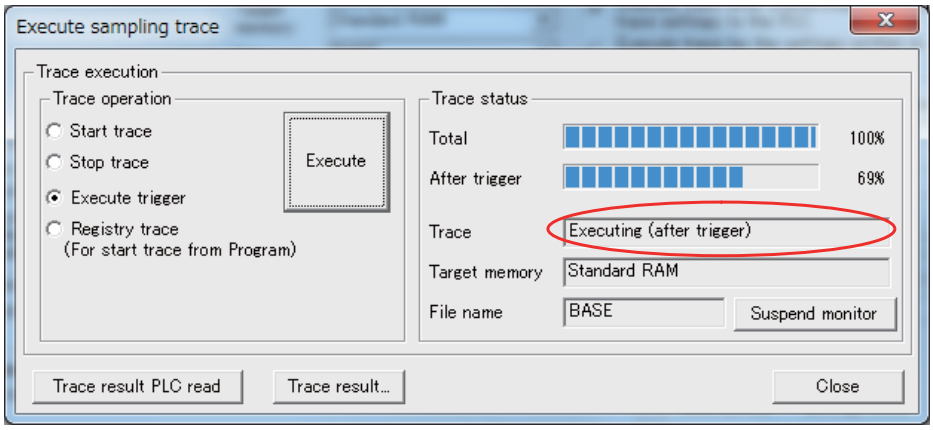
[Note]

Trace result data is overwritten per each trace execution. Always save the necessary data in CSV file.

Holding the Trace Execution Status

The trace execution status is held after the CNC power is turned OFF.
This enables tracing to be executed right after the power ON in the following procedure.

(1) When the trace status is "Executing" or the "In sampling trace" signal is ON, turn the CNC power OFF.
The trace status can be checked on the "Executing sampling trace" screen.



(2) Turn the CNC power ON again.
(3) Trace is executed at the power ON.

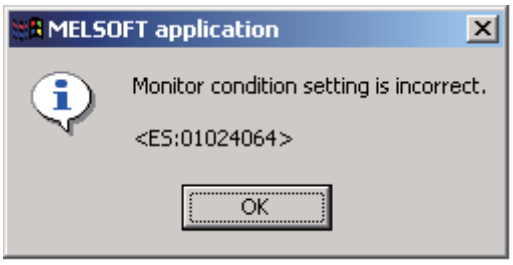
* Trace result is erased when the CNC power is turned OFF.
Even when the post-trigger status is active at the CNC power OFF, the tracing at the power ON is always started from the pre-trigger status.

4.5.9.5 Operation at Error

Error will occur under the following conditions. The following dialog will be displayed on the GX Developer screen when parameter check during trace execution is carried out.

Error details

No.	Error definition	Remedies
1	No applicable device for sampling trace is set with device setting.	Set the applicable device for sampling trace with device setting.
2	An invalid condition is set for trace point.	Set a valid condition set for trace point.
3	No applicable device is set for trace point.	Set an applicable device set for trace point.
4	An invalid condition is set for trigger point.	Set a valid condition for trigger point.
5	No applicable device is set for trigger point.	Set an applicable device for trigger point.
6	The size of trace data exceeded the specified size per project.	Set a size of trace data that falls within the range of the specified size per project.



Error dialogue

When sampling trace cannot be executed, check the following items.

- Check if CPU type is Q26UDHCPU.
- Check the trace execution status. (Trace execution command is not possible during tracing.)
- When trace execution method is set to "Execute trace for the settings written in PLC.", check if setting file is saved in CNC.
- Check if devices on the program and that set by trace match.

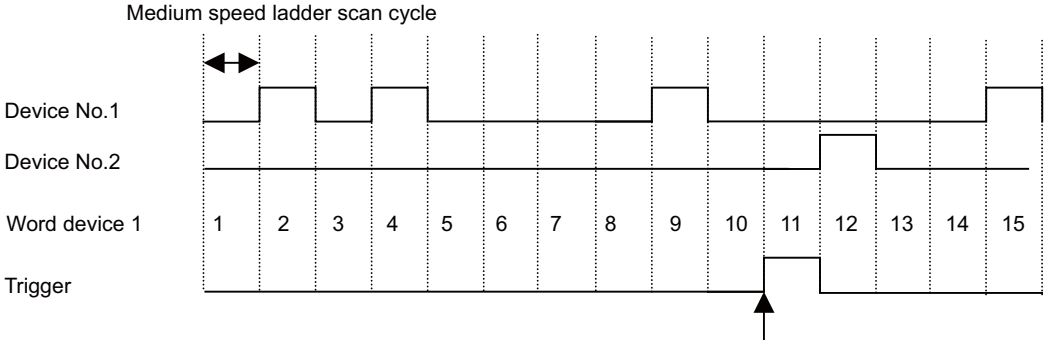
4.5.9.6 Operation Example

Example 1 Trigger judgment and trace result with device setting

[Setting details]

Trace setting details for example 1

Setting item	Setting value	Setting item	Setting value
Target memory	Memory card(RAM)	Trigger point setting	■ Device Word device Word device 1 = 11 ■ Step 30
File name	MAIN		
Total number	10		
Number after trigger	4	Device setting	■ Bit device Device No.1 Device No.2 ■ Word device Word device 1
Trace additional information	Time, step No.		
Trace point setting	Interval: 10msec		



Trigger execution timing
(Scan when "word device 1=11" has been established.

Ignores step No. setting; only device setting will be valid for trigger point.

Device status when sampling trace is executed at example 1

[Trace result]

Trace result display for example 1

Count	-6	-5	-4	-3	-2	-1	0	1	2	3
Device No.1										
Device No.2										
Word device 1	5	6	7	8	9	10	11	11	12	13
Time	0	0.007	0.014	0.021	0.028	0.035	0.042	0.042	0.049	0.056
Step No	-	-	-	-	-	-	-	-	-	-
File name	-	-	-	-	-	-	-	-	-	-

← The scan in which trigger has been executed is regarded as count "0". Trace data is retrieved when trigger has been established. Thus, when trigger establishment and trace execution happen simultaneously, count "0" and count "1" will be the same data.

← "Interval" trace point setting is ignored. Execute trace per scan.

← Word device is shown as numerical value.

← Time is displayed as trace additional information.

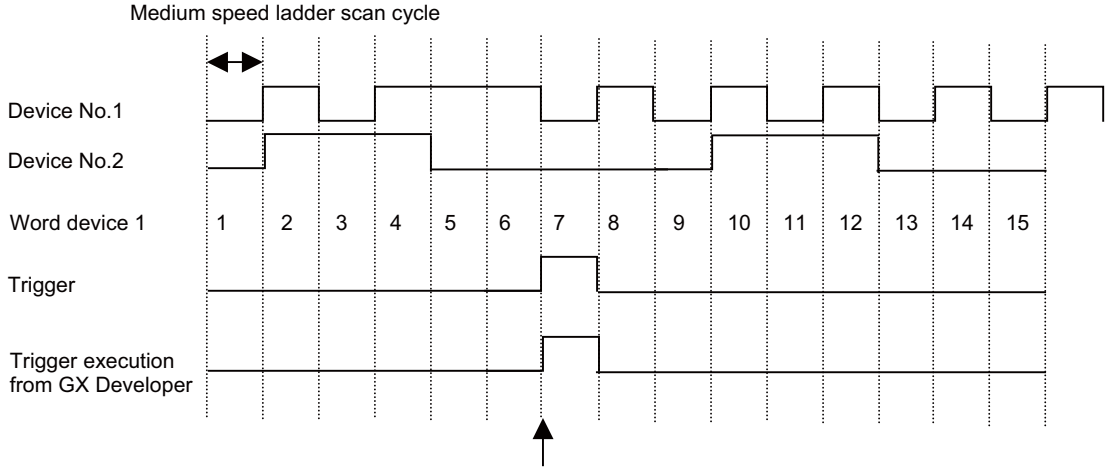
← Nothing is displayed as trace additional information other than time.

Example 2 Trace judgment and trace result with device setting

[Setting details]

Trace setting details for example 2

Setting item	Setting value	Setting item	Setting value
Target memory	Memory card(RAM)	Trigger point setting	■ At the time of TRACE instruction execution
File name	MAIN		
Total number	6		
Number after trigger	4	Device setting	■ Bit device Device No.1 Device No.2 ■ Word device Word device 1
Trace additional information	None		
Trace point setting	■ Device Bit device Device No.1 ↑		



Ignores "At the time of TRACE instruction execution" and "At the time of trigger operation from GX Developer" will be valid for trigger point.

Device status when sampling trace is executed at example 1

[Trace result]

Trace result display for example 2

Count	-2	-1	0	1	2	3
Device No.1						
Device No.2						
Word device 1	2	4	7	8	10	12

← The scan in which trigger has been executed is regarded as count "0".

← Trace is executed only for the scan where device No.1 turns ON from OFF.
Note that, however, the device data for the scan when trigger has been executed will be saved.

4.5.9.7 Precautions

(1) Sampling can be executed for the other stations on network or with serial communication connection. Note that, however, sampling is not possible from multiple areas at the same time.

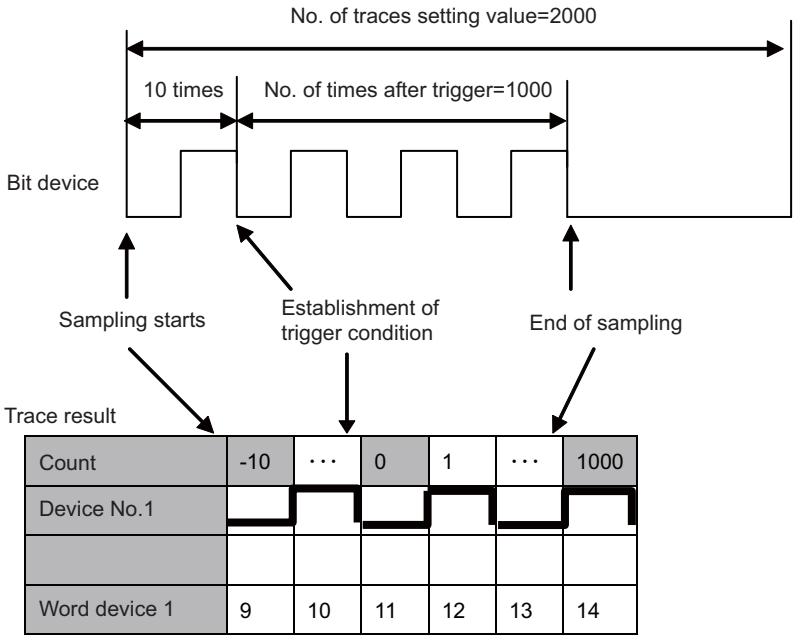
(2) The trace conditions (trace settings) registered in CNC are retained after the CNC power is turned OFF.
However, the saved data is discarded when any of the following states occurs.
- The data is not consistent with the saved trace conditions (the trace size and the device range) at the power ON.
- The data is not consistent with the saved trace conditions (the trace size and the device range) when the multi-project setting is changed from the on-board and the CNC is restarted.
- The data is not consistent with the saved trace conditions (the trace size and the device range) when USERPLC.LAD which has different multi-project setting is input through [Mainte] - [I/O] in the NC screen and the CNC is restarted.

(3) Sampling trace is executed by connecting CNC controller and GX Developer.

(4) Trace data within CNC is deleted during trace execution. So, please be aware that the data up to previous time will be deleted.

(5) When trace is ended before reaching the set No. of traces, such as when trigger occurs as soon as trace is started, the shortened data will not be displayed.

<Example> Trigger occurred at 10th trace when No. of traces is set to 2000 and No. of traces after trigger is set to 1000.



Count	-10	・・・	0	1	・・・	1000
Device No.1						
Word device 1	9	10	11	12	13	14

(6) Descriptions about sampling trace in this manual are given under the assumption of GX Developer Ver.8 specifications.
Sampling trace setting wizard is not available for the version prior to GX Developer Ver.8.
Refer to the precautions for each setting item described in this manual and perform settings respectively.

(7) When the trace setting that is invalid with this CNC is performed, the setting is forcibly corrected to the valid one within CNC controller. Refer to "Sampling Trace Operation Screen" for trace settings that can be used.

(8) Status of SM800 to SM805 cannot be checked on CNC controller screen. Check the sampling trace status with GX Developer.

(9) If the CNC power is turned OFF during tracing, the trace is started after the power is turned ON again.
Even when the post-trigger tracing is active at the power OFF, The trace after the power ON again is started from the pre-trigger status.
The trace started after the power ON again can be interrupted on the "Execute sampling trace" screen. To prevent the trace from starting after the power ON again, interrupt the trace through the "Execute sampling trace" screen or while the trace is stopped, and then turn the power OFF.

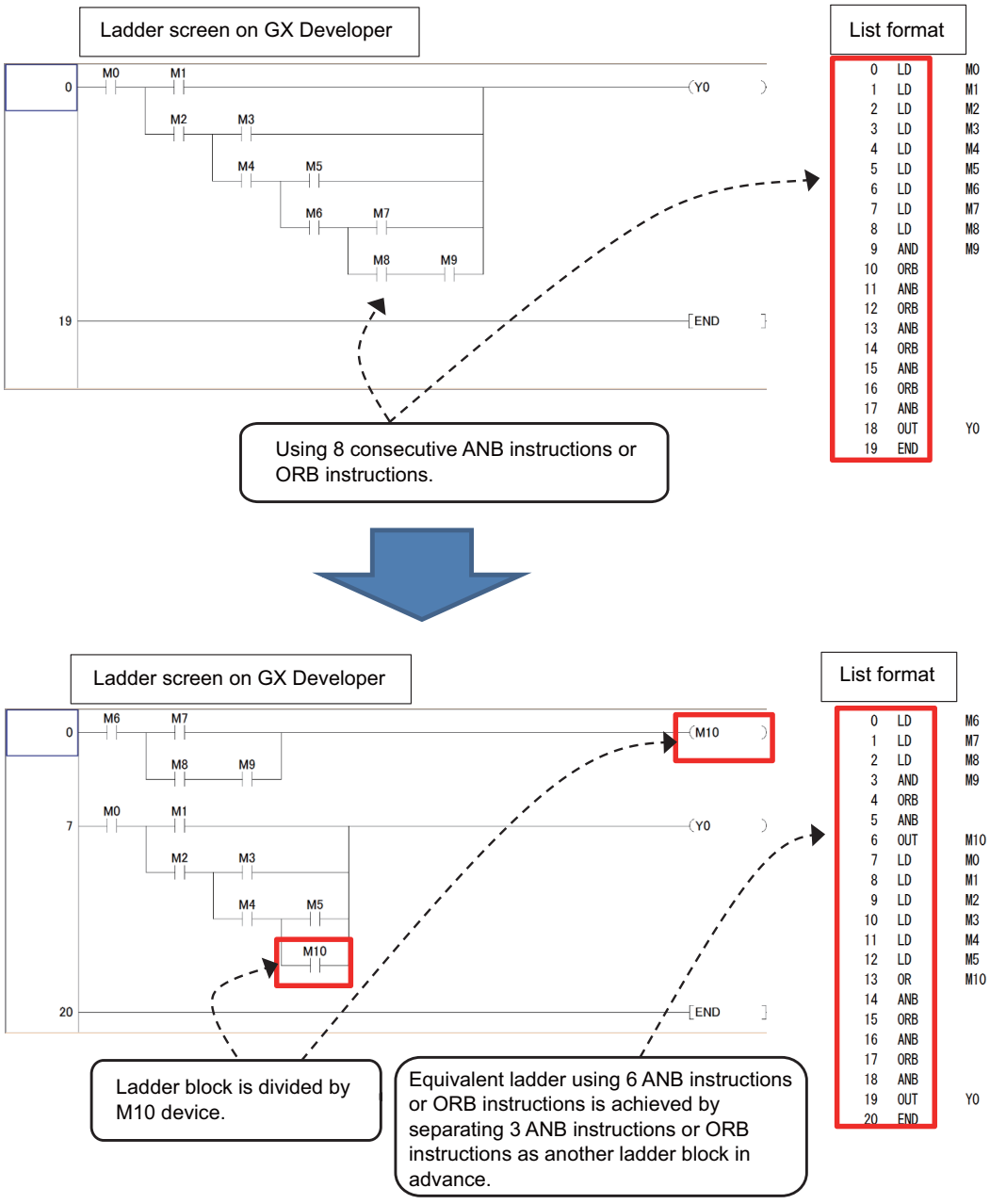
(10) [Trace repeat] cannot be set on GX Developer. When executing [Trace repeat], use built-in editing function.

4.5.10 CNC-Specific Considerations

(1) Restriction on use of ANB instruction and ORB instruction

Overview: Only up to seven ANB instructions and ORB instructions can be used consecutively.

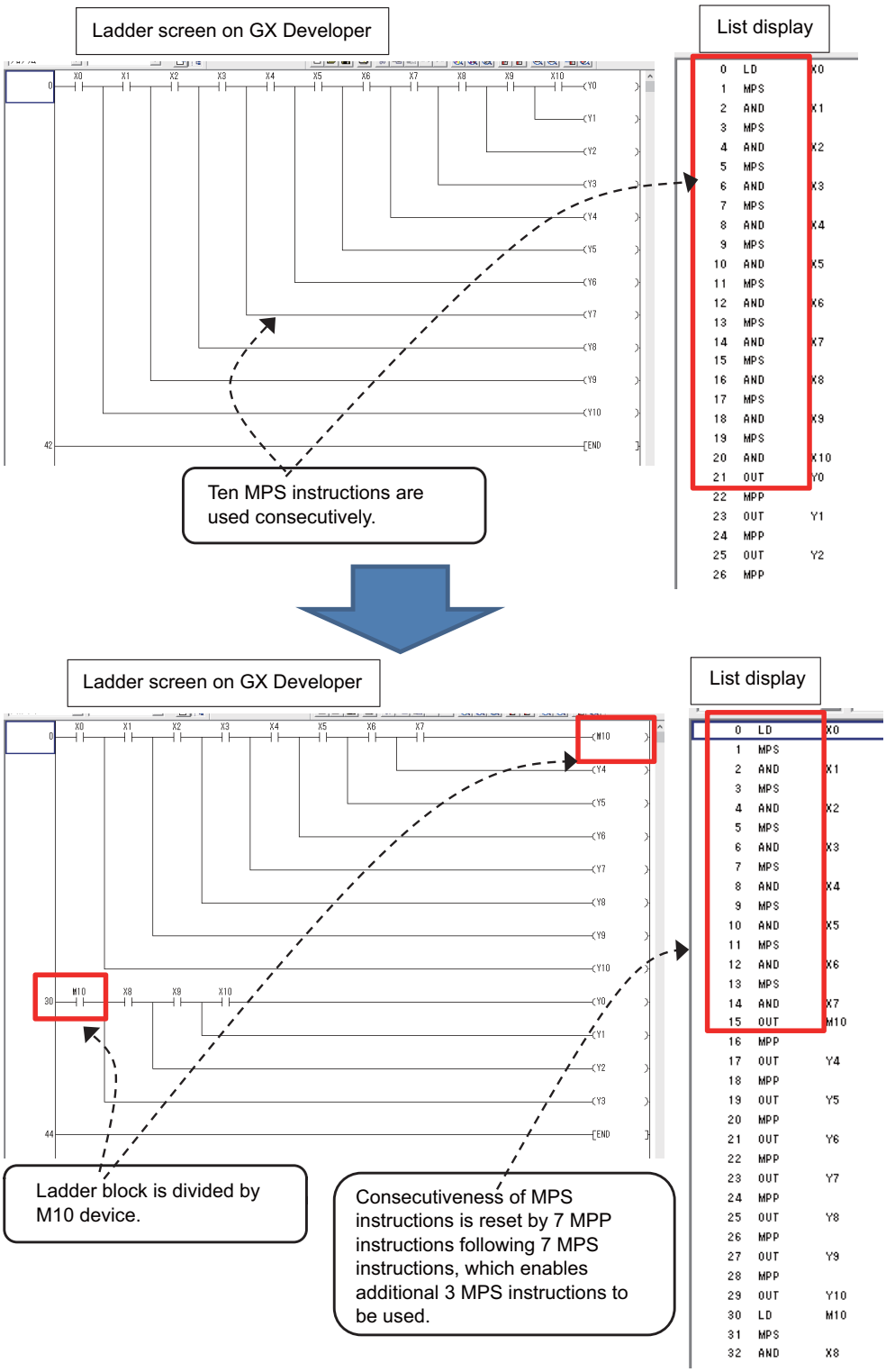
Workaround: When using a ladder containing eight or more of these instructions, use a substitute ladder as follows.



(2) Restriction on MPS instruction use

Overview: Only up to seven MPS instructions can be used consecutively. When an MPP instruction is used, another instruction can be used.

Workaround: When using a ladder containing the number of MPS instructions that exceeds the upper limit, use a substitute ladder as follows.



Set NC parameter "#6456 bit0" to "1" to display an error dialog on GX Developer when sequence programs that do not conform to restrictions (1) and (2) are written, and thereby prevent PLC from becoming RUN status. When an error dialog is displayed, use the above substitute ladder.

4.6 PLC Message Development

This section describes the procedures to develop PLC-related data such as alarm messages, operator messages, and PLC switches. Refer to "PLC Programming Manual" on how to display a PLC message on HMI screen.
For the user safety sequence, PLC message function cannot be used.

4.6.1 Adding PLC Messages

There are the following two methods as a general development procedure of message data.

(1) Writing PLC messages from the standard screen

	Development procedure	Description	Reference
1	Creating PLC messages using a text editor	Develop PLC messages.	
2	Writing PLC messages	Transfer PLC messages to CNC controller using HMI screen.	

(2) Writing PLC messages from GX Developer

	Development procedure	Description	Reference
1	Creating PLC messages using a text editor or GX Developer	Develop PLC messages.	
2	Writing PLC messages	Transfer PLC messages to on-board ROM using GX Developer.	"Writing into CNC controller using GX Developer"

* PLC messages are written directly to built-in ROM when GX Developer is used. Writing to ROM is not required.

(Note) PLC messages are written as different types of files depending on whether (1) or (2) above is used.
When a PLC message is in both files, the one written on the standard screen is used first.

4.6.2 Development Procedure Using Standard Screen

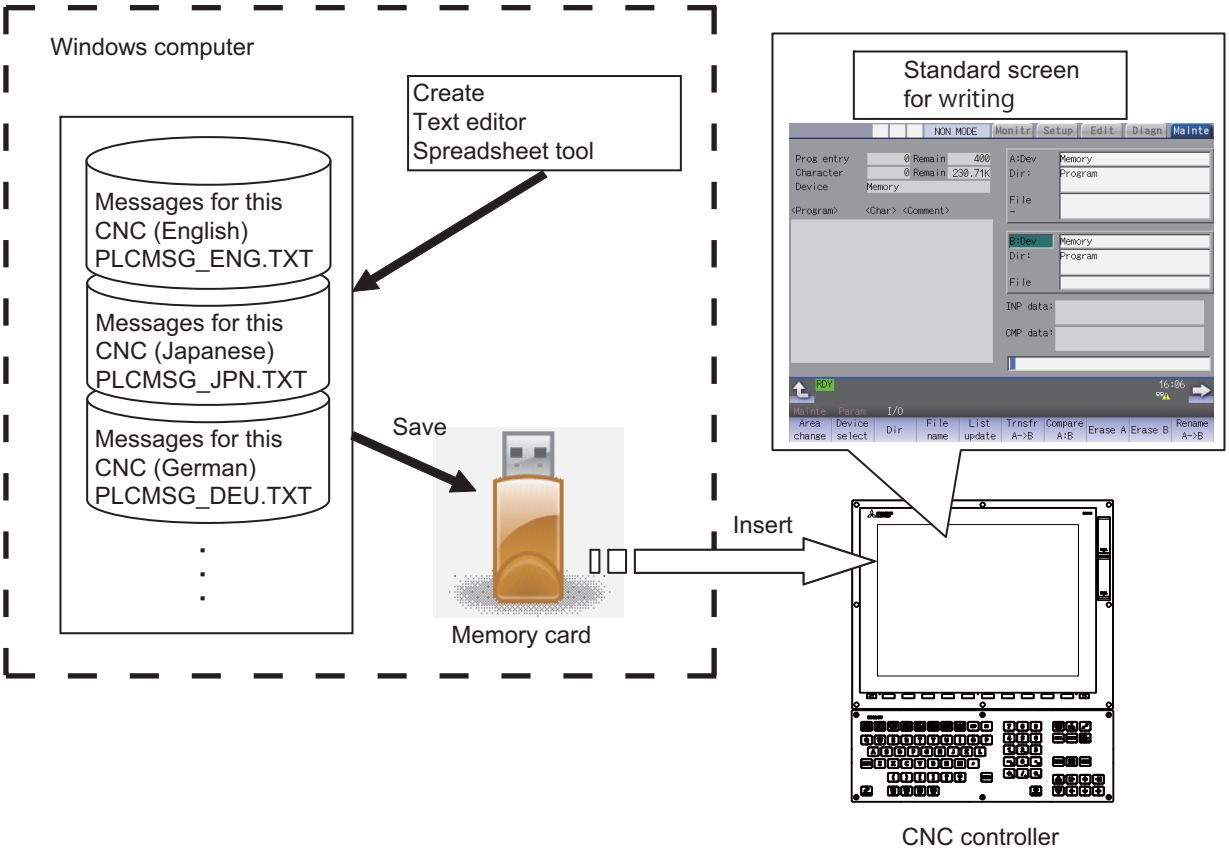
The procedures of message data development is shown below.

(1) Creation

Describe the message data using a general text editor. The description format and method will be shown later.

(2) Writing

Write the data into the CNC controller from the input/output screen of the standard screen.



4.6.3 Message Data Description Method

The message data can be described as text data by a general text editor and also by commercially available spreadsheet software.
The message file must be created with one-byte alphanumeric characters or multi-byte characters according to the target language.

Description Format

The message data is described using the following description format.
Use commas (,) as the separator between descriptions.
The description format cannot be abbreviated. Commas (,) and line feed code must be described, even the message character string is blank.

Message classification	Description format				
Alarm message	A ,	Index No. ,	Data register No.,	Message character string	Line feed code
Operator message	O ,	Index No. ,	Data register No.,	Message character string	Line feed code
PLC switch	P ,	Switch No.,	Message character string	Line feed code	
Comment message	M ,	Device,	Device No.,	Message character string	Line feed code
Macro alarm message	M ,	Index No. ,	Alarm No.,	Message character string	Line feed code

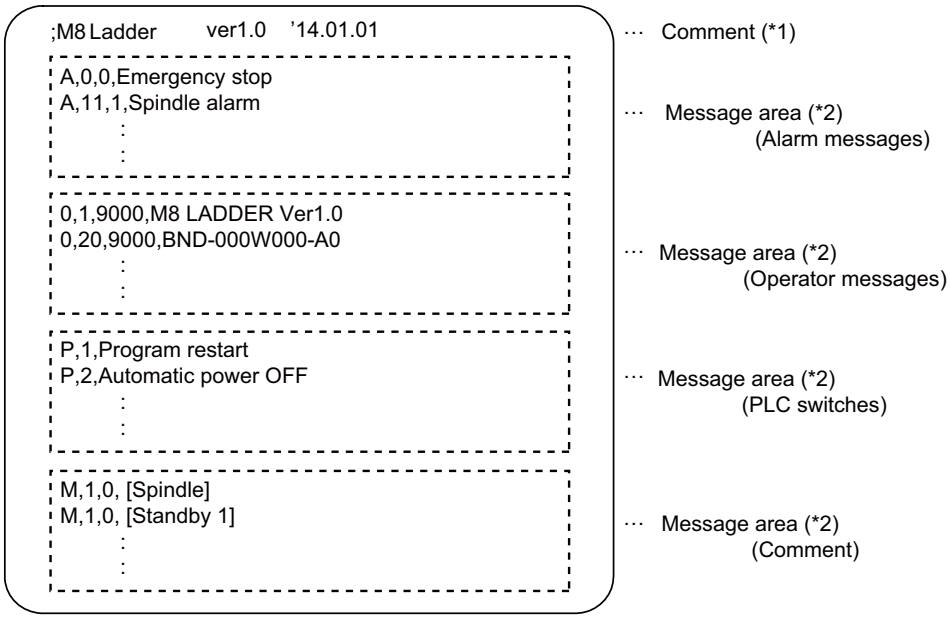
Message classification code	:	A one-byte alphabetic character expressing each message classification
Index No.	:	One-byte numeric character
Switch No.	:	One-byte numeric character
Data register No.	:	One-byte numeric character
Device	:	One-byte numeric character (1: Spindle/standby name)
Device No.	:	One-byte numeric character (Always "0" if the device is the spindle/standby name)
Alarm No.	:	One-byte numeric character
Message character string	:	One-byte alphanumeric character, or multi-byte characters. Semicolons, commas, spaces and tabs can also be used. Note that the tab at the head of the message character string is ignored.
Line feed code	:	(CR/LF) or (LF)

Refer to the section "Precautions" for the maximum number of characters in a message.

Description Method

The message data is described as text data by the following description format.
The applicable character code is different depending on the target language. Refer to the section "File name rule" for details.

(1) Example for the description of alarm message, operator message, PLC switch and comment



(*1) Comment

A line begins with a semicolon (;) is regarded as a comment.

```
; comment character string [LF]
```

(*2) Message area

Describe messages of the same type together. When the same elements (e.g. index No.) are included, the latter description is enabled.

(2) Example for the description of macro alarm message

```
M,0,1,CALL #PROGRAMMER #TEL590
M,1,2,CALL #PROGRAMMER #TEL560
M,9,10,CALL #PROGRAMMER #TEL550
        :
        :
M,511,9999,CALL #PROGRAMMER #TEL520
```

(*1) When there are duplicate index Nos. or alarm Nos., the one appears later on the file is enabled.
(*2) The index Nos. need not be in sequential order, if they are within the designated range. Also, there is no restriction for the description order (in ascending or descending order).
(*3) When an alarm message is consist of 32 characters or more, the 32nd or later character is not displayed. If the 31st character is 2-byte character, the 31st character is not displayed.
(*4) A blank character (a space character) can be used for the alarm message string.
(*5) A line matches any of the following conditions is regarded as invalid data.
- The classification code is set to other than "M".
- Index No. is not in the range from 0 to 511.
- Alarm No. is not in the range from 1 to 9999.
- Other incorrect format is described in the file.
- Description for one line is exceeded 128 characters.

File Name Rule

The following table shows the names of files written to the CNC controller and the character codes used to describe messages.

The CNC controller switches the file for PLC message display in accordance with the setting of parameter for the display language ("#1043 lang").

#1043 lang		File name		
		Alarm message, operator message, PLC switch or comment	Macro alarm message	Character code
0	English	PLCMSG_ENG.TXT	MCRMSG_ENG.TXT	Windows-1252
1	Japanese	PLCMSG_JPN.TXT	MCRMSG_JPN.TXT	Shift-JIS
11	German	PLCMSG_DEU.TXT	MCRMSG_DEU.TXT	Windows-1252
12	French	PLCMSG_FRA.TXT	MCRMSG_FRA.TXT	Windows-1252
13	Italian	PLCMSG_ITA.TXT	MCRMSG_ITA.TXT	Windows-1252
14	Spanish	PLCMSG_SPA.TXT	MCRMSG_SPA.TXT	Windows-1252
15	Chinese (traditional)	PLCMSG_CHI2.TXT	MCRMSG_CHI2.TXT	Big5
16	Korean (Hangeul)	PLCMSG_KOR.TXT	MCRMSG_KOR.TXT	KS C 5601-1987
17	Portugese	PLCMSG_POR.TXT	MCRMSG_POR.TXT	Windows-1252
18	Dutch	PLCMSG_DUT.TXT	MCRMSG_DUT.TXT	Windows-1252
19	Swedish	PLCMSG_SWE.TXT	MCRMSG_SWE.TXT	Windows-1252
20	Hungarian	PLCMSG_HUN.TXT	MCRMSG_HUN.TXT	Windows-1250
21	Polish	PLCMSG_POL.TXT	MCRMSG_POL.TXT	Windows-1250
22	Chinese (simplified)	PLCMSG_CHI1.TXT	MCRMSG_CHI1.TXT	GB2312
23	Russian	PLCMSG_RUS.TXT	MCRMSG_RUS.TXT	Windows-1251
24	Turkish	PLCMSG_TUR.TXT	MCRMSG_TUR.TXT	CP1254
25	Czech	PLCMSG_CZE.TXT	MCRMSG_CZE.TXT	Windows-1250
31	Indonesian	-	MCRMSG_IND.TXT	Windows-1252

Precautions

(1) Priority of message files in each language

When PLC message files for display languages are not in the CNC controller, English message files are used.

(2) Maximum values of message data

The maximum value of the described messages is shown below.

Message classification	Maximum message length (number of characters)	Maximum number of messages
Alarm messages	46 bytes	1024
Operator messages	60 bytes	512
PLC switches	14 bytes	96
Comments	60 bytes	5
Macro alarm messages	31bytes	512

Even though a message data exceeds the maximum message length, no error occurs. The excessive characters are not displayed.

Even though the total number of messages exceeds the maximum number, no error occurs. The excessive messages are not displayed.

A full-width character is handled as two characters (2 bytes).

(3) Macro alarm messages are displayed with the following priority.

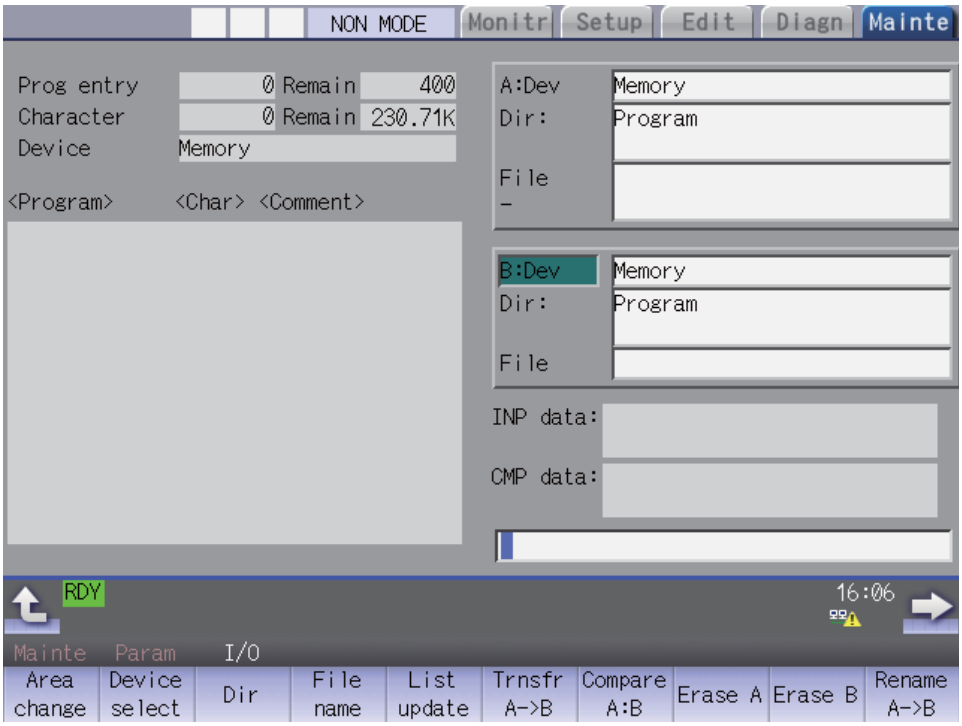
Priority	Details
1	Displays the macro alarm message of corresponding alarm No. which is described in the macro alarm message file of the display language. However, the macro alarm message of the second priority is displayed in the following cases: - No macro alarm messages file for the display language - No corresponding alarm No. in the macro alarm message file
2	Displays the macro alarm message of corresponding alarm No. which is described in the macro alarm message file of the default language (English). However, the macro alarm message of the third priority is displayed in the following cases: - No macro alarm messages file for English - No corresponding alarm No. in English macro alarm message file
3	Displays the macro alarm message described on a machining program.

4.6.4 Writing Message to CNC Controller on Standard Screen

The following operation procedure shows how to write massages to the CNC controller from the standard screen.
For details on the operation on the input/output screen, refer to the instruction manual of the CNC controller.
File names and directory names of PLC messages differ depending on by whom they are used (MTB or users).
PLC messages for users are displayed when "E/U mode" is enabled.
For details on the "E/U mode", refer to "9.1 Enhanced PLC Security Mode".

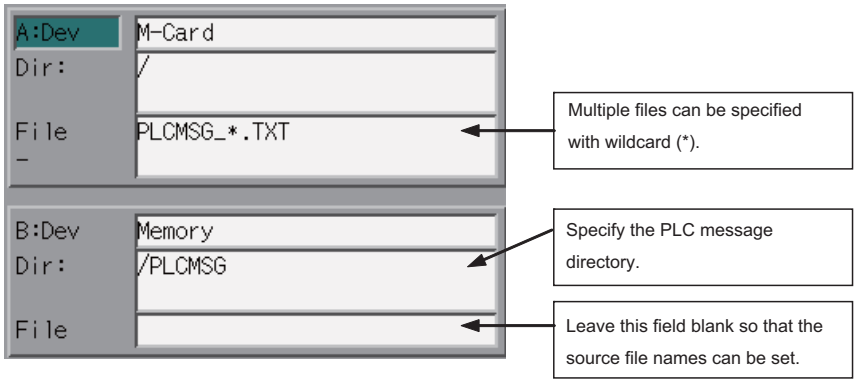
Operation Procedure

(1) Press [I/O] menu on the maintenance screen.

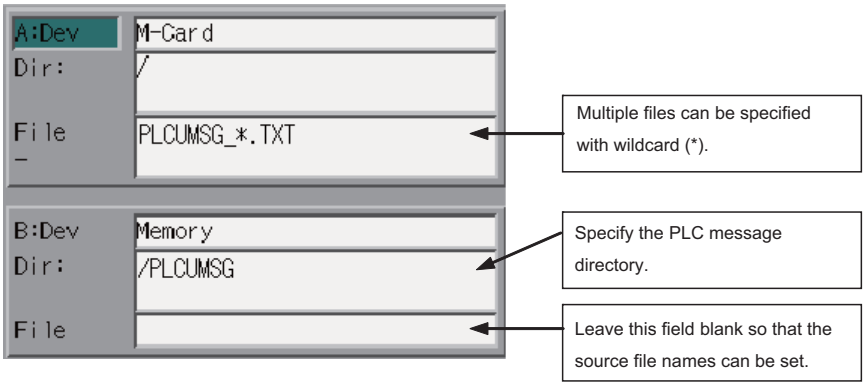


(2) Specify the source file to be transferred, and set the device name, directory and file name of the destination as follows.

(a) Display example of a PLC message file for MTB



(b) Display example of a PLC message file for users



(3) Press the menu key [Trnsfr A->B] to start file transfer.

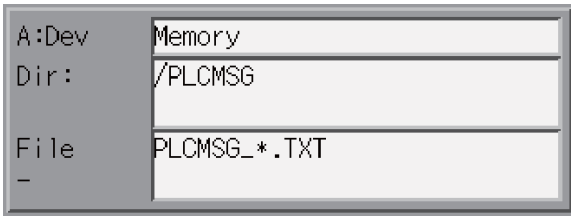
4.6.5 Reading out from CNC Controller on Standard Screen

Operation Procedure

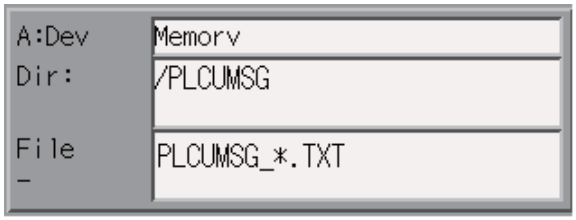
(1) Press [I/O] menu on the maintenance screen.

(2) Set the device name, directory and file name of the source as follows. Specify the output file in the destination field.

(a) Display example of a PLC message file for MTB



(b) Display example of a PLC message file for users



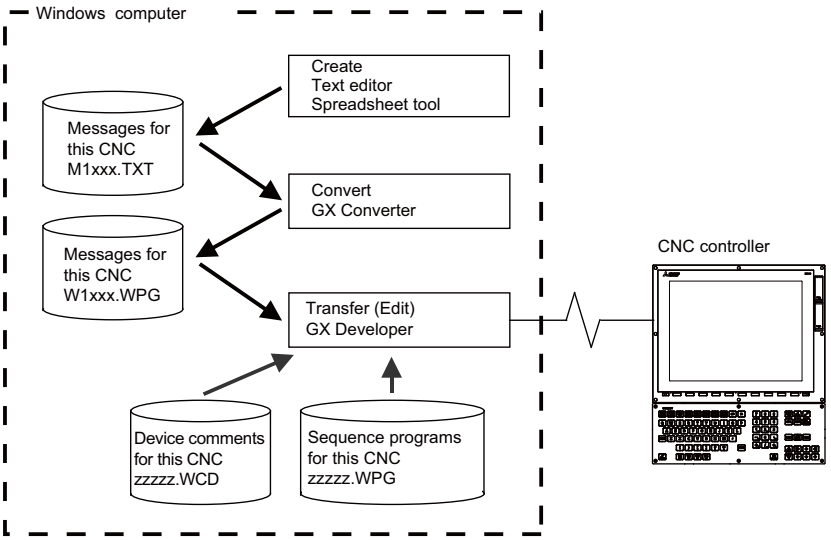
(3) Press the menu key [Trnsfr A->B] to start file transfer.

4.6.6 Development Procedure Using GX Developer

There are the following two methods as a general development procedure of message data.
Refer to "GX Developer Operating Manual" for details on how to create a new message.

1) Converting into GX Developer data using a general text editor or spreadsheet tool and the data conversion package. (When there is a large volume of message data and you want to control them with a commercially available tool, for example)

2) Entering messages directly from GX Developer (When there is a small volume of message data or when you want to add or correct data, for example)



(Note)
You cannot develop PLC messages in a GX Developer project for which you set "Use label".
When you created a sequence program as a labeled program, you cannot control the program and PLC messages in the same project.
In this case, develop PLC messages in either of the following methods.
· Develop and control PLC messages in a project created only for PLC messages. (Label setting is not allowed.)
· Develop and control PLC messages with the procedure shown in the section "Development Procedure Using Standard Screen".

4.6.6.1 Using a General Text Editor

(1) Creation

The message data is described using a general text editor. The description method and format will be described later.

(2) Conversion

The conversion from text data to GX Developer data is carried out using the "GX Converter (data conversion software package)".

(3) Transfer

With the GX Developer, the message data is handled as a sequence program interlinear comment, and can also be edited. The message data is transferred to the CNC controller using the GX Developer, in the same manner as the sequence program.

4.6.6.2 Entering Messages Directly from GX Developer

(1) Creation

The message data is described directly from GX Developer. The message data is handled as a sequence program interlinear comment by GX Developer. The description method and format will be described later.

(2) Transfer

The message data is transferred from GX Developer to the CNC controller in the same manner as the sequence program.

4.6.7 Message Data Description Method

The message data can be described as text data by a general text editor and also by commercially available spreadsheet software in addition to the direct input with GX Developer.

Description Format

The message data is described using the following description format.
The description format cannot be abbreviated. Commas (,) and line feed code must be described, even the message character string is blank.

Message classification	Description format				
Alarm message	A ,	Index No.,	Data register No.,	Message character string	Line feed code
Operator message	O ,	Index No.,	Data register No.,	Message character string	Line feed code
PLC switch	P ,	Switch No.,	Message character string	Line feed code	
Comment message	M ,	Device,	Device No.,	Message character string	Line feed code

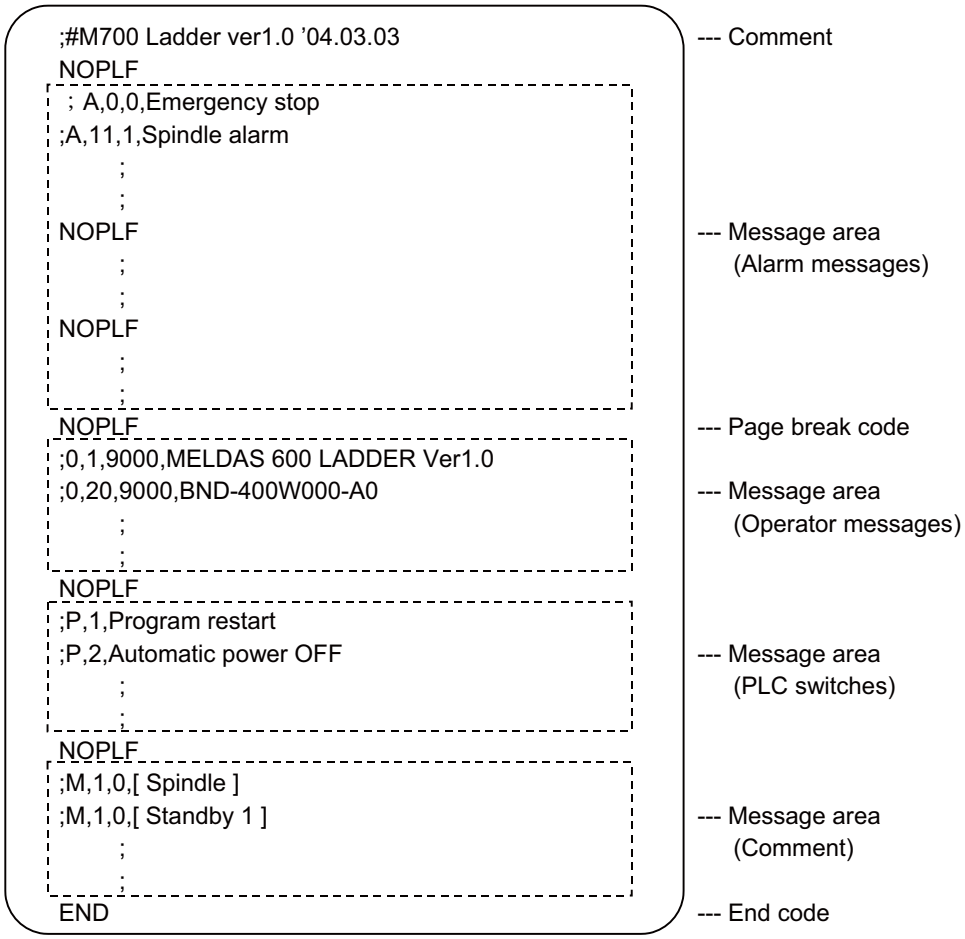
Message classification code	:	A one-byte alphabetic character expressing each message classification
Index No.	:	One-byte numeric character (0 to No. of messages in the setting area - 1)
Switch No.	:	One-byte numeric character (0 to No. of messages in the setting area - 1)
Data register No.	:	One-byte numeric character
Device	:	One-byte numeric character (1 or 2)
Device No.	:	One-byte numeric character (0 to 10)
Message character string	:	One-byte alphanumeric character, No. of characters in the setting area message length. Semicolons, commas, spaces and tabs can also be used. Note that the tab at the head of the message character string is ignored.
Semicolon (;)	:	Message data identification code
Comma (,)	:	Separator between each description (use only commas to leave a message character string blank)
Line feed code	:	(CR/LF) or (LF)
Back slash (\)	:	Continue to next line. If the end of the description is a back slash, continue to head character on next line.

(Note) Setting area

The setting area (each message's message length and message quantity declaration) used with the old models is no longer required. The storage area in the CNC controller is always stored in the most efficient state.
Even if the old setting area remains in the data, it will be ignored and will not result in an error.

Description Method

The message data is described as text data by the following description format.



(1) Comment

A line with a semicolon (;) followed by a sharp (#) at the head of the line are interpreted as comments.

; # comment character string [LF]

(2) Message area

Collect similar messages in a group and describe them. There is no description order in the respective messages, but the latter description is validated if there are descriptions with the same factors (index No., etc.).

(3) Page break code

A page break code is described at one or more places approximately every 15 lines in the setting area and message area. The message data may skip if there is no page break code.

(4) End code

An end code is described at the end of the description. Description after the end code are ignored. An error will occur if there is no end code.

(5) Other descriptions

A description that does not have a semicolon (;) at the head will result in an error. A description with a format other than the above will also result in an error.

Precautions

No. of characters, quantity limitations, handling of information other than settings, handling of information other than format are described below.

(1) Message data maximum value

The maximum value of the described messages is shown below.

Message classification	Maximum message length	Maximum number of messages
Alarm messages	46 bytes	1024
Operator messages	60 bytes	512
PLC switches	14 bytes	96
Comments	60 bytes	100

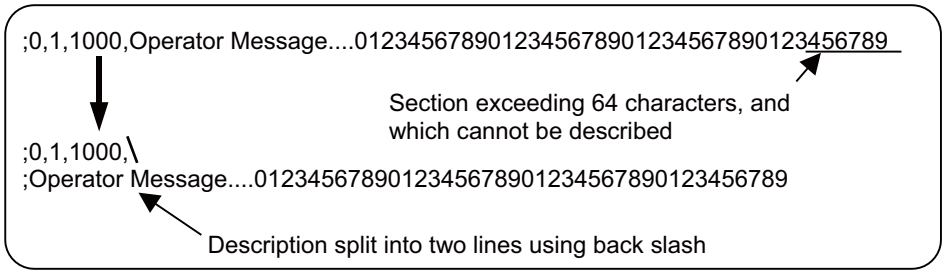
When maximum number of characters is exceeded: An error will not occur, but the excessive characters will not be displayed.
When maximum number of messages is exceeded: An error will occur when writing.

(Note)

Two-byte data in the message character string is handled as two characters.

(2) When message cannot be described in one line

With GX Developer, up to 64 characters can be input in one line as an interlinear statement. However, information other than the message character string (message classification code, index No., data register No., etc.), so a 60-character message character string cannot be described on one line.
A 60-character description is possible by splitting the message into two lines using a back slash (\) at the end of the line.



(Note)

If the message is split into two lines, an asterisk (*) cannot be used as the head character of the second line. Use another character, such as a space, in this case.

(3) When the message data with duplicated index No. or switch No. is created

If plural message data with duplicated index No. or switch No. are described in one message file, the message data closer to the END instruction is displayed as a priority.

4.6.8 Converting Data into GX Developer Format

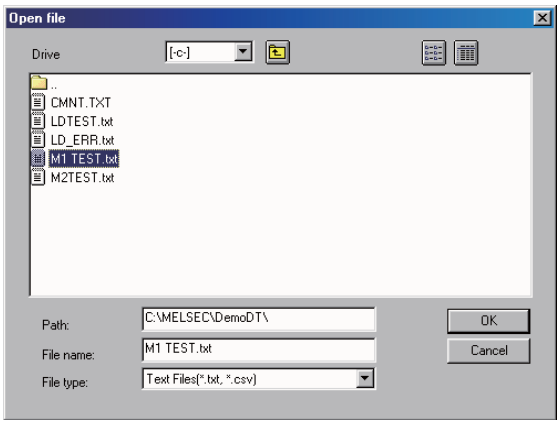
Convert the message data, which was described using a text editor or like, into GX Developer data in the following method. Use "GX Converter (data conversion software package)" for conversion. GX Converter can be started from the GX Developer menu.

Starting GX Converter and Specifying the File to be Converted

Perform the following operation from GX Developer to start GX Converter (read).

[Project] -> [Import file] -> [Import from TEXT, CSV format file]

On the following screen, specify the file to be converted (M1TEST.TXT) and click [OK].

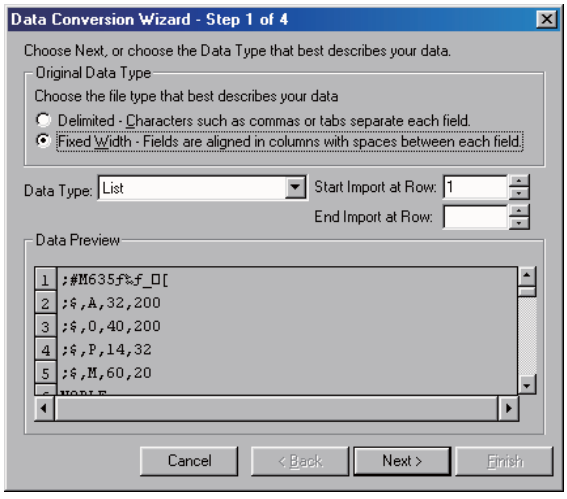


Conversion Format Setting

Set the conversion format on the following data conversion wizard screen.

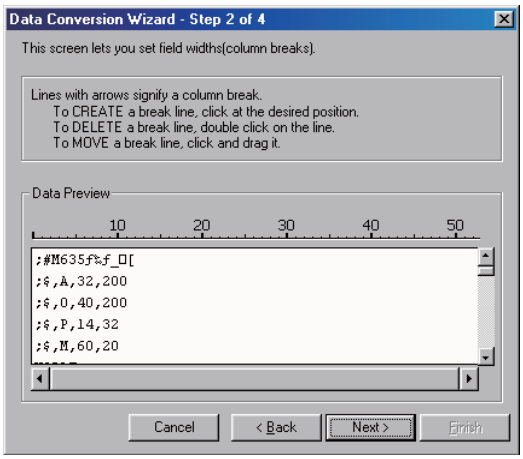
(1) Data conversion wizard 1/4

Choose [Original Data Type]-[Fixed Width] and [Data Type]-[List], and click [Next>].



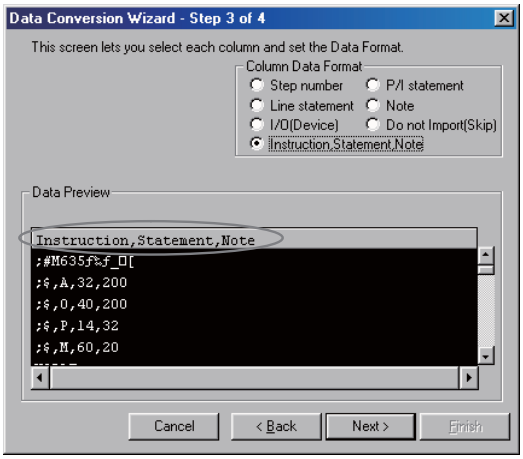
(2) Data conversion wizard 2/4

Just click [Next>].



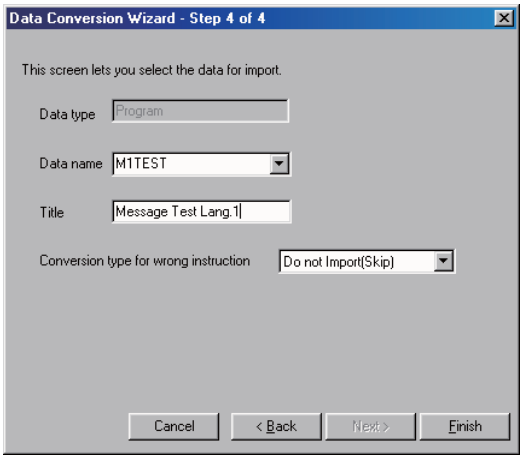
(3) Data conversion wizard 3/4

Choose to highlight the instruction column part in the [Data Preview] list and choose [Column Data Format]-[Instruction, Statement, Note]. Click [Next>].



(4) Data conversion wizard 4/4

Set the program name used on GX Developer in [Data name] and a data annotation in [Title], and click [Finish]. The setting is complete when the completed dialog appears. Click [OK].



4.6.9 Entering/Editing Data using GX Developer

The message data in GX Developer are handled as the "integrated type interlinear statements" of a sequence program. "Integrated type interlinear statements" are interlinear comments provided to assist the understanding of the sequence program, and those transferred to the controller together with the sequence program are called the "integrated type". "Interlinear statements" can be displayed and edited using [Ladder] or [Instruction list].

Interlinear Statement Display using [Ladder]

(1) Display of project data list

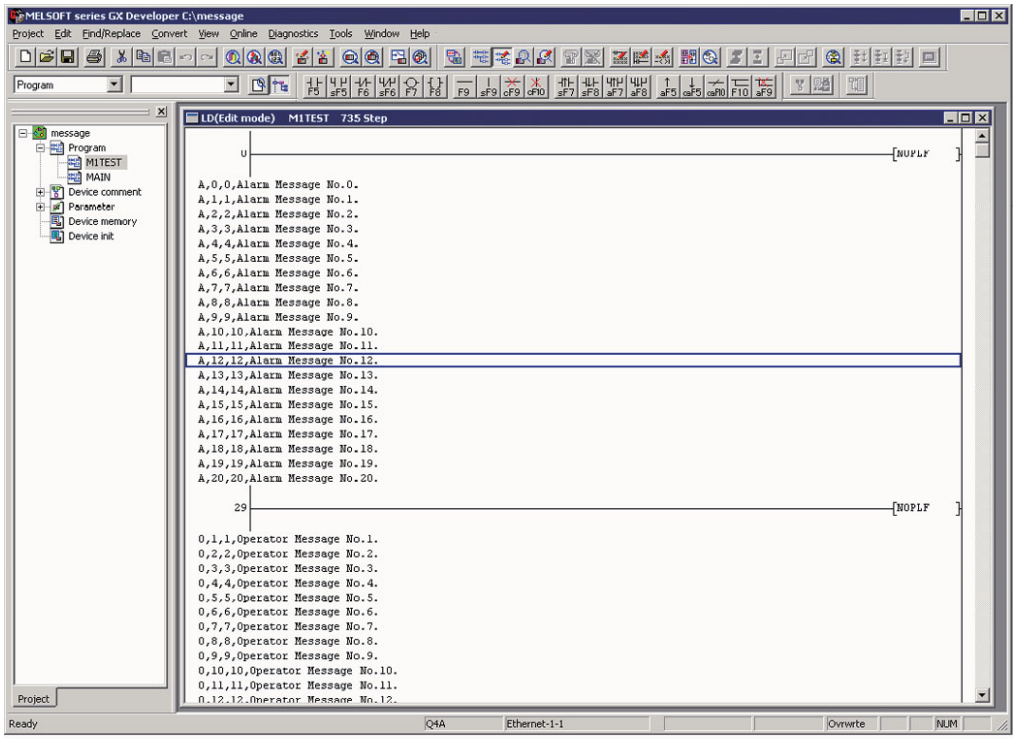
Perform the following operation to display the "Project data list" window and double-click the file name to display the edit screen. First, the normal ladder screen appears.

Select [View] - [Project data list], then double-click [File name you want to display].

(2) Display of message data

Perform the following operation to display the message data that are integrated type interlinear statements.

[View] -> [Statement]



Interlinear Statement Display using [Instruction list]

(1) Display of project data list

Perform the following operation to display the "Project data list" window and double-click the file name to display the edit screen. First, the normal ladder screen appears.

Select [View] - [Project data list], then double-click [File name you want to display].

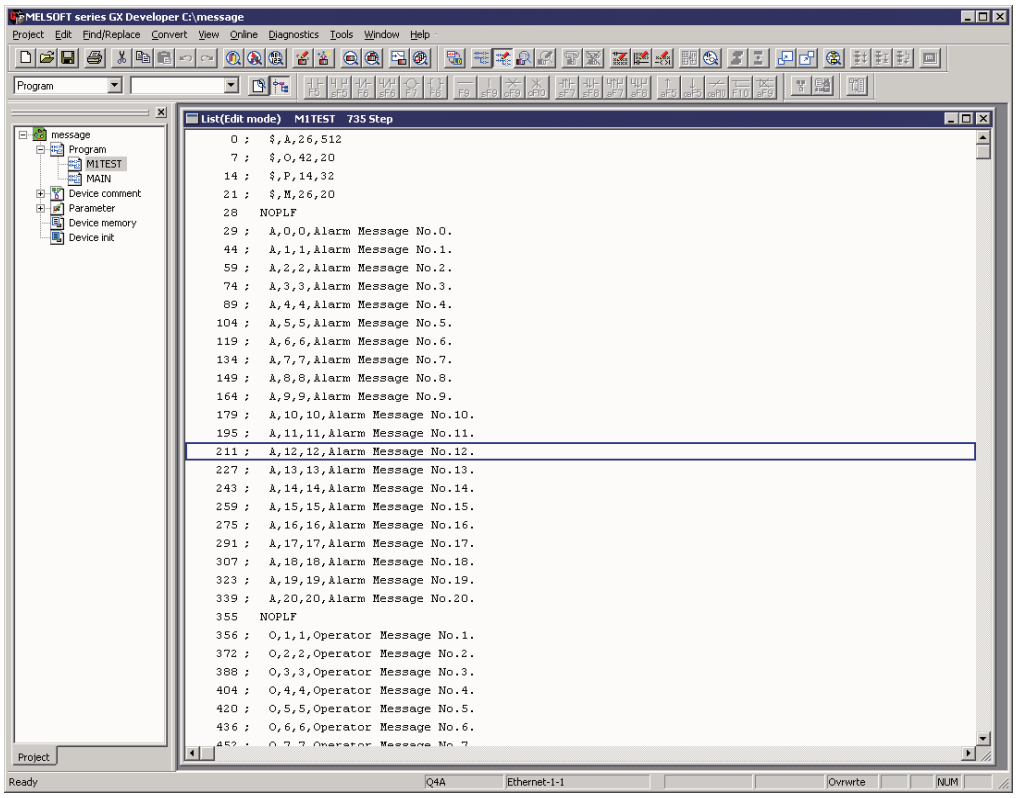
(2) Display of list data

Perform the following operation to display the list data. The list display also shows the message data that are integrated type interlinear statements.

[View] -> [Instruction list]

Perform the following operation to return to the circuit display.

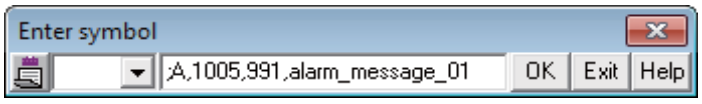
[View] -> [Ladder]



Editing of Integrated Type Interlinear Statements

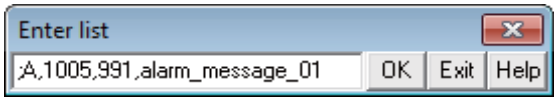
(1) Circuit display

On the circuit display screen that shows the integrated type interlinear statements, double-clicking the interlinear statement you want to edit displays the following dialog. Perform editing operation on the dialog and click [OK] or press [Enter].



(2) List display

On the list display screen, double-clicking the interlinear statement you want to edit displays the following dialog. Perform editing operation on the dialog and click [OK] or press [Enter].

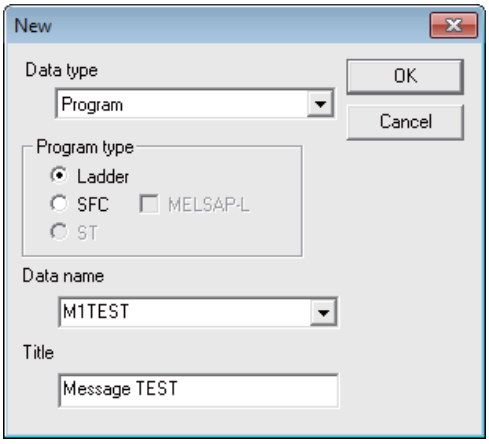


(3) Entering new message data

- Displaying new edit screen

Perform the following operation to display the [New] dialog, and set the [Data name] and [Title]. After setting, click [OK].

[Project] -> [Edit Data] -> [New]



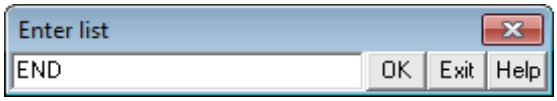
- Changing to list display mode

Perform the following operation to display the list data.

[View] -> [Instruction list]

- Entering message data

Press "Enter" on the "END" line, enter data as in the section "(2) List display", and then press "Enter" on the next line and enter message data.



4.6.10 Writing to the CNC Controller Using GX Developer

The following shows the method of transferring a message from the GX Developer to the CNC controller. The transfer method is the same as the sequence program transfer method.

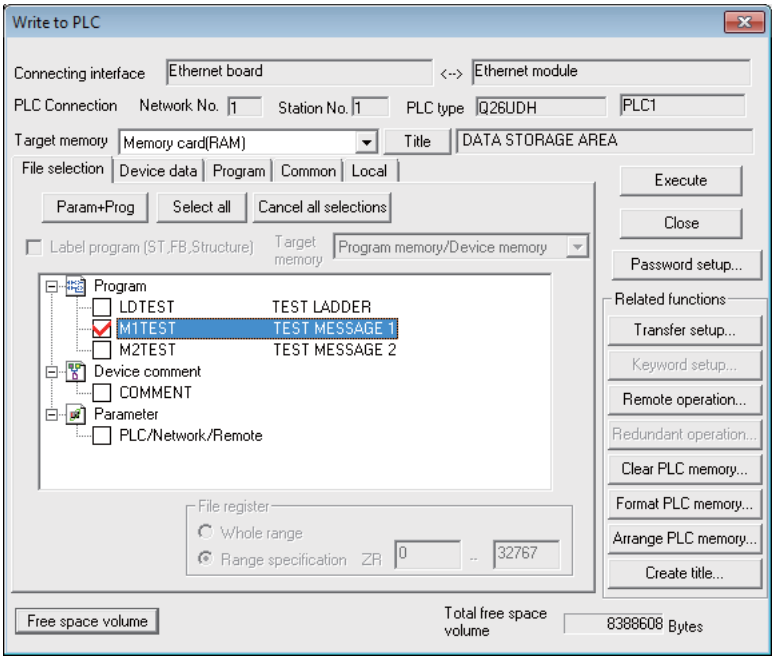
Operation Procedure

Perform the following operation to display the "Write to PLC" screen, and select the file to be written.

[Online] -> [Write to PLC]

The following example transfers a message first language file "M1TEST.GPG".

Set the target memory to "Memory card(RAM)".



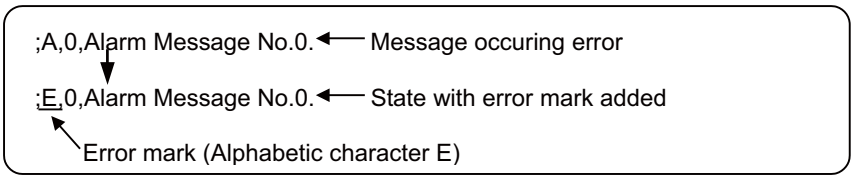
(Note1) Only one file of message data can be stored in the same language. When message data with different file names in the same language are overwritten, overwrite confirm dialog is displayed.

(Note2) A message data password-protected file cannot be overwritten with a message data file of the same language with different file name. Write a new file after canceling the password of the stored message file or deleting the file.

Writing Operation

When executing message write from GX developer, the data will be checked by the CNC controller.

A conversion error will occur if there is a description exceeding the specifications. An error mark will be added to the description section in which the error occurred, and the data will be transferred to the last step.



(Note) The message data file in which an error occurred cannot be displayed.

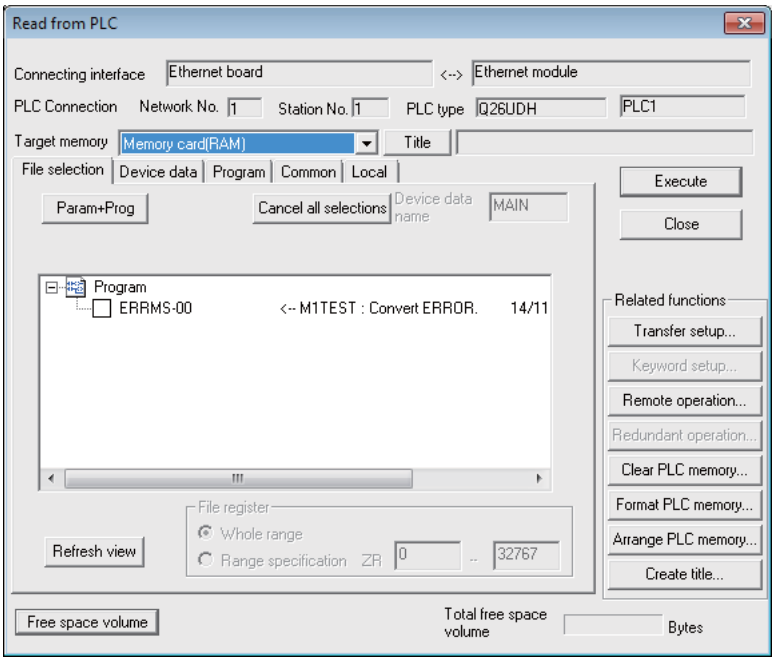
Operation at Write Error

The following dialog appears on the GX Developer screen when a conversion error occurs.

If the message file resulting in a conversion error is selected with the [File Selection] tab on the "Read from PLC" screen, the file name and title will change and be displayed as shown below.
If this message file is read out to the GX Developer, it will be stored under the file name "ERRMS-00" ("00" is a hexadecimal number given to the error file in the order starting from "0".).

ERRMS-00 (1) <-- M1TEST : Convert ERROR. (2)

(1) File name at error + error number (hexadecimal)
(2) Title statement including transferred original file name

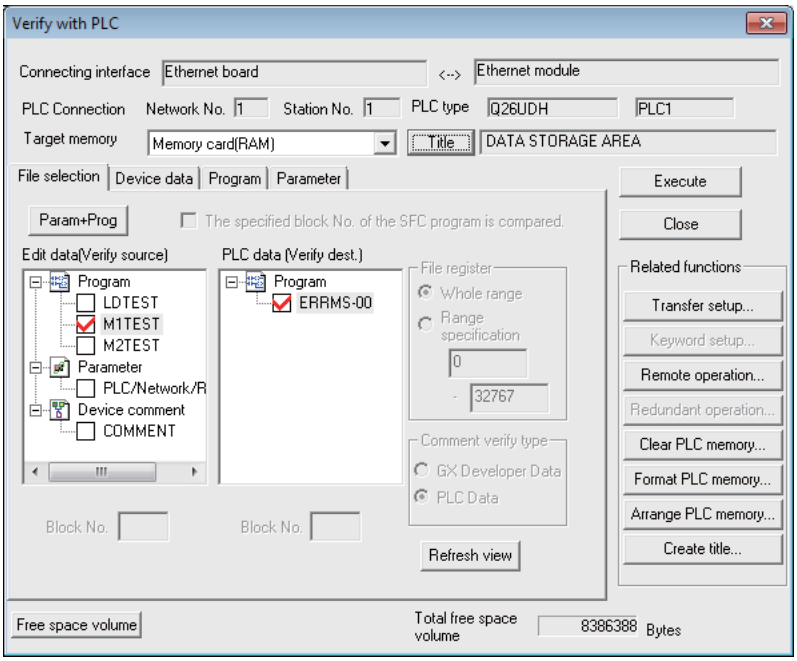


> **⚠ CAUTION**
>
> **Do not read out a message file resulting in a conversion error to the GX Developer and use it. It may contain unexpected data, and result in incorrect operations.**

How to Confirm the Error Position

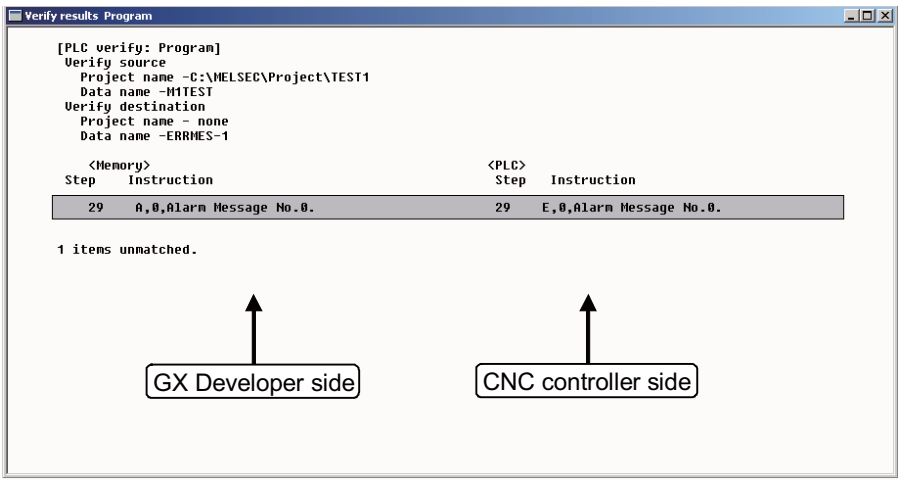
The error position can be confirmed with the PLC verification function. Refer to section "Sequence Program Development:Verifying the Sequence Programs" for details on the PLC verification function.

Target memory: Select "Program memory/Device memory" or "Memory card(RAM)"
Verify source: Select the message file transferred to the GX Developer
Verify dest.: Select the message file resulting in an error "ERRMS-00" on the CNC controller



When PLC verification is executed, the mismatching details will appear as shown in the following example. The section with the error mark in the CNC controller side is the message description section with the check error. Double-click the mismatch to display and to edit the corresponding part of the GX Developer side.

"<Memory>" indicates the GX Developer side, and "<PLC>" the CNC controller side.



4.6.11 Reading and Verifying from the CNC Controller

The method of reading and verifying a message from the CNC controller to the GX Developer is the same as that of sequence program except for also being able to select "Memory card (RAM)" for the target memory. Sequence program and message data are distinguished by their file names only.

Refer to the following sections for operation methods.

For read: "Sequence Program Development: Reading the Sequence Program from the CNC Controller"
For verification: "Sequence Program Development: Verifying the Sequence Programs"

4.7 Device Comment Creation

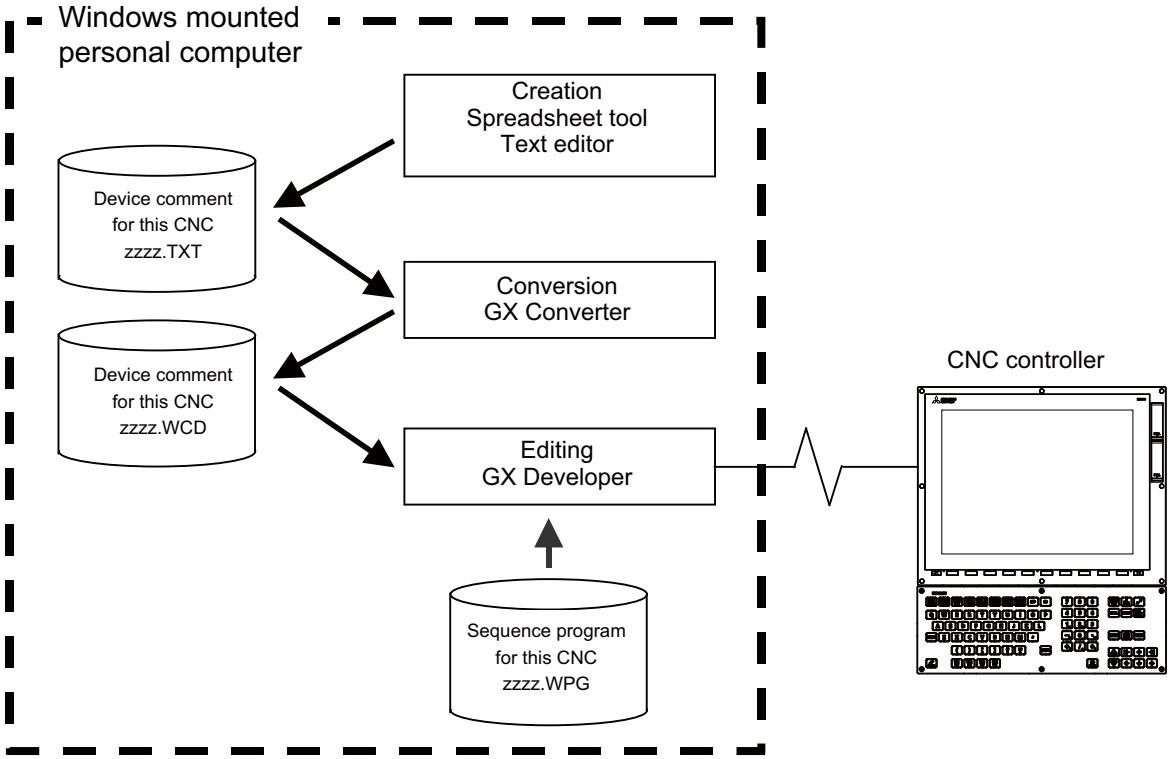
There are no Mitsubishi Electric CNC-specific operations for device comments. Therefore, refer to GX Developer Operating Manual for the development method. This section describes the device comment development procedure outline, the development method and the input/output method using a general-purpose tool.

4.7.1 Development Procedure

There are the following two methods as a general development procedure of device comments.

(1) Indirect entry

In this method, device comments are converted into GX Developer data using a general text editor or spreadsheet tool and data conversion package. Use this method when you want to divert the device comments of the old model or when a device comment volume is large and you want to control them with a commercially available tool, for example.



(2) Direct entry

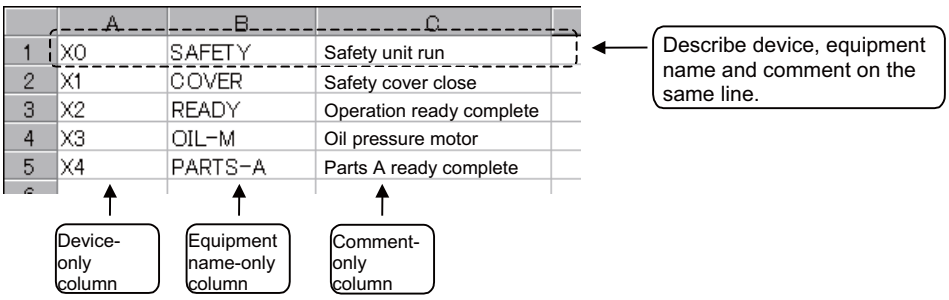
In this method, device comments are entered directly from GX Developer. Use this method when a device comment volume is small or when addition or correction is to be made, for example.

There are the following three methods for direct entry from GX Developer. Refer to GX Developer Operating Manual for details.

- Creating comments on the device comment edit screen
- Creating device comments after circuit creation during sequence program creation
- Making addition/correction to device comments in the created sequence program

4.7.2 Description Method for Indirect Entry

The following explains the description method for creating device comments using a spreadsheet tool or like. The following example describes device comments using a spreadsheet tool.



Column data format	Explanation
Device	(1) Describe a device. - Conversion cannot be made if a device has not been described. Always describe a device. (2) A device is a required item. Describe it in one-byte code.
Comment	(1) Describe a comment. - It is not registered if the device part on the same row is blank or the device is illegal. (2) You can describe a comment of up to 32 characters.
Equipment name	(1) Describe an equipment name. - It is not registered if the device part on the same row is blank or the device is illegal. (2) You can describe an equipment name of up to 8 characters.

(Note) Describe data in any of the following combinations.

(1) Device, equipment name, comment
(2) Device, comment
(3) Device, equipment name

Save the above data in the CSV format. The following example shows the above data saved in the CSV format.

```
X0, SAFETY, Safety unit run
X1, COVER, Safety cover close
X2, READY, Operation ready complete
X3, OIL-M, Oil pressure motor
X4, PARTS-A, Parts A ready complete
```

4.7.3 Converting Comment Data into GX Developer Data

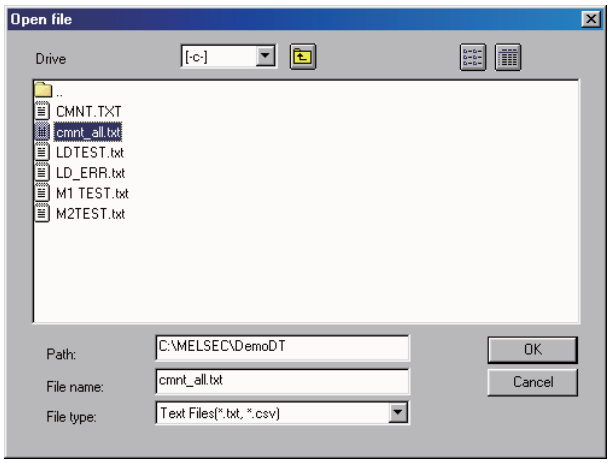
Convert the comment data (CSV format), which was created using a spreadsheet tool or like, into GX Developer data in the following method. Use "GX Converter (data conversion software package)" for conversion. GX Converter can be started from the GX Developer menu.

4.7.3.1 Starting GX Converter and Specifying the File to be Converted

Perform the following operation from GX Developer to start GX Converter (read).

[Project] -> [Import file] -> [Import from TEXT, CSV format file]

On the following screen, specify the file to be converted (cmnt_all.txt) and click [OK].

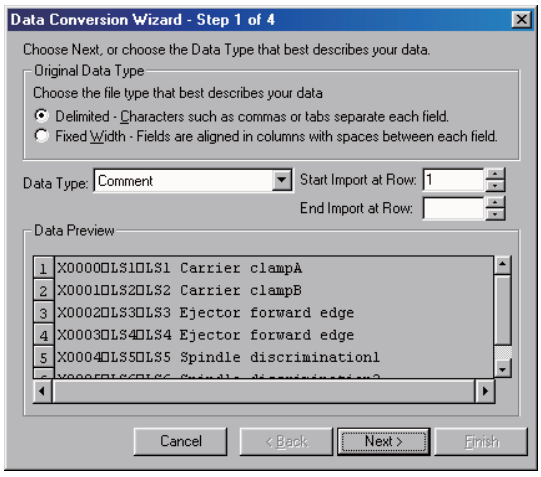


4.7.3.2 Conversion Format Setting

Set the conversion format on the following data conversion wizard screen.

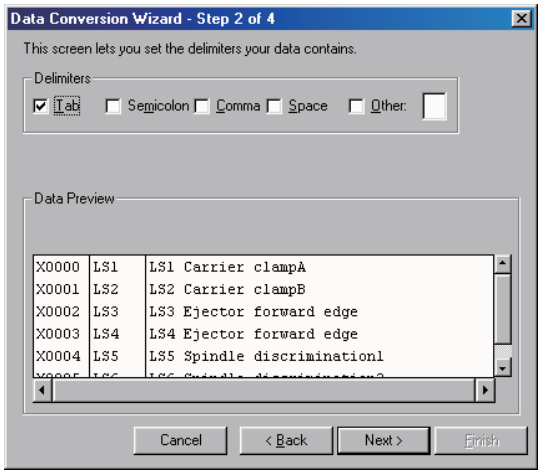
(1) Data conversion wizard 1/4

Choose [Original Data Type]-[Delimited] and [Data Type]-[Comment], and click [Next>].



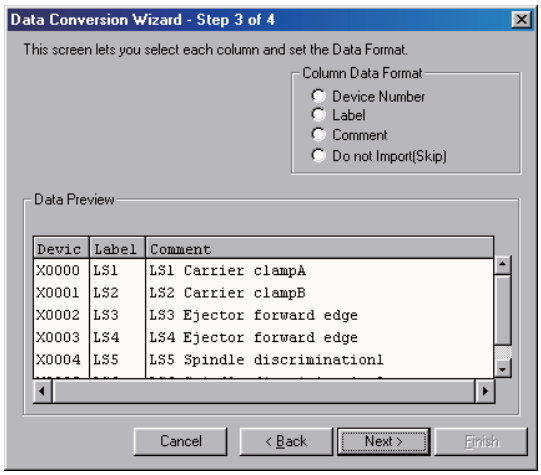
(2) Data conversion wizard 2/4

Choose [Delimiters]-[Tab] and click [Next>].



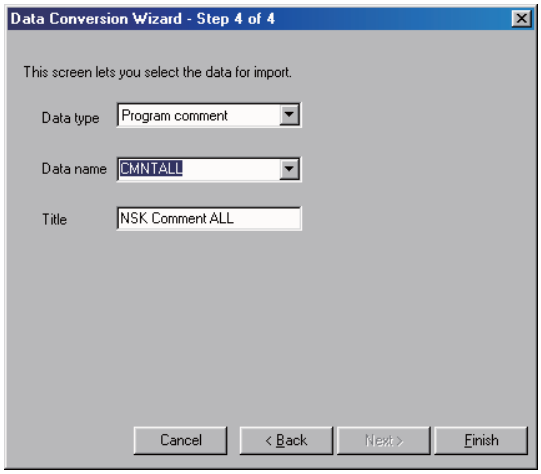
(3) Data conversion wizard 3/4

Make sure that the column parts in the [Data Preview] list are in order of [Device Number], [Label] and [Comment], and click [Next>].



(4) Data conversion wizard 4/4

Choose [Data type]-[Common comment] or [Program comment], set the comment file name used on GX Developer in [Data name] and a comment annotation in [Title], and click [Finish].

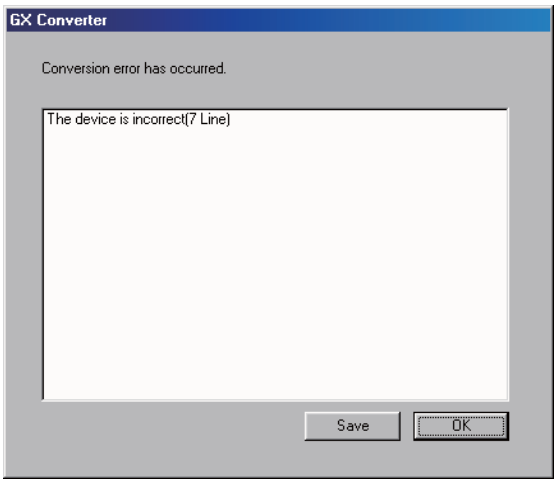


(5) Completion

The setting is complete when the following dialog appears. Click [OK].

(6) Error status

If an error occurred during conversion, its status and the line where it occurred are displayed.



4.7.4 Writing Device Comments to CNC Controller

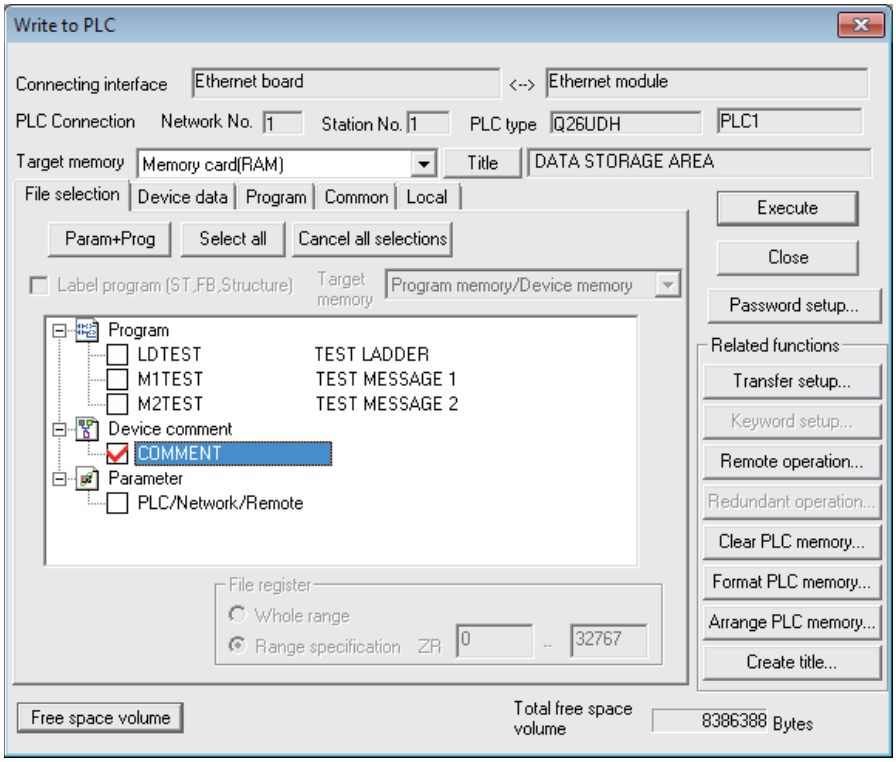
This section describes how to write device comments to the CNC controller using GX Developer. (Especially the information on the restriction and CNC-specific operation is given.)

4.7.4.1 Operation procedure

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Write to PLC]

On the following screen, select "Program memory/Device memory" or "Memory card (RAM)" from [Target memory] options. Then, in the [File selection] tab, select the device comment file to be written, and click [Execute].



(Note) Select either "Program memory/Device memory" or "Memory card (RAM)" for [Target memory].
Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].

4.7.5 Reading Device Comments from CNC Controller

This section describes how to read device comments from the CNC controller using GX Developer. (Especially the information on the restriction and CNC-specific operation is given.)

4.7.5.1 Operation Procedure

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Read from PLC]

On [Read from PLC] screen, select "Program memory/Device memory" or "Memory card (RAM)" from [Target memory] options. Then, in the [File selection] tab, select the device comment file to be read, and click [Execute].

(Note) Only "Program memory/Device memory" and "Memory card (RAM)" are valid for [Target memory].
Do not set the other tabs ([Device data], [Program], [Common], [Local]) than [File selection].
Always click [Refresh view] button before start reading of data.

4.8 File Password Function

The file password function prohibits programming tools from reading/writing data such as programs in the CNC. A password can be set for each file.

4.8.1 Data Protected by a File Password

A file password can be set for each file in a project currently opened on GX Developer including sequence program, device comment and PLC message. "File read protection" and "file write protection" can be specified when registering a password. Set a password using 4 one-byte alphanumeric characters. (Case sensitive)

4.8.2 File Password Function

Passwords can be registered, cleared and disabled from GX Developer.

- Registering a file password means that you set a password.
- Clearing a file password means that you delete a password.
- Disabling a file password means that you temporarily disable the lock set by a password for a program file.

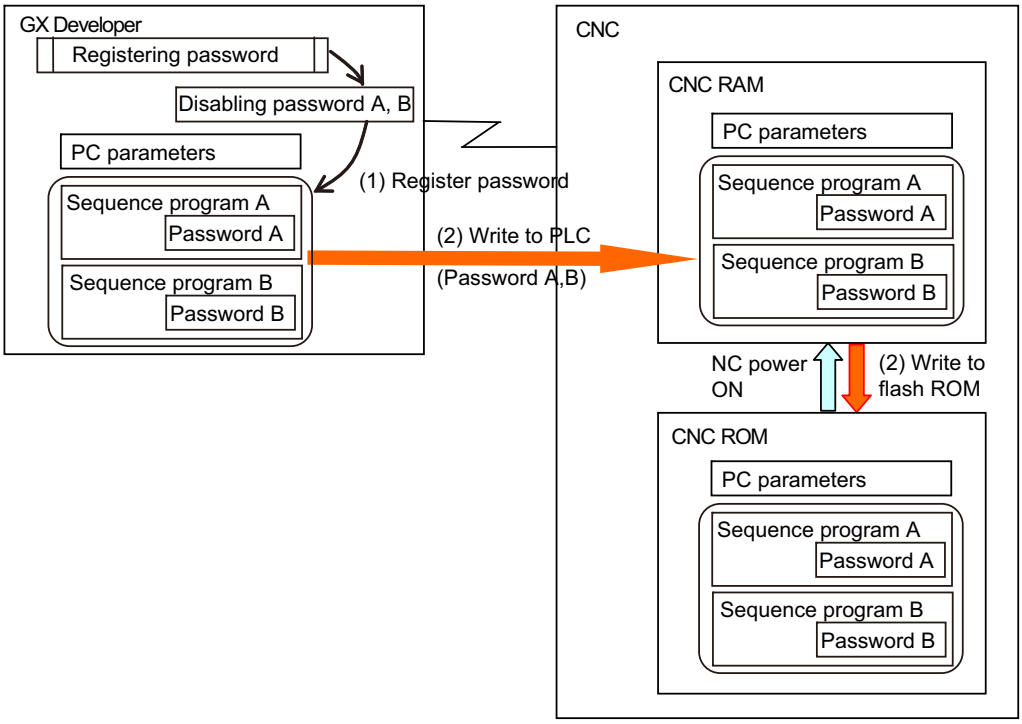
4.8.3 File Password Attribute

A file password has Write (enable/disable writing) and Read (enable/disable reading) attributes.
From GX Developer, the following attributes can be set.

- Write protection: Writing and editing are prohibited.
- Read/Write protection: Reading, verification, writing and editing are prohibited.

4.8.4 Outline of File Password Setting

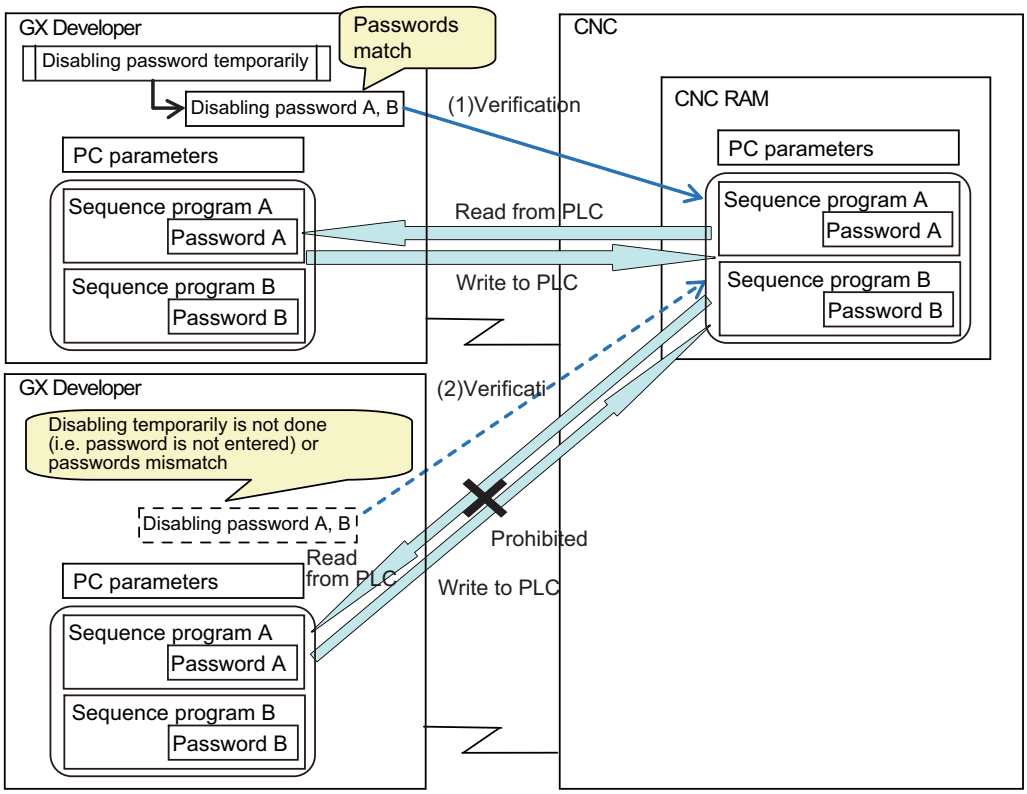
4.8.4.1 Registering a File Password



(1) Register a file password to prohibit reading/writing of files of sequence programs, device comments and PLC messages. When a file password is registered on GX Developer, the file password information (file password and its attribute) for a sequence program in the currently edited project is set. At the same time, the registered password information is saved in GX Developer as the Disabling password.

(2) When "Write to PLC" function is executed, the data containing the file password information is saved in the CNC RAM. When "Write to PLC (Flash ROM)" function is executed, the data containing the file password information is saved in the CNC ROM.

4.8.4.2 Operating a File for which a File Password is Set



(1) To operate a file for which a file password is set, first you need to disable the file password temporarily. When the file password is disabled temporarily, it is saved in a GX Developer as the Disabling password. The password is temporarily disabled only for the GX Developer which you used for disabling.
If you terminate the GX Developer and start it again, you need to disable the file password temporarily again.
When you attempt to operate a file on the GX Developer, the Disabling password is sent to the CNC. In the CNC, the password is compared with the registered password for verification. The file can be operated only when these passwords match.

(2) Operation of the file is not allowed when you don't disable password temporarily using the GX Developer or when a password mismatch occurred between the Disabling password and the registered password.

4.8.5 Statuses of Password and Registration Condition for Operations Performed with GX Developer

The following table shows the statuses of password and registration condition for operations performed with GX Developer.

GX Developer opration		Statuses of password and registration condition
Read from/Write to PLC		
	Read from PLC	If passwords exist in the read source PLC, the password settings are also read.
	Write to PLC	Password settings are written to the write destination PLC.
Edit project		
	Open project	If passwords exist in the read source, the password settings are also read.
	Save	If passwords exist in the save source, the password settings are also saved.
	Save as	If passwords exist in the save source, the password settings are also saved.
	Delete project	The password is deleted together with the project.
	Copy (project)	If passwords exist in the copy source, the password settings are also copied.
	Copy (data)	If passwords exist in the copy source, the password settings are also copied.
	Save and write after data name change	If passwords exist in the old data name, the password settings are also saved.
	Edit ladder (paste ladder to other GX Developer)	Password settings are not added.
	Merge data	Password settings are not added.
	Automatic save	If passwords exist in the save source, the password settings are also saved.

4.8.6 Precautions for File Password Setting

When you forgot the password

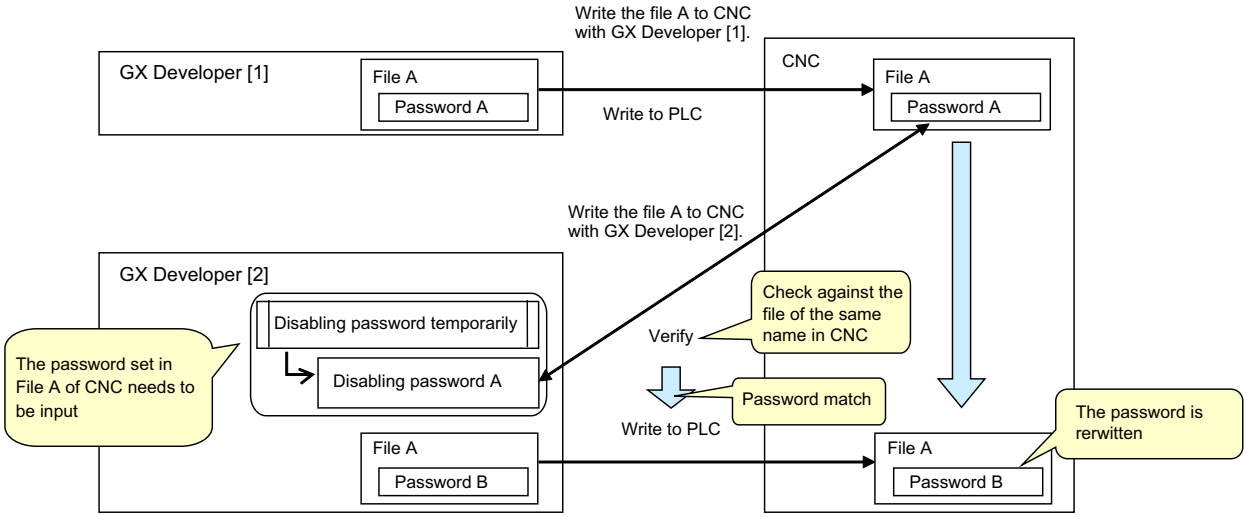
When you forgot the registered password, you need to format the PLC memory. However, doing so will delete all data along with the password. To restore the deleted data, open the data file on GX Developer and execute "Write to PLC" function.

Note that if you execute "Write to PLC" for a file whose password was forgotten, the forgotten password will also be written to the memory. To avoid this, copy and paste the data (e.g. ladders) into a newly started GX Developer. Then, execute "Write to PLC" to restore data using the GX Developer in which the data is pasted.

When you have rewritten the password by mistake

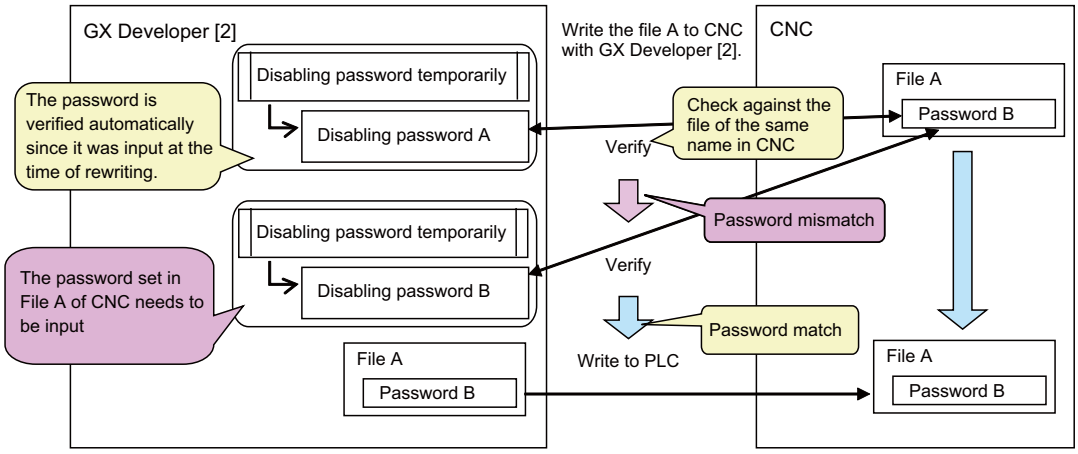
If you have unintentionally overwritten a password-protected file in CNC with another file of the same name protected with another password, the password is rewritten. (Refer to the following diagram "Operation up to the point of overwrite of password-protected file".)

- Operation up to the point of overwrite of password-protected file



If you have rewritten the file password by mistake, and then perform "Write to PLC" or other operation that needs password cancel, the password set in the CNC file is inconsistent with the one you enter for file rewrite. Thus you need to cancel the password set in the CNC file. (Refer to the following diagram "Operation after rewriting a file".)

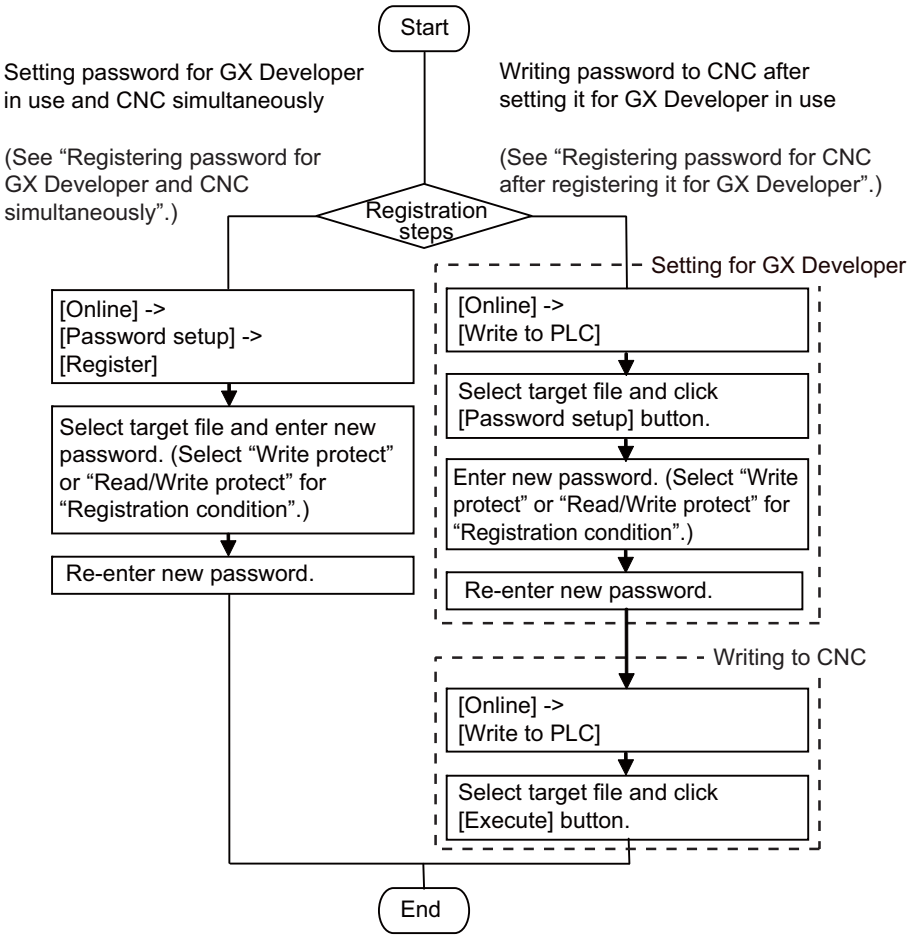
- Operation after rewriting a file



4.8.7 File Password Setting Procedure

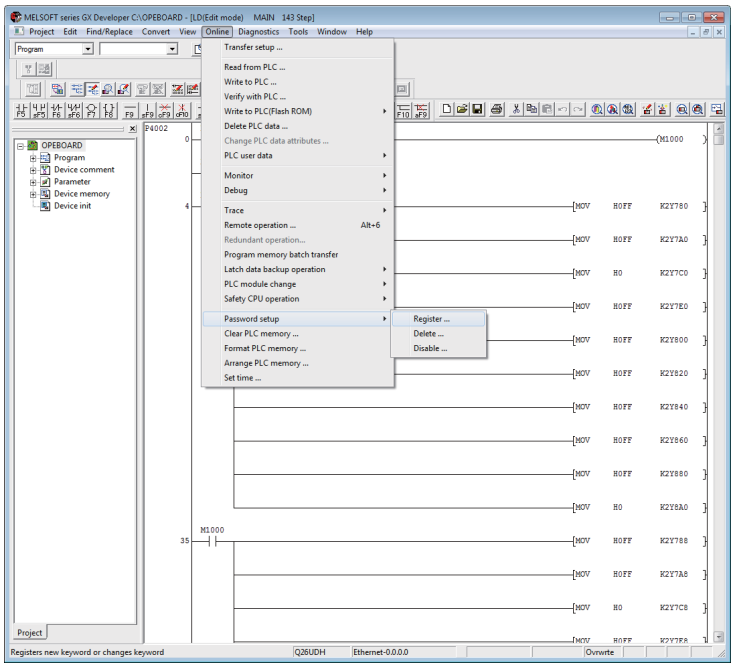
4.8.7.1 Registering New File Password

The following flowchart shows the procedure of registering new file passwords.

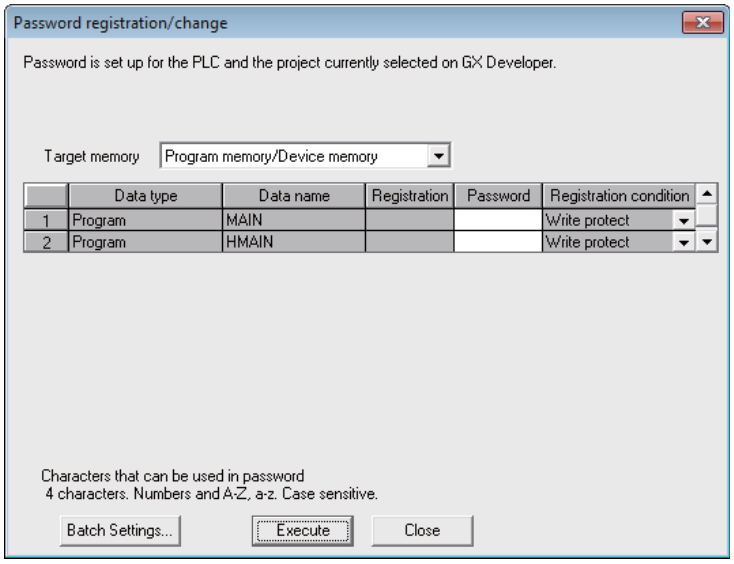


Registering password for GX Developer and CNC simultaneously

(1) Select [Online] - [Password setup] - [Register].

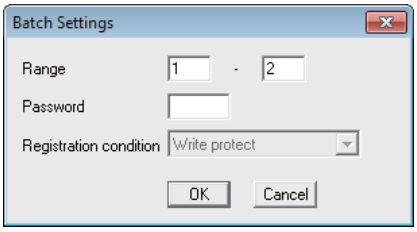


(2) The following "Password registration/change" screen is displayed.



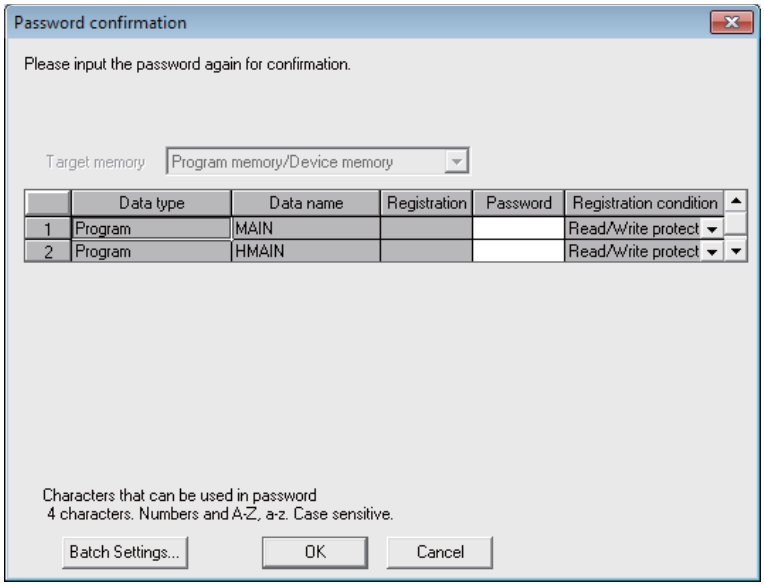
Select the target memory that contains files for which you want to set password. The list of files in the selected memory will be displayed on the "Password registration/change" screen. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory".
To register new password for each file, enter a password consisting of 4 one-byte alphanumeric characters (case sensitive) in each "Password" field. The entered password is shown as asterisks. For "Registration condition", select "Write protect" or "Read/Write protect". After setting these items, click [Execute] and go to step (5).
When you want to set password for multiple files simultaneously, click [Batch Settings].

(3) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the Password registration/change screen) and a new password consisting of 4 one-byte alphanumeric characters (case sensitive), and select the registration condition. Click [OK] to close the "Batch Settings" screen.



(4) The "Password registration/change" screen is displayed with the entered password. Click [Execute].

(5) The "Password confirmation" screen is displayed. For confirmation, enter the new password again, and click [OK].



Or, you can enter password for the selected range of files in the following way: click [Batch Settings], enter the new password on the displayed "Batch Settings" screen, and click [OK].

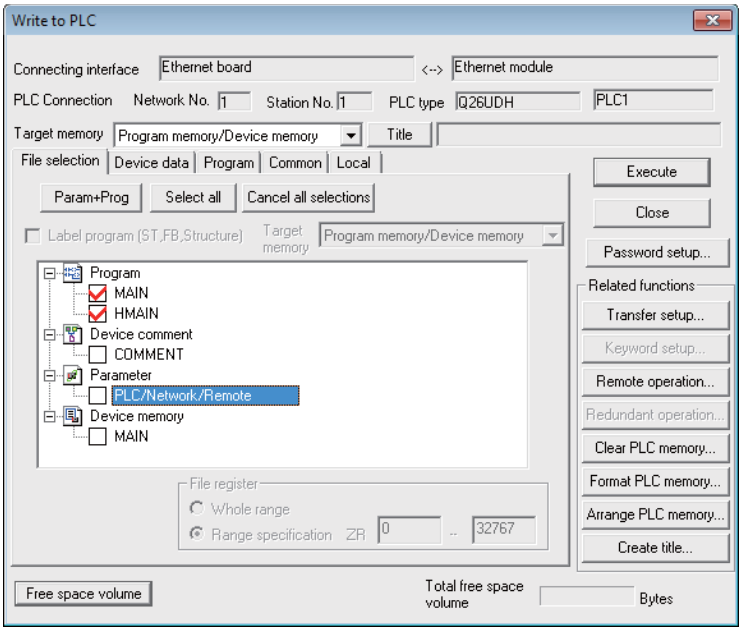
(6) If the message "The password will be registered for GX Developer's data. The password registered before is cancelled." is displayed, click [OK].

(7) When the message "Complete." is displayed, click [OK]. The registration is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

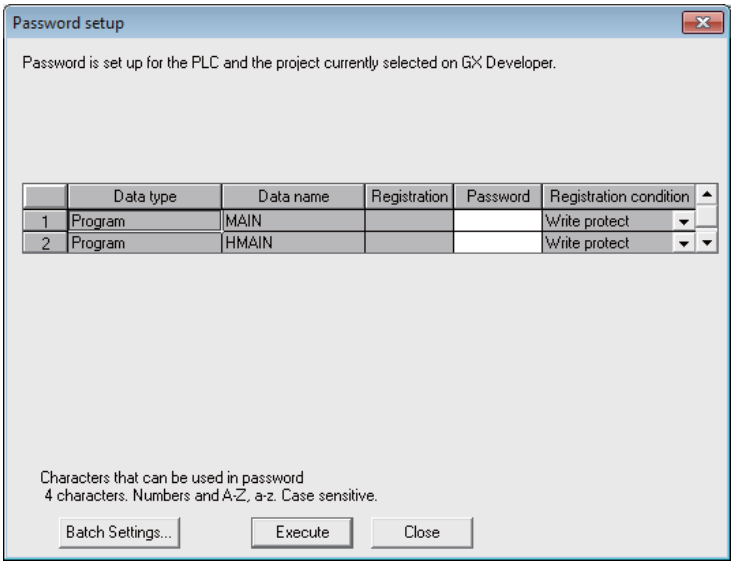
Registering password for CNC after registering it for GX Developer

(1) Select [Online] - [Write to PLC].

(2) On the displayed Write to PLC screen, select the target memory. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory". After setting "Target memory", check files for which you want to set password, and click [Password setup] button.



(3) The following "Password setup" screen is displayed.



To register password for each file, enter a new password consisting of 4 one-byte alphanumeric characters (case sensitive) in each "Password" field. The entered password is shown as asterisks. For "Registration condition", select "Write protect" or "Read/Write protect". After setting these items, click [Execute] and go to step (6).
When you want to register password for multiple files simultaneously, click [Batch Settings].

(4) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the "Password registration/change" screen) and a new password consisting of 4 one-byte alphanumeric characters (case sensitive), and select the registration condition. Click [OK] to close the "Batch Settings" screen.

(5) The "Password setup" screen is displayed with the entered password. Click [Execute].

(6) The "Password confirmation" screen is displayed. For confirmation, enter the new password again, and click [OK]. Or, you can re-enter password for the selected range of files in the following way: click [Batch Settings], enter the new password on the displayed "Batch Settings" screen, and click [OK].

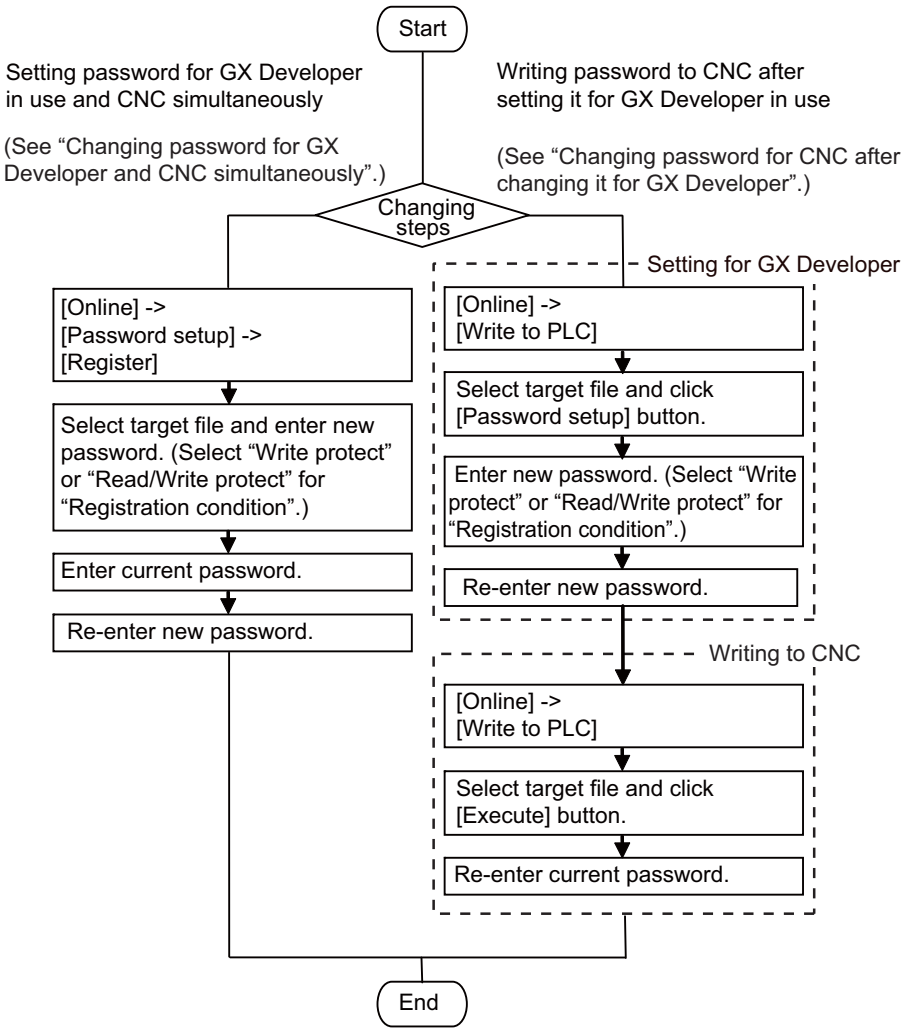
(7) On the "Write to PLC" screen, confirm that the files for which you entered password are displayed with a check mark. Click [Execute].

(8) If the message "The program (MAIN) already exists. Are you sure OK to overwrite?" is displayed, click [Yes] or [Yes all].

(9) When the message "Completed." is displayed, click [OK]. The registration is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

4.8.7.2 Changing File Passwords

The following flowchart shows the procedure of changing file passwords.



Changing password for GX Developer and CNC simultaneously

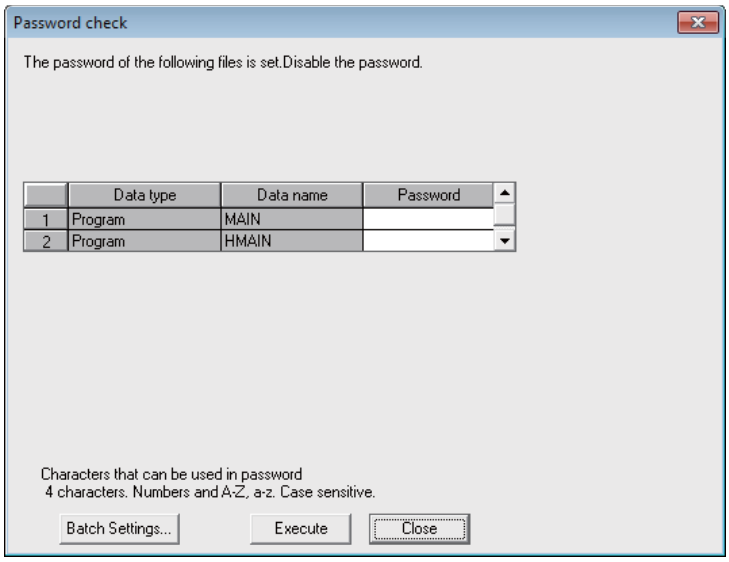
(1) Select [Online] - [Password setup] - [Register].

(2) The Password registration/change screen is displayed.
Select the target memory that contains files whose password you want to change. The list of files in the selected memory will be displayed on the "Password registration/change" screen. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory". For files for which a password is already registered, asterisks appear in their "Password" field.
To change password for each file, enter a new password consisting of 4 one-byte alphanumeric characters (case sensitive) in each "Password" field. The entered password is shown as asterisks. For "Registration condition", select "Write protect" or "Read/Write protect". After setting these items, click [Execute] and go to step (5).
When you want to change password for multiple files simultaneously, click [Batch Settings].

(3) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the Password registration/change screen) and a new password consisting of 4 one-byte alphanumeric characters (case sensitive), and select the registration condition. Click [OK].

(4) The "Password registration/change" screen is displayed with the entered password. Click [Execute].

(5) The "Password check" screen is displayed. Enter the password before change and click [Execute].



Or, you can enter password for the selected range of files in the following way: click [Batch Settings], enter the password before change on the displayed "Batch Settings" screen, and click [OK].

(6) The "Password confirmation" screen is displayed. For confirmation, enter the new password again, and click [OK].
Or, you can re-enter password for the selected range of files in the following way: click [Batch Settings], enter the new password on the displayed "Batch Settings" screen, and click [OK].

(7) If the message "The password will be registered for GX Developer's data. The password registered before is cancelled." is displayed, click [OK].

(8) When the message "Complete." is displayed, click [OK]. The registration is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

Changing password for CNC after changing it for GX Developer

(1) Select [Online] - [Write to PLC].

(2) On the displayed "Write to PLC" screen, select the target memory. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory". After setting "Target memory", check files for which you want to change password, and click [Password setup] button.

(3) The "Password setup" screen is displayed.
On this screen, all applicable files stored in the CNC are listed. For files for which a password is already registered, asterisks appear in their "Password" fields.
To change password for each file, enter a new password consisting of 4 one-byte alphanumeric characters (case sensitive) in each "Password" field. The entered password is shown as asterisks. For "Registration condition", select "Write protect" or "Read/Write protect". After setting these items, click [Execute] and go to step (6). When you want to change password for multiple files simultaneously, click [Batch Settings].

(4) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed in the Password registration/change screen) and a new password consisting of 4 one-byte alphanumeric characters (case sensitive), and select the registration condition. Click [OK] to close the displayed "Batch Settings" screen.

(5) The "Password setup" screen is displayed with the entered password. Click [Execute].

(6) The "Password confirmation" screen is displayed. For confirmation, enter the new password again, and click [OK]. Or, you can re-enter password for the selected range of files in the following way: click [Batch Settings], enter the new password on the displayed "Batch Settings" screen, and click [OK].

(7) On the "Write to PLC" screen, confirm that the files for which you entered password are displayed with a check mark. Click [Execute].

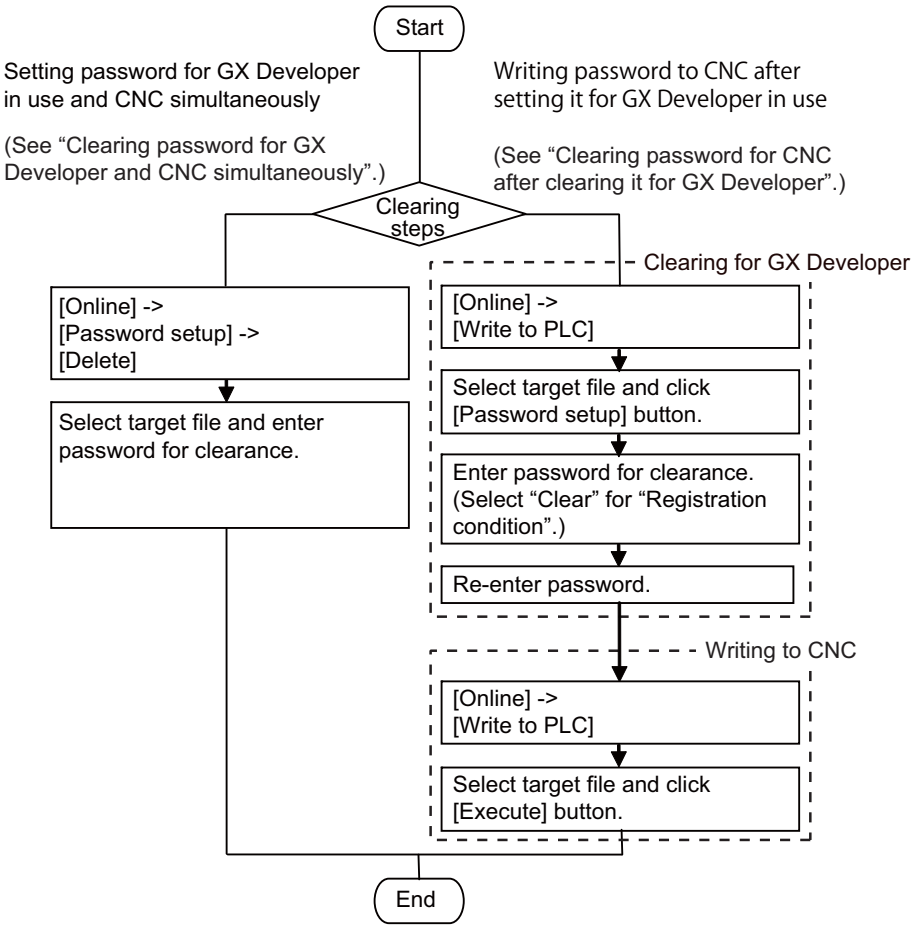
(8) If you did not disable password temporarily with the GX Developer which you are currently using, the following "Password check" screen will appear. Enter the password before change in each "Password" field and click [Execute].

(9) If the message "The program (MAIN) already exists. Are you sure OK to overwrite?" is displayed, click [Yes] or [Yes all].

(10) When the message "Completed." is displayed, click [OK]. The change is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

4.8.7.3 Clearing File Password

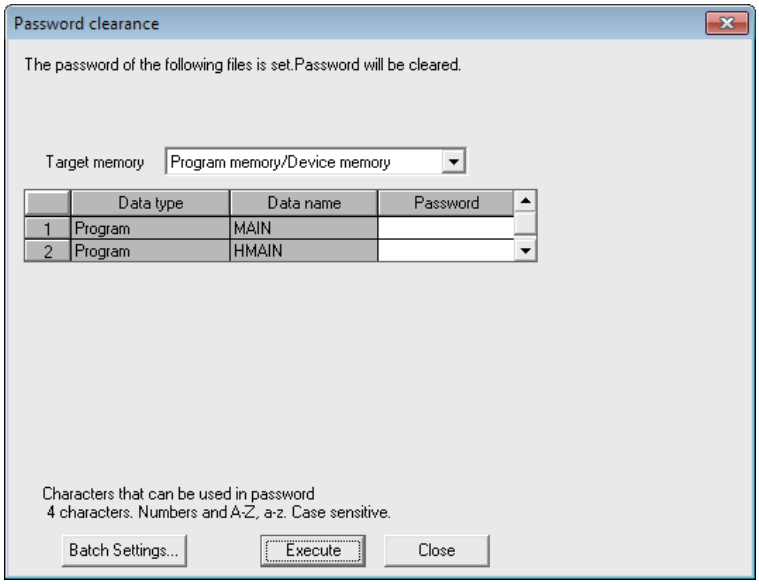
The following flowchart shows the procedure of clearing a file password.



Clearing password for GX Developer and CNC simultaneously

(1) Select [Online] - [Password setup] - [Delete].

(2) The following "Password clearance" screen is displayed.



Select the target memory that contains files whose password you want to delete. The list of files in the selected memory will be displayed on the Password clearance screen. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory".
To delete password for each file, enter the password registered for the target file, click [Execute], and go to step (4).
When you want to delete password for multiple files simultaneously, click [Batch Settings].

(3) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the "Password clearance" screen) and the registered password. Click [OK] to close the "Batch Settings" screen.

(4) The "Password clearance" screen is displayed with the entered password. Click [Execute].

(5) If the message "The password for GX Developer's data will be cleared, too." is displayed, click [OK].

(6) When the message "Complete." is displayed, click [OK]. The clearance is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

Clearing password for CNC after clearing it for GX Developer

(1) Select [Online] - [Write to PLC].

(2) On the displayed "Write to PLC" screen, select the target memory. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory". After setting "Target memory", check files for which you want to delete password, and click [Password setup] button.

(3) The "Password setup" screen is displayed.
To delete password for each file, enter the password registered for the target file and select "Clear" for "Registration condition". Click [Execute] and go to step (6). When you want to delete password for multiple files simultaneously, click [Batch Settings].

(4) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the "Password registration/change" screen) and the registered password, and select "Clear" for "Registration condition". Click [OK] to close the "Batch Settings" screen.

(5) The "Password setup" screen is displayed with the entered password. Click [Execute].

(6) The "Password confirmation" screen is displayed. For confirmation, enter the password again for the target file, and click [OK].
Or, you can re-enter password for the selected range of files in the following way: click [Batch Settings], enter the password on the displayed "Batch Settings" screen, and click [OK].

(7) On the "Write to PLC" screen, confirm that the files for which you entered password are displayed with a check mark. Click [Execute].

(8) If the message "The program (MAIN) already exists. Are you sure OK to overwrite?" is displayed, click [Yes] or [Yes all].

(9) When the message "Completed." is displayed, click [OK]. The clearance is completed.
Click [Online] - [Write to PLC (Flash ROM)] - [Export to ROM Format] to retain the password registration for the sequence program even after NC is restarted.

4.8.7.4 Disabling File Password Temporarily

Disabling file password temporarily is required when you use GX Developer to perform the following operations for a file for which a password is registered. Disabling file password temporarily means that a registered file password and entered password are compared for verification, and file locking is released to allow you to operate the file. If the password verification fails, you cannot operate the file.

For example, a file password needs to be verified and disabled temporarily in the following situation: you set a file password for a program file using a GX Developer to prohibit reading. Then, you start another GX Developer and execute "Read from PLC" for the program file.

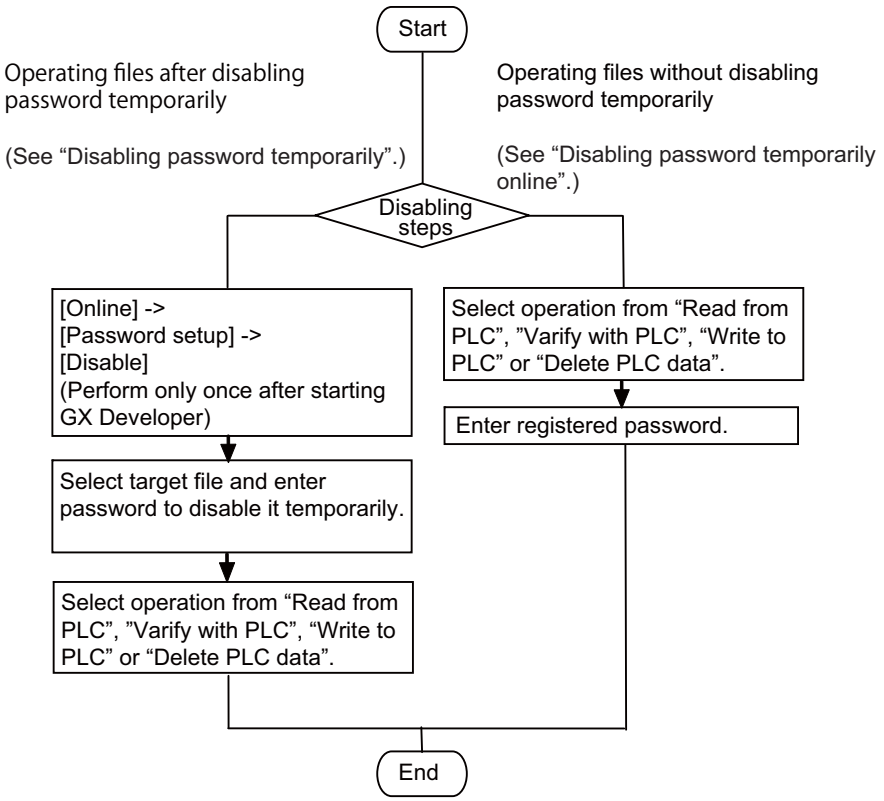
Only the program for which the file password was temporarily disabled can be operated by the GX Developer which was used for disabling. To operate the same file using a newly started GX Developer, you must disable the file password temporarily again.

Once you disabled the file password using a GX Developer, you can use the GX Developer continuously to operate the program until the operation is completed.

GX Developer operation	Disabling password required/not required
[Online] -> [Read from PLC] [Online] -> [Verify with PLC]	Disabling file password temporarily is required if the password is set for "Read/Write protection".
[Online] -> [Write to PLC] [Online] -> [Delete PLC data]	Disabling file password temporarily is required if the password is set for "Write protection".

There are two ways to disable file password temporarily.

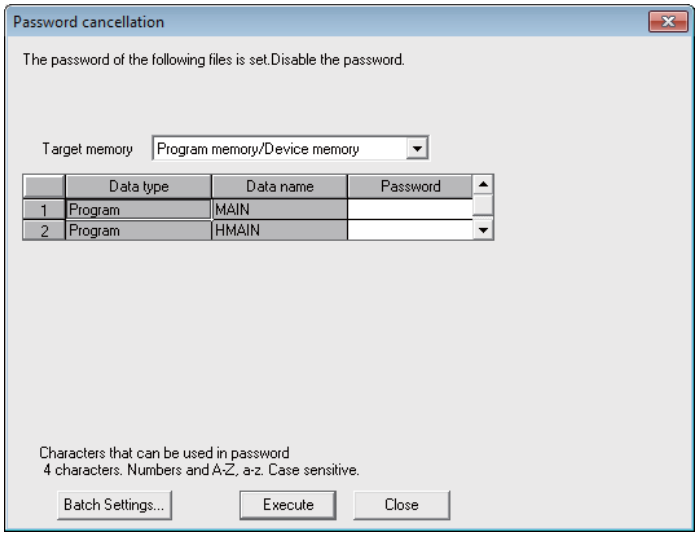
The following flowchart shows the procedure of disabling file password temporarily.



Disabling password temporarily

(1) Select [Online] - [Password setup] - [Disable].

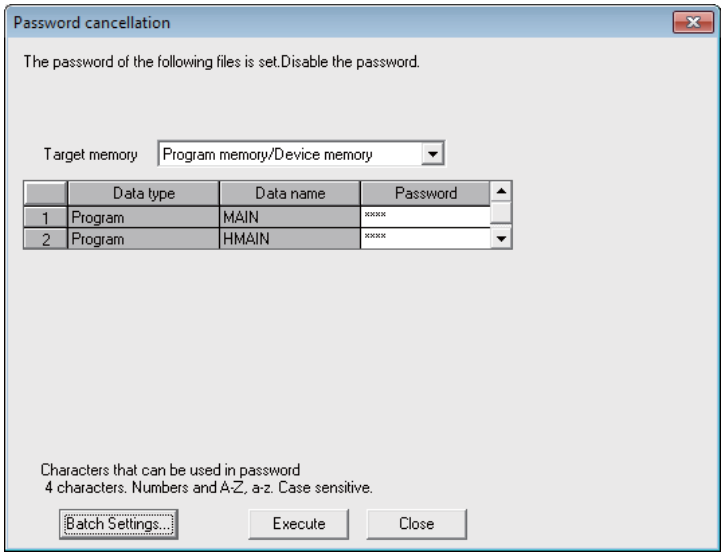
(2) The following "Password cancellation" screen is displayed.



Select the target memory that contains files whose password you want to disable. The list of files in the selected memory will be displayed on the "Password cancellation" screen. If you want to specify sequence programs, select "Program memory/Device memory" for "Target memory". If you want to specify device comments or PLC messages, select "Program memory/Device memory" or "Memory card (RAM)" for "Target memory".
To disable password temporarily for each file, enter the password registered for the target file, click [Execute], and go to step (4).
When you want to enter password for multiple files simultaneously, click [Batch Settings].

(3) On the displayed "Batch Settings" screen, enter the file range (the file numbers displayed on the Password cancellation screen) and the registered password. Click [OK] to close the "Batch Settings" screen.

(4) The "Password cancellation" screen is displayed with the entered password. Click [Execute].



(5) When the message "Complete." is displayed, click [OK]. The disabling is completed.

Disabling password temporarily online

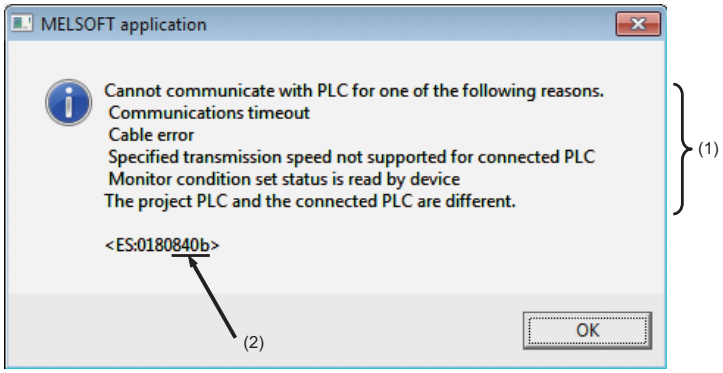
If you execute the following functions, the password check screen is displayed and you must enter the registered password: "Read from PLC"/"Verify with PLC" function for a file for which "Read/Write protect" file password is set, or, "Write to PLC"/"Delete PLC data" function for a file for which "Write protect" file password is set. After entering password, click [Execute].

Or, you can enter password for the selected range of files in the following way: click [Batch Settings], enter the password on the displayed Batch Settings screen, and click [OK].

4.9 Troubleshooting

4.9.1 List of Errors During GX Developer Online Operations

If an error has occurred in GX Developer, the following dialog appears. The error message and error status are displayed in the dialog. Note that the display error messages may be applicable only to the MELSEC PLC. Therefore, they are not necessarily accurate for the CNC side. Error status is shown in the last 4 digits of the number displayed.



(1) Error message
(2) Error status

⚠ CAUTION

When an error occurred at GX Developer On-line function, the error message may not explain exactly the state in the CNC side.
Always refer to the error list.

The following table indicates the causes and remedies of the errors that can occur during online operation with the CNC. For other errors, refer to the GX Developer Operating Manual.

Status	Message	Cause	Remedy
4001 **4002**	The executed function is not supported. Please check the manual and other documentation.	An operation not supported by the specifications was attempted.	Check the operation procedures.
4005	Writing the data exceeding the size of PLC was attempted. Execute again within the range of PLC size.	Maximum number of steps that can be executed with NC has been exceeded.	Check the size of execution area. (Refer to the section "Sequence Program Development: Operations and Check Items at the Other Errors".) Reduce the number of steps for the relevant sequence program to be executed with reference that value.
4010	Cannot write because the PLC is executing a RUN command. Stop the PLC, then execute again.	The PLC of the NC is running.	After stopping the PLC of the NC, start execution again.
4021	The applicable drive is not ready. Check the applicable drive, then execute again.	The specified target memory does not exist or is not in a usable status.	Change the target memory.
4022	A file which does not exist in the PLC was specified.	Ladder program writing during RUN was attempted to nonexistent sequence program.	Check the editing program whether it exists in NC or not.
4024	The executed function is not supported. Please check the manual and other documentation.	Writing unavailable files (files except sequence program, comment, message, and parameters) was conducted.	Check the operation procedures.

Status	Message	Cause	Remedy
4025	Processing is in progress from another peripheral device. Please wait until the other processing is completed, then execute again.	Multiple peripheral development tools (Built-in PLC edit function/GX Developer) were accessed to the same file.	Wait for completion of access from other peripheral development tool, then execute again.
4029	Insufficient file capacity. Execute again after deleting unnecessary files.	An attempt was made to write a file that exceeds the storage capacity.	Examine the file structure so that the data falls within the limited capacity.
4031	The specified device No. exceeds the permissible range. Specify a device No. that is within the range set in the parameter.	The access request given is outside the accessible device range.	Check the number range of each device.
4052	The file is write protected. Change the file attributes to enable writing to the file.	The specified target memory is a write-disabled device (internal ROM).	Specify "Program memory/Device memory" or "Memory card(RAM)" as the target memory.
4061	No condition set. Check the settings and program.	Ladder program writing during RUN was attempted in the following situations: 1) A sequence program is run with independent program method. 2) A high-speed processing program using common pointers is run. 3) The writing was attempted into a high-speed processing program while the high-speed processing is disabled. 4) A common pointer CALL instruction writing was attempted into a high-speed processing program. 5) Execution size of the high-speed processing program exceeds 4000 steps.	Execute following operations. 1) Change the method into multi-program one. 2) Delete the command which uses common pointers from the high-speed processing program. 3) Turn ON the bit selection parameter "Enable ladder program writing during RUN (for high-speed processing)". 4) Change the CALL instruction into local pointer one. 5) Reduce the number of steps in the high-speed processing program. (Refer to of status 4005's remedy)
4065	A mismatch occurred between the PLC and peripheral parameters Match the parameters between the PLC and peripherals.	There is a problem in the device setting value.	Set the number of device points. (Refer to "Common Items: Setting the Parameters".)
4070	The program before correction differs from the registered program.	(1) In writing into PLC, an unspecified sequence instruction is included in the program. (2) In ladder program writing during RUN, the program before the modification does not match with the one in the NC.	(1) Verify the program and specify the instruction which has caused the error. (2) Check whether the target program is the same as the running one in the NC. Check the device setting in PC parameter as well.
4080	Incorrect abnormal.	When executing "Read from PLC" or "Verify PLC" function: Data not included in the specifications was found in the designated file.	The sequence program or message data in the CNC controller may be damaged. Delete the corresponding file and start again, or initialize the PLC data storage area. If the problem cannot be resolved, contact the Mitsubishi System Department.
		When executing "Write to PLC": Multiple END instructions were found in the designated sequence program file.	Edit the sequence program in the list mode to delete END instructions except only one at the last line.
4083	A program without registered parameters exists in PLC. Set PLC parameters in the program.	Ladder program writing during RUN was attempted to an unregistered sequence program.	The RUN writing is available only to a registered program. Check the program registration.

Status	Message	Cause	Remedy
4086	The specified P and I are already in use. Please use another P and I.	The label to be written during RUN has already been used.	Designate a different label.
4087	The accessible pointers in the PLC exceed the specified range.	The number of labels written during RUN has exceeded the allowable number of local labels.	Check the number of local labels used in high-speed processing and main processing.
412b	The select drive was write protected. Cancel write protect, then execute again.	Built-in ROM write was executed during ROM write function lock.	Cancel the ROM write function lock, and re-execute the ROM write.
41c5	The specified file does not exist. Please execute again after confirming the file.	Files which are not stored in NC were written/read.	Press "Refresh view" button on write/read menu to update the file list.
8008	An unusable port or IP address was specified. Execute again after checking the port/IP address setting.	The Ethernet setting on the GX Developer is incorrect.	Check the Ethernet setting, or check the cable connection.
8201	Cannot communicate with the PLC. Execute again after checking the connections with the PLC.	The serial communication cable is faulty. - Not connected - DTR signal off	Check the serial port setting and cable connection.
8301	Cannot communicate with the PLC. Execute again after checking the connections with the PLC.	There was no response from the NC connected with Ethernet.	Check the following: - CNC status - Cable connection - Ethernet address setting - Inhibiting GX Developer/GX Works2 connection setting
840b	Cannot communicate with PLC for one of the following reasons. Communications timeout Cable error Specified baud rate not supported for connected PLC Monitor condition set status is read by device The project PLC and the connected PLC are different.	There is no response from the NC. - The CNC has not started properly. - The connection channel of the CNC side serial port is different. - The serial cable outside the specifications is used for signal connection. - An incorrect Ethernet address is set on the NC side	Check the following. - CNC side status - Cable connection - Bit selection: GPP communication valid - Set the Ethernet address

[Note] Interpret the "PLC" in the message as "CNC controller".

4.9.2 Confirmation of PLC Alarms on CNC Controller Side

When an error occurs during starting or executing a sequence program, user PLC alarm status will be entered. There are three methods of confirming alarm details.

- Method by using the "ALARM" screen on the CNC controller setting display unit.
- Method by using the "PLC DIAGNOSIS" screen of the internal PLC edit function.
- Method by using the GX Developer "PLC diagnostics" window.

In the GX Developer "PLC diagnostics" window, the same kind of information as displayed in the "ALARM" screen of the CNC controller setting display unit is displayed in a simple manner. In addition, the ladder in which error has occurred is displayed, as well.

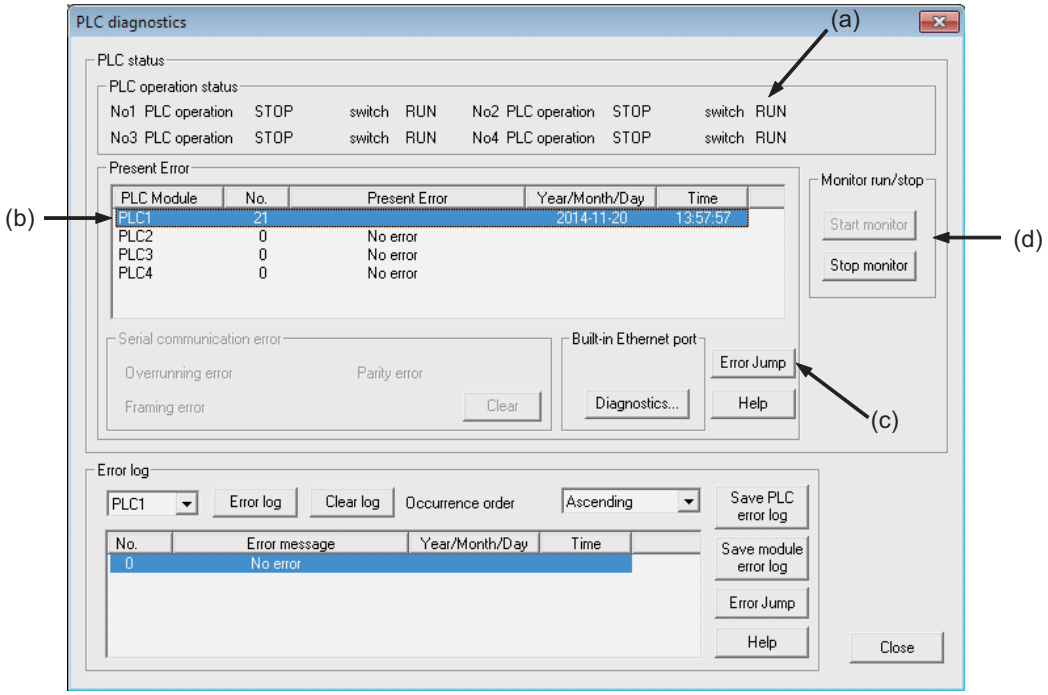
Refer to the section "List of PLC Alarms" for causes and remedies for the displayed PLC alarm.

4.9.2.1 Operating Procedures

With the GX Developer, follow the procedures given below to startup the "PLC diagnostics" window.

[Diagnostics] -> [PLC diagnostics]

The following screen is displayed. Error information is indicated in the area (a) to (b).



(a) PLC operation status display: RUN/STOP status of PLC is displayed.

(b) Error information display: Error No. and error occurrence time are displayed.

- If there is no error, "No error" is displayed.
- Error No. is the upper 2 digits of the CNC side alarm sub status1.
- Further detail is available upon double-click. (Described later)
- When the multi-project is enabled, the CPU unit that is displayed depends on the project to which GX Developer is connected.
  When connected to project 1 to 4: Errors related to project 1 to 4 are displayed on CPU1 to CPU4.
  When connected to project 5 and 6: Errors related to project 5 to 6 are displayed on CPU1 and CPU2.
  Errors that are common to all projects are displayed on the same location as the project 1.

(c) Error jump button: Ladder in which error has occurred is displayed. (Described later)

(d) Error display, start monitor and stop monitor button: Monitoring error information is started/stopped.

[Note] All the buttons other than (a) to (d) and [CLOSE] are not supported.

4.9.2.2 Details of Each Display

Error information is generated or cleared based on the following rules.

- The error that occurred last after PLCRUN is displayed until a new error occurs.
- Error display will be cleared only when RUN is executed from PLC STOP.
- When multi-project is enabled and errors are present in multiple projects, the project in which the last error occurred in the execution order is displayed.
- As for the errors that occurred before PLC execution, the error display starts from project 1.
- Errors that are common to all projects (e.g. PLC system error) are displayed on CPU No.1.

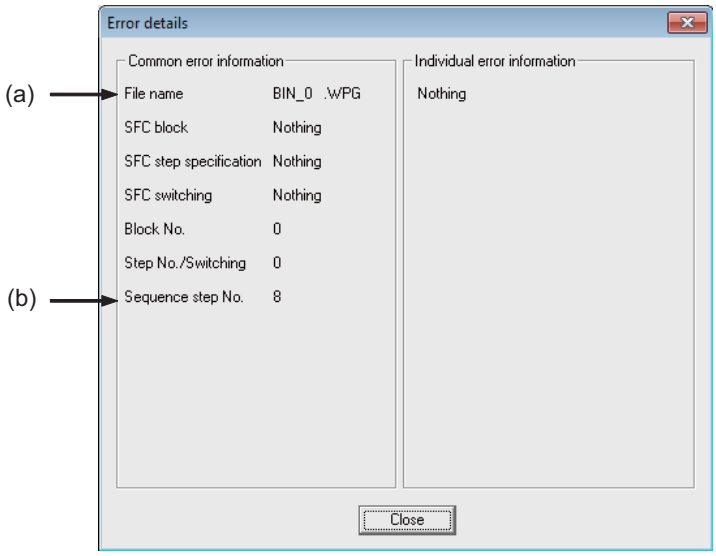
4.9.2.3 Detailed Error Information Display

Detailed error information can be displayed in the "PLC diagnostics window" following the operating procedures below.

Double-click "(b) error display list box" in the "PLC diagnostics window".

The "Error details" screen (see below) is displayed.

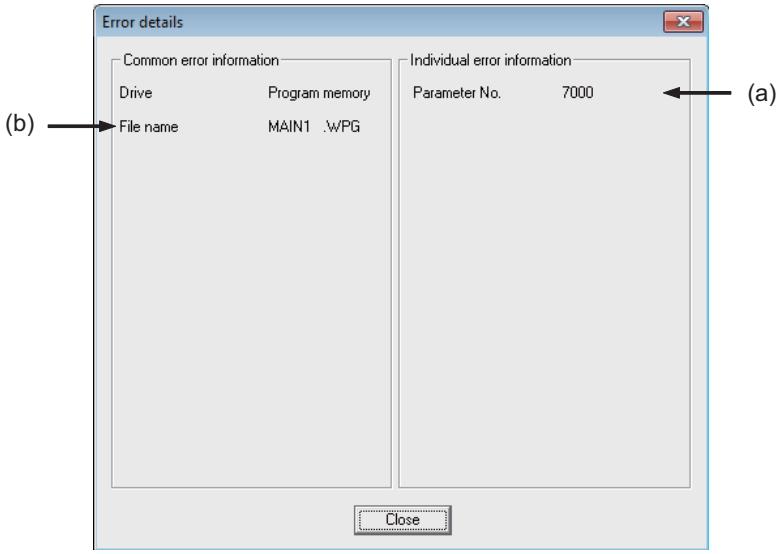
(1) When there is a cause in the sequence program:



(a) File name: The name of sequence program file in which error has occurred is displayed.

(b) Sequence step No.: The step No. for which an error occurred in (a) is displayed.

(2) When there is a cause in the parameter setting:



(a) Parameter No.: Illegal parameter No. is displayed.
1005: Common pointer No.
7000: Program setting
(b) File name: The name of parameter setting file relating with the error is displayed.

[Note]
The displays other than (a) and (b) in (1) and (2) above have no significant meanings.
Also, depending on the error factors, (a) or (b) may not be displayed.

4.9.2.4 Displaying the Ladder in Which an Error Occurred

The ladder in which an error has occurred is displayed on the "PLC Diagnostics" screen. By following the operations below, the ladder in which an error occurred which exists in the project currently opened with the GX Developer can be displayed in the edit mode.

Click [Error Jump] (c) on the "PLC Diagnostics" screen

The ladder of the file in which an error has occurred is displayed on another window. Then the cursor moves to the step where the error has occurred.
The following conditions are required to accurately display the ladder in which an error occurred section.

- The file name and sequence program No. must be displayed in the "Error details" screen.
  (In this case, no response or error dialog display will be given even if the button is clicked.)
- A project including the sequence program currently in operation in the CNC controller side must be opened.
  (Even when a project not in operation is opened, if the same program name already exists, a ladder different from the actual one in which an error occurred is displayed. So, be careful.)
- Depending on the type of error, sequence step No. does not show the ladder in which an error occurred accurately.

4.9.3 Initialization for PLC Data Storage Area

In the following cases, initialize the CNC controller's temporary memory area and start again.
The CNC ROM is not initialized by this initialization operation. To hold the recovered state after the power is turned OFF, it must be stored in the CNC ROM.

- If an error occurs while writing to the CNC controller
- If the state cannot be recovered even after remedying the error
- To delete the stored data at once

By initialization operation, the initializable area and data to be initialized are as follows.
For details of PLC data storage area, refer to "Common Items: PLC Data Storage Areas".

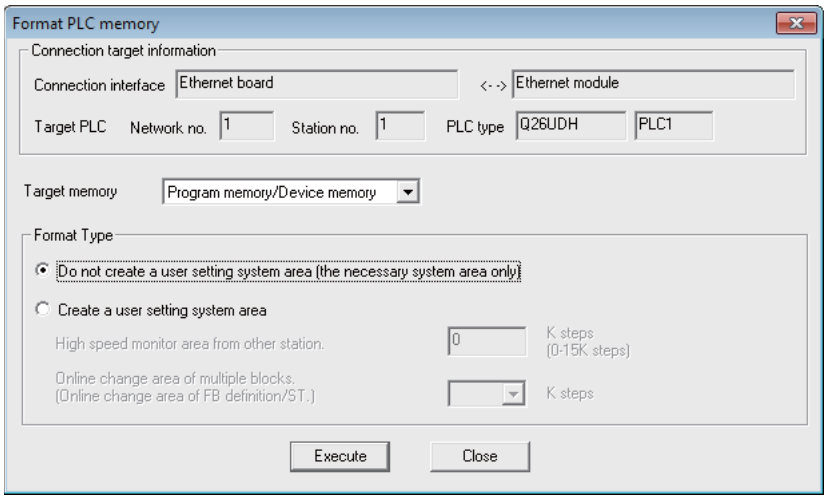
Target data	Target memory	Target area
Sequence program Parameter	Program memory/Device memory	Sequence program storage area/ temporary memory area (RAM in CNC)
PLC message Device comment Symbolic information	Program memory/Device memory Memory card (RAM)	Data storage area/ Storage area (ROM in CNC)

4.9.3.1 Operation Procedure

Perform the following operation from GX Developer to start the operation screen.

[Online] -> [Format PLC memory]

On the following screen, click [Execute].



[Note] As [Target memory], only "Program memory/Device memory" or "Memory card(RAM)" is valid. The setting is not necessary for [Format Type].

The setting is completed when the following dialog appears. Click [OK]. All data stored in the area selected with "Target memory" have been deleted and initialized.

4.10 Backing Up Sequence Programs and Other Data

This section explains the methods for backing up the developed sequence programs and PLC related data in a personal computer.

4.10.1 Backing up All PLC Related Data by Batch

This section explains the procedure for backing up all data related to PLC by batch.
This procedure backs up the data of all projects by batch when the multi-project function is enabled.

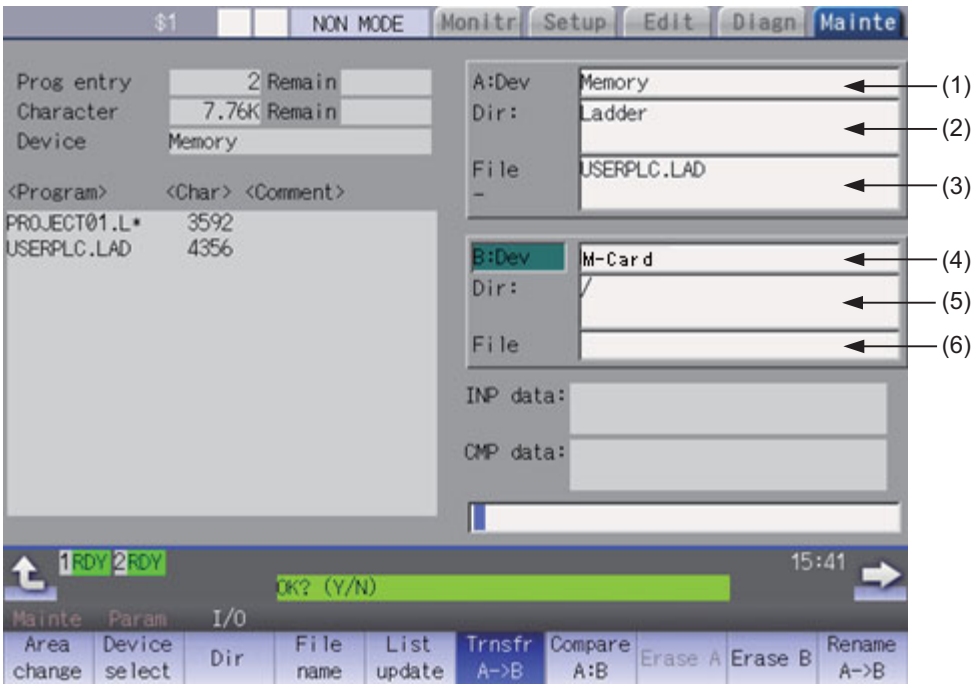
4.10.1.1 Backup Target Data

The following data can be backed up.

	Related data classification	Remarks
1	Sequence program	Sequence program code
2	Parameter	Execution order setting information, etc.
3	Sequence program comment	GX Developer comment data
4	Message	Message data such as alarm messages, operator messages and PLC switches in each language
5	Multi-project setting parameter	Multi-project function setting information

4.10.1.2 Backup Procedures

The data is backed up from the CNC controller's input/output screen.
Designate the transmission symbolic information (CNC controller side) and transmission target information (personal computer side) on the input/output screen. When transmission is started, the sequence programs, etc., stored in the ROM will be backed up in the personal computer.
The input/output screen and operation procedures are shown below.



Refer to the instruction manual for the respective model for details on the input/output screen.

Setting for the CNC controller

Set the device name, directory, and file name for [A:Dev].

(1) Set [A:Dev]

Select "Memory" with menu keys.

(2) Set [Dir:]

Input the character string "/LAD".

(3) Set [File]

"USERPLC.LAD" is automatically set when [Dir:] is set.

For the user safety sequence, input "SAFEPLC1.LAD" or "SAFEPLC2.LAD".

Setting for the personal computer (device name, directory, and file name)

Set the device name, directory, and file name for [B:Dev].

(4) Set [B:Dev]

Select "HD" with menu keys.

(5) Set [Dir:]

Input the character string "/".

(6) Set [File]

Set the file name to be stored. When omitted, "USERPLC.LAD" is assigned.

Transmission

The backup process starts when the menu key [Trnsfr A->B] is pressed.

4.10.1.3 Restoring Backed Up Data

The data is restored following the backup operation in reverse (Set personal computer settings in "A: Device" and the CNC controller settings in "B: Device".)

The PLC must be STOP before restoration can be started.

4.10.1.4 Precautions

Precautions for input/output between different NC models or between systems with different additional specification status

If the large capacity PLC (256 kilo steps)/large capacity PLC (512 kilo steps) additional specification is enabled, the size of sequence programs that can be stored in CNC is increased.
The USERPLC.LAD file that was output when the large capacity PLC (256 kilo steps)/ large capacity PLC (512 kilo steps) additional specification was enabled may not be input to the system that switched the disable/enable setting of the large capacity PLC additional specification. Whether the USERPLC.LAD file can be input depends on the size of the sequence program contained in the USERPLC.LAD file when it was output.

Large capacity PLC additional specification, type of input "USERPLC.LAD", and operation

	Inputting "USERPLC.LAD" that was output when it contained more than 256 kilo steps sequence programs.	Inputting "USERPLC.LAD" that was output when the following was true: "128 kilo steps < Number of contained sequence program steps ≦ 256 kilo steps"
Large capacity PLC additional specification is disabled in M800 series	"Can't write file for dev B" error occurs.	"Can't write file for dev B" error occurs.
Large capacity PLC (256 kilo steps) additional specification is enabled in M800 series	"Can't write file for dev B" error occurs.	Writing and PLC execution is possible.
Large capacity PLC (512 kilo steps) additional specification is enabled in M800 series	Writing and PLC execution is possible.	Writing and PLC execution is possible.

If the PLC project extension (3 projects)/PLC project extension (6 projects) additional specification is enabled, the numbers of usable projects and devices are increased when the multi-project function is enabled.
The USERPLC.LAD file that was output when the PLC project extension (3 projects)/PLC project extension (6 projects) additional specification was enabled may not be input to the system that switched the disable/enable setting of the PLC project extension additional specification. Whether the USERPLC.LAD file can be input depends on the numbers of projects and devices that were set when the USERPLC.LAD file was output.

PLC project extension additional specification, type of input "USERPLC.LAD", and operation 1

	Inputting "USERPLC.LAD" that was output when the maximum project No. was set to 4 or larger	Inputting "USERPLC.LAD" that was output when the maximum project No. was set to 2 or 3
PLC project extension additional specification is disabled in M800 series	"Can't write file for dev B" error occurs.	"Can't write file for dev B" error occurs.
PLC project extension (3 projects) additional specification is disabled in M800 series	"Can't write file for dev B" error occurs.	Writing and PLC execution is possible.
PLC project extension (6 projects) additional specification is disabled in M800 series	Writing and PLC execution is possible.	Writing and PLC execution is possible.

PLC project extension additional specification, type of input "USERPLC.LAD", and operation 2

	Inputting "USERPLC.LAD" that was output when a number which was larger than the standard (Note 1) was set as the number of device points.
PLC project extension additional specification is disabled in M800 series	"Can't write file for dev B" error occurs.
PLC project extension (3 projects) additional specification is disabled in M800 series	"Can't write file for dev B" error occurs.
PLC project extension (6 projects) additional specification is disabled in M800 series	Writing and PLC execution is possible.

(Note 1) The following tables show the "standard" number of device points and "extended" number of device points. (The number shown below is the total number of points set in all projects.)

Device	Device points "standard"		Device	Device points "extended"
M	61440		M	122880
L	1024		L	2048
F	2048		F	4096
SB	1024		SB	2048
B	57344		B	114688
SM	6144		SM	12288
V	256		V	1024
SW	1024		SW	2048
SD	6144		SD	12288
T	2048		T	4096
ST	128		ST	256
C	512		C	1024
D	4096		D	8192
W	12288		W	24576
Z	60		Z	120
N	48		N	96
P	12288		P	24576

Precautions for inputting or outputting to or from CNC in different version

The storage capacity of device comment and message files differs depending on the CNC version.

CNC version	Storage capacity
C0 or earlier	60 device comment files, 10 message files, and 6 symbolic information files
C0 or later	80 files in total of device comment files, message files, and symbolic information files

The number is the total of all the projects.

If you create "USERPLC.LAD" that contains more than 60 device comment files or 10 message files in the version C0 or newer system, the file cannot be stored in the system that is older than version C0.
If you attempt to store it, the error "Can't write file for dev B" will occur.

4.10.2 Backing up PLC Related Data of Each Project by Batch

This section explains the procedure for backing up PLC related data of each project by batch when the multi-project function is enabled.

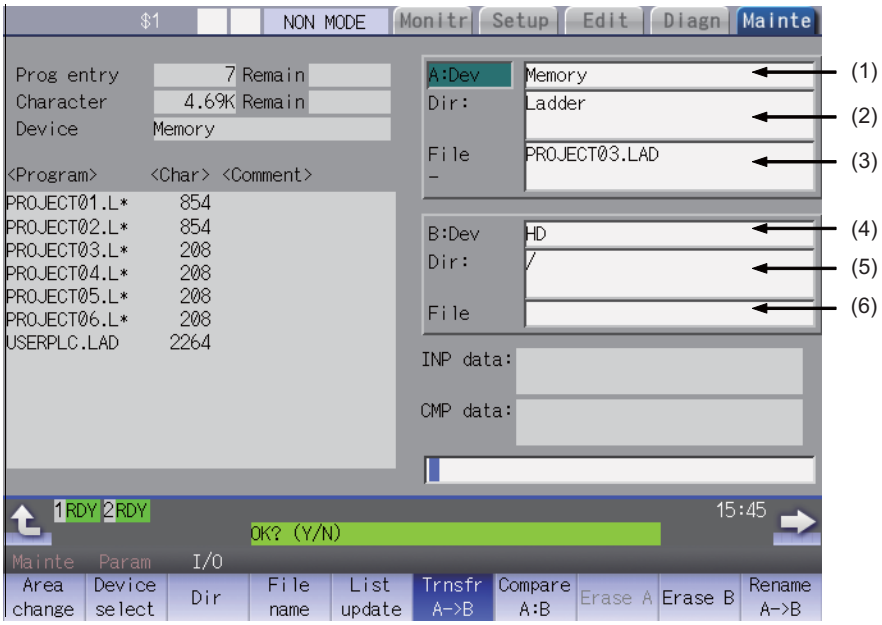
4.10.2.1 Backup Target Data

The following data can be backed up.
When backup is executed, only data of the specified project is output.

	Related data classification	Remarks
1	Sequence program	Sequence program code
2	Parameter	Execution order setting information, etc.
3	Sequence program comment	GX Developer comment data
4	Message	Message data such as alarm messages, operator messages and PLC switches in each language
5	Multi-project setting parameter (Device point settings only)	Device points setting information for multi-project function

4.10.2.2 Backup Procedures

The data is backed up from the CNC controller's input/output screen.
Designate the transmission symbolic information (CNC controller side) and transmission target information (personal computer side) on the input/output screen. When transmission is started, the data such as sequence programs of the specified project stored in the CNC ROM will be backed up in the personal computer.
The input/output screen and operation procedures are shown below.



Refer to the instruction manual for the respective model for details on the input/output screen.

Setting for the CNC controller

Set the device name, directory, and file name for [A:Dev].

(1) Set [A:Dev]

Select "Memory" with menu keys.

(2) Set [Dir:]

Input the character string "/LAD".

(3) Set [File]

Select "From list" using the menu key and select "PROJECTxx.LAD" (xx: output project number) from the file list.

Press the "INPUT" key.

Setting for the personal computer (device name, directory, and file name)

Set the device name, directory, and file name for [B:Dev].

(4) Set [B:Dev]

Select "HD" with menu keys.

(5) Set [Dir:]

Input the character string "/".

(6) Set [File]

Set the file name to be stored. When omitted, "PROJECTxx.LAD" (xx: output project number) is assigned.

Transmission

The backup process starts when the menu key [Trnsfr A->B] is pressed.

4.10.2.3 Restoring Backed Up Data

The data is restored following the backup operation in reverse (Set personal computer settings in "A: Device" and the CNC controller settings in "B: Device".)

The PLC must be STOP before restoration is started.

4.10.2.4 Precautions

Precautions for input/output according to CNC internal status

Project-based backup data (PROJECTxx.LAD) may not be able to be input depending on the CNC's status (Stored sequence programs, data size, etc.).
The table below lists the factors that disable input of the project-based backup data and their solutions.

Factors that disable input of project-based backup data and their solutions

Error details	Factor	Solutions
The data size has exceeded the available device size.	The data to input is exceeding the device size available for all the projects.	The device is short of free capacity. Correct the multi-project parameter (number of device points) to increase the free capacity.
Input has been attempted for an unavailable project.	An attempt to input the data to unavailable project.	Input the data to any available project.
Data to input is too large.	Size of data to input is greater than the storage area.	Correct the multi-project parameter (project percentage) to increase the storage area size to be greater than the PLC data (sequence program and comment) of the project-based backup data.

Precautions for inputting or outputting to or from CNC in different version

The storage capacity of device comment and message files differs depending on the CNC version.

CNC version	Storage capacity
C0 or earlier	60 device comment files, 10 message files, and 6 symbolic information files
C0 or later	80 files in total of device comment files, message files, and symbolic information files

The number is the total of all the projects.

If you create "PROJECTxx.LAD" that contains more than 60 device comment files or 10 message files in the version C0 or newer system, the file cannot be stored in the system that is older than version C0. If you attempt to store it, the error "Can't write file for dev B" will occur.

4.11 Restrictions

4.11.1 Enhanced PLC Security Mode

When enhanced PLC security mode is enabled on a CNC, some functions of GX Developer which communicate with the CNC are restricted.
For details on the enhanced PLC security mode, refer to "9.1 Enhanced PLC Security Mode".

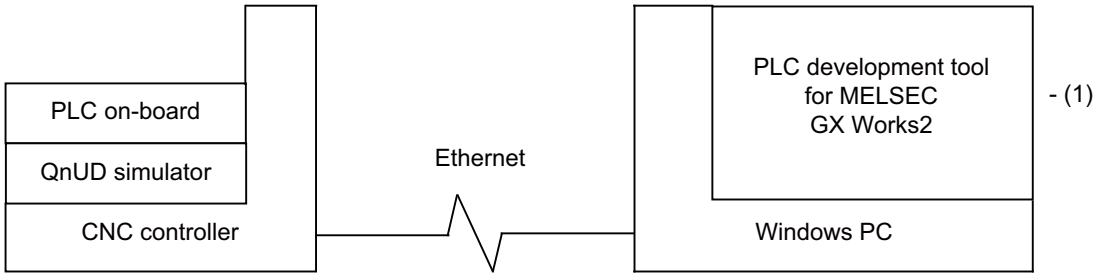
5

Peripheral Development Environment (GX Works2)

5.1 Overview

This CNC supports user PLC development environment using Mitsubishi Electric FA engineering software MELSOFT series (GX Works2), one of the PLC development tools for Mitsubishi Electric PLC MELSEC series.
This manual describes user PLC development environment using GX Works2, centering on specific procedures relevant to Mitsubishi Electric CNC.
For details on user PLC development environment using GX Developer, refer to "4 Peripheral Development Environment (GX Developer)".
GX Developer is installed when GX Works2 is installed.
The following shows the difference between the machine sequence and the user safety sequence.
Machine sequence: Control circuit created to control the machine tools (ladder circuit)
User safety sequence: Control circuit of the safety-related I/O observation created with the smart safety observation function (ladder circuit)
For the smart safety observation function, refer to "M800/M80 Series Smart safety observation Specification manual".

5.1.1 Software Configuration



(1) GX Works2 (PLC development software package)

GX Works2 is a programming software package (model name:SW1DND-GXW2) for Mitsubishi Electric programmable controller MELSEC series. It enables sequence programs for Mitsubishi Electric CNC series to be developed using similar operations to those for MELSEC series. Some of the functions are exclusively for MELSEC series and cannot be used in developing sequence programs for CNC.
GX Works2 Version 1.570U or newer version is recommended for developing sequence programs for Mitsubishi Electric CNC series. For details of the functions, refer to each of "GX Works2 Operating Manuals".

5.1.2 Operating Environment

The tools that make up the development environment can be used with the personal computer that satisfies the following operating environment of GX Works2.
The system requirements shown below are for GX Works2 Version 1.568S. For details on the specifications of different versions, consult GX Works2 Installation Instructions.

Item		Requirement
Personal computer		Personal computer supporting Windows* operating systems
Performance	CPU	Intel* Core 2 Duo processor 2 GHz or higher
	Memory	64 bit OS: 2 GB or larger is recommended 32 bit OS: 1 GB or larger is recommended
Available hard disk space		2.5 GB or larger is required for installation (17 GB or larger is required for installation of GX Works3) 512 MB or larger (virtual memory) is required for operation
Monitor		Resolution of 1024 × 768 pixels or higher
Communication interface		Ethernet port
OS (English version)		-Windows 10 (Home, Pro, Enterprise, Education, IoT Enterprise*1) -Windows 8.1, Windows 8.1 (Pro, Enterprise) -Windows 8, Windows 8 (Pro, Enterprise) -Windows 7 (Starter, Home Premium, Professional, Ultimate, Enterprise) -Windows Vista (Home Basic, Home Premium, Ultimate, Business, Enterprise)*2 -Windows XP (Professional SP3, Home SP3)*2

For details of the system requirements for GX Works3, refer to GX Works3 Installation Instructions.
GX Works3 is only used to display project verification results in ladder diagrams in developing sequence programs for CNC.
*1 32-bit version is not supported.
*2 64-bit version is not supported.

5.2 Types of GX Works2 Projects and Programs Used for Mitsubishi Electric CNC

This chapter describes the types of GX Works2 projects and programs that can be used in developing ladders for CNC controllers.

5.2.1 Support Status of Project Types, Program Types and POUs

The following lists show the project types that can be used in developing ladders for CNC controllers, and the program types and POUs (Program Organization Units) that can be handled in each project type.

The program types marked by ○ can be used in developing ladders for this CNC.

The program types marked by × cannot be used in developing ladders for this CNC.

The difference between machine sequence and user safety sequence is as follows.

Machine sequence: Control ladder to control machine tools

User safety sequence: Control ladder for safety-related I/O observation created by the Smart Safety observation function

List of project types

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
Simple project (without labels)	○	○	○	
Simple project (with labels)	○	○	×	Label function is unavailable for PLC on-board
Structured project	○	○	×	Structured project is unavailable for PLC on-board

(Note) By selecting [Project] - [Change Project Type], simple projects (without labels) can be changed to simple projects (with labels), and simple projects (with labels) to structured projects after they are created. Note that these changes cannot be reverted.

List of program types for simple projects (without labels)

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
Sequence program (without labels)	○	○	○	
List	×	×	○	Editing list for each ladder block is possible
ST	×	×	×	
SFC	×	×	×	

List of POUs for simple projects (without labels)

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
FB	×	×	×	
Structure	×	×	×	
Function	×	×	×	

List of program types for simple projects (with labels)

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
Sequence program (with labels)	○	○	×	Label function is unavailable for PLC on-board
List	×	×	×	Editing list for each ladder block is possible
ST	○	○	×	Inline structured text is unavailable
SFC	×	×	×	

List of POUs for simple projects (with labels)

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
FB	○	○	×	Unavailable for PLC on-board Only one-level nesting is allowed for ladder Up to four-level nesting is allowed for structured text
Structure	○	○	×	
Function	×	×	×	

List of program types for structured project

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
Sequence program (with labels)	○	○	×	Label function is unavailable for PLC on-board
List	×	×	×	Editing list for each ladder block is possible
ST	○	○	×	Inline structured text is unavailable
SFC	×	×	×	
Structured ladder/FBD	×	×	×	

List of POUs for structured project

○ : Supported; × : Not supported

Program type	Machine sequence support	User safety sequence support	Support in GX Developer	Remarks
FB	○	○	×	Unavailable for PLC on-board Only one-level nesting is allowed for ladder Nesting of structured text - Up to four-level nesting is allowed for macro type FB - Up to fifteen-level nesting is allowed for subroutine type FB
Structure	○	○	×	
Function	○	○	×	Available only when inline structured text is selected

5.3 GX Works2 Functions Available for Mitsubishi Electric CNC

This chapter lists the GX Works2 functions that this CNC supports. For details of each function, refer to "GX Works2 Operating Manual (Common)", "GX Works2 Operating Manual (Simple Project)" and "GX Works2 Operating Manual (Structured Project)".

The functions marked by ○ are available for this CNC.

The functions marked by × are exclusively for MELSEC series, and unavailable for this CNC.

The list of device memory functions is omitted because none of the functions is available for this CNC.

5.3.1 Function Support Status (Common Functions)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Project	New		○	○	
	Open		○	○	
	Close		○	○	
	Save		○	○	
	Save As		○	○	
	Compress/Unpack		○	○	
	Delete		○	○	
	Verify		○	○	Verification results can be displayed in ladder diagram on GX Works3.
	Project Revision	Revision Entry	○	○	
		Revision List	○	○	
	Change PLC Type		×	×	
	Change Project Type		○	○	
	Object	New	○	○	
		Rename	○	○	
		Delete	○	○	
		Copy	○	○	
		Paste	○	○	
		Set as Default Connection	○	○	
		Property	○	○	
	Intelligent Function Module		×	×	
	Open Other Data	Open Other Project	○	○	
		Read ASC Format File	×	×	
	Export to GX Developer Format File		○	○	
	Library	Create	○	○	
		Install	○	○	
		Export FB to Library (Project)	○	○	
		Deinstall	○	○	
		Reload	○	○	
		Rename	○	○	
		Open	○	○	
		Close	○	○	
		Change Password	○	○	
		Save As	○	○	
		Save	○	○	
		Help	○	○	
	Security	Change Password	○	○	
		User Management	○	○	
		Data Security Setting	○	○	
		Soft Security Key Management	×	×	
	Print		○	○	
	Print Preview		○	○	
	Print Window		○	○	
	Print Window Preview		○	○	
	Printer Setup		○	○	
	Recently used files		○	○	
	Start GX Developer		○	○	
	Exit		○	○	

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Edit	Undo		○	○	
	Redo		○	○	
	Cut		○	○	
	Copy		○	○	
	Paste		○	○	
Find/Replace	Cross Reference		○	○	
	Device List		○	○	
	Find Device		○	○	
	Find Instruction		○	○	
	Find Contact or Coil		○	○	
	Find String		○	○	
	Replace Device		○	○	
	Replace Instruction		○	○	
	Replace String		○	○	
	Change Open/Close Contact		○	○	
	Device Batch Replace		○	○	
	Register to Device Batch Replace		○	○	
Compile	Build		○	○	Displayed on programming without labels
	Build		○	○	Displayed on programming with labels
	Online Program Change		○	×	Displayed on programming without labels
	Online Program Change		○	×	Displayed on programming with labels
	Rebuild All		○	○	Displayed on programming without labels
	Rebuild All		○	○	Displayed on programming with labels

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
View	Toolbar	Toolbar name	○	○	
		Display All	○	○	
	Statusbar		○	○	
	Color and Font		○	○	
	Docking Window	Navigation	○	○	
		Element Selection	○	○	
		Output	○	○	
		Cross Reference	○	○	
		Device List	○	○	
		Device Reference	×	×	
		Watch	○	○	
		Intelligent Function Module Monitor	×	×	
		Intelligent Function Module Guidance	×	×	
		Find/Replace	○	○	
		Debug	○	○	
		Reset the Window Position to its Default	○	○	
Debug	Start/Stop Simulation		○	○	
	Instructions Unsupported by Simulation		○	○	
	Step Execution	Stop	○	○	
		Cancel	○	○	
		Break Execution	○	○	
		Step Execution	○	○	
		Enter in FB	×	×	
		Exit from FB	×	×	
		Block Execution	×	×	
		Scan Execution	×	×	
		Jump to the Canceled Position	×	×	
		Execution Option	○	○	
	Break Setting	Set/Cancel Break Point	○	○	
		Enable/Disable Break Point	○	○	
		Cancel All Break Points	○	○	
		Break Point Window	○	○	
		Cancel All Break Devices	○	○	
		Break Device Window	○	○	
	Skip Setting	Set/Cancel Skip Range	○	○	
		Enable/Disable Skip Range	○	○	
		Cancel All Skip Ranges	○	○	
		Skip Range Window	○	○	

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Tool	IC Memory Card	Read IC Memory Card	○	○	
		Write IC Memory Card	○	○	
		Read Image Data	○	○	
		Write Image Data	○	○	
		Read from IC Memory Card (Edit + Data Copy)	×	×	
		Write to IC Memory Card (Edit + Data Copy)	×	×	
	Check Program		○	○	
	Check Parameter		○	○	
	Clear All Parameters		○	○	
	Check Device Duplication of Global Label		○	○	
	Device/Label Automatic-Assign Setting		○	○	
	Block Password		○	○	
	Confirm Memory Size		○	△	(*1)
	Merge Data		○	○	
	Set TEL Data/Connect via Modem		×	×	
	Logging Configuration Tool		×	×	
	Ethernet Adapter Module Configuration Tool		×	×	
	Built-in I/O Module Tool		×	×	
	Check Intelligent Function Module Parameter		×	×	
	Intelligent Function Module Tool		×	×	
	Predefined Protocol Support Function		×	×	
	Language Selection		○	○	
	Profile Management		×	×	
	Key Customize		○	○	
	Options		○	○	
Window	Cascade		○	○	
	Tile Vertically		○	○	
	Tile Horizontally		○	○	
	Arrange Icons		○	○	
	Close All		○	○	
	(Switch to other window)		○	○	
	Other Window		○	○	
Help	GX Works2 help		○	○	
	Operating Manual		○	○	
	Connection to MITSUBISHI ELECTRIC FA Global Website		○	○	
	About		○	○	

(*1) While the online calculation is specified, free capacity may not be calculated correctly when the user safety sequence is connected.
For details, refer to "5.5.12 Checking Data Size".

5.3.2 Function Support Status (Label Setting)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Edit	Delete		○	○	
	Select All		○	○	
	New Declaration (Before)		○	○	
	New Declaration (After)		○	○	
	Delete Row		○	○	
	Read from CSV File		○	○	
	Write to CSV File		○	○	
	System Label		×	×	
	Sort	Class	○	○	
		Label Name	○	○	
		Data type	○	○	
		Constant	○	○	
		Device	○	○	
		Address	×	×	
		Comment	○	○	
		Remark	○	○	
	Unused label list		○	○	

5.3.3 Function Support Status (Device Comments)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Edit	Delete		○	○	
	Select All		○	○	
	Import from Sample Comment	Special Relay/Special Register	○	○	
		Intelligent Function Module	×	×	
	Clear All (All Devices)		○	○	
	Clear All (All Displayed Devices)		○	○	
	Read from CSV File		○	○	
	Write to CSV File		○	○	
	Hide Bit Specification Information		○	○	
	Show Bit Specification Information		○	○	
	Cut The Range including Hidden Bit Specification Information		○	○	
	Copy The Range including Hidden Bit Specification Information		○	○	
	Paste The Range including Hidden Bit Specification Information		○	○	

5.3.4 Function Support Status (Ladder Diagram)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Edit	Continuous Paste		○	○	
	Delete		○	○	
	Restore After Ladder Conversion		○	○	
	Insert Row		○	○	
	Delete Row		○	○	
	Insert Column		○	○	
	Delete Column		○	○	
	NOP Batch Insert		○	○	
	NOP Batch Delete		○	○	
	Edit Line		○	○	
	Delete Line		○	○	
	Change TC Setting		○	○	
	Ladder Edit Mode	Read Mode	○	○	
		Write Mode	○	○	
	Ladder Symbol	Open Contact	○	○	
		Close Contact	○	○	
		Open Branch	○	○	
		Close Branch	○	○	
		Coil	○	○	
		Application Instruction	○	○	
		Vertical Line	○	○	
		Horizontal Line	○	○	
		Delete Vertical Line	○	○	
		Delete Horizontal Line	○	○	
		Pulse Contact Symbol	△	△	Rising/Falling Pulse Close Branch (OR) are unavailable
		Invert Operation Results	○	○	
		Operation Result Rising Pulse	○	○	
		Operation Result Falling Pulse	○	○	
	Inline Structured Text		×	×	
	Edit FB Instance		○	○	
	Documentation	Device Comment	○	○	
		Statement	○	○	
		Note	○	○	
		Statement/Note Batch Edit	○	○	
	Easy Edit	Connect Line to Right-Side Symbol	○	○	
		Connect Line to Left-Side Symbol	○	○	
		Enter/Delete HLine Rightward	○	○	
		Enter/Delete HLine Leftward	○	○	
		Enter/Delete VLine Downward	○	○	
		Enter/Delete VLine Upward	○	○	
		Switch Open/Close Contact	○	○	
		Switch Statement/Note Type	○	○	
		Instruction Partial Edit	○	○	
		Edit List for Ladder Block	○	○	
	Read from CSV File		○	○	
	Write to CSV File		○	○	

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Find/Replace	Change Module I/O No.		×	×	
	Switch Statement/Note Type		○	○	
	Line Statement List		○	○	
	Jump		○	○	
	Jump to Next Ladder Block Start		○	○	
	Jump to Previous Ladder Block Start		○	○	
	Next Device		○	○	
	Next Coil		○	○	
	Back		○	○	
View	Comment		○	○	
	Statement		○	○	
	Note		○	○	
	Display Lines of Monitored Current Value		○	○	
	Display Format for Device Comment		○	○	
	Display Ladder Block	Hide Ladder Block	○	○	
		Display Ladder Block	○	○	
		Hide All Ladder Block	○	○	
		Display All Ladder Block	○	○	
	Device Display	Device Display	○	○	
		Batch Device Display	○	○	
		Cancel All Device Display	○	○	
	Display Compile Result		○	○	
	Zoom		○	○	
	Text Size	Bigger	○	○	
		Smaller	○	○	
	Open Other Window	Open Reference Window	○	○	
		Update Reference Window	○	○	
		Open Reference Source Window	○	○	
		Tile FB Horizontally	○	○	
		Open Label Setting	○	○	
		Open Zoom SFC Block	○	○	
	Move SFC Cursor		×	×	
	Open Instruction Help		○	○	

(Note) For details on the sequence program instructions available for CNC, refer to "PLC programming Manual".

5.3.5 Function Support Status (Online)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Online (common function)	Read from PLC		○	○	
	Write to PLC		○	○	
	Verify with PLC		○	○	
	Remote Operation		○	○	
	Redundant Operation		×	×	
	Password/Keyword	New	○	○	
		Delete	○	○	
		Disable	○	○	
	Soft Security Key Management		×	×	
	PLC Memory Operation	Format PLC Memory	○	○	
		Clear PLC Memory	×	×	
		Arrange PLC Memory	×	×	
	Delete PLC Data		○	○	
	PLC User Data		×	×	
	Export to ROM Format		○	×	
	Program Memory Batch Download		×	×	
	Latch Data Backup		×	×	
	PLC Module Change		×	×	
	Set Clock		×	×	
	Register/Cancel Display Module Menu		×	×	
	Monitor	Monitor Mode	○	○	
		Monitor (Write Mode)	○	○	
		Start Monitoring (All Windows)	○	○	
		Stop Monitoring (All Windows)	○	○	
		Start Monitoring	○	○	
		Stop Monitoring	○	○	
		Change Value Format (Decimal)	○	○	
		Change Value Format (Hexadecimal)	○	○	
		Device/Buffer Memory Batch	○	○	
		Program List	×	×	
		Interrupt Program List	×	×	
		Change Instance (Function Block)	○	○	
		SFC All Block Batch Monitoring	×	×	
		SFC Auto Scroll	×	×	
	Watch	Start Watching	○	○	
		Stop Watching	○	○	
		Insert Next Object	○	○	
		Display Format of Bit Device	○	○	
		Register to Watch	○	○	
	Local Device Batch Read + Save CSV		×	×	
Online (Ladder Diagram)	Monitor	Monitor Condition Setting	×	×	
		Monitor Stop Condition Setting	×	×	
		Entry Ladder Monitor	○	○	
		Delete All Entry Ladder	○	○	

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Debug (common function)	Modify Value		△	△	Buffer memory is unavailable.
	Forced Input Output Registration/ Cancellation		×	×	
	Device Test with Execution Condition		×	×	
	Sampling Trace	Open Sampling Trace	○	○	
	Scan Time Measurement		×	×	
Diagnostics (common function)	PLC Diagnostics		○	○	
	Ethernet Diagnostics		×	×	
	CC IE Control Diagnostics		×	×	
	CC IE Field Diagnostics		×	×	
	MELSECNET Diagnostics		×	×	
	CC-Link Diagnostics		×	×	
	Sensor/Device Monitor		×	×	
	System Monitor		×	×	
	Online Module Change		×	×	
Edit (function for verification result)	Write to CSV File		○	○	
Find/replace (function for verification result)	Next Mismatch		○	○	
	Previous Mismatch		○	○	
View (function for verification result)	Return to Result List		○	○	
	Close Detail Result		○	○	
	Close All Detail Result		○	○	
View (function for executing sampling trace)	Result Position	Move to Trigger Point	○	○	
	Switching Display Items	Device	○	○	
		Address	×	×	
		Comment	○	○	
		Data types	○	○	
		Radix	○	○	
	Timing Chart Scale	Narrow Scale	○	○	
		Wide Scale	○	○	
	Trend Graph Scale	Narrow Scale	○	○	
		Wide Scale	○	○	
		Initial Display	○	○	
	Additional Information	Time	○	○	
		Program Name	×	×	
Debug (function for executing sampling trace)	Sampling Trace	Open Sampling Trace	○	○	
		Trace Setting	○	○	
		Start Trace	○	○	
		Stop Trace	○	○	
		Execute Manual Trigger	○	○	
		Register Trace	○	○	
		Forced Execution Registration Effective	×	×	
		Export CSV Data	○	○	
		Read from PLC	○	○	
		Write to PLC	×	×	
		Delete All Data	○	○	

5.3.6 Function Support Status (NC Special Functions)

○: Supported; Δ: Supported with restrictions; ×: Not supported

Function	Menu	Sub-menu	Machine sequence support	User safety sequence support	Remarks
Multi-project			○	×	

5.4 Preparation

5.4.1 Installing Tools

In the PLC development environment for this CNC, the tools are assumed to be used on Windows PC. Install tools for Windows PC.

For details of GX Works2 installation procedure, refer to GX Works2 Installation Instructions.

When GX Works2 is installed, GX Developer is automatically installed as well.

5.4.2 Preparing Ethernet Communication

Prepare Ethernet communication as follows. For details, refer to each instruction manual.

(1) Check the IP address of the CNC unit

(2) Check the setting for prohibiting connection from GX Developer/GX Works2 on the CNC unit

(3) Set the IP address of the personal computer

(4) Connect the Ethernet cable

(5) Set connection destination on GX Works2

5.4.2.1 Checking IP address of CNC unit

Check the IP addresses of the CNC unit. The IP addresses are specified in the following parameters.

Base common parameter	Item	Description	Example
#1926	Global IP address	CNC unit IP address for external sources	192.168.200.1
#1927	Global Subnet mask	Subnet mask of #1926	255.255.255.0

This example uses 192.168.200.1, the initial value after SRAM clear.

5.4.2.2 Checking CNC unit setting prohibiting connection from GX Developer/GX Works2

Check the setting on the CNC unit that prohibits connection from GX Developer and GX Works2. The restriction is set with the following parameter. When the parameter is set in the way that prohibits connection from GX Developer and GX Works2, connection from GX Works2 is blocked.

Base common parameter	Item	Description	Example
#11094	GX Restriction	Select whether to block connection from GX Developer/GX Works2	0: Allow the connection 1: Block the connection

5.4.2.3 Setting IP Address of Personal Computer

Set the IP address of the personal computer that runs GX Works2 within the same range of subnet mask as that of the CNC unit.

In the case of the above mentioned "Confirming IP Address of the CNC Unit", the address should be selected from the range between 192.168.200.1 and 192.168.200.254, excluding 192.168.200.1. When other CNCs and devices are connected to the same network, ensure that their addresses are not used.

5.4.2.4 Connecting Ethernet Cable

Connect the Ethernet cable to the LAN connector on the control unit. When the connector is already used, connect the Ethernet cable to the hub of the device connected.

5.4.2.5 Setting Connection Destination

The connection target must be specified before performing online operations from GX Works2 to the CNC controller.
GX Works2 supports the TCP connection method for Ethernet connection.

- TCP protocol: A connection-mode protocol. Most networks use TCP. TCP is highly reliable (it requests re-transmission when data are lost), but not optimized for timely delivery because of a large volume of communication it handles.

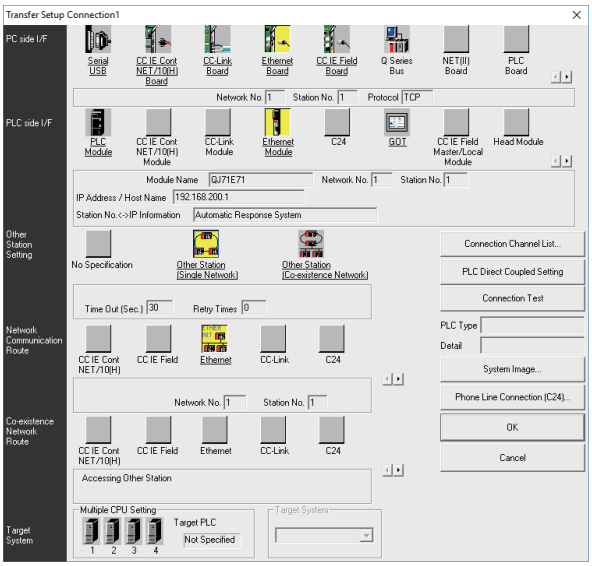
Start the setting screen by the following operation in the navigation window on GX Works2.
Select [Connection Destination], then double-click [Current Connection].

[For the machine sequence]
Set the following items in the order of the list.

Item		Setting	Note
PC side I/F		Ethernet Board	
	Network No.	1	(*1)
	Station No.	1	(*1)
	Protocol	TCP	(*1)
PLC side I/F		Ethernet Module	
	Module Name	QJ71E71	(*2)
	Station No.	1	(*2)
	IP Address	IP address of CNC	(*2)
	IP Input Format	DEC.	(*2)
	Station No. <-> IP information	Automatic Response System	(*2)
Other Station Setting		Other Station (Single Network)	
	Time Out (Sec.)	Arbitrary time (approximately 10 seconds and longer)	(*3)
	Retry Times	0	(*3)
Network Communication Route Detailed setting of Ethernet			
	Access to Ethernet module set on PCL side I/F		(*4)

(*1) Double-click [Ethernet Board] to display the setting item.
(*2) Double-click [Ethernet Module] to display the setting item.
(*3) Double-click [Other Station (Single network)] to display the setting item.
(*4) Double-click [Ethernet] to display the setting item.

■Transfer Setup Connection 1 screen



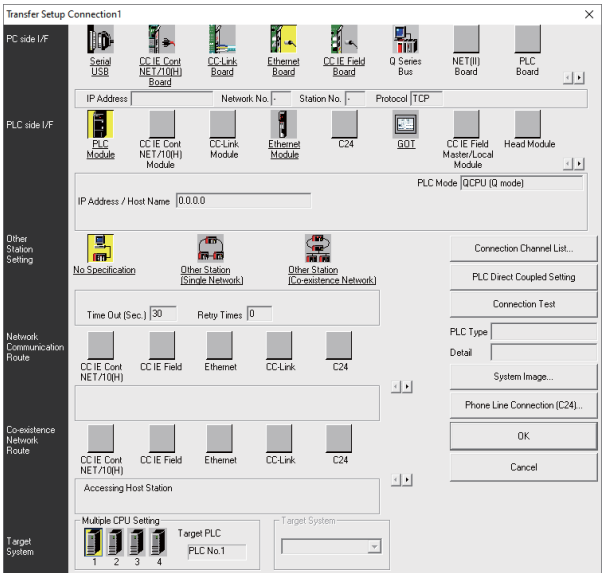
When the above setting is completed, press [Connection Test].
If connection is successful, the message "Connected with Q26UDHCPU" is displayed with the multi-CPU connection status below the message. This indicates the connection status of each project.

[For the user safety sequence]
Set the following items in the shown order.

Item		Setting	Note
PC side I/F		Ethernet Board	
	Network No.	1	(*1)
	Station No.	1	(*1)
	Protocol	TCP	(*1)
PLC side I/F		CPU unit	
	CPU mode	QCPU (Q mode)	(*2)
	Ethernet: direct port connection and connection via hub selection	Connection via hub	(*2)
	IP address	IP address of CNC	(*2)
	IP input format	Decimal	(*2)
Other station setting		No other station specified	
	Check at communication time (sec.)	Arbitrary time (approximately 10 seconds and longer)	(*3)
	Retry times	0	(*3)
Multi CPU designated			
	Select the first machine for the user safety sequence 1. Select the second machine for the user safety sequence 2.		

(*1) Double-click [Ethernet Board] to display the setting item.
(*2) Double-click [Ethernet Module] to display the setting item.
(*3) Double-click [Other Station (Single network)] to display the setting item.

■Transfer Setup Connection 1 screen



After setting the connection, press [Connection Test].
If communication is successful, the message "Connected with Q26UDHCPU" is displayed with the multi-CPU connection status below the message. This indicates the connection status of each project.

5.5 Common Items

5.5.1 Cautions Before Development

Before developing sequence programs using GX Works2, note the following.

⚠ CAUTION

When operating GX Works2, observe the following precautions.

(1) Select PLC type

Set PLC type when creating a new program. When prompted to set PLC type by GX Works2, select the following CPU type. If other types are selected, the transfer of sequence programs to a CNC controller fails with an error.

⚠ CAUTION

Select “Q26UDH” as CPU type.

(2) Set devices

Set the numbers of device points when developing a sequence program for CNC controllers. If a sequence program is developed without setting the values as described later, the sequence program is not transferred to a CNC controller properly.

⚠ CAUTION

Set the number of device points.

(3) PLC instruction

MELSEC-specific PLC instructions cannot be used in developing sequence programs for CNC controllers. The formats of some instructions have been changed.

For details, refer to "PLC Programming Manual".

⚠ CAUTION

MELSEC-specific PLC instructions cannot be used.

(4) Save sequence programs

Sequence programs transferred from GX Works2 or built-in PLC (built-in edit function) to a CNC controller are stored in temporary storage. Data in temporary storage are cleared at power OFF. (The sequence program stored in the ROM in the CNC comes into effect at the next power ON.)

To retain the sequence programs transferred to the CNC controller after the next power ON, write them to the ROM in the CNC

⚠ CAUTION

Sequence programs not saved in the ROM in the CNC are not retained after power OFF.

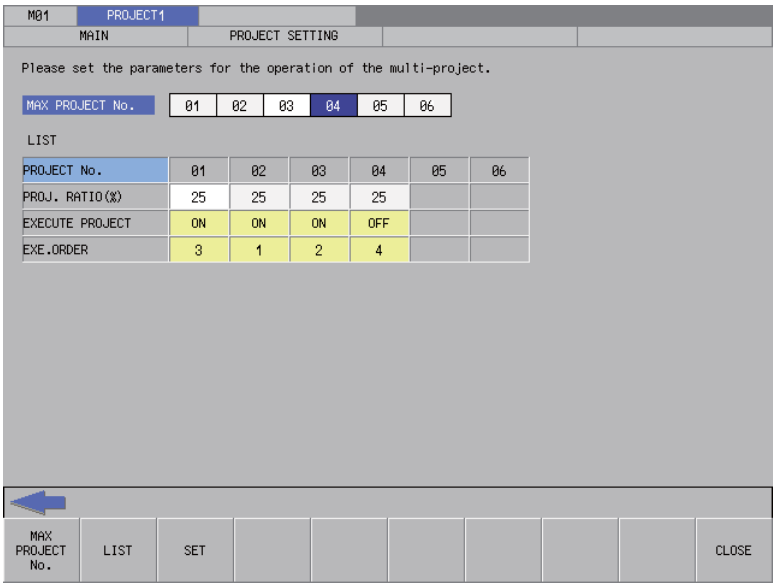
5.5.2 Multi-Project Function

Multiple-CPU system configuration of MELSEC PLC is implemented in CNC. This function divides a project by machine sequence to manage and start multiple devided projects independently on one CNC. For details, refer to "PLC Programming Manual".

The multi-project function is not available for the user safety sequence.

5.5.2.1 Setting Multi-Project

To enable multi-project, set the multi-project setting parameters as follows and restart the CNC.

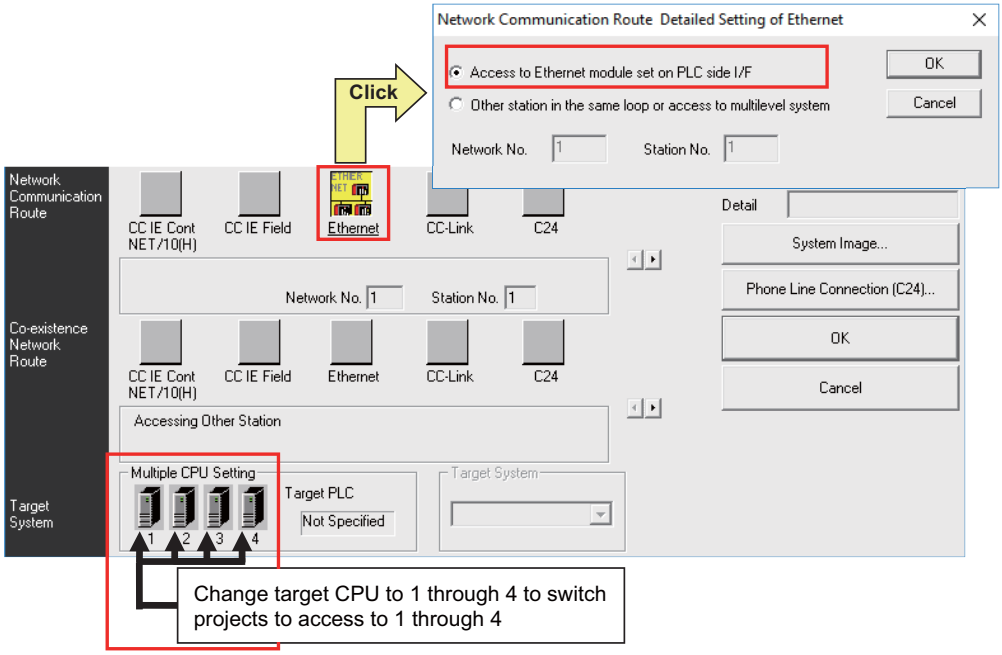


5.5.2.2 Switching Projects to Access

Set which projects in the CNC to access. If not set, the access destination is project 1.
The number of projects that GX Works can connect to depends on the setting of Multi-project parameter "Maximum project No. parameter".

(1) How to connect to projects 1 to 4
The figure below shows how to connect to projects 1 to 4.

Screen for selecting connection target



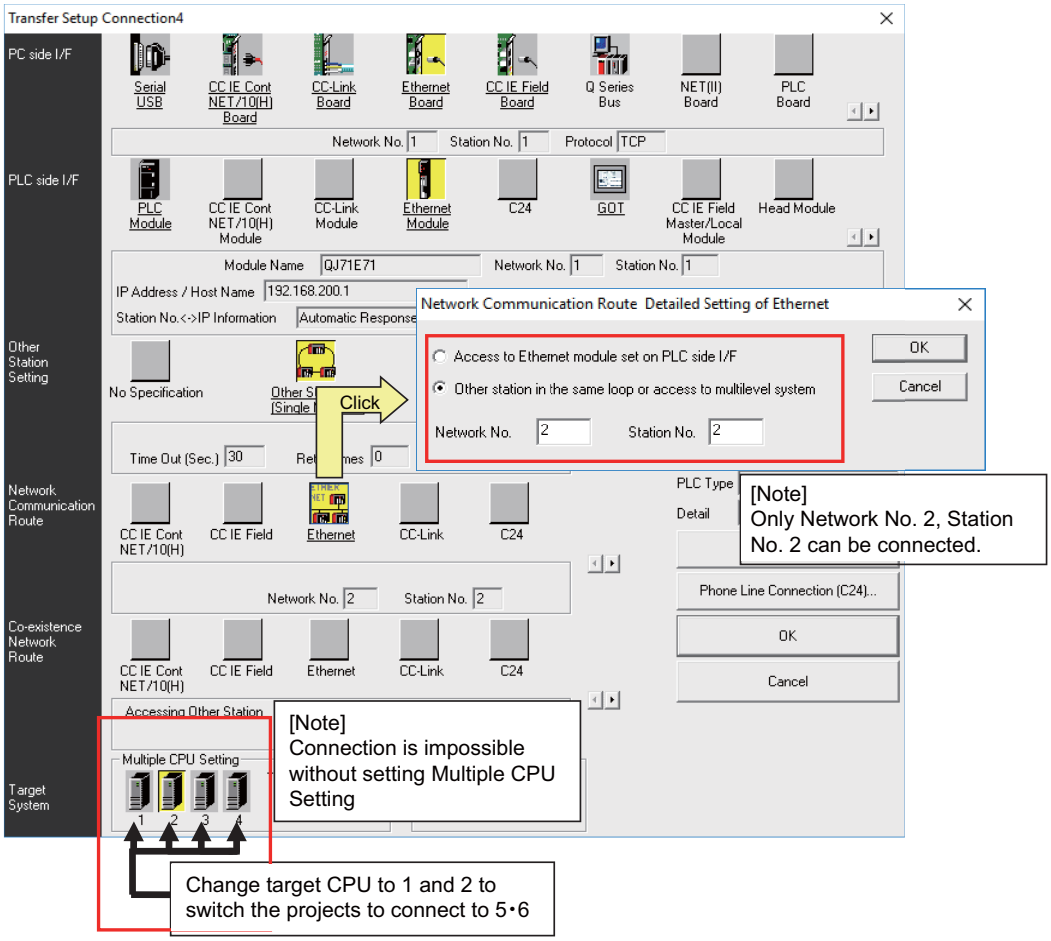
Setting items		Setting details	Remarks
Network Communication Route		Ethernet	
	Access to the Ethernet module specified on PCL side I/F		(Note)
Multiple CPU Setting			
	CPU 1 to 4	Switch to multi-project 1 to 4	

(Note) Double-click [Ethernet] to display the setting item.

(2) How to connect to projects 5 and 6

The figure below shows how to connect to projects 5 and 6.

Screen for selecting connection target

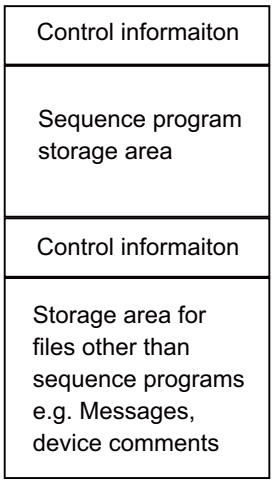


Setting items			Setting	Remarks
Network Communication Route			Ethernet	
	Access to other stations in the same loop or multi-tier system			(Note)
		Network No.	2	
		Station No.	2	
Multiple CPU Setting				
	CPU 1 and 2		Switch to multi-project 5 and 6	

(Note) Double-click [Ethernet] to display the setting item.

5.5.3 PLC Data Storage Area

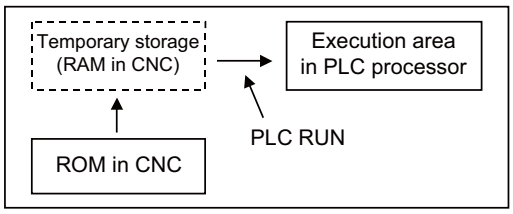
M8 series CNC stores PLC data in the ROM in CNC. The the storage is configured as follows.
(Refer to "PLC Programming Manual" for data area configuration and size.)
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".



5.5.3.1 Executing Sequence Program

When executed, a sequence program transferred from GX Works2 or built-in PLC (built-in edit function) is processed as follows.

(1) At the power ON
Data are transferred from the ROM in the CNC to the execution area in the PLC processor via temporary storage (RAM in the CNC) before being executed.

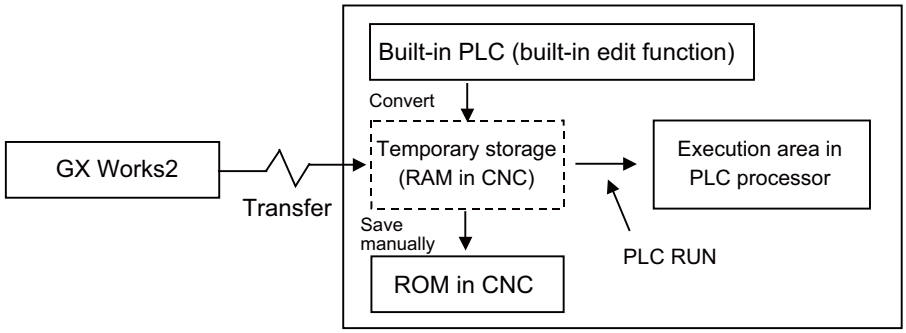


The mode that prevents PLC RUN from being executed can be activated by the following operation.
- Set the rotary switch 2 on the CNC unit to "1" (default is "0").

(2) During PLC development

PLC data transferred from GX Works2 or built-in PLC (built-in edit function) are first stored in the volatile RAM for temporary storage. After transferred to the execution area in the PLC processor prior to PLC execution, the sequence program is executed.

The PLC data in temporary storage (RAM in CNC) are not retained after the CNC is powered OFF. To retain the PLC data after power OFF, write the data to the ROM in the CNC (refer to "Writing Sequence Programs to ROM in CNC").



When a sequence program is transfered from the temporary storage area to the execution area, the program execution format is converted to that of the sequence program. Although the execution area of the PLC processor has twice the capacity of the temporary storage area, PLC cannot be executed if the capacity exceeds the allowable range. When the PLC cannot be executed, reduce the number of steps of the sequence program.

5.5.3.2 Relationship between Areas in CNC and Storage Areas Selectable on GX Works2

This subsection describes the relationship between PLC data storage area in the CNC and the storage area selectable on GX Works2.

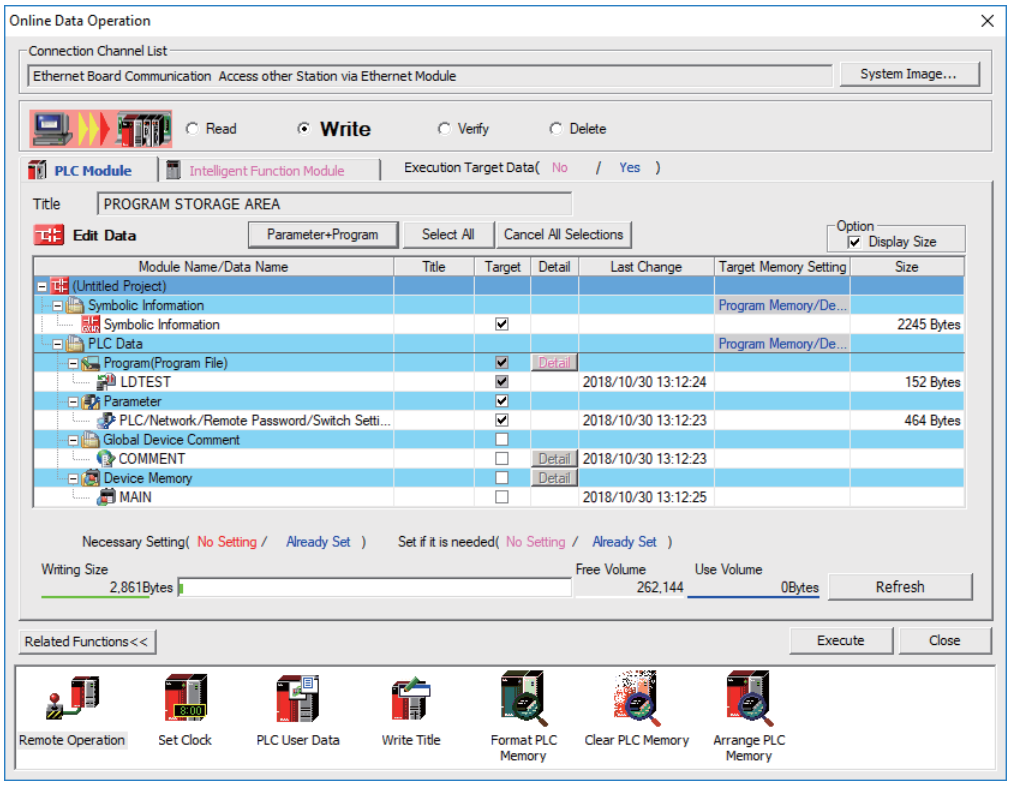
For details on what data can be stored in which area, refer to "PLC Programming Manual".

PLC data that can be saved from GX Works2	Memory selectable on GX Works2	PLC data storage area in CNC
Sequence programs Parameters	Program memory/device memory	Sequence program storage area/ Temporary storage (RAM in CNC)
Device comments PLC messages Symbolic information (*1)	Program memory/device memory Memory Card (SRAM)	Data storage area/ Storage area (ROM in CNC)

(*1) Files written to CNC when simple projects (with labels) or structured projects are used.

5.5.3.3 Displaying Storage Area on GX Works2

The storage area available for the online functions can be specified as [Target Memory Setting] on each of the operation screens in GX Works2. Select [Program Memory/Device Memory] when not checking the available space and the number of steps for execution. When checking the available space in data storage area, select [Memory card(SRAM)]; when checking the number of steps for execution, select [Standard RAM].



Click [Refresh] to display the available space in the area selected as [Target Memory Setting].

When [Target Memory Setting] is Program Memory/Device Memory:
The available space in storage area for sequence programs is displayed
When [Target Memory Setting] is Memory card (SRAM):
The available space in storage area for data is displayed

This table shows the relationship between the [Target Memory Setting] items and storage areas.

Target Memory Setting	Meaning in M8 series	Available space display
Program Memory/ Device Memory	Sequence program storage area (temporary storage (RAM in CNC))	Available space: available space in storage area for sequence program
Memory card(SRAM)	Data storage area (storage area (ROM in CNC))	Available space: available space in storage area for data
Memory card(Flash)	Not used (Not selectable)	
Memory card(ATA)	Not used (Not selectable)	
Standard RAM	Check number of steps for execution	Not used
Standard ROM	Not used (Not selectable)	

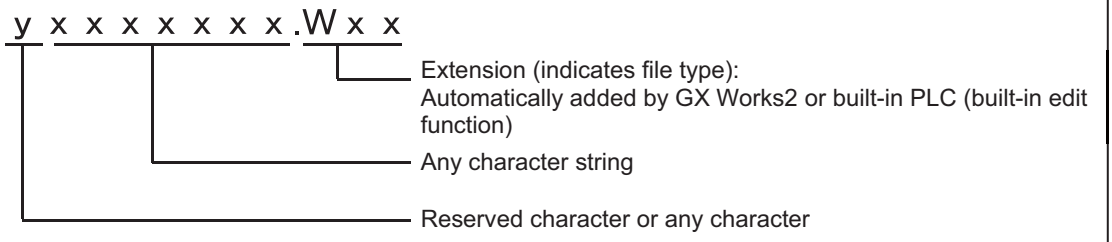
5.5.4 File Name

PLC-related data such as sequence programs and message data are managed and stored in categories inside this CNC as shown below. These data are also developed under each category.

> **⚠ CAUTION**
>
> **Observe the following naming conventions for data files. Transferring data not adhering to these guidelines may confuse the CNC and lead to unintended results such as erasing sequence programs.**

5.5.4.1 Naming Conventions for Sequence Programs, Parameters, and Device Comment Files

File naming conventions (sequence programs, parameters, device comments)



When saving data on GXWorks2 or on built-in PLC (built-in edit function), differentiate the data type with the file name. A file name can be up to 8 characters long and can contain half-width alphanumeric characters, hyphens (-), and underscores (_) (excluding extensions). The extension is automatically added to indicate the file type.
The first one character may be reserved to indicate the data type.

Note 1: Reserved file name
If the first character of the file name is the following, the file name is reserved by the CNC.
・H
Do not use the file name in this combination.

Note 2: File name of structured project
Files of structured project are named their program file name, not names of POUs (program blocks).
When you input a reserved character or numeric characters, rename the program file.

List of sequence programs, parameters, and device comments

	Data category	Data type	File name	Storage quantity	Remark
1	Sequence program *4	High-speed process	H+[Any character string].WPG	120 in total *2	Execution type (Scan) *1
		Main process	[Any character string].WPG		Execution type (Scan) *1
		Initialization process	[Any character string].WPG		Execution type (Initial) *1
		Standby process	[Any character string].WPG		Execution type (Standby/Low-speed) *1
2	Parameter	PLC parameter	PARAM.WPA (fixed)	6 *2	One data item per project can be stored
		Network parameter			One data item per project can be stored
3	Device comment	Common comment	COMMENT.WCD (fixed)	80 in total *2,*3	Common to all sequence programs
		Comment by program	[Any character string].WCD		For sequence program of same name

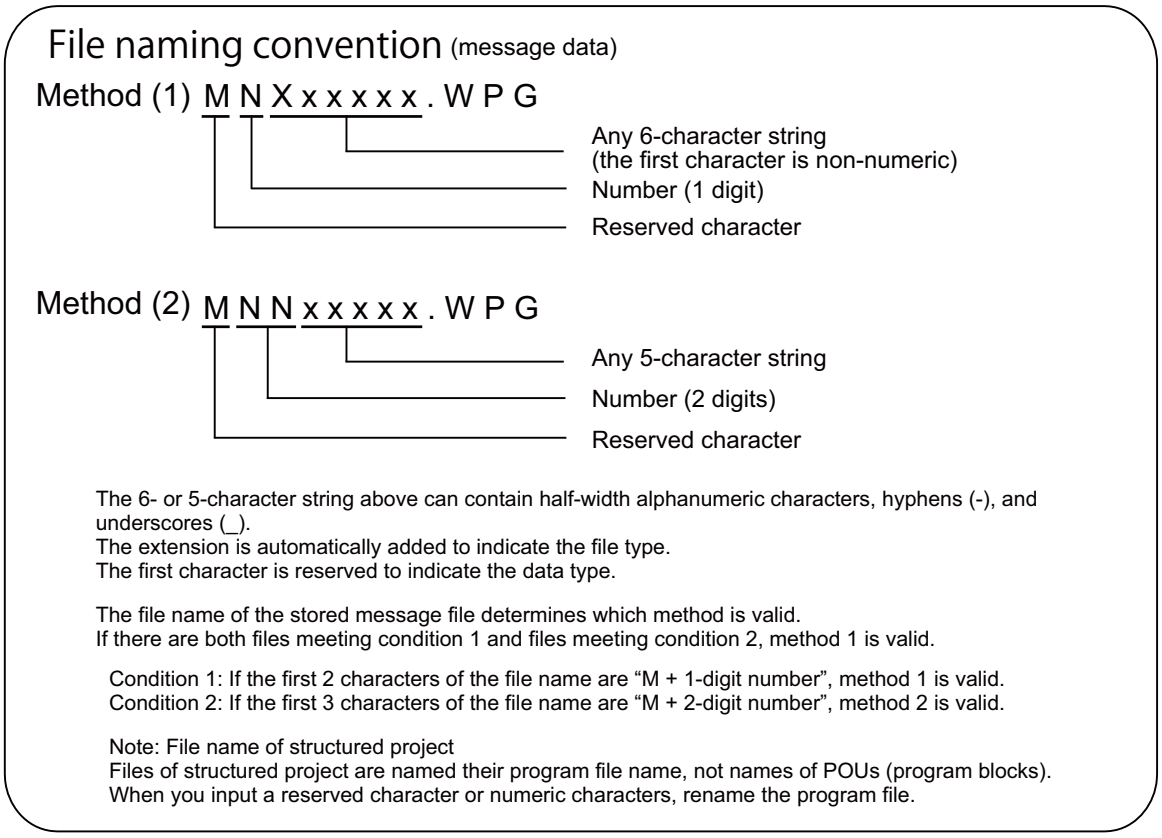
"Any character string" means a string of up to 8 half-width alphanumeric characters, hyphens (-), and underscores (_).
*1: Execution type is a type of sequence program operation specified by parameters.
*2: The total number of projects when the multi-project function is active.
*3: The total number of files for device comments, messages, and symbolic information.
*4: Reserved words cannot be used in file names of data with labels.

5.5.4.2 File Name Rule for Message Data

There are two types of file naming conventions for message data, depending on the method for specifying the language. Although either method can be selected, method (2) is recommend, as it works with the language specification for the setting display screen.

Method (1): Specify the language by three bits (bit 0-2) of Bit selection parameter #6453 (language selection method when using PLC on its own)

Method (2): Specify the language by the display language selection parameter (Base specifications parameter #1043) (language selection method that works with the setting display screen)



(1) Method 1

Language is selected by three bits (bit 0-2) of Bit selection parameter #6453; the number corresponds to the number in the message file name.

List of message file names in method 1

Data category	Bit selection parameter #6453 bit0-2	Data type *1	File name	Storage quantity	Remark
Message (Method 1)	0	1st language	M1Xxxxxx.WPG	One for each language 80 in total *2	Multiple files of the same language number cannot be stored even if the file names are different. If an attempt is made to save a file of the same language number, a dialog prompting for overwrite confirmation is displayed.
	1	2nd language	M2Xxxxxx.WPG		
	2	3rd language	M3Xxxxxx.WPG		
	3	4th language	M4Xxxxxx.WPG		
	4	5th language	M5Xxxxxx.WPG		
	5	6th language	M6Xxxxxx.WPG		
	6	7th language	M7Xxxxxx.WPG		
	7	8th language	M8Xxxxxx.WPG		

*1: The “Xxxxxx” in a file name is a string of up to 6 half-width alphanumeric characters, hyphens (-), and underscores (_). The third character X must be a non-numeric character (to avoid being confused as method 2).

*2: When the multi-project function is active, one file per language can be stored for each project.

The total number of projects when the multi-project function is active.

The total number of files for device comments + messages + symbolic information.

(2) Method 2

Language is selected in the language parameter #1043 for the setting screen display; the number corresponds to the 2-digit number in the message file name.

When the message file corresponding to the language parameter is not stored, the file for alphabet display (M00xxxxx.WPG) is referred to as the substitute file. Ensure that the message data file for alphabet display is stored.

List of message file names in method 2

Data category	Language parameter (Base specifications parameter #1043)	File name	Number of files storable	Remark
Message (Method 2)	0 (English) [mandatory]	M00xxxxx.WPG	One file per language: 80 in total *1	When there is no message file corresponding to the language parameter, the file for alphabet display (M00xxxxx.WPG), if stored, is referred to as the substitute file. Multiple files of the same language number cannot be stored even if the file names (xxxxx) are different. If an attempt is made to save a file of the the same language number, a dialog prompting for overwrite confirmation is displayed.
	1 (Japanese)	M01xxxxx.WPG		
	11 (German)	M11xxxxx.WPG		
	12 (French)	M12xxxxx.WPG		
	13 (Italian)	M13xxxxx.WPG		
	14 (Spanish)	M14xxxxx.WPG		
	15 (Traditional Chinese)	M15xxxxx.WPG		
	16 (Korean, Hangeul)	M16xxxxx.WPG		
	17 (Portuguese)	M17xxxxx.WPG		
	18 (Dutch)	M18xxxxx.WPG		
	19 (Swedish)	M19xxxxx.WPG		
	20 (Hungarian)	M20xxxxx.WPG		
	21 (Polish)	M21xxxxx.WPG		
	22 (Simplified Chinese)	M22xxxxx.WPG		
	Other than above; up to 99	The message for the corresponding number is displayed if exists. Otherwise, English (M00xxxxx.WPG) is displayed.		
	Other than above; 100 or greater	English (M00xxxxx.WPG) is displayed.		

*1: When the multi-project function is active, one data item per language can be stored for each project.
The total number of projects when the multi-project function is active.
The total number of files for device comment + message + symbolic information.

(3) Caution

- If the third character in the name of a stored file is a numeric character, the file may be recognized as method 2 (display language selection parameter), even if it is an existing method 1 file for old models.
  (e.g.) M1720V02.WPG, M750MESS.WPG, M65S-MES.WPG

- If file names contain the same number, the files are recognized as identical and overwritten even if the names contain different strings.
  (e.g.) M1TEST.WPG and M1JAPAN.WPG; M00ENG01.WPG and M00ENG02.WPG

- If the methods are different, files of similar file names are not recognized as identical, and not overwritten. If there are both files meeting method 1 and files meeting method 2, method 1 is valid.
  (e.g.) M1TEST.WPG and M01TEST.WPG; M1JAPAN.WPG and M01JAPAN.WPG

- Files not meeting condition 1 or condition 2 are not recognized as message files. They are recognized as sequence program (ladder) files.
  (e.g.) M0TEST.WPG, M9MESS.WPG, M0-1TEST.WPG, M-01JPN.WPG, MM00ENG.WPG

- If reserved characters are used in the name of data file with labels, a compilation error occurs. Include at least one non-numeric character in xxxxx.
  (e.g.) M00.WPG, M11000.WPG, M295.WPG, etc.

5.5.5 Creating Project

In GX Works2, PLC-related data such as sequence programs and message data are handled in units called "project". This section describes how to create project.

5.5.5.1 Project

A project is an assembly of sequence programs, device comments, PLC message data, and parameters. Those data are usually managed in project units organized by model or by version.

(1) Overview of project

For the overview of project, refer to the following.

- Overview of simple project
- Overview of structured project

(2) One project per GX Works2

Only one project unit can be edited on one GX Works2. When editing more than one project, start GX Works2 additionally.

(3) Device comment

Comment type	Number of comments that can be created	Description
Global device comment	1	Device comment common to programs in a project
Language device comment	Same as the number of programs	Device comment set for each program. Set the same name as program name.

(4) The number of ladder files and PLC message files that can be handled in one GX Works2 project

Up to 124 ladder files and PLC message files in total can be handled in one project on GX Works2. (When an attempt is made to create the 125th file, an error occurs, and a file is not created.)

To handle more than 125 ladder files and PLC message files in total, perform either of the following operations for development.

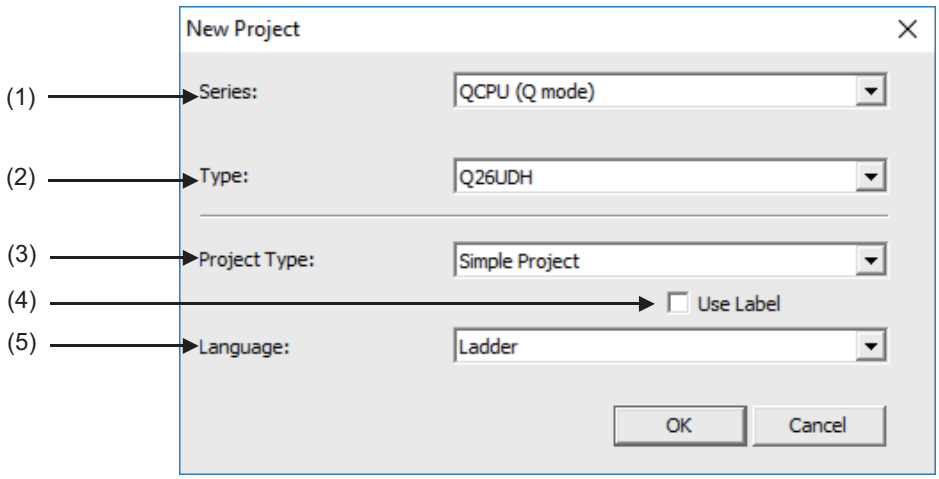
- Create and manage a PLC message-dedicated project apart from sequence programs.
- Use the multi-project function to reduce the number of files per project to 124 or fewer.

5.5.5.2 Operating Procedures

Start the operation screen by the following operation on GX Works2.

[Project] -> [New]

Set the PLC series, PLC type, and project name, which are required to create a new project, in the following window.



Set the following items, and press [OK] in the "New Project" window.

(1) Series

Set the series name of the PLC (Programmable controller). Select "QCPU (Q mode)" here.

(2) Type

Set the type of the PLC. Set "Q26UDH" here.

(3) Project type

Set the project type. To create a sequence program (without labels), select "Simple Project".

To create a sequence program (with labels), select "Simple Project" or "Structured Project".

(4) Use Label

To create a sequence program (with labels), check the "Use Label" checkbox.

To use function blocks and labels, check the "Use Label" checkbox.

(Note) Even when labels are used, the built-in PLC (built-in edit function) displays an unlabeled actual ladder (ladder with labels and functional blocks compiled).

When "Structured Project" is selected, this setting becomes non-selectable. (Labels are used by default.)

(5) Language

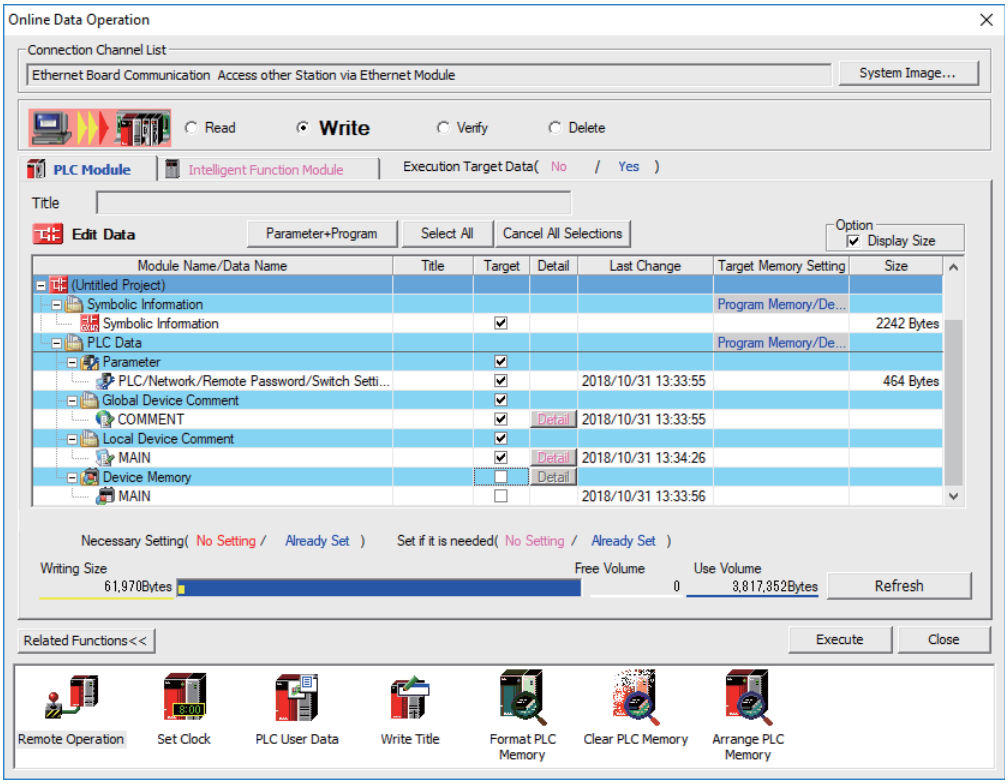
Set the programming language. To create a sequence program (without labels, with labels), select "Ladder".

5.5.6 Writing Data to CNC Controller

To operate on the CNC controller the data created and edited by GX Works2, write them to the CNC controller.
This section describes how to write data to the CNC controller.
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

(1) Start the operation screen by the following operation on GX Works2.
[Online]->[Write to PLC]

(2) Select the files to write, and click [Execute] on the following screen.
(i) To write individual files, select files to be written.
(ii) To write parameters and sequence programs, click [Parameter+Program].
(iii) To write all files, click [Select All].



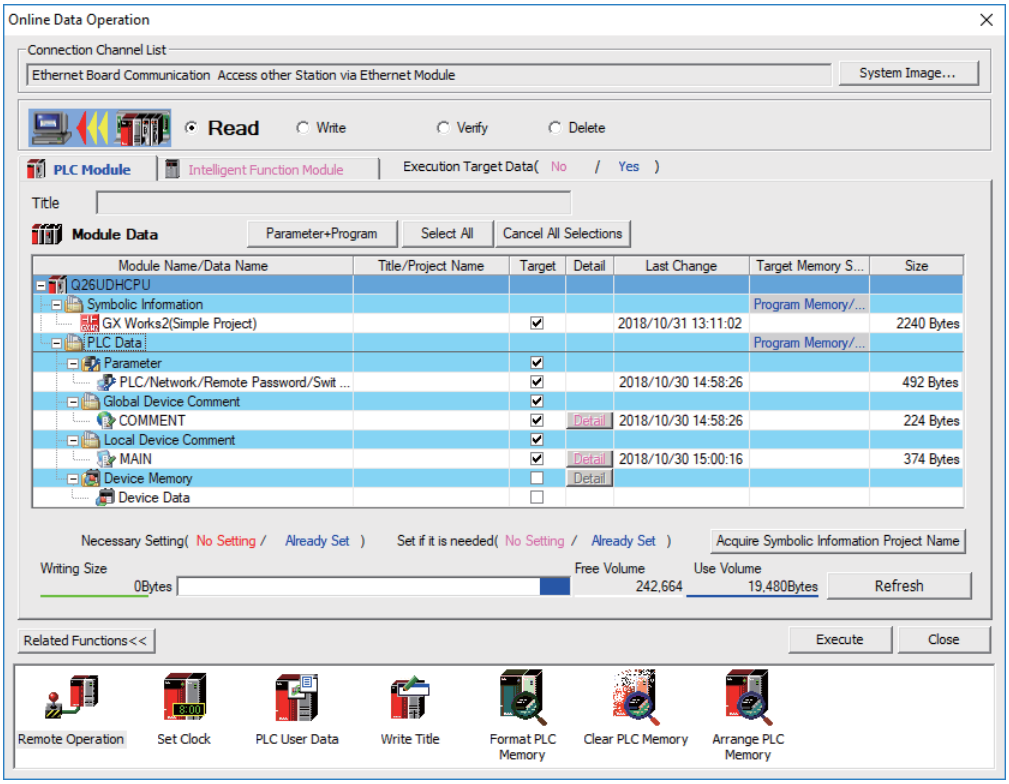
(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].
(Note2) Uncheck the Device Memory checkbox as device memory cannot be written to the CNC controller.
(Note3) When an attempt is made to write sequence programs after unchecking parameter during PLC RUN, the message "PLC is running. Do you want to force write of the files?" is displayed.
The CNC can only write during RUN from the [Compile] menu; when [Yes] is clicked, writing sequence programs fails with an error message. When [No] is clicked, the message "Do you want to write to PLC after remote stop?" is displayed; click [Yes].

5.5.7 Reading Data from CNC Controller

Read data in the CNC controller to GX Works2 to edit them.
This section describes how to read data from the CNC controller.

(1) Start the operation screen by the following operation on GX Works2.
[Online]->[Read from PLC]

(2) Select the file to be read on the following screen, and click [Execute].
(i) To read individual files, select files to be read.
(ii) To read parameters and sequence programs, click [Parameter+Program].
(iii) To read all files, click [Select All].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].
(Note2) Device memory is not written on the CNC controller. Uncheck the Device Memory checkbox.

5.5.8 Setting the Parameters

Set GX Works2 parameters when developing sequence programs for the CNC controller on GX Works2. This section describes the items that require parameter settings. For details of each setting item, refer to "GX Works2 Operating Manual (Common)".

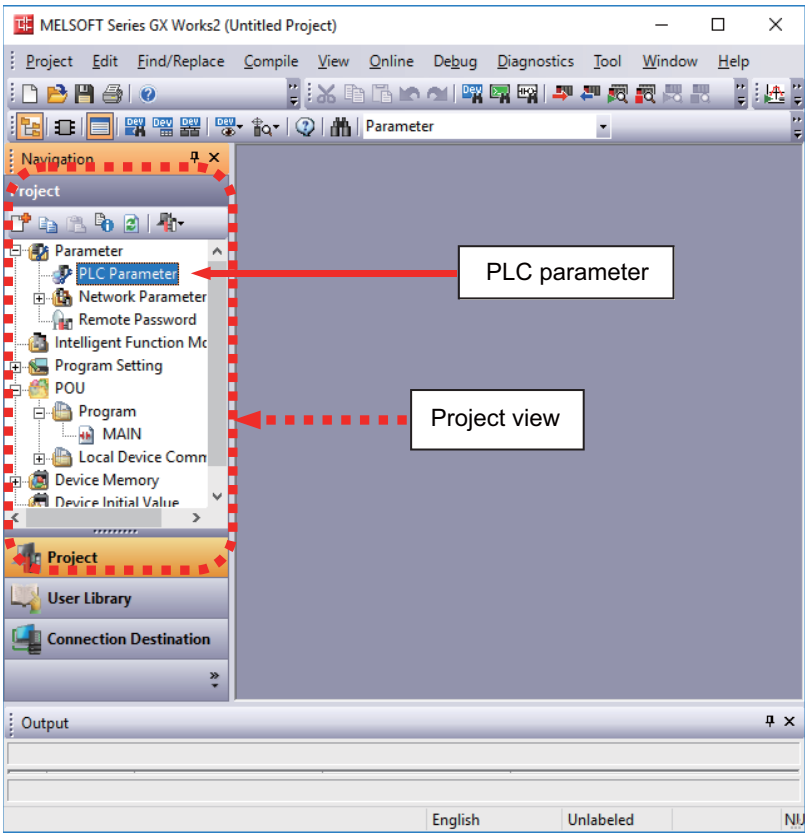
- Device points
- Common Pointer No.
- Program executing order
- Labels/comments of project

5.5.8.1 Parameter Setting Screen

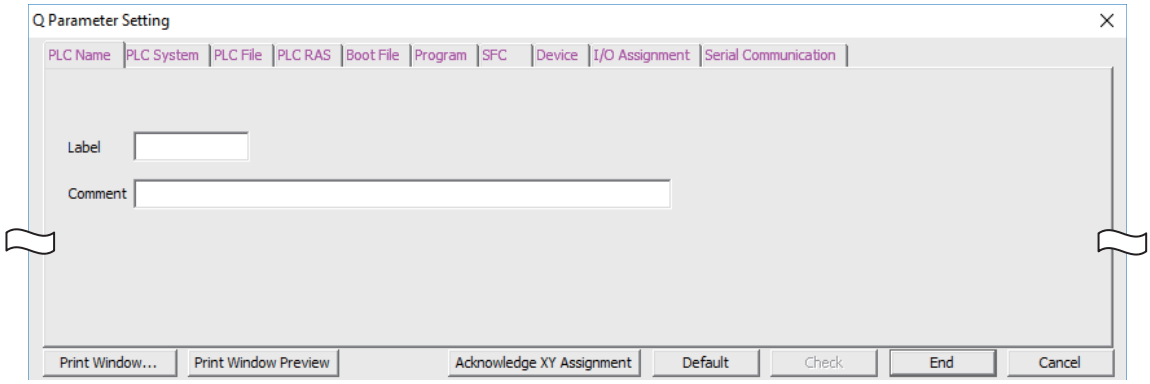
(1) Displaying parameter setting screen

To open the parameter setting screen, display the project view on the navigation window by the following operation. Expand the tree by double-clicking [Parameter], and double-click [PLC Parameter].

[Project] -> Double-click [Parameter] -> Double-click [PLC Parameter]



The above operation opens the following parameter setting screen. Tab names in red indicate that the initial values are set.



5.5.8.2 Setting the Number of Device Points

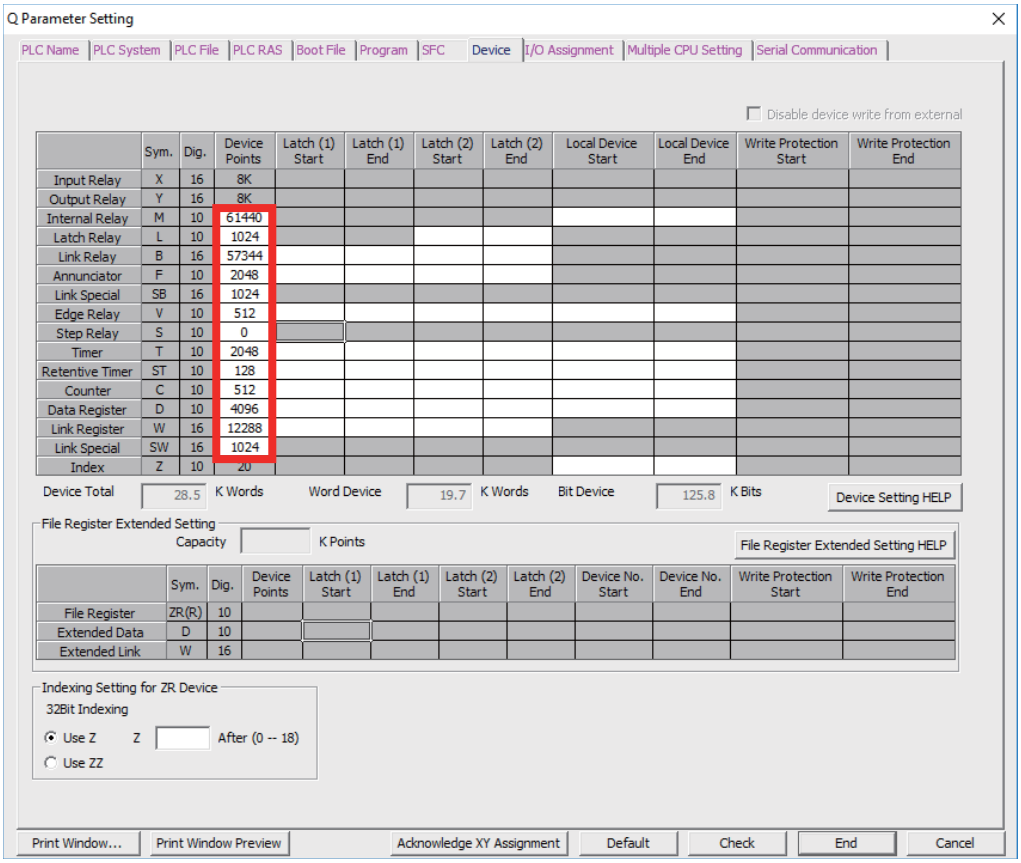
After creating an area (project) to manage sequence programs, set the number of the device points used in the project.
This operation is required every time a new project is created.
For details on each setting item, refer to the "PLC Programming Manual".
(Note) Without this operation, an error occurs when sequence programs are downloaded to the CNC controller.

(1) Select the Device tab.

Populate the device points in the parameter with the numbers of device points + common points that are set on the device setting screen in built-in PLC (built-in edit function). Setting wrong device points incurs an error. The range of devices that can be used in each project varies in multi-project environment.

(2) Enter the device points, and click [End] on the following screen.

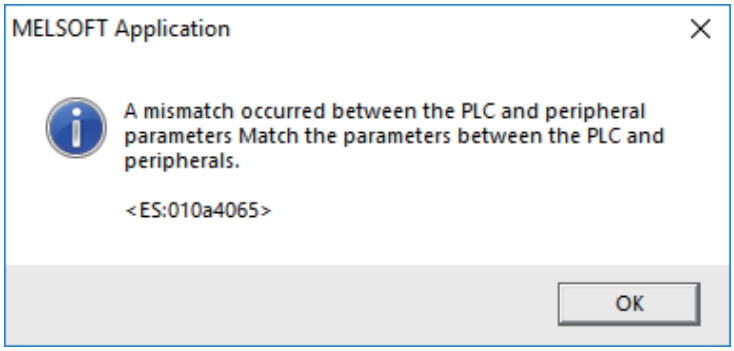
Enter the number of devices in the project currently connected to inside the red line indicated in the figure below.
When all device points are set, press [End] to end editing.



(Note) If the wrong number is set, downloading to the CNC controller fails with an error.

If the set values for devices are illegal

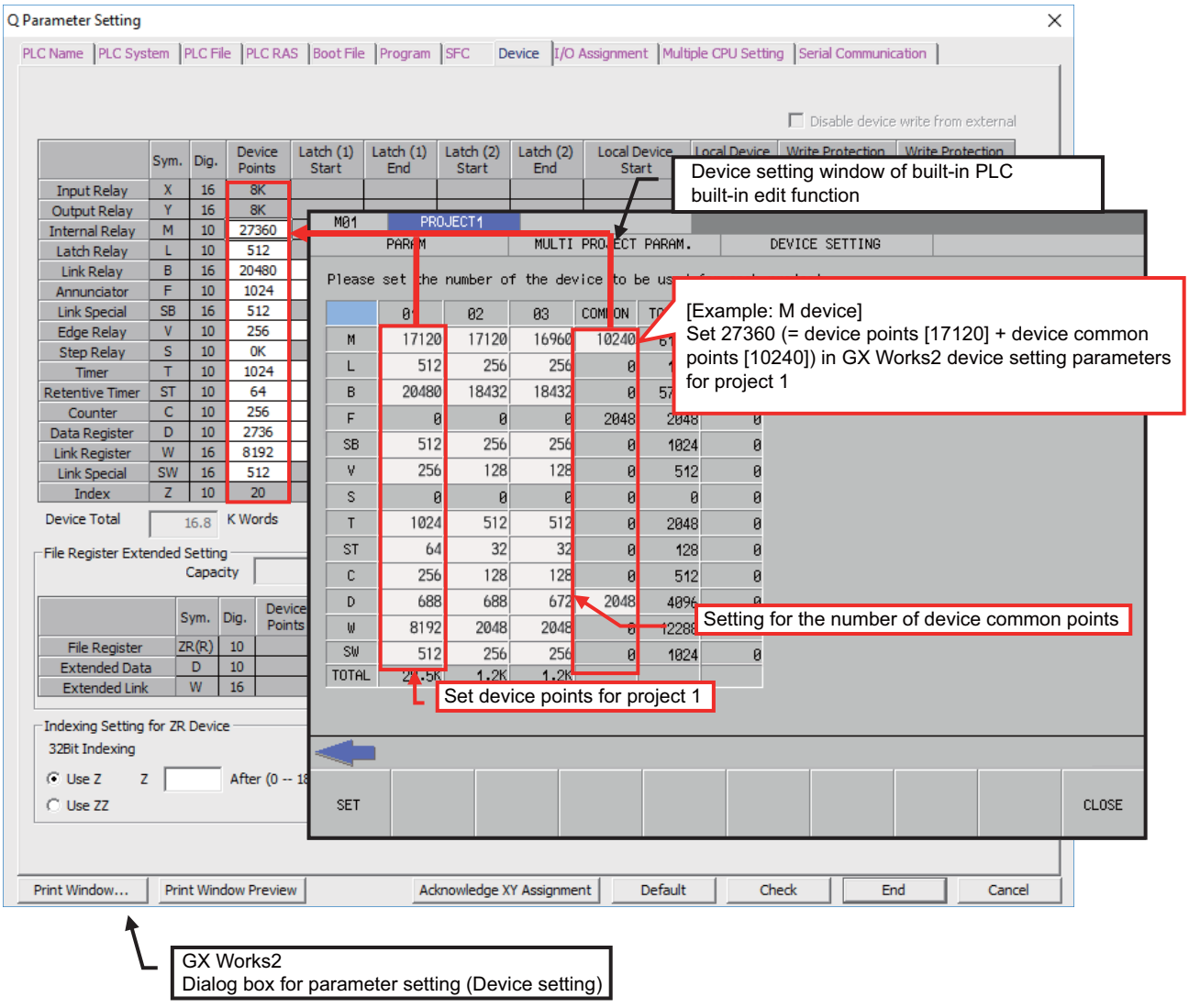
When the set values for devices are illegal, the following error dialog is displayed when sequence programs are written to a CNC controller. In this case, set the device points as described above.



Example of device point setting (project 1)

An example of project 1 device point setting is shown below.

Populate the device setting parameter of GX Works2 with the sum of device points and device common points of project 1 set in built-in PLC (built-in edit function) as this example shows.



5.5.8.3 Setting Common Pointer No.

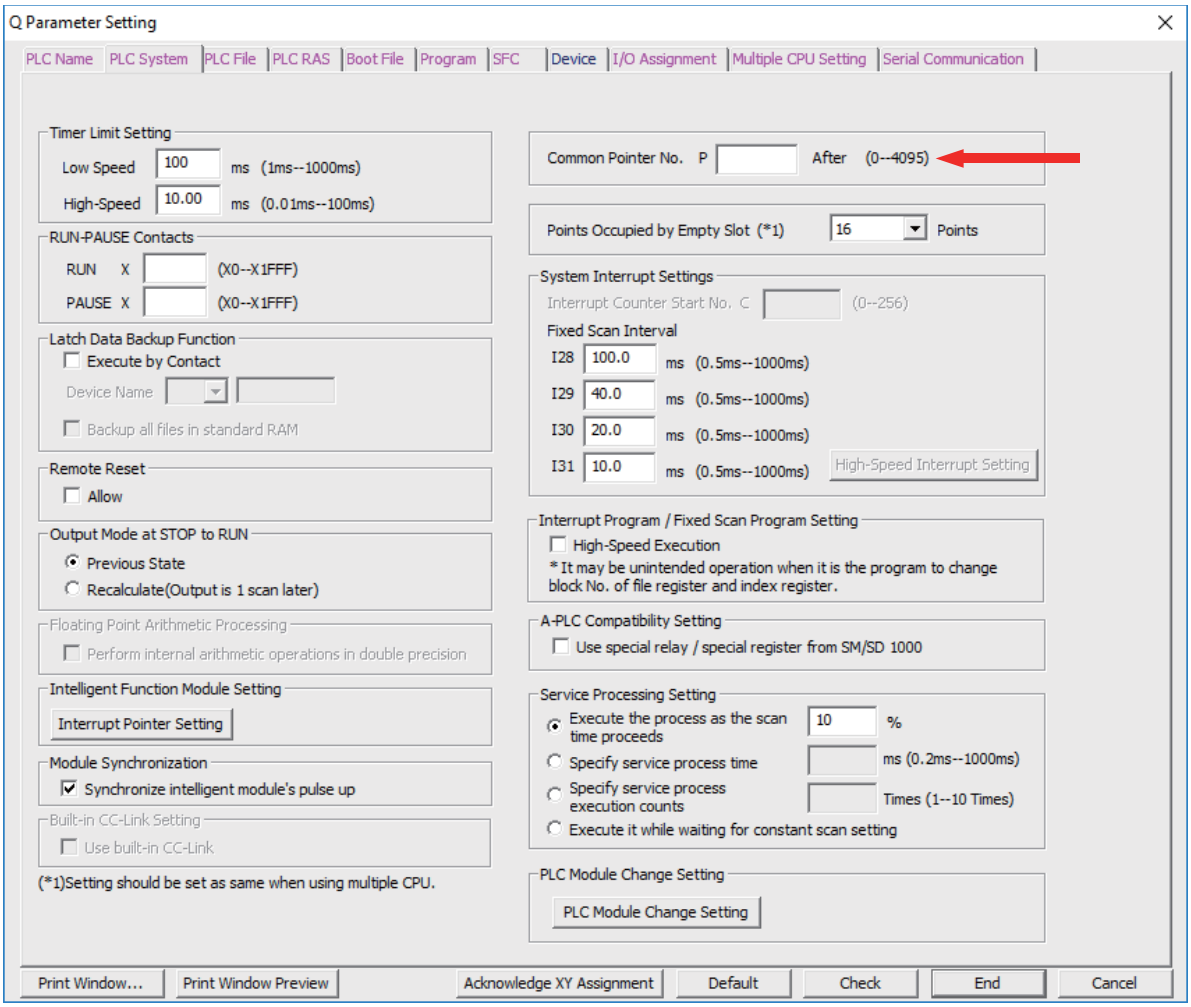
Set the pointer No. common to sequence programs when creating sequence programs in multi-program method. This operation is required every time a new project is created, and parameter files must be written to the CNC controller.

(Note) When not set, Common Pointer No. is set as P1800.

When a simple project (with labels) or a structured project is newly created, or when "Project Type" is changed to any of the said project, "2048" is automatically set to "Common Pointer No." as the default value if its setting has been blank.

(1) Select the PLC System tab.

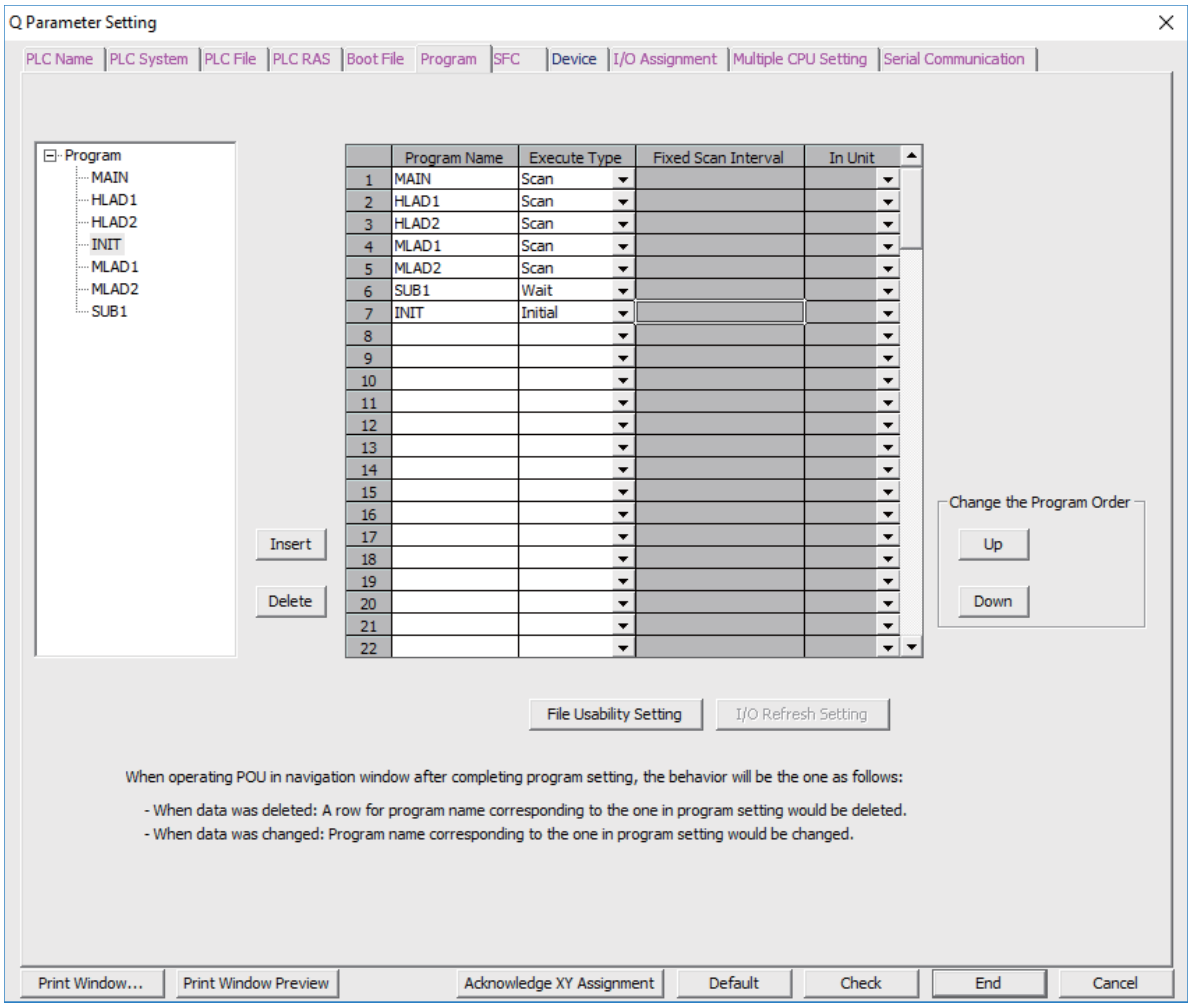
(2) Set a numeric value in [Common Pointer No.], and click [End] on the following screen.



5.5.8.4 Setting Program Executing Order

When creating sequence programs in multi-program method, set the execution method and execution order of sequence programs. This operation is required before a sequence program is executed on the CNC controller, and parameter files must be written to the CNC controller.
(Note) Without this operation, an error occurs on the RUN of sequence programs when multi-program method is in use.

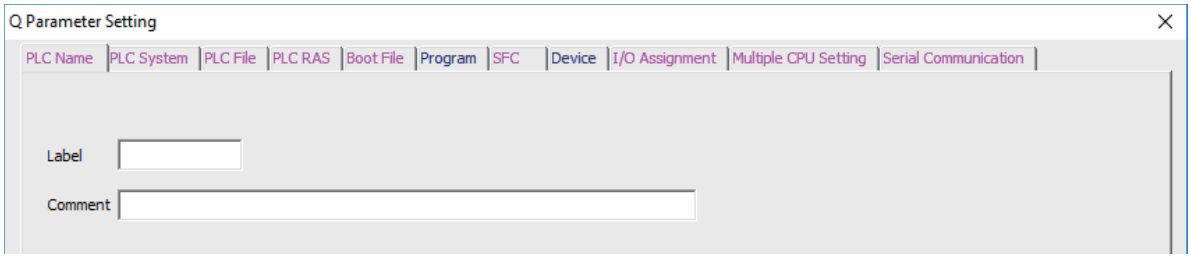
(1) Select the Program tab.
(2) Select the name of the sequence program to be registered for execution from the program list on the left side of the following screen, and press [Insert]. Select the execution mode from the registered program list on the right side.
(3) After registering all sequence programs to execute, click [End].



5.5.8.5 Setting Labels and Comments to Each Project

Labels and comments can be set for each project for clarification of the functions of the programs running on a project. Labels and comments can be set using GX Works2 or built-in PLC (built-in edit function).

(1) Select the PLC Name tab
(2) Input labels and comments, and click [End].



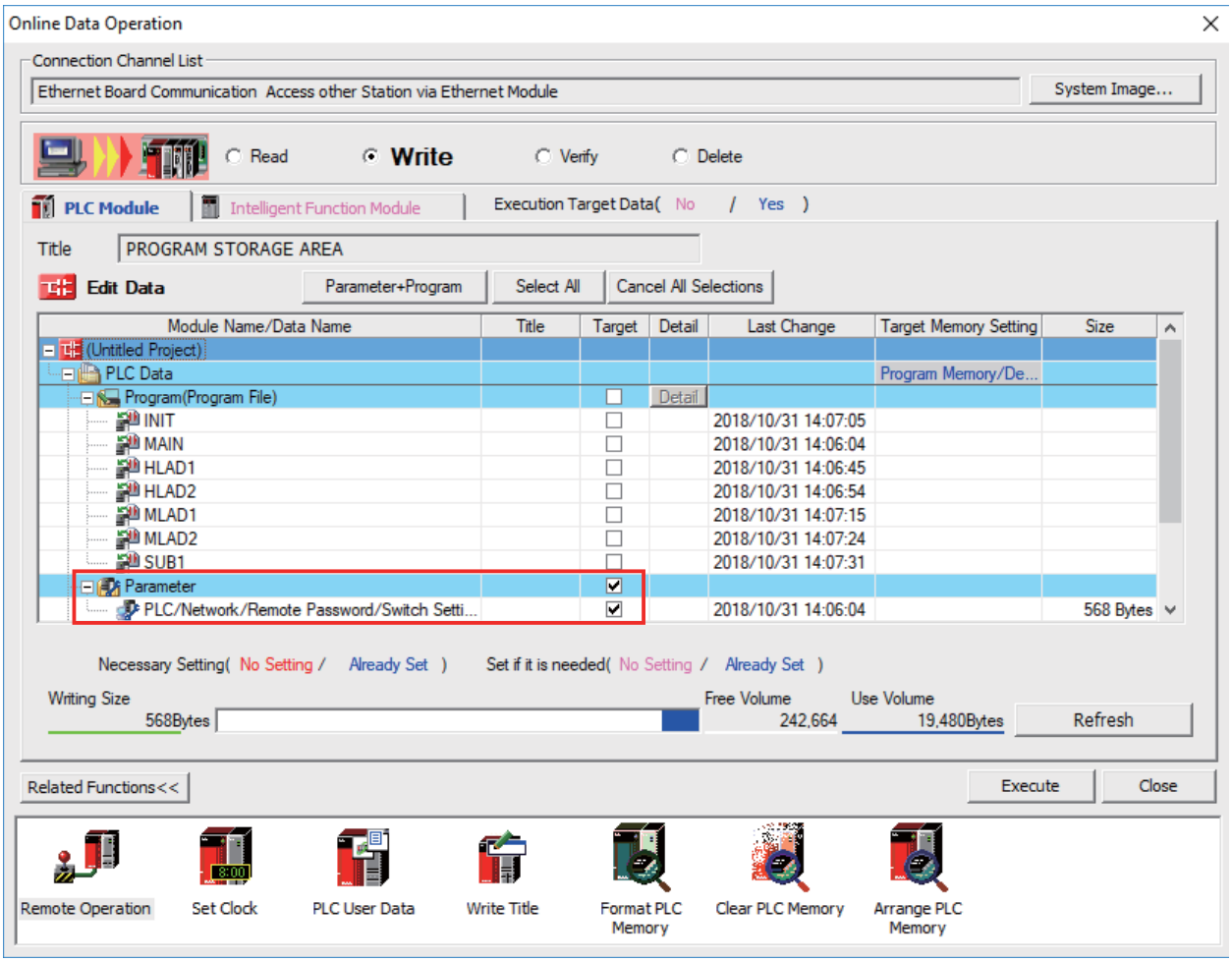
The following table describes the setting on the window above.

Parameter name	Tab name	Setting item	Num. of characters	Setting
PLC parameter	PC name setting	Label	Up to 10 half-width characters	Label of project
		Comment	Up to 64 half-width characters or 32 full-width characters	Comment of project

5.5.8.6 Writing and Reading Parameters to CNC Controller

To create sequence programs in multi-program method, parameter files must be written to the CNC controller. They can be read from the CNC controller to be used on GX Works2.
They can be read and written in the same way as reading and writing sequence programs.

(1) Start the operation screen by the following operation on GX Works2.
[Online] -> [Write to PLC]/[Read from PLC]
(2) Select write/read parameter [PLC/Network/Remote Password/Switch Setting], and click [Execute] on the Online Data Operation screen.
(3) Use [Remote Operation] under [Related Functions] to instruct the PLC to RUN or STOP.



(Note) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

5.5.9 Starting/Stopping PLC

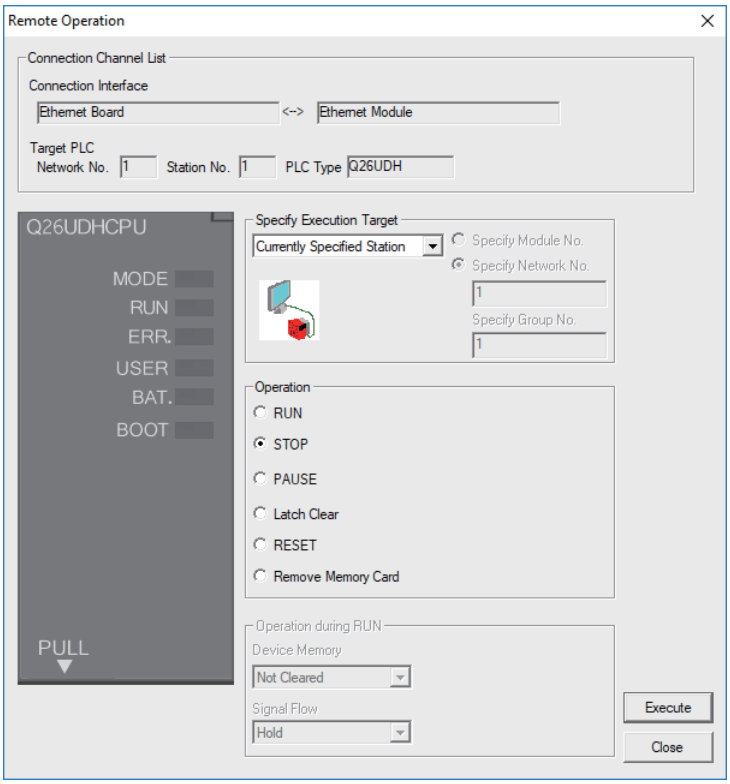
Stop PLC on the CNC controller before writing sequence programs.
Confirmation of stop and restart is usually required before and after the operation that requires PLC stop. Stop and restart can be done in advance by the following operation.

5.5.9.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

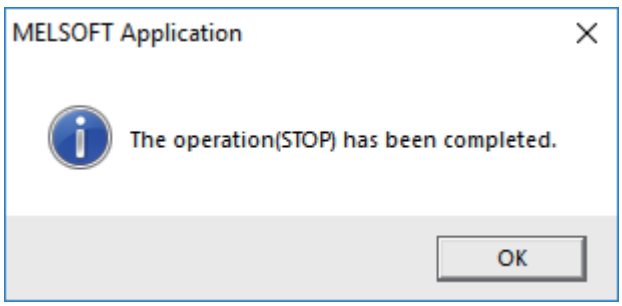
[Online] -> [Remote Operation]

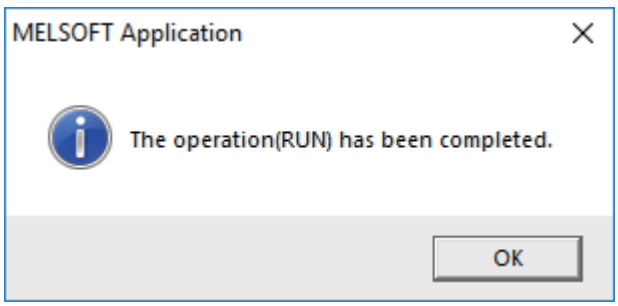
Set "STOP" or "RUN" in [Operation], and click [Execute] on the following screen. The status can be checked by the lighting of the "RUN" LED (ON: RUN, OFF: STOP) on the left side of the screen.



(Note) Only RUN and STOP can be executed.

RUN or STOP is completed when the following dialog is displayed. Click [OK]. The status of the PLC can be checked by the lighting of the "RUN" LED. When the status does not change, check whether an alarm is displayed on the CNC controller.





5.5.10 Reading Sequence Programs in GX Developer Format

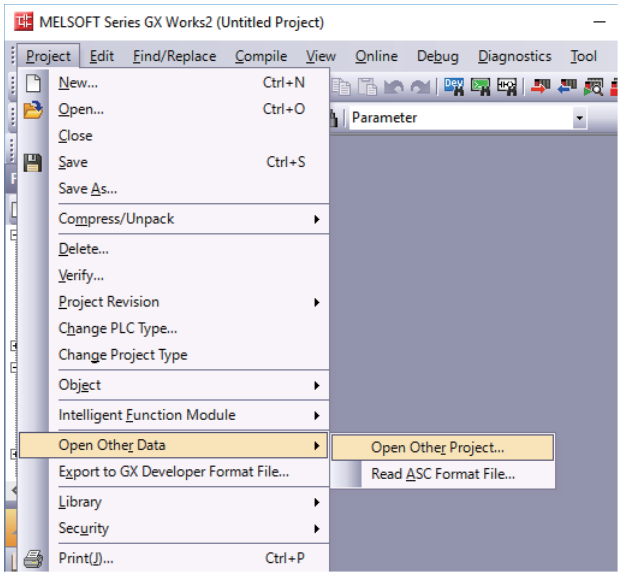
Sequence programs created by GX Developer can be read on GX Works2. This allows sequence programs for CNC controllers previously created by GX Developer to be used in development on GX Works2.
Refer to "5.15.3 Multi-Language Data" for precaution of multi-language data setting.

5.5.10.1 Reading Sequence Programs in GX Developer Format on GX Works2

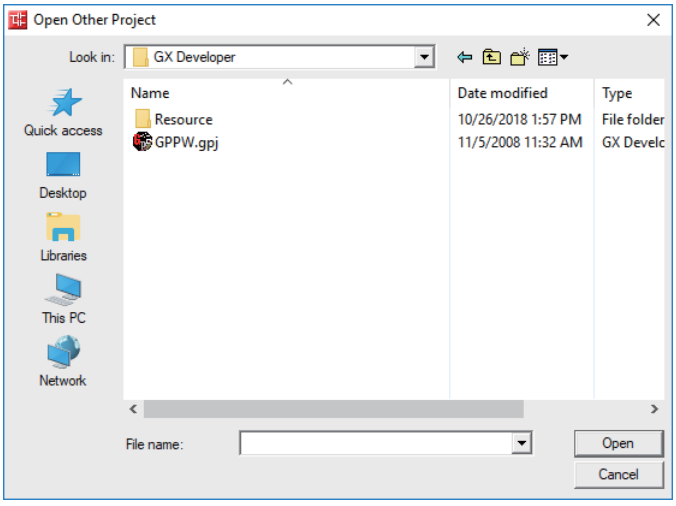
Read sequence programs created by GX Developer on GX Works2 as follows.

(1) Display the file selection screen by the following operation on GX Works2.

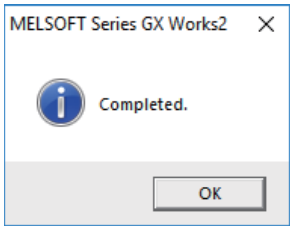
[Project] -> [Open Other Data] -> [Open Other Project]



(2) Select the project, and click [Open] on the following screen.



The reading of programs is complete when the following dialog is displayed. Click [OK].



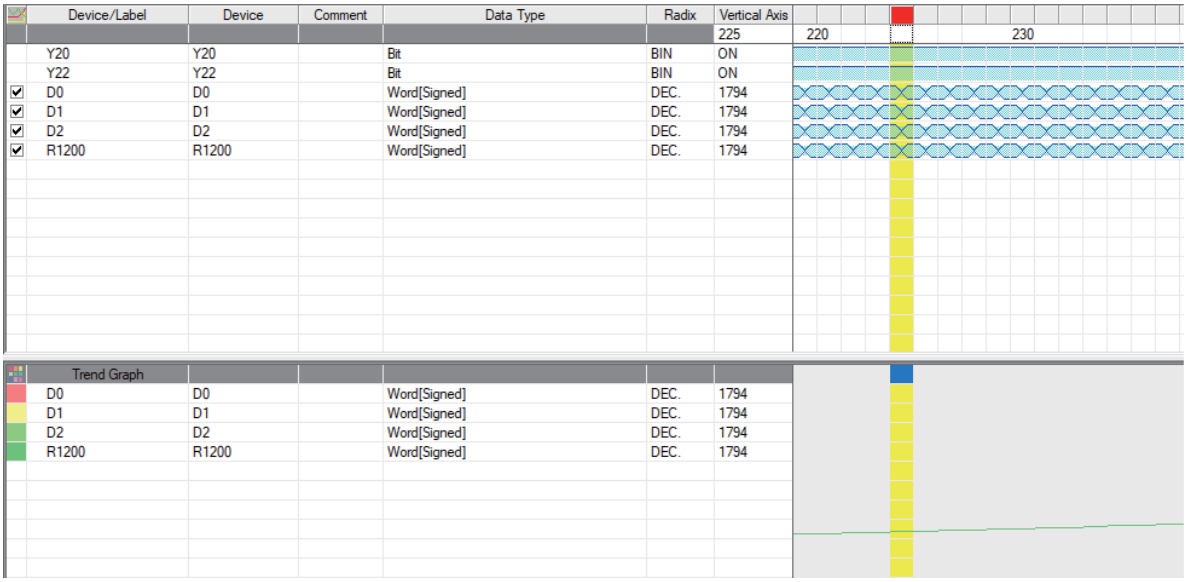
5.5.11 Sampling Trace of Device

The sampling trace function of GX Works2 enables the sampling trace (hereafter trace) of the status of the external signals of the CNC controller and devices used in user ladders. Trace results can be read from the CNC controller after trace to be displayed on the screen and output as a CSV file.

■Example of trace result display

The present values of devices are displayed for each sampling point. The trend graph of word devices is also displayed.

The chart is displayed in the upper part of the screen; the trend graph of word devices is displayed in the lower part of the display. The red mark indicates the trigger position.



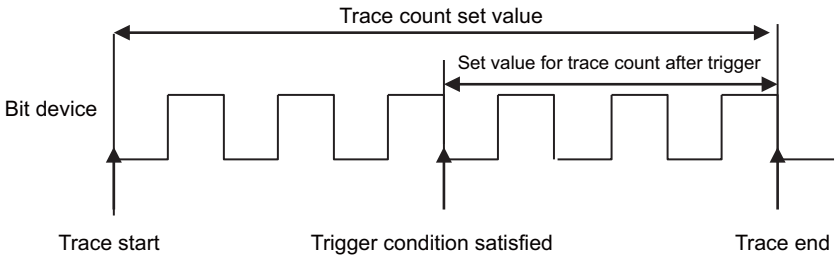
The display items on the Sampling Trace screen are as follows.

Item name	Display item
Device/Label	Set devices and labels to be traced. 50 bit devices and 50 word devices can be registered.
Device	Devices corresponding to “Device/Label” are displayed.
Comment	Input device comments corresponding to “Device/Label” are displayed.
Data type	Data type of “Device/Label” is displayed.
Radix	Radix of the devices input in "Device/Label" is displayed. For bit devices, it is fixed as "BIN". For word devices, "BIN (Binary)", "DEC. (Decimal)", "HEX. (Hexadecimal)", or "ASCII" can be selected.
Vertical Axis	Data of the time axis of the selected cell is displayed.

Click the [Switch Chart/Detail] button  to display detailed data.

	Device/Label	Device	Comment	Data Type	Radix	Vertical Axis	223	224	225	226	227	228	229	230
	Y20	Y20		Bit	BIN	ON	*	*	*	*	*	*	*	*
	Y22	Y22		Bit	BIN	ON	*	*	*	*	*	*	*	*
☑	D0	D0		Word[Signed]	DEC.	1794	1792	1793	1794	1795	1796	1797	1798	1799
☑	D1	D1		Word[Signed]	DEC.	1794	1792	1793	1794	1795	1796	1797	1798	1799
☑	D2	D2		Word[Signed]	DEC.	1794	1792	1793	1794	1795	1796	1797	1798	1799
☑	R1200	R1200		Word[Signed]	DEC.	1794	1792	1793	1794	1795	1796	1797	1798	1799

Trace count, trace condition, trigger condition, and trace count after trigger can be set in trace setting.
Trace is executed when trace conditions are all met.
After trigger conditions are met, trace is executed for the number of times set in the trace count after trigger, then finishes. The status before and after trigger conditions are met can be sampled.



From satisfacion of trigger condition to trace end

5.5.11.1 Basic Operation

The operation for sampling trace is done on GX Works2. Execute the sampling trace function as follows.
For detail on actual operating procedure on GX Works2, refer to "5.5.11.4 Sampling Trace Operating Procedure".
Sampling trace of each project in the multi-project mode is possible.

(1) Configure trace setting.

Setting item	Setting detail
Trace Count Setting	Set trace count to be saved. Data items for trace count from the latest data are saved. When trace count is exceeded, data is deleted from the oldest one.
Count After Trigger	Set the trace count executed from the trigger is established until the sampling completes.
Data Acquisition Timing Setting	This refers to "trace condition". Set the timing of tracing data. Either "Each Scan" or "Detail Setting" can be selected. Do not select the other options. In "Detail Setting", conditions for executing trace can be set.
Trigger Condition Setting	Set the timing of trigger. When trigger is established, status of trace device is taken in. "At the Time of Manual Trigger Execution" or "Detail Setting" can be selected. "Detail" enables the trigger establishment condition setting.
Trace device	Set the device to be traced.

(2) Write trace setting to the CNC controller.

(3) Execute trace. The CNC controller starts tracing devices. The execution status during trace is displayed on the trace status in GX Works2, and can be checked by the special relay SM800 to SM805 of the CNC. Trace continues until the following conditions are met.

(a) Tracing is completed upon establishment of trigger.

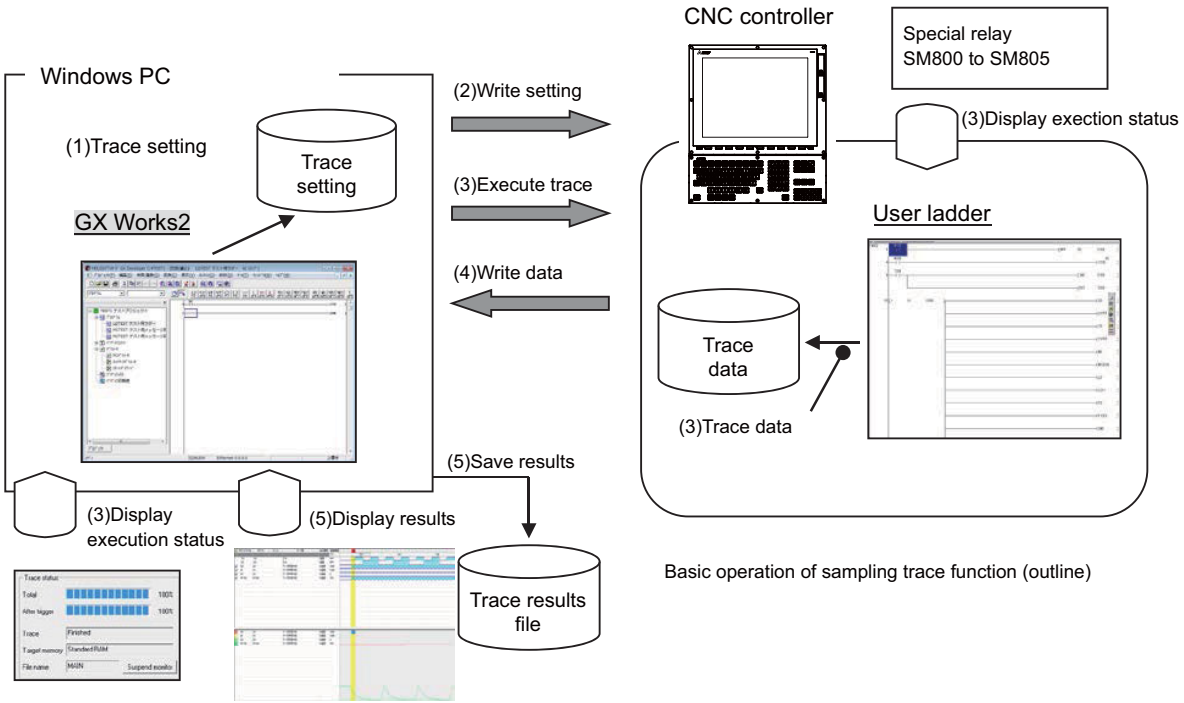
(b) Stop tracing from GX Works2.

(c) Power OFF the CNC controller.

(d) PLC turns to STOP mode.

(4) Read the trace data from the CNC controller.

(5) Display the result, and, if necessary, output the result to a file.



Basic operation of sampling trace function (outline)

*1 The trace conditions (setting) set in (1) are retained even after the CNC is powered OFF.

*2 The trace data obtained in (4) are erased after the CNC is powered OFF.

*3 The trace conditions are retained in (2). If the CNC is powered OFF before the settings are written, the conditions changed before settings are written are not retained, and the previous trace conditions are retained.

5.5.11.2 Basic Specifications

List of basic specifications ("[ ]" shows the name in built-in edit function)

<table>
<tr><th>Contents</th><th colspan="3">Specifications</th></tr>
<tr><td>Multi-project</td><td colspan="3">Sampling trace can be executed for each project.
Refer to (Note6) for the timing of sampling when the multi-project is enabled.</td></tr>
<tr><td>Trace count</td><td colspan="3">The number between 1 and 8192 can be set. Note that, however, the total trace data size has to be smaller than 220 kilobytes.
(The data size for a project depends on the number of usable projects.)
Refer to (Note1) for trace data size calculation.</td></tr>
<tr><td>Trace count after trigger</td><td colspan="3">Sets the number smaller than the No. of traces.</td></tr>
<tr><td rowspan="3">Data acquisition timing
[trace point]
(Each scan or specified interval)</td><td>Each scan</td><td colspan="2">Trace on scan of main processes.</td></tr>
<tr><td rowspan="2">Detail
(Refer to (Note4) for precaution.)</td><td>Word device</td><td>Applicable device: Refer to (Note2).
Setting condition: Sets the condition and the value to be used for judgment. Sets the value to be used for judgement. When the setting value becomes equal to the word device value, or when the value of the word device changes judgement will be effective and trigger is executed.</td></tr>
<tr><td>Bit device</td><td>Applicable device: Refer to (Note2).
Setting condition: Sets ↑ or ↓ . When the setting condition is satisfied, trace is executed.</td></tr>
<tr><td rowspan="3">Trigger condition
[trigger point]
(Two types of setting: "At the time of trigger operation from GX Works2" and "Detail" are available.)</td><td>At the time of trigger operation from GX Works2</td><td colspan="2">Executes trigger by GX Works2 operations.</td></tr>
<tr><td rowspan="2">Detail
(Refer to (Note5) for precaution.)</td><td>Word device</td><td>Applicable device: Refer to (Note2).
Setting condition: Sets the value to be used for judgement. When the setting value becomes equal to the word device value, judgement will be effective and trigger is executed.
Refer to (Note5) for when writing to the device.</td></tr>
<tr><td>Bit device</td><td>Applicable device: Refer to (Note2).
Setting condition: Sets ↑ or ↓ . When the setting condition is satisfied, trace is executed.</td></tr>
<tr><td>Trace device</td><td colspan="3">Up to 50 points of word device, 50 points of bit device can be set. Note that, however, the total trace data size has to be smaller than 220 kilobytes.
Refer to (Note1) for trace data size calculation.
(The data size for a project depends on the number of usable projects.)
Refer to (Note3) for applicable devices.</td></tr>
</table>

(Note1) Calculation of trace data size

The trace data size in one project varies with the number of multi-projects that can be used.

Trace data size per project for the number of projects that can be used

The number of projects that can be used	Maximum trace data size per project
6	25 kilobytes
5	32 kilobytes
4	44 kilobytes
3	64 kilobytes
2	103 kilobytes
1	220 kilobytes
User safety sequence	220 kilobytes

When the number of projects that can be used is 6, set the trace count and trace devices so that the trace data size is within 25 kilobytes (25600 bytes). Calculate trace data size with the following equation.

[Trace data size (byte)] = [size (byte) required per trace] × [trace count]

The size required per trace is calculated from the numbers of word points and bit points of the trace device and the size required per trace of each device. When time information is added, 4 bytes per trace is required.
Size required per trace of each device

Type of trace device	size per trace required (byte)
Word device	2 bytes per point
Bit device	2 bytes per unit (1 unit = 16 points) 1 to 16 points -> 1 unit -> 2 bytes 17 to 32 points -> 2 units -> 4 bytes 33 to 48 points -> 3 units -> 6 bytes 49 to 50 points -> 4 units -> 8 bytes

The size of trace data can be calculated from the following equation.
[Trace data size (byte)]
= (([number of bit device units]+[number of word devices])×[2 (byte)]+ [4 (byte) *])×[trace count]
* Only when time information is added

The examples of trace data size calculation are provided below.
Trace data size calculation examples (when three projects are valid)

No.	Bit device points	Word device points	Trace count	Trace data size	Sampling
1	16 (1 unit)	2	8192	((1+2)×2)×8192 = 49152 bytes	Possible
2	8 (1 unit)	8	1000	((1+8)×2)×1000 = 18000 bytes	Possible
3	50 (4 units)	50	606	((4+50)×2)×606 = 65448 bytes	Possible
4	50 (4 units)	50	607	((4+50)×2)×607 = 65556 bytes	Not possible

(Note2) Applicable devices with trace/trigger point details setting

Applicable device
Bit device: X, Y, M, L, F, SB, B, SM, T(contact), ST(contact), C(contact) Word device: T(current value), ST(current value), C(current value), D, R, SW, SD, W, ZR Following qualifications are available for the above devices. - Bit device digit designation - Word device bit designation

When any inapplicable device is set for [Device], an error occurs when the trace setting file to execute trace is read.

(Note3) Applicable devices with device setting

Applicable device
Bit device: X, Y, M, L, F, SB, B, SM, T(contact), T(coil), ST(contact), ST(coil), C(contact), C(coil) Word device: T(current value), ST(current value), C(current value), D, R, SW, SD, W,ZR Following qualifications are available for the above devices. - Bit device digit designation - Word device bit designation

Process following an inapplicable device setting is as follows.
- If one or more applicable devices already exist, the setting of the inapplicable device will be ignored.
- If no applicable devices exist, an error occurs at trace execution.

(Note4) Precautions for trace point details setting

- When only devices that are not corresponding to Mitsubishi Electric CNC are set for "Device", an error occurs when the trace setting file to execute trace is read.

(Note5) Precautions for trigger point details setting

- When devices that are not corresponding to Mitsubishi Electric CNC are set for [Device], an error occurs when the trace setting file to execute trace is read.
- When you select "Word device" in [Device] and "Write data" in [Condition] for the trigger point settings, an error occurs when the trace setting file to execute trace is read.

(Note6) Precautions on multi-project function

When the multi-project is enabled, one scan is executed in the order specified by the user.
Sampling is started after one scan is executed. Therefore, there may be some restrictions in operation depending on the settings.

Example 1: Three projects

Order of project execution		1 -> 2 -> 3
Program (ladder) Device R: project-common Device D: project-specific	Project 1	Device R0<-1, Device D0<-1
	Project 2	Device R0<-2, Device D0<-2
	Project 3	Device R0<-3, Device D0<-3
Trace setting	Project 1 to 3 the same	Trace point: Each scan Trace device: R0, D0
Trace result (1 sampling extracted)	Project 1	R0: 3,D0: 1
	Project 2	R0: 3,D0: 2
	Project 3	R0: 3,D0: 3

* In the above example, sampling is executed after the operation of project 3. Therefore, the result of update performed in project 3 is used as the sampling data for R0 (the device common to all projects) of all projects.

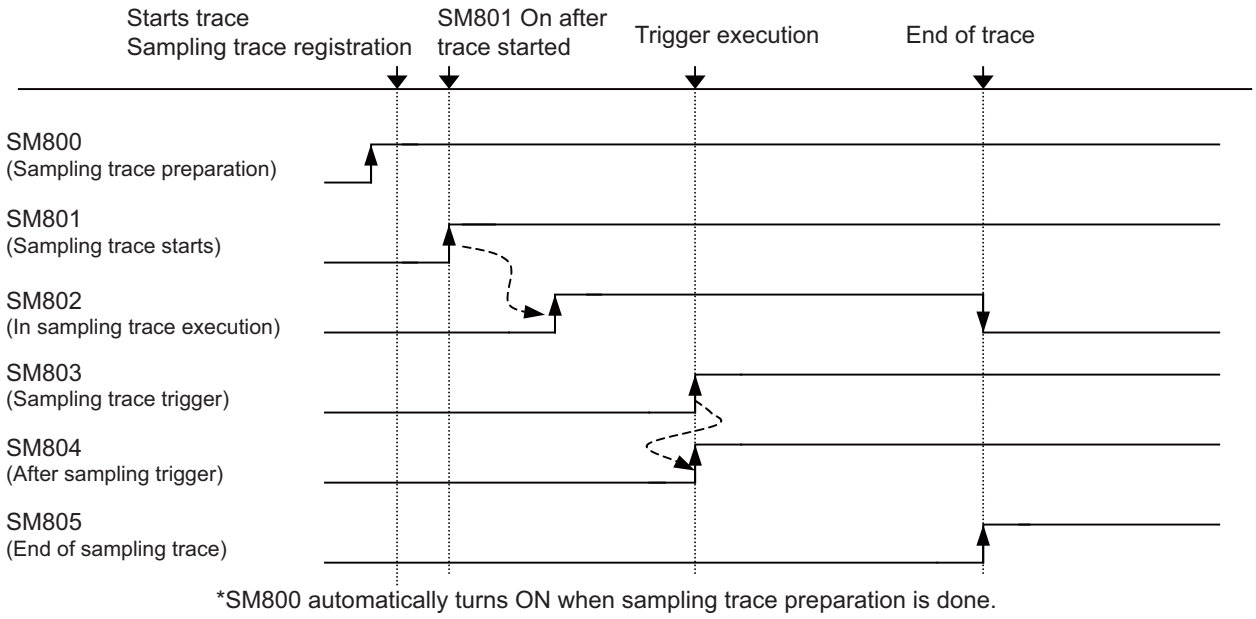
Example 2: Six projects

Order of project execution		6 -> 1 -> 5 -> 2 -> 4 -> 3
Program (ladder) Device R: project-common Device D: project-specific	Project 1	Device R0<-1, Device D0<-1
	Project 2	Device R0<-2, Device D0<-2
	Project 3	Device R0<-3, Device D0<-3
	Project 4	Device R0<-4, Device D0<-4
	Project 5	Device R0<-5, Device D0<-5
	Project 6	Device R0<-6, Device D0<-6
Trace setting	Project 1 to 3 the same	Trace point: Each scan Trace device: R0, D0
	Project 4 to 6 the same	Trace point: Detail Setting Trace device: R0, D0 when device R0 is 5
Trace result (1 sampling extracted)	Project 1	R0: 3,D0: 1
	Project 2	R0: 3,D0: 2
	Project 3	R0: 3,D0: 3
	Project 4	No trace
	Project 5	No trace
	Project 6	No trace

* In the above example, sampling is executed after the operation of project 3. Therefore, the result of update performed in project 3 is used as the sampling data for R0 (the device common to all projects) of all projects.
* For project 4 to 6 for which the trace point is specified as "when device R0 is 5", tracing is not performed because R0 is "3" at the sampling timing.

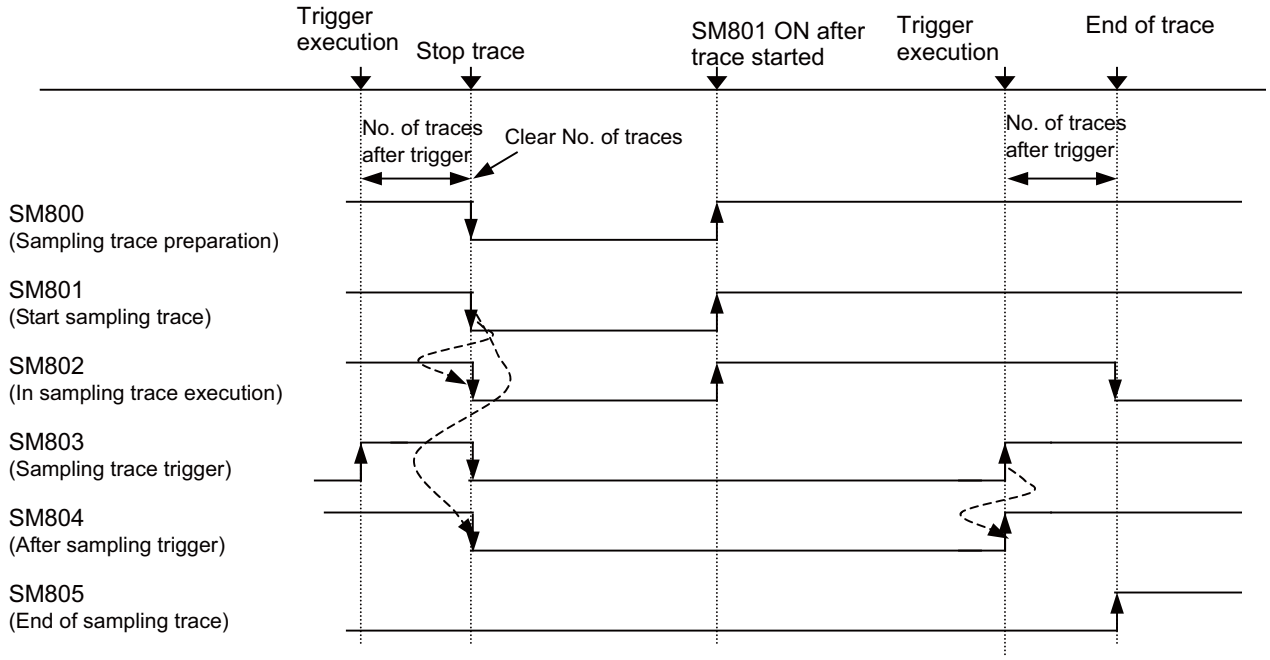
5.5.11.3 Status of Special Relay during Sampling Trace

The status during the execution of the sampling trace function can be checked by the status of SM device 800 to 805.



*SM800 automatically turns ON when sampling trace preparation is done.

Device status when trace execution operation is carried out.



Device status when trace stop operation is carried out

The specifications of SM800 to SM805 are as follows.

List of sampling trace function related device specifications

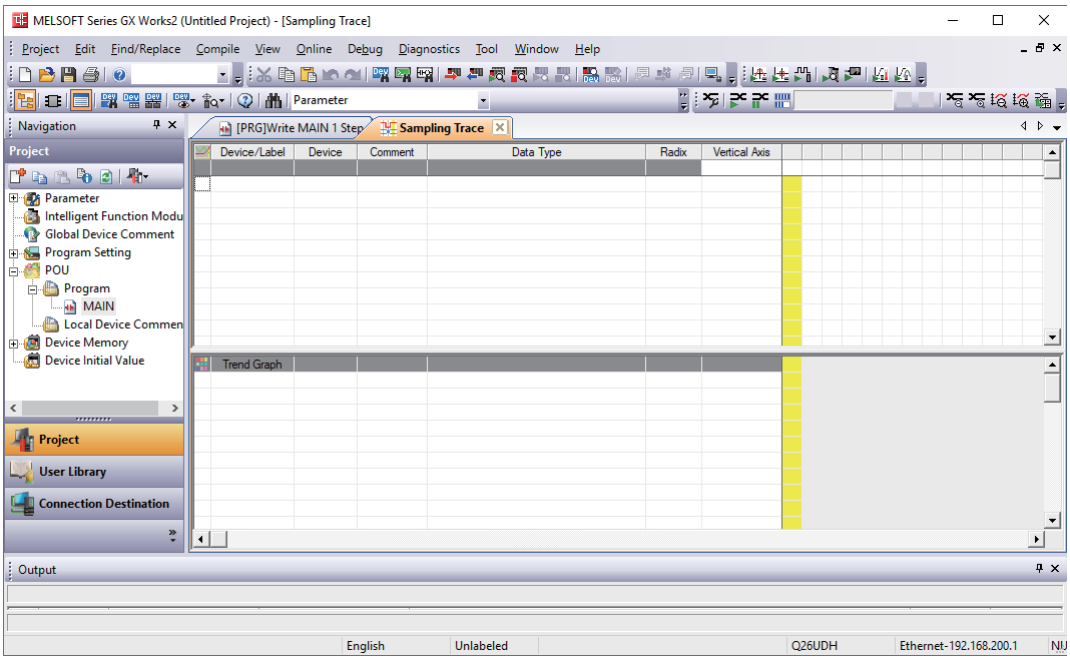
No.	Name	Description
SM800	Sampling trace preparation	OFF: Preparation not completed ON: Preparation completed
SM801	Starts sampling trace	OFF: Cancel ON : Start
SM802	In sampling trace execution	OFF: Cancel ON : Start
SM803	Sampling trace trigger	OFF -> ON:Trigger execution
SM804	After sampling trace trigger	OFF: Not after trigger ON : After trigger
SM805	End of sampling trace	OFF: Not completed ON: Completed

5.5.11.4 Sampling Trace Operating Procedure

This section provides the overview of trace operating procedure and cautions.
For details of basic operating procedure, refer to "GX Works2 Operating Manual (Common)".

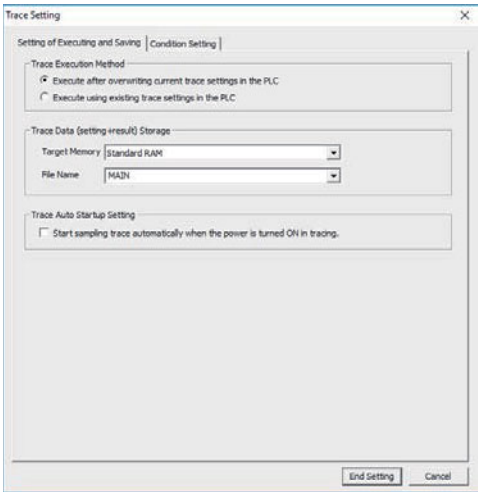
Sampling trace screen

Select [Debug] - [Sampling Trace] - [Open Sampling Trace] to open the "Sampling Trace" screen.



Setting execute conditions for sampling trace

(1) Open [Debug] - [Sampling Trace] - [Trace Setting], and configure the settings on the [Setting of Executing and Saving] tab.

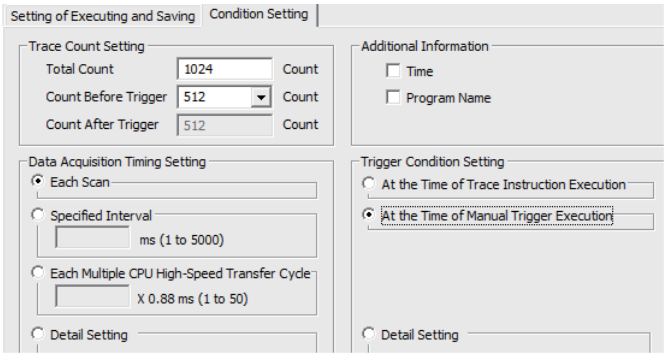


Item		Setting
Trace Execution Method		Execute after overwriting current trace settings in the PLC
Trace Data (setting+result) Storage		
	Target Memory	Standard RAM*1
	File Name	Any file name
Trace Auto Startup Setting		Not check

*1 Since [Target Memory] is the RAM CNC controller, trace data (result) are erased at power OFF.
Only one trace data set (setting, result) can be saved on the CNC controller. Trace data result is overwritten every time sample trace is executed.

(2) Configure settings on the [Condition Setting] tab as follows.

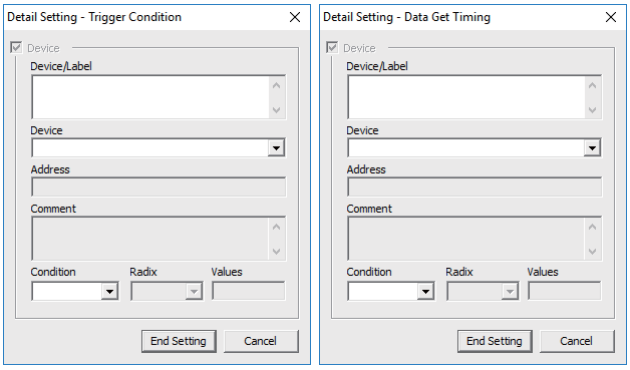
* No setting is required if [Execute using existing trace settings in the PLC] is selected as the trace execution method.



Item		Setting
Trace Count Setting		
	Total Count	1 to 8192
	Count Before Trigger	0 to Total Count -1
Additional Information		
	Time	Optional *2
	Program Name	Not check
Data Acquisition Timing Setting		Each scan or Detail Setting *1
Trigger Condition Setting		At the Time of Manual Trigger Execution or Detail Setting *1

*1 When selecting Detail Setting, click [Setting Change...] and configure settings as follows.

*2 If time information is added, the size of traceable data becomes smaller than usual by [4 bytes] × [Trace Count]



Item		Setting
Device /Label		Device or label to be used in condition *1
Device		Display the device corresponds to "Device/Label".
Comment		Display the device comment of "Device /Label".
Condition		
	Bit device	at the rising (↑), or at the falling (↓)
	Word device	=, or Change
Radix (Word device only)		Decimal or hexadecimal
Values (Word device and “=” only)		Optional

*1 For details on devices that can be set, refer to "5.11.2 Basic specifications".

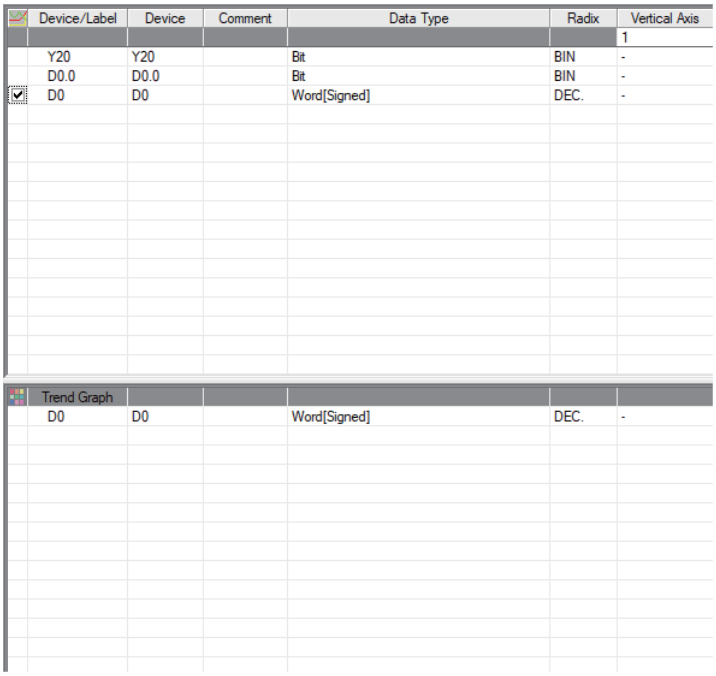
Registering devices/labels

Set trace device.

Register device/label to trace in the [Device/Label] column on the "Sampling Trace" screen.

For word device, check trend graph register target to display trend graph.

For details on device that can be set, refer to "5.5.11.2 Basic specifications".



Execute trace

This section describes how to start and stop trace, and execute trigger.

(1) Start trace

Click [Debug] - [Sampling Trace] - [Start Trace]. Trace is started.

The progress status of trace can be checked by [Trace Data Storage Status]. Click [Close] to close the [Display Trace Buffer Condition] window.

To display the trace execution screen again after clicking [Close], click [Debug] - [Sampling Trace] - [Display Trace Buffer Condition].

(Note1) Trace cannot be executed again until the execution of trace ends.

(Note2) If [Execute using existing trace settings in the PLC] is selected as the trace execution method, and trace settings are not written to the CNC, an error occurs when [Debug] - [Sampling Trace] - [Start Trace] is clicked. Start trace after writing trace settings to the CNC.

(Note3) Shen trace is started, previous trace data are deleted.

(2) Execute trigger

When [At the Time of Execute Manual Trigger] is set in [Trigger Condition Setting], trigger can be executed at any timing. Click [Debug] - [Sampling Trace] - [Execute Manual Trigger].

(3) Stop trace

To stop trace, click [Debug] - [Sampling Trace] - [Stop Trace].

The results up to the trace stop is displayed on the "Sampling Trace" screen.

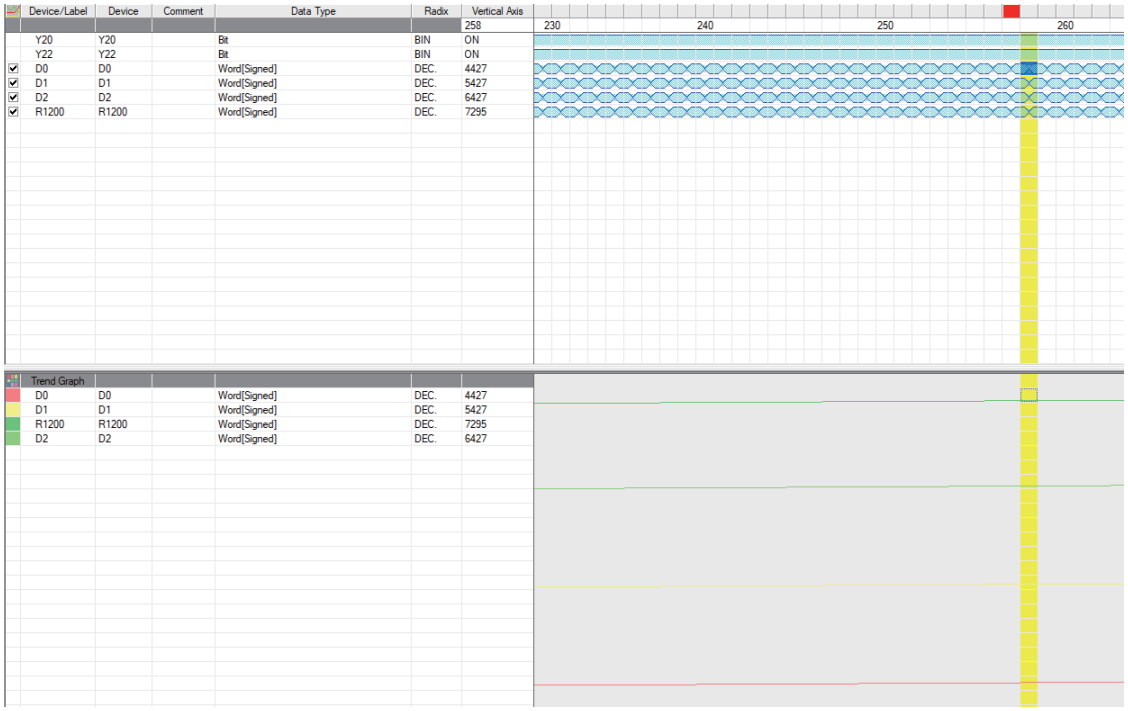
(Note1) Stopped trace cannot be restarted.

(Note2) If trace is started before data are saved, data before trace stop are deleted. Save trace data before stop as a CSV file by selecting [Debug] - [Sampling Trace] - [Export CSV Data] as needed.

(4) Complete trace

Trace is executed for the preset times of trace after the execution of trigger, the "Trace Data Storage Status" screen is closed, and trace is completed. After that, trace results are automatically read to GX Works2 and displayed as follows.

Click [Switch Chart/Details]  to display details.



For details on how to evaluate trace result, refer to "19.4 Sampling Trace in GX Works2 Operating Manual (Common)".

(5) End trace screen

Even when the "Sampling Trace" screen is closed, or GX Works2 is ended while trace is being executed, trace is executed.

Restart GX Works2, open the "Sampling Trace" screen, click [Read from PLC] to read the result of trace executed.

Display trace results

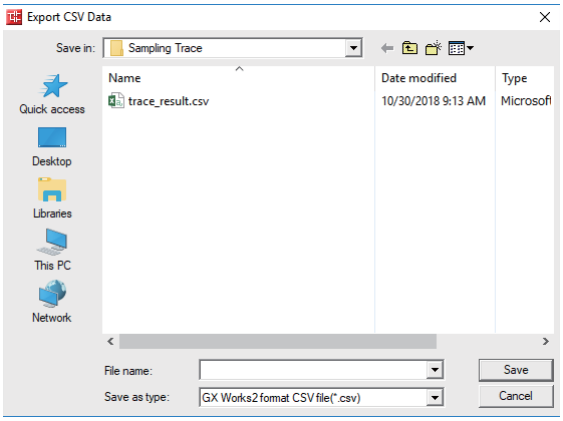
When the "Sampling Trace" screen is closed, or GX Works2 is ended while trace is being executed, manually read trace results from the CNC controller.

(1) Start GX Works2, click [Debug] - [Sampling Trace] - [Open Sampling Trace] to open the "Sampling Trace" screen.

(2) Click [Debug] - [Sampling Trace] - [Read from PLC].

Save trace result

(1) Click [Debug] - [Sampling Trace] - [Export CSV Data] to open the "Export CSV Data" window.



(2) Select the location for storage, input a file name, and click [Save].

(Note) Trace result data are overwritten every time trace is executed. Save data as a CSV file as necessary.

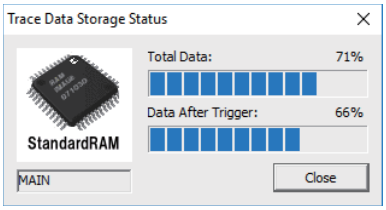
Maintain trace execution status

The trace execution status is retained after the CNC is turned OFF.

This allows trace to be executed from power ON as follows.

(1) Turn OFF the CNC while trace is being executed.

* To check the progress of trace, click [Debug] - [Sampling Trace] - [Display Trace Buffer Condition] to display the "Trace Data Storage Status" screen.



(2) Turn the CNC power ON again.

(3) Trace is executed at the power ON.

(Note1) Trace result is erased when the CNC power is turned OFF.

(Note2) Even when the post-trigger status is active at the CNC power OFF, the tracing at the power ON is always started from the pre-trigger status.

5.5.11.5 Operation on Error

An error is generated under the following condition, and an error dialog is displayed on the GX Works2 screen when parameters are checked on trace execution.

Errors and remedies

No.	Name	Description
1	Device setting has no devices that are traceable	Set a traceable device for "Sampling Trace" screen.
2	Trace setting has invalid conditions.	Set valid conditions for trace set.
3	Detailed trace setting has no valid devices set.	Set a valid device in detailed trace setting.
4	The capacity of trace data exceeds the capacity per project	Set the capacity of trace data that does not exceed the capacity per project.

When trace cannot be executed, check the following.

- Ensure that the CPU type is "Q26UCPU"
- Check the trace execution status (Trace execution cannot be commanded during trace.)
- When "Execute using existing trace settings in the PLC" is selected in the trace execution setting, check whether the setting file is saved in the CNC
- Check the consistency between the devices on the program and devices in the trace setting

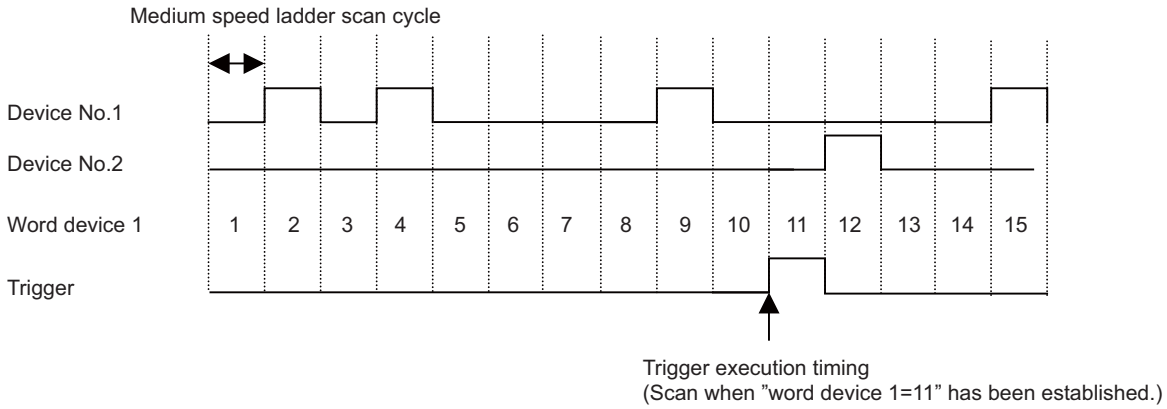
5.5.11.6 Operation Example

Example 1: Trigger judgment and trace result with device setting

[Setting details]

Trace settings for example 1

Setting item	Setting value	Setting item	Setting value
Target Memory	Standard RAM	Trigger Condition Setting	■ Detailed setting Word device Word device 1 = 11
File name	MAIN		
Total Count	10		
Count After Trigger	4	Device setting	■ Bit device Device No.1 Device No.2 ■ Word device Word device 1
Additional Information	Time		
Specified Interval	Interval: 10 ms		



Device status when sampling trace is executed at example 1

[Trace result]

Trace result display for example 1

Count	5	6	7	8	9	10	11	12	13	14
Device No.1										
Device No.2										
Word device 1	5	6	7	8	9	10	11	11	12	13
Time	0	0.007	0.014	0.021	0.028	0.035	0.042	0.042	0.049	0.056

<- The scan at trace start is count 1. Because trace data are imported when trigger condition is satisfied, when the satisfaction of trigger condition and trace overlap, data for count 11 and count 12 are the same.

<- Setting for trace point by the hour is ignored, and trace is executed at each scan.

<- Word device is displayed as numeric values on the detailed data screen.

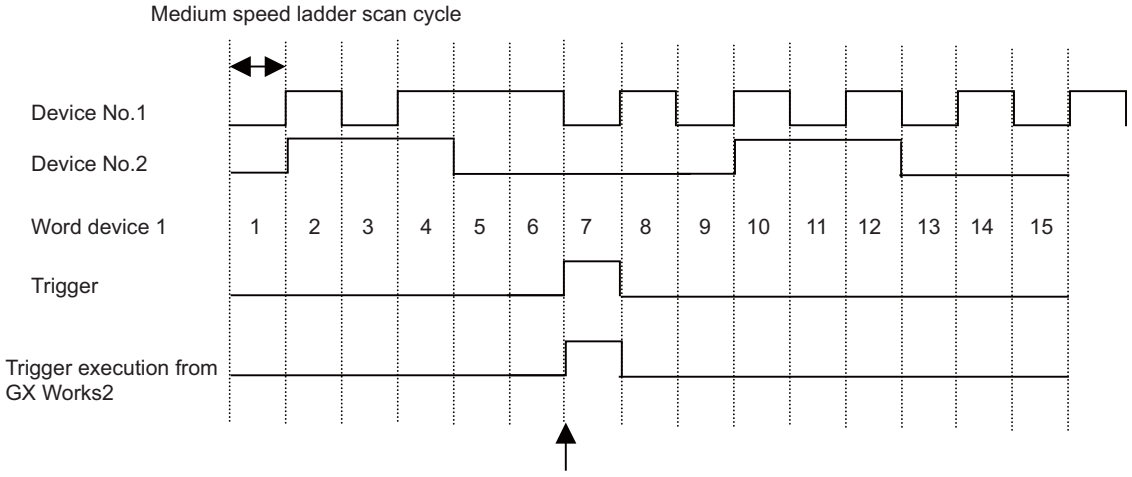
<- Trace Additional Information is displayed as time on the detailed data screen.

Example 2: Trace judgment and trace result with device setting

[Setting details]

Trace setting details for example 2

Setting item	Setting value	Setting item	Setting value
Target Memory	Standard RAM	Trigger Condition Setting	■ At the time of TRACE instruction execution
File name	MAIN		
Total Count	6		
Count After Trigger	4	Device setting	■ Bit device Device No.1 Device No.2 ■ Word device Word device 1
Additional Information	None		
Specified Interval	■ Detailed setting Bit device Device No.1 ↑		



Device status when sampling trace is executed at example 2

[Trace result]

Trace result display for example 2

Count	1	2	3	4	5	6
Device No.1						
Device No.2						
Word device 1	2	4	7	8	10	12

<- Trace scan at trace start is count 1.

<- Trace is executed only for the scan where device No.1 turns ON from OFF.
Device data for the scan when trigger is executed is saved

5.5.11.7 Caution

(1) Trace can be executed for the other stations on the network or with serial communication connection, trace from multiple areas at the same time is not possible.

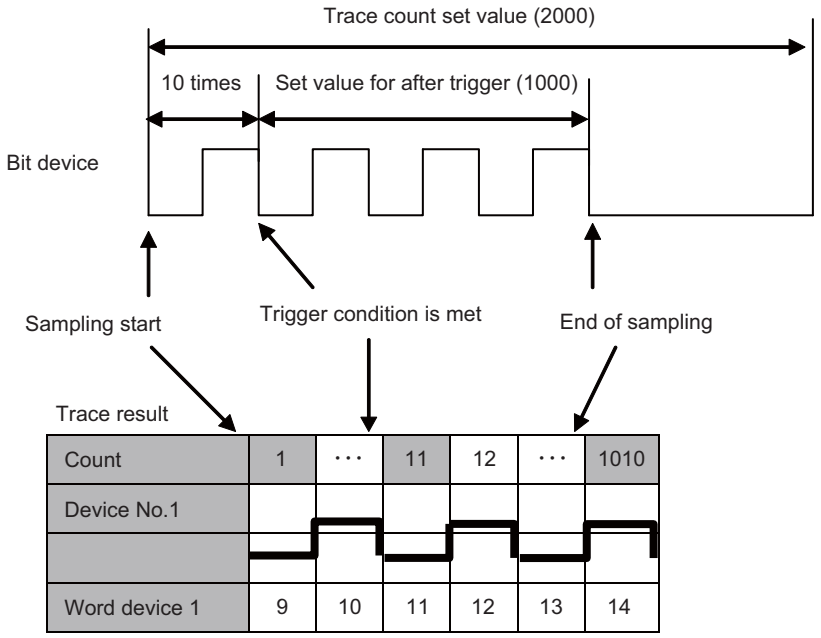
(2) The trace conditions registered in the CNC are retained after the CNC is powered OFF.
Trace data are deleted when the CNC is powered OFF.
Saved data are discarded when:
- Data are inconsistent with the saved trace conditions (the trace size and the device range) at the power ON.
- Data are inconsistent with the saved trace conditions (the trace size and the device range) when the multi-project setting is changed from the on-board and the CNC is restarted.
- Data are inconsistent with the saved trace conditions (the trace size and the device range) when USERPLC.LAD which has different multi-project setting is input through [Mainte] - [I/O] on the NC screen and the CNC is restarted.

(3) Trace is executed by connecting CNC controller and GX Works2.

(4) Previous trace data in the CNC are deleted during the execution of trace. Save them before executing trace if necessary.

(5) When trace is ended before reaching the set No. of traces, such as when trigger occurs as soon as trace is started, the shortened data will not be displayed.

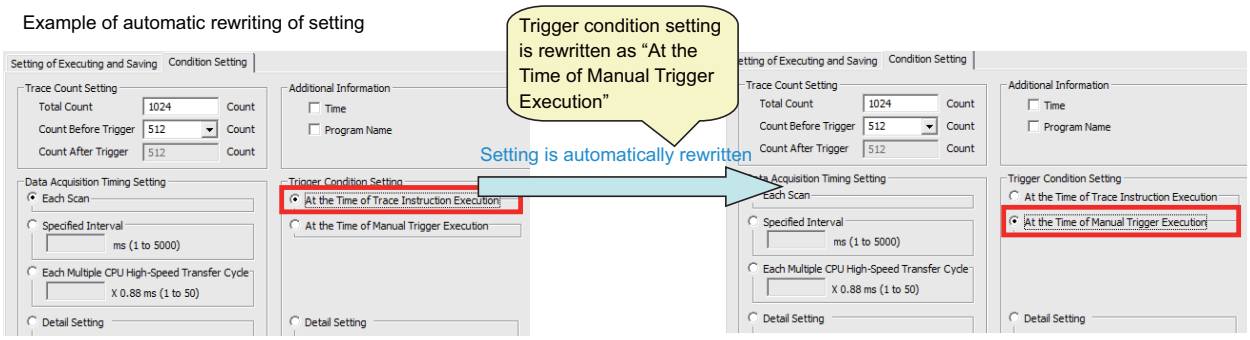
<Example> Trigger condition is met at 10th trace when the number of traces is set to "2000" and the number of traces after trigger is set to "1000".



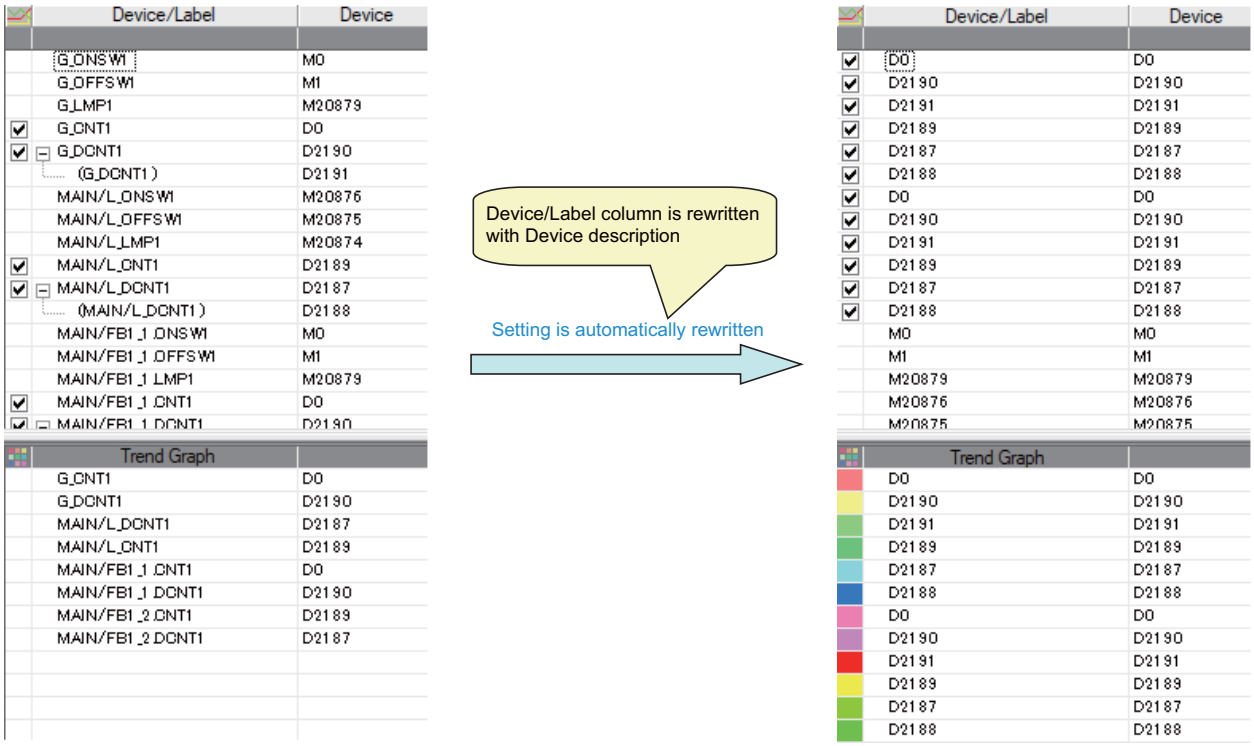
Count	1	···	11	12	···	1010
Device No.1						
Word device 1	9	10	11	12	13	14

(6) When [Specified Interval] or [Each Multiple CPU High-Speed Transfer Cycle] is set as [Data Acquisition Timing Setting] in trace setting, they are rewritten as [Each Scan] at trace start. When [At the Time of Trace Instruction Execution] is set as Trigger condition, it is rewritten as [At the Time of Manual Trigger Execution] at trace start. When the Program Name under Additional Information is checked, it is removed at trace start. For details on what trace settings can be used, refer to "5.5.11.4 Sampling Trace Operating Procedure".

Example of automatic rewriting of setting



If settings are automatic rewritten in Simple project (with labels), the labels of trace target are overwritten with actual device at trace completion.



(7) The status of SM800 to SM805 cannot be checked on the CNC controller screen. Check the trace status on GX Works2.

(8) When the CNC is powered OFF while trace is being executed, trace is started after the CNC is powered ON again. (Even if the trace status at power OFF is trace after trigger, the trace after the CNC is powered ON again starts from before trigger.)
To cancel trace started by powering ON the CNC again perform stop operation on the trace execution screen.
To prevent trace from being started by powering ON the CNC again, power the CNC OFF while trace is stopped or after performing stop operation on the trace execution screen.

(9) Trace results cannot be read or displayed while trace is being executed.

(10) [Write to PLC] writes only trace settings to the CNC controller; trace results are not written.

(11) When trace data that were executed with labels set as trace target in a simple project (with labels) are read by [Read from PLC], the labels of the trace target are overwritten by actual devices.

(12) [Trace repeat] cannot be set on GX Works2. When executing [Trace repeat] use built-in editing function.

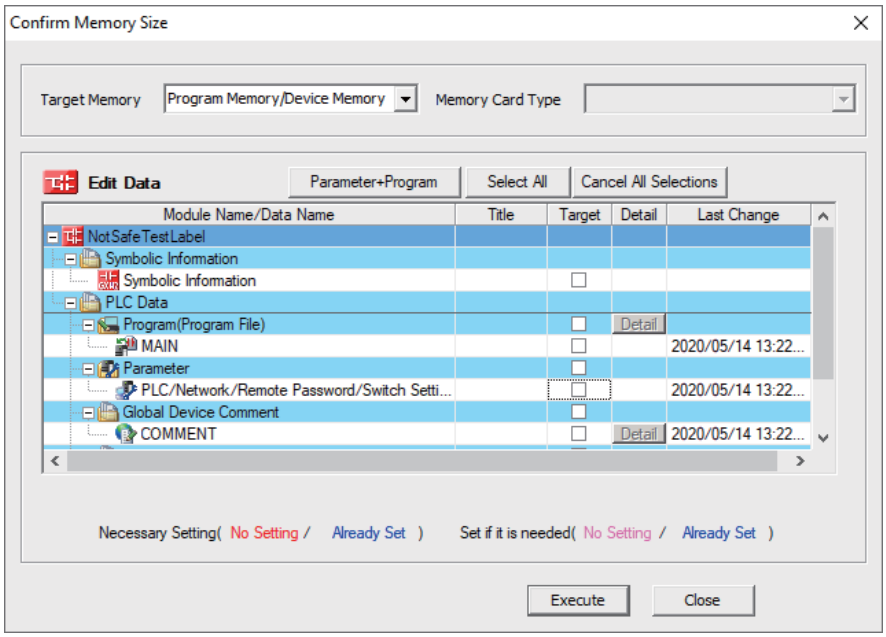
5.5.12 Checking Data Size

Data such as sequence program and comment files can be checked whether its amount is within the allowable range to be written to the CNC by using memory capacity calculation function of GX Works2.

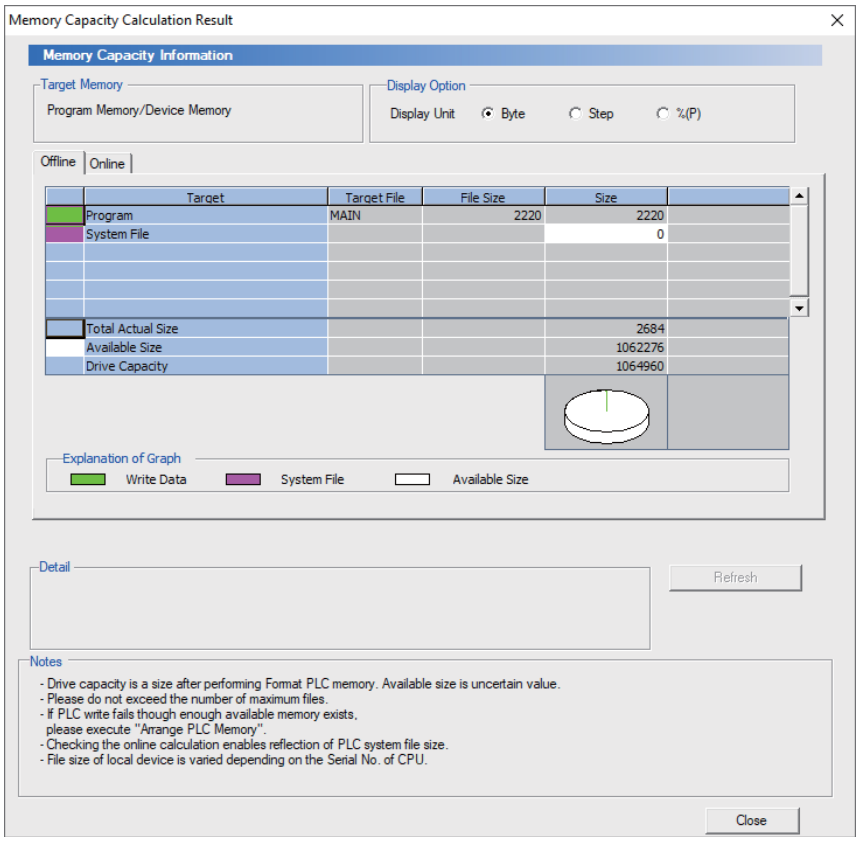
5.5.12.1 Operating Procedure

(1) Use GX Works2 and perform the following operation to display the operation screen.
[Tool] -> [Confirm Memory Size]

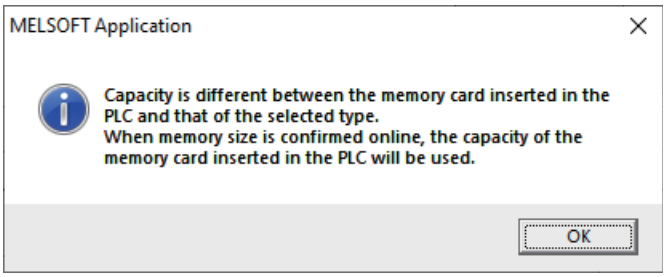
Select the data you want to write on the following screen and click [Execute].
To select program or parameter, select "Program Memory/Device Memory" for [Target Memory].
To select comment file or source information, select "Memory card (SRAM)" for [Target Memory].



(2) The screen with the [Offline] tab selected appears.
The free capacity displayed on this screen differs from the actual one of the CNC controller.
Select the [Online] tab.

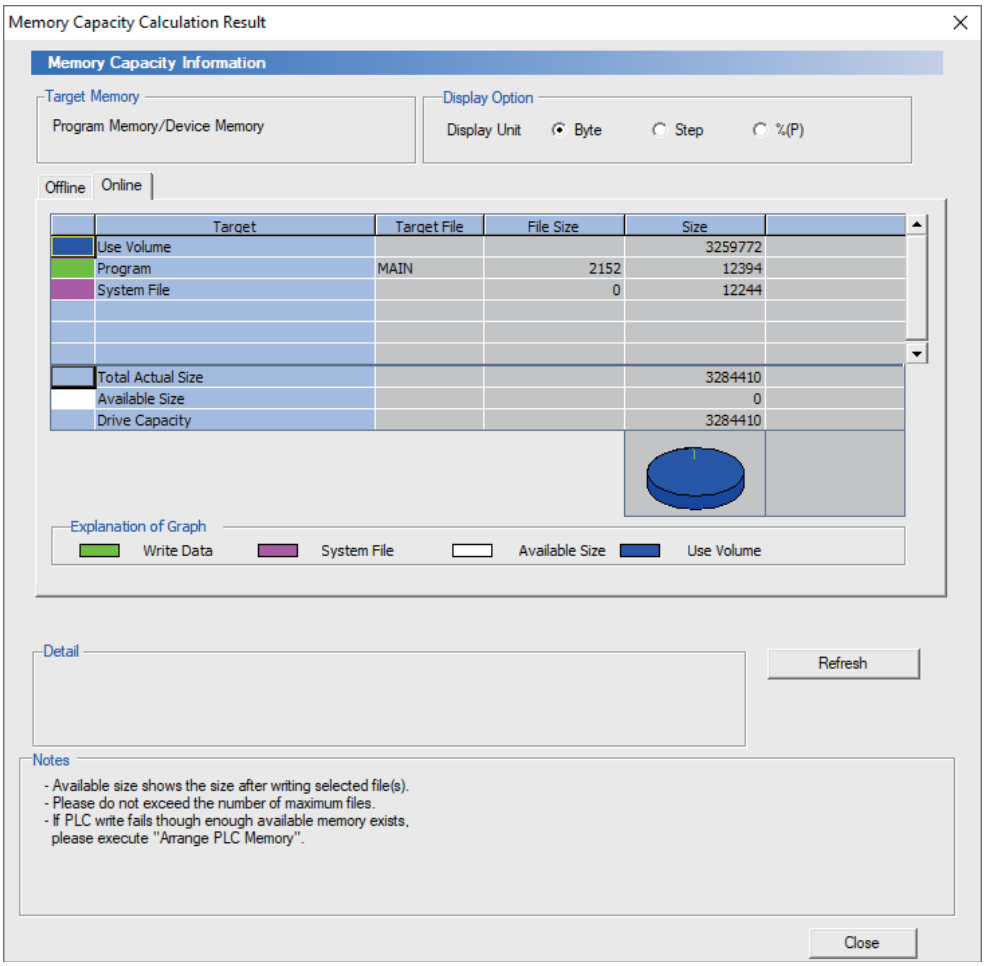


(*) When "Memory card (SRAM)" is selected for [Target Memory], the following screen appears.
Click [OK].



(3) The following screen appears.

The free capacity displayed on this screen is equivalent to the actual capacity of the CNC controller. When there is not enough free capacity, secure the required capacity before writing data.



5.5.12.2 Caution

- When the source information is selected, the program is also selected automatically. Actual free capacity is the sum of displayed free capacity selected in the [Online] tab and the file size of the program.
- When an item such as comment files and source information of the user safety sequence is selected, the file size on GX Works2 and that on CNC is calculated in double. Therefore, free capacity displayed in the [Online] tab is smaller than the actual size.

  To confirm whether the CNC has enough free capacity to write the comment file and source information of the user safety sequence, compare the total file size displayed in the [Offline] tab and the storable data size of the comment for the user safety sequence.

  For the storable data size of the comment for the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

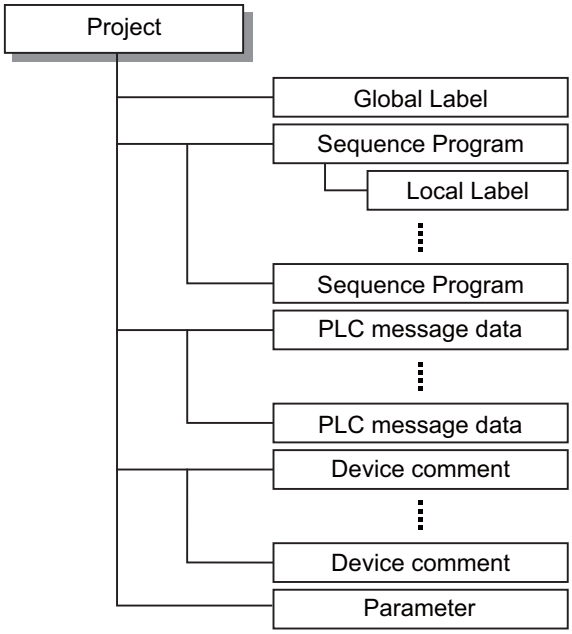
5.6 Developing Simple Project

This chapter provides the overview of simple projects and the development procedure focusing on those specific to Mitsubishi Electric CNC.
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".
For details of the program types that can be used in Simple project, refer to "5.2.1 Support Status of Project Types, Program Types and POUs".
There are two types of simple projects: without labels and with labels. To create a sequence program using function blocks (FBs), select simple project (with labels). The features of the types are described below.

- Simple project (without labels)
  Simple project (without labels) allows sequence programs to be developed in like conventional GX Developer and built-in edit function. Labels and FB are unavailable.
- Simple project (with labels)
  Simple project (with labels) enables users to create highly versatile sequence program labels without being aware of devices. In simple projects (with labels), FB can be used. FB can be nested in another FB; however, the nesting depth is limited to one level. Programs cannot be input/output in the CSV file format. For details on labels, refer to "5.9 Creating Label"; for details on FB, refer to "5.10 Creating Function Block".
  Reserved characters cannot be used in the file names of simple projects (with labels). Use care when changing projects from without labels to with labels. For detail on reserved characters, refer to "GX Works2 Operating Manual (Common)".

5.6.1 Overview of Simple Project

The configuration of a simple project is as follows. Global label and local label are available only when simple project (with labels) is selected when the project is created.



Item	Description
Sequence program	Sequence program (user PLC) for Mitsubishi Electric CNC
PLC message data	Defines PLC messages such as alarm messages and PLC switches.
Device comment	Comment for devices in sequence programs. There are two types: project-common “Global Device Comment” and program-specific “Local device comment”. To change the settings, open [Tools] - [Options] window and select [Program Editor] - [All Editors] - [Device Comments].
Parameter	Set the use range of devices and order of sequence program execution, etc.
Global label (with labels only)	Label variable that becomes valid for all sequence programs when multiple sequence programs are create in a project.
Local label (with labels only)	Label variable that becomes valid only in each sequence program. This is one-on-one setting with an individual sequence program.

5.6.1.1 Symbolic Information

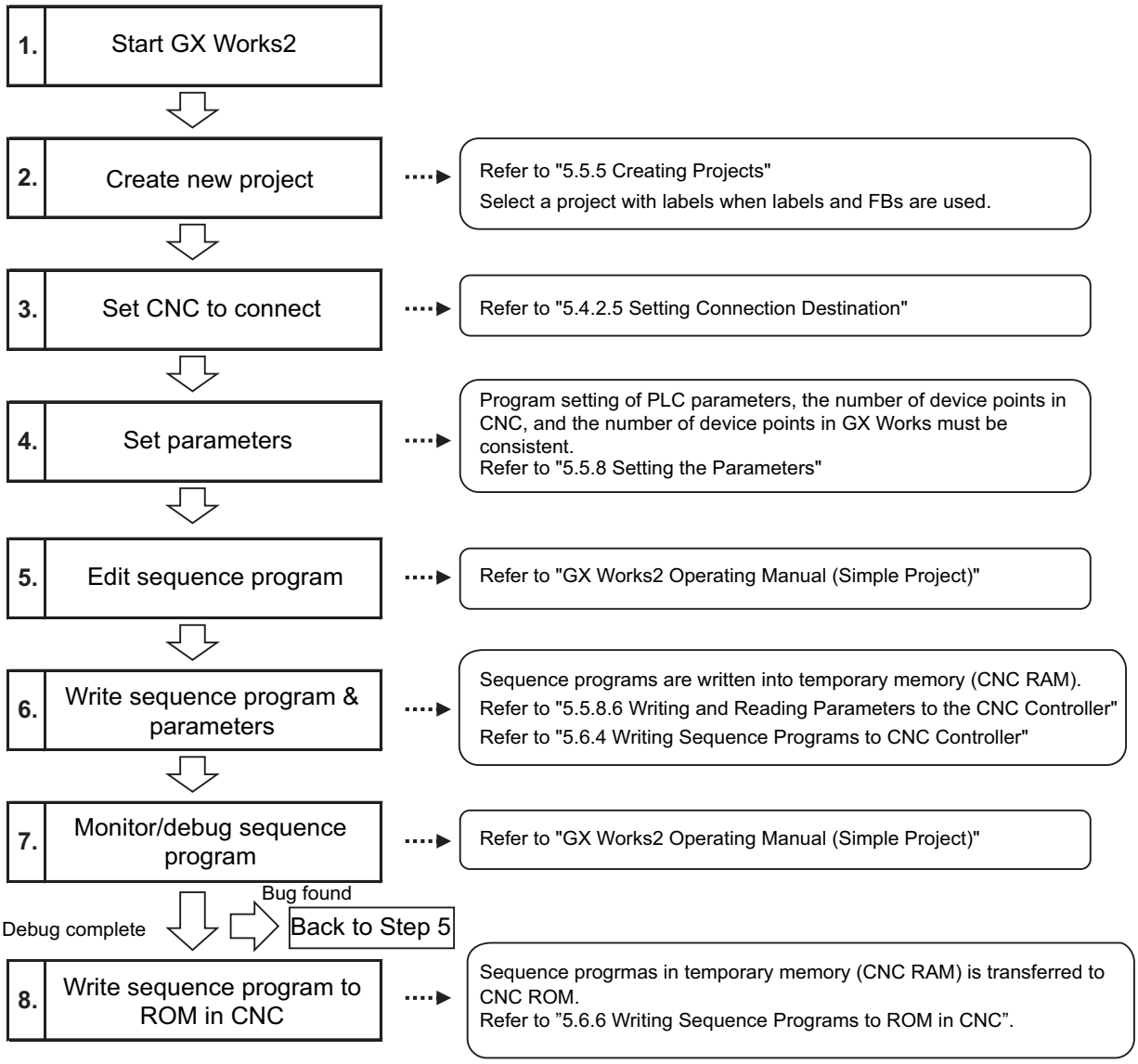
Symbolic information is data storing program configuration such as labels and FB. To read or write labels and FB to the CNC controller, read or write symbolic information.

For details on symbolic information, refer to "GX Works2 Operating Manual (Simple Project)".

5.6.2 Development Procedure

One of the standard procedures for developing simple projects is to create on GX Works2.

5.6.2.1 Developing New Simple Projects on GX Works2



(Note1) After a project is created, a simple project (without labels) can be changed to a simple project (with labels) by [Project] - [Change Project Type]. The change cannot be reverted.

(Note2) If character string that cannot be used, "Label/data name contains invalid character string. Unable to use devices." is displayed when Simple project (with labels) is compiled, reserved characters are used in the file name. Change the file name.

(Note3) The timer limit setting must be fixed to "100ms" for low speed or "10.00ms" for high speed. It can be set on [PLC System] tab on the [Q Parameter Setting] setting screen displayed by selecting [Parameter] - [PC Parameter] of the project view.
The CNC is not compatible with any other value described above for the timer limit.

5.6.3 Developing Sequence Programs

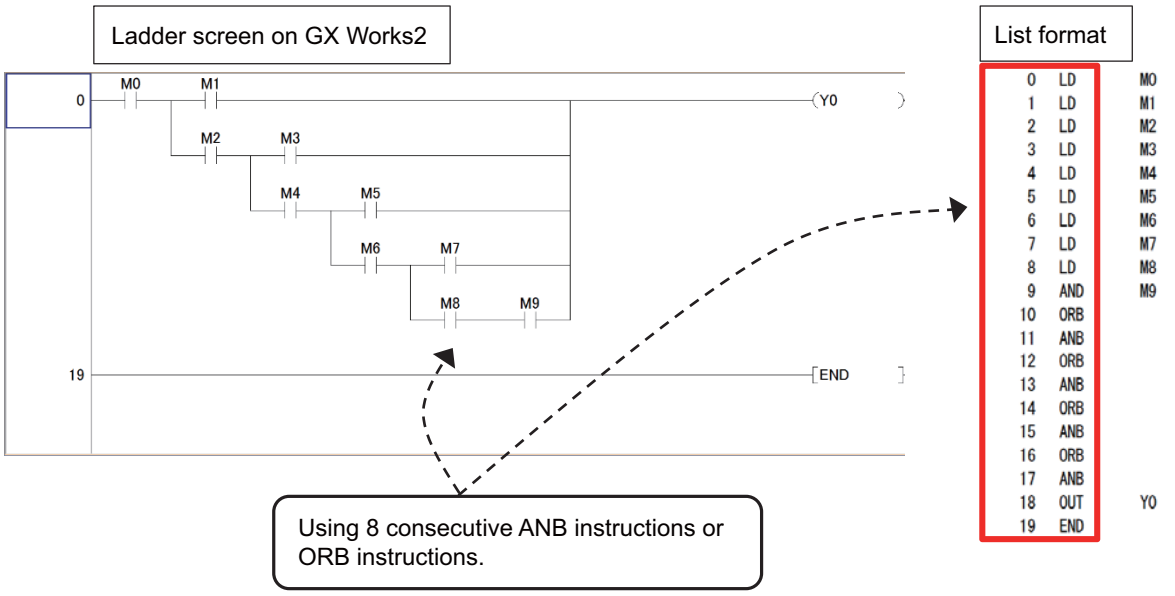
This section describes how to develop sequence programs in a simple project. There is no basic development procedure that is specific to Mitsubishi Electric CNCs. Refer to "GX Works2 Operating Manual (Simple Project)". This section provides information on CNC-specific considerations.

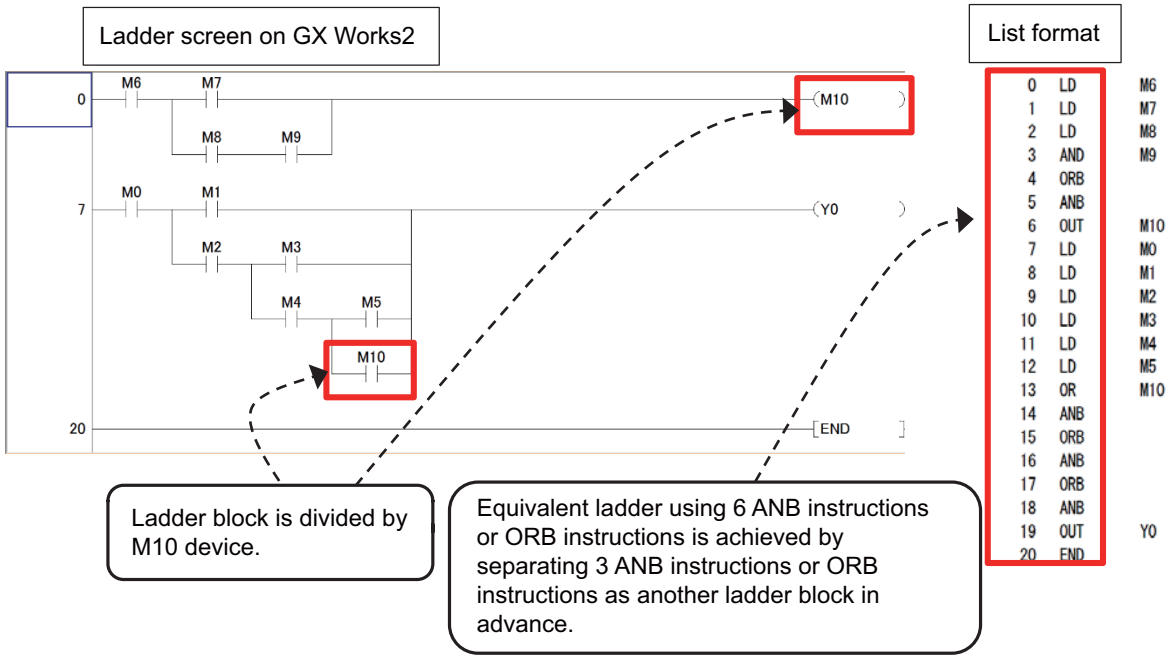
5.6.3.1 CNC-Specific Considerations

(1) Restriction on use of ANB instruction and ORB instruction

Overview: Only up to seven ANB instructions and ORB instructions can be used consecutively.

Workaround: When using a ladder containing eight or more of these instructions, use a substitute ladder as follows.

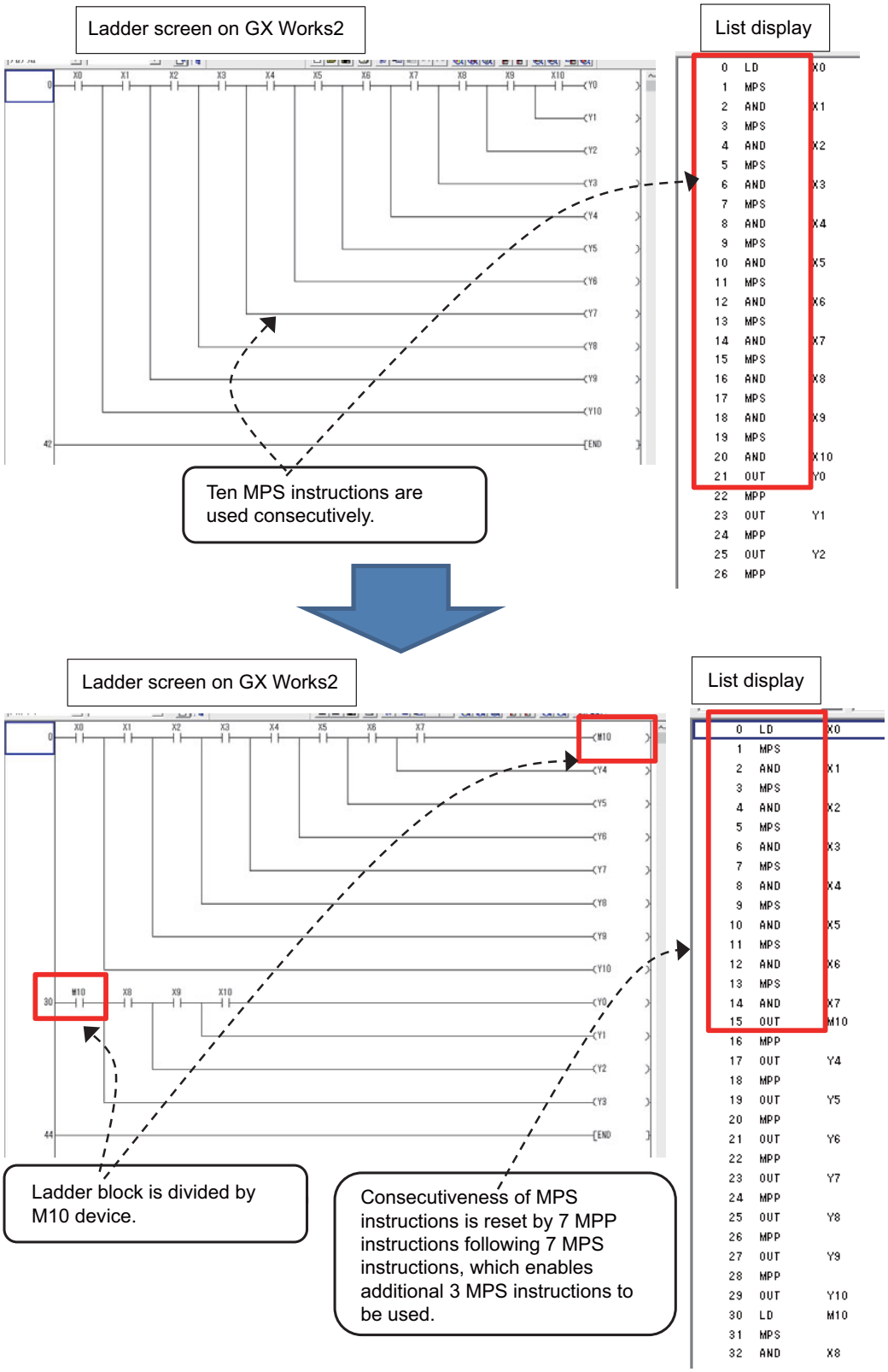




(2) Restriction on MPS instruction use

Overview: Only up to seven MPS instructions can be used consecutively. When an MPP instruction is used, another instruction can be used.

Workaround: When using a ladder containing the number of MPS instructions that exceeds the upper limit, use a substitute ladder as follows.



Set the NC parameter "#6456/bit0" to "1" to display an error dialog on GX Works2 when sequence programs that do not conform to restrictions (1) and (2) are written, and thereby prevent PLC from becoming RUN status. When an error dialog is displayed, use the above substitute ladder.

5.6.4 Writing Sequence Programs to CNC Controller

This section describes how to write sequence programs in a simple projects from GX Works2 to the CNC controller (particularly considerations and operation specific to this CNC).

(Note) This operation writes data to the temporary storage in the CNC (RAM in CNC). Data in temporary storage (RAM in CNC) are not retained after power OFF. To retain data after power OFF, write sequence programs to the ROM in the CNC according to "5.6.6 Writing Sequence Programs to ROM in CNC".

5.6.4.1 Operating Procedure

(1) Operating procedure for simple projects (without labels)

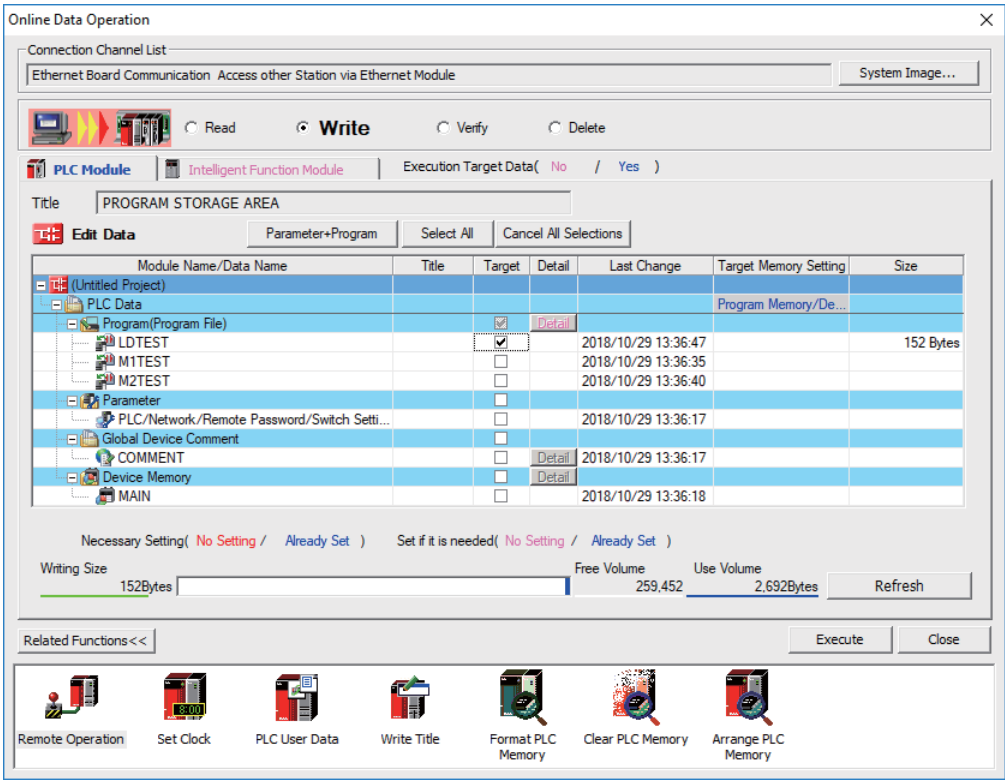
Start the operation screen by the following operation on GX Works2.

[Online] -> [Write to PLC]

Select [Program Memory/Device Memory] in [Target Memory Setting] of PLC data on the following screen.

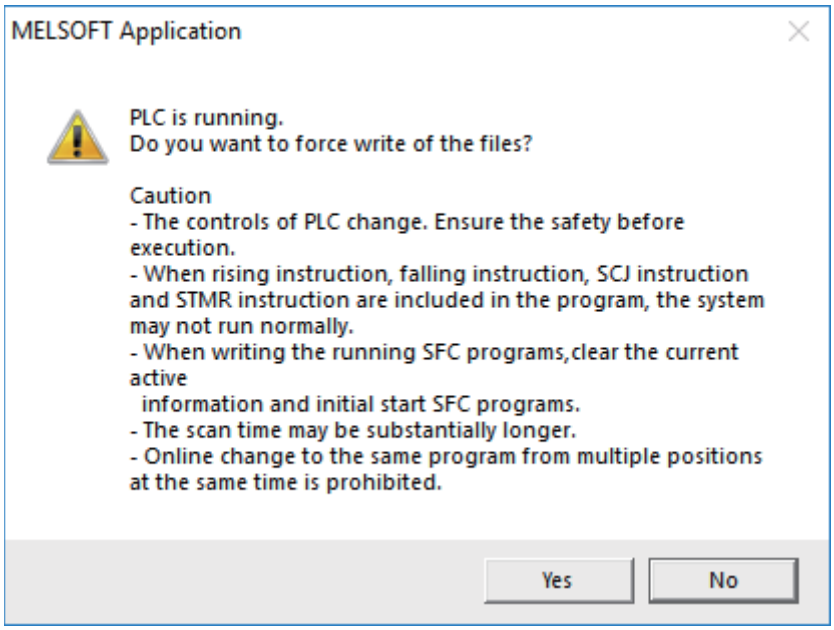
Select write sequence program files, and click [Execute].

RUN/STOP of PLC can be instructed by selecting [Related Functions] - [Remote Operation].

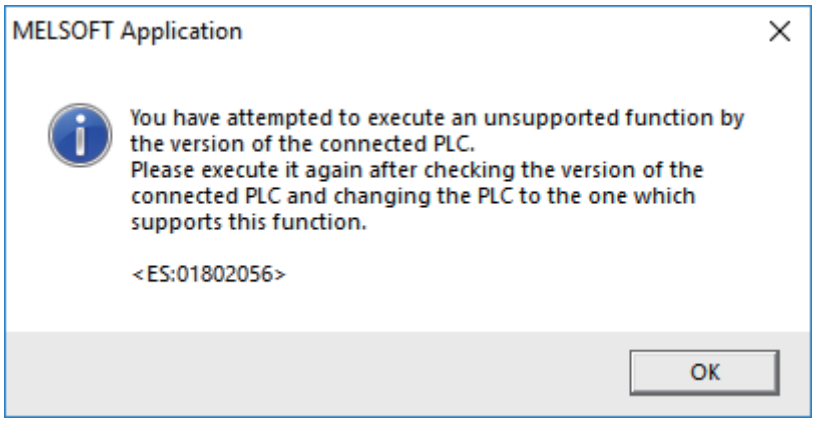


(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

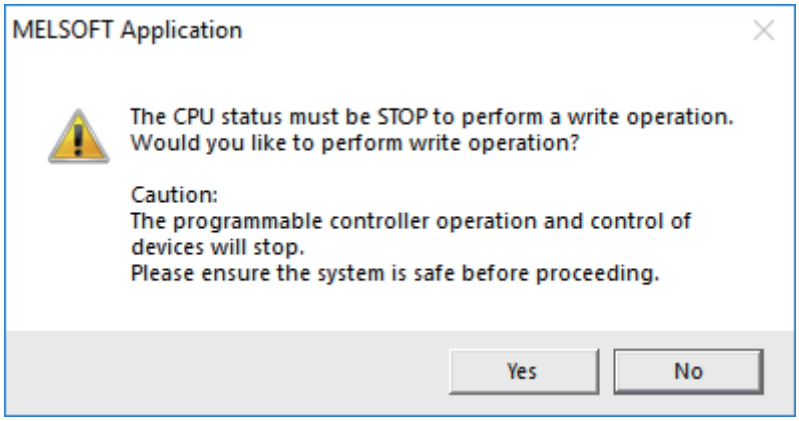
(Note2) If an attempt is made to remove the check from parameter and write sequence programs during PLC is running, the prompt "PLC is running. Do you want to force write of the files?" is displayed.



The CNC only supports writing during RUN from the [Compile] menu; if [Yes] is clicked, an error dialog is displayed and sequence programs are not written.



Click [No], and click [Yes] to the prompt: “The CPU status must be STOP to perform a write operation. Would you like to perform write operation?”



(2) Operating procedure for simple projects (with labels)

The operating procedure when "use label" is set is described below.

Start the operation screen by the following operation on GX Works2.

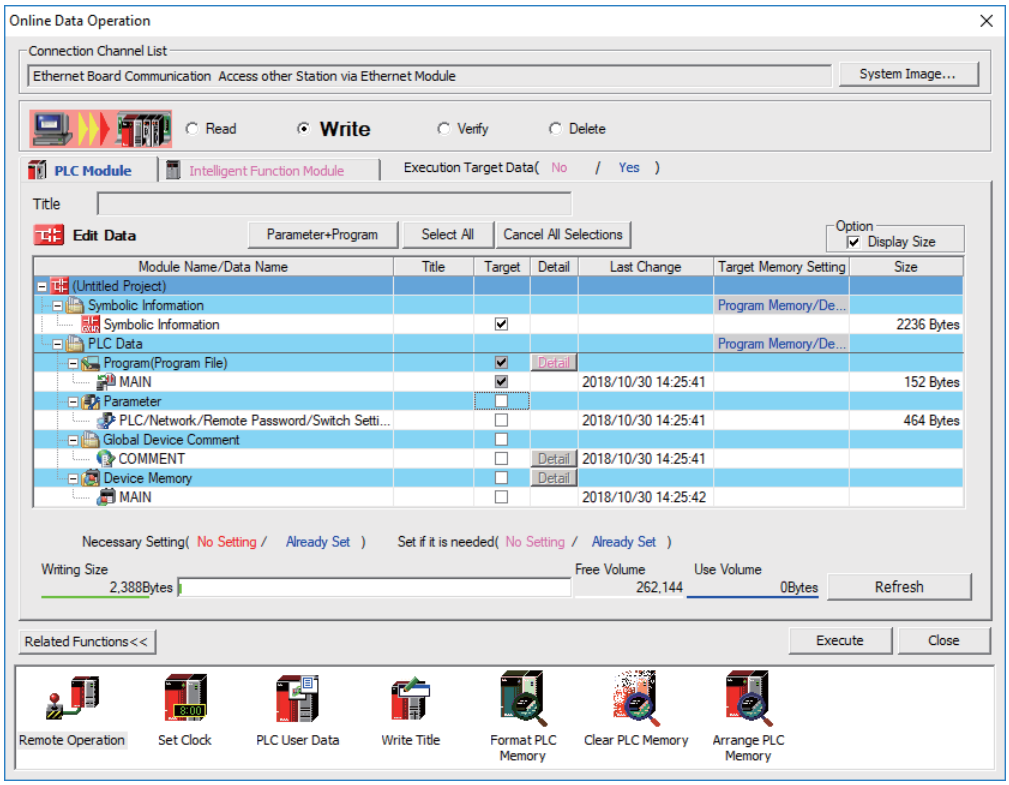
[Online] -> [Write to PLC]

Select [Program Memory/Device Memory] in target memory setting for symbolic information on the following screen.

Select [Program Memory/Device Memory] in the target memory setting for PLC data.

Click [Parameter+Program], and then click [Execute].

RUN/STOP of PLC can be instructed by selecting [Related Functions] - [Remote Operation].



(Note1) Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) Since device memory cannot be written to the CNC controller, unselect the checkbox for device memory.

(Note3) Make sure to write parameters at the same time when the symbolic information is to be written. If parameters are not written, the project has not been compiled when the symbolic information is read.

(Note4) If an attempt is made to remove the check from the parameter and to write sequence programs while PLC is running, the prompt "PLC is running. Do you want to force write of the files?" is displayed.
The CNC only supports writing during RUN from the [Compile] menu; if [Yes] is clicked, an error dialog is displayed and sequence programs are not written.
Click [No], and click [Yes] to the prompt "The CPU status must be STOP to perform a write operation. Would you like to perform write operation?" is displayed.

5.6.4.2 Write Operation

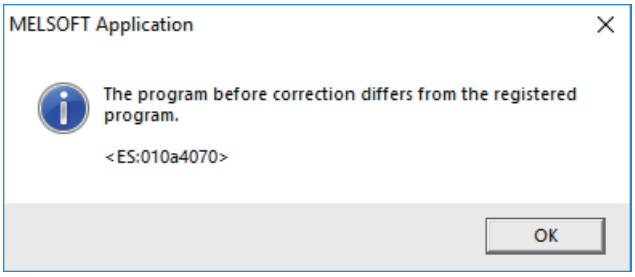
When the writing of ladders to the CNC controller is executed on GX Works2, the CNC controller converts the ladders to ladder machine codes specific to CNC as they are written.
When devices and instruction formats that are not supported by the CNC controller are used, a conversion error is generated. Even if a conversion error is generated, writing is not stopped. Transfer up to the final step is completed by converting the instructions with error into NOP instruction (No operation instruction).

(Note) Ladders with an error cannot be run for safety reasons.

5.6.4.3 Operation and Check on Conversion Error

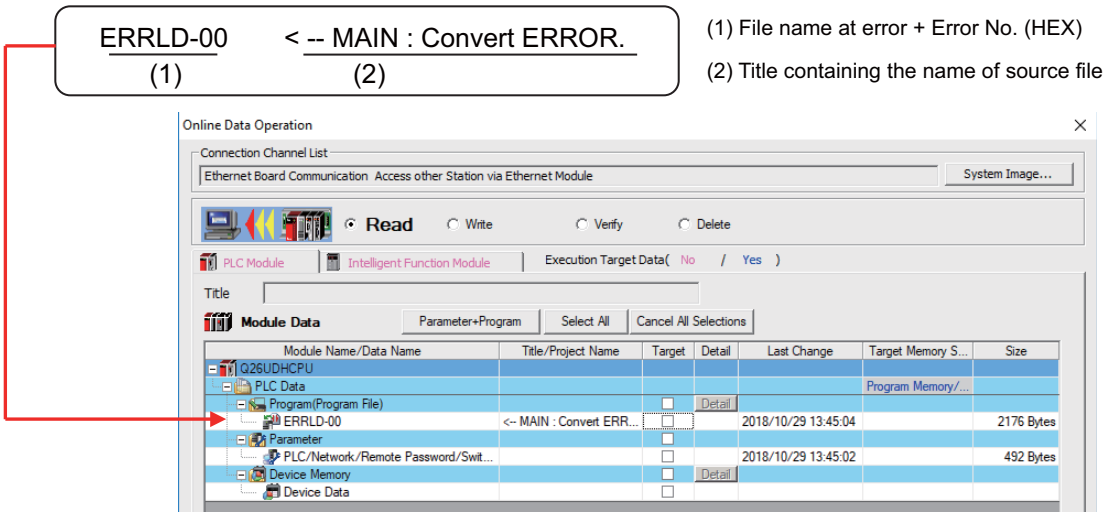
(1) Operation on conversion error

The following dialog is displayed on the GX Works2 screen on conversion error.



An attempt to run the PLC fails with an alarm on the CNC.
If a program file with a conversion error is displayed on the "Read from PLC" screen, the file name and title will change and be displayed as shown below.
When this program file is read to GX Works2, saved as a file named "ERRLD-00".
(“ERRLD-XX”: XX represents the error file number that is sequentially added from 0 in hexadecimal notation.)

(Note) When developing program with labels, error file names cannot be checked on the "Read from PLC" dialog.
Check the error file name on the "Delete PLC Data" screen.



⚠ CAUTION

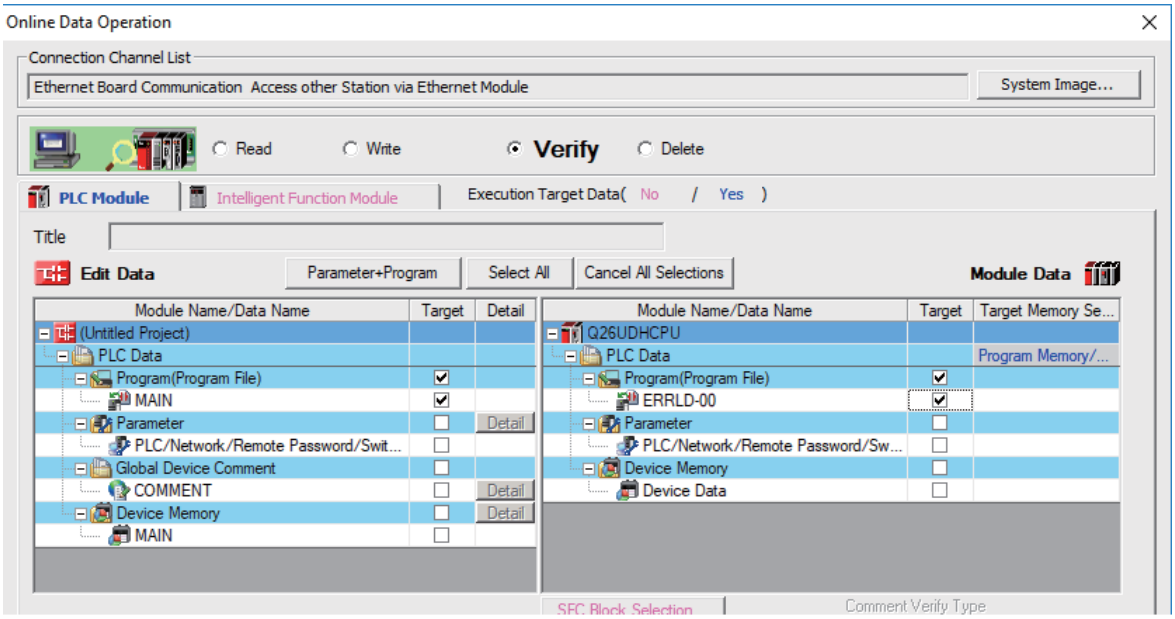
Do not read to and use on GX Works2 the ladder files for which a conversion error is generated. Unintended data are included, and malfunction may result.

(2) How to check conversion step with an error number

Error steps can be checked using PLC verify function. For details on PLC verify function, refer to "5.6.7 Verifying Sequence Programs".

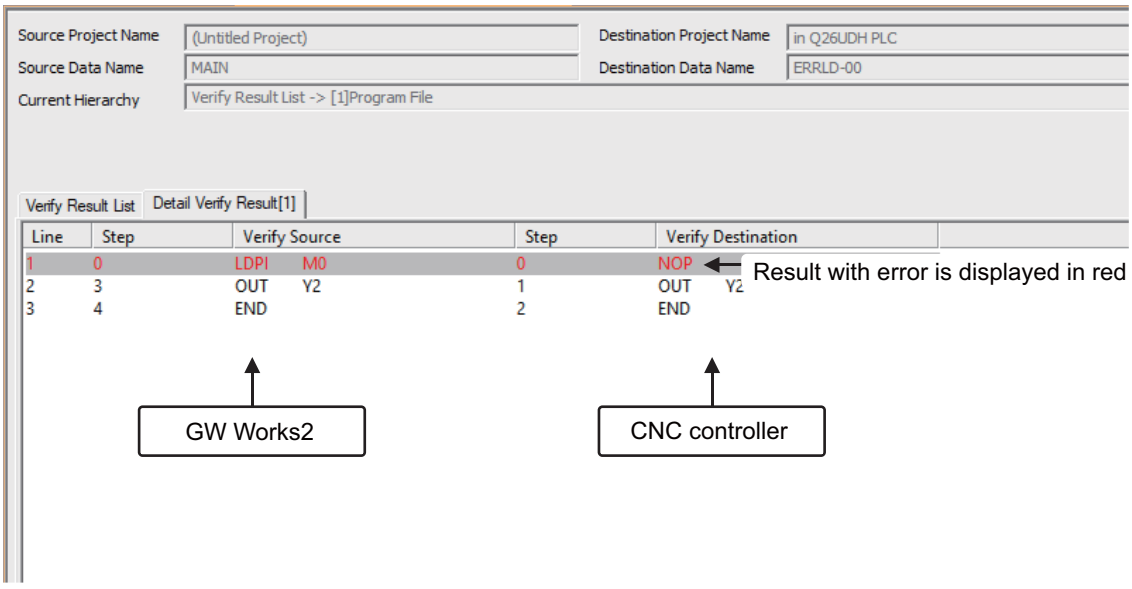
Verify Source: Select transfer source ladder file on GX Works2

Verify Destination: Select ladder with an error file "ERRLD-00" in the CNC controller



When PLC verification is executed, the verify result screen is displayed. When a file name is double-clicked, mismatched contents are displayed as shown in the example below. The NOP instructions on the CNC controller are the steps with conversion errors. Double-click one of them to display and edit the corresponding part on the GX Works2 file.

"<Verify Source>" indicates the GX Works2 side, and "<Verify Destination>" the CNC controller side.



5.6.4.4 Other Operations and Checks on Error

(1) Other errors

This section describes common errors that are generated when sequence programs are written.

Note that messages in displayed dialogs may not indicate the correct error status for CNC because they are for MELSEC PLC center. Status is indicated by the last four digits of displayed number.

For details of other errors, refer to "5.12.1 List of Errors during GX Works2 Online Operation".

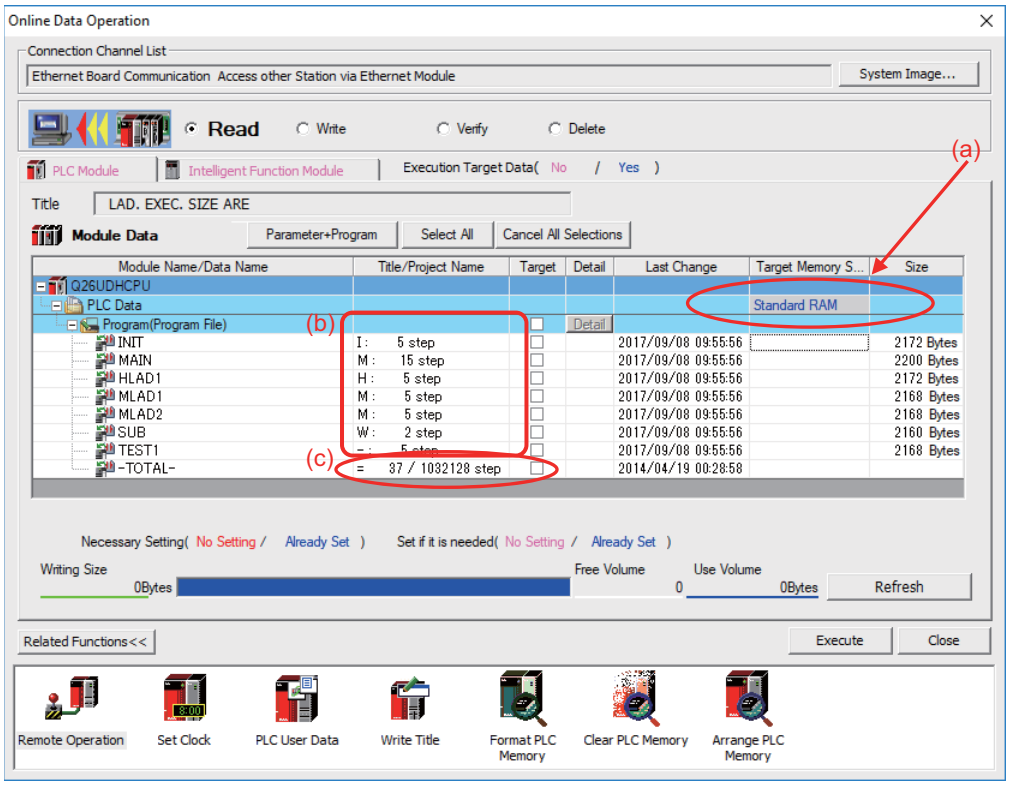
Status	Message	Cause	Corrective Action
4005 (Note1)	Writing of data which exceeds the capacity of the PLC was attempted. Execute again within the capacity of the PLC.	The maximum number of steps that can be executed with NC has been exceeded.	Check the size of execution area. (Refer to (2) of this section.) Reduce the number of steps for the sequence program to be executed according to that value.
4010	Cannot write because the PLC is executing a RUN command. Stop the PLC, then execute again.	The PLC of the NC is running.	After stopping the PLC of the NC, start execution again.
4021	The applicable drive is not ready. Check the applicable drive, then execute again.	The specified target memory does not exist or is not in a usable status.	Change the target memory.
4029	Insufficient file capacity. Execute again after deleting unnecessary files.	An attempt was made to write a file that exceeds the storage capacity.	Examine the file structure so that the data falls within the limited capacity.
4052	The file is write protected. Change the file attributes to enable writing to the file.	The specified target memory is a write-disabled device (CNC ROM).	Specify “Program Memory/Device Memory” as the target memory.
4065	A mismatch occurred between the PLC and peripheral parameters Match the parameters between the PLC and peripherals.	There is a problem in the device setting value.	Set the number of device points. (Refer to 5.5.8)
4070	The program before correction differs from the registered program.	A ladder instruction outside the specification is included.	Execute verify to identify the problematic instructions (Refer to 5.6.4.3)

(2) How to check size of area for execution

When "error status (4005): Execution area size over" ((Note1) in the error list described previously) is generated, check the size of the execution area as follows. For details on execution area, refer to "PLC Programming Manual".

When [Standard RAM] is selected as [Target Memory] on the "Read from PLC" screen, the file name and the title are changed and displayed as follows. For simple projects (with labels), open the "Delete PLC Data" screen instead of the "Read from PLC" screen.

(a) shows the set target memory.
(b) shows the numbers of steps when executed with changed titles.
The alphabet at the head of the number of steps indicates the state of parameter designation.
I: Initial H: High speed M: Medium speed W: Standby
-: No parameters or parameters not stored
(c) indicates the total number of steps at execution. (Total of "initial", "high speed", "medium speed" and "wait to be executed.)
The denominator indicates the maximum size of the execution area.
When there is no parameter, the single program method is applied and "TOTAL" will not be displayed.



In the above screen example, adjust the size of the sequence program so that the total number of steps at execution (37) indicated in (c) is smaller than the denominator: the maximum size (1032128) of the execution area.

(Note) Exercise caution not to delete files by mistake when checking the size of the execution area for simple projects (with labels).

5.6.5 Reading Sequence Programs from CNC Controller

This section describes how to read GX Works2 sequence programs from the CNC controller.

5.6.5.1 Operating Procedure

(1) Operating procedure for simple projects (without labels)

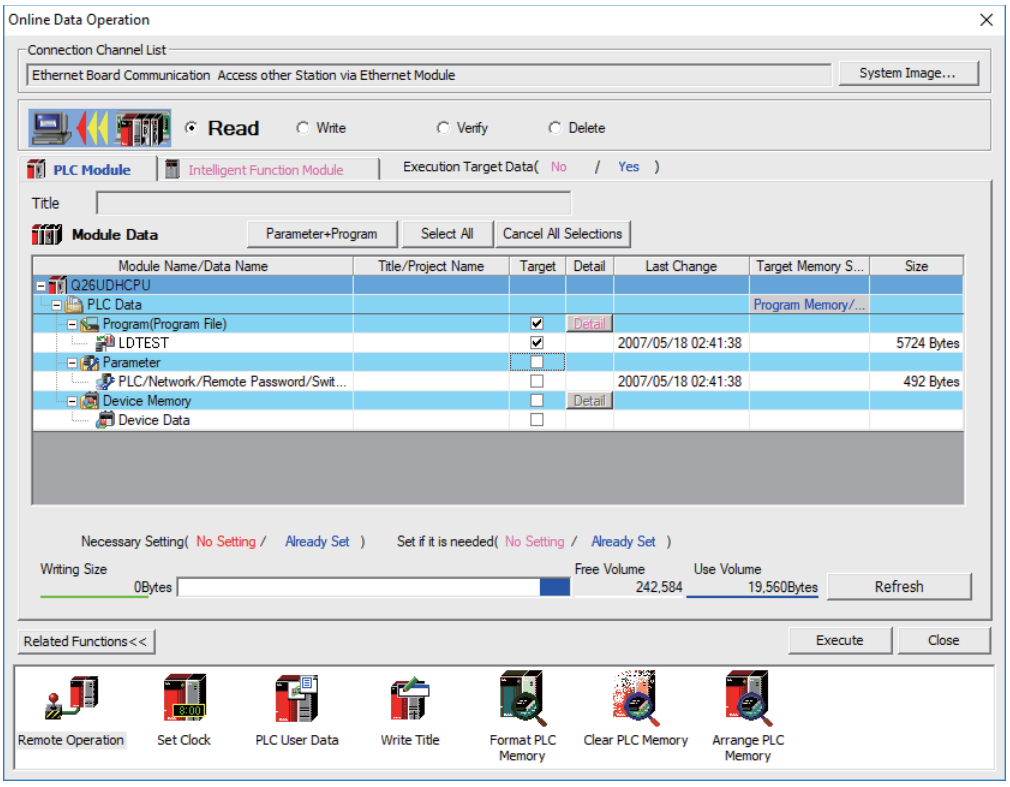
The operating procedure for when labels are not used is described below.

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

Select [Program Memory/Device Memory] in target memory setting for PLC data on the following screen.

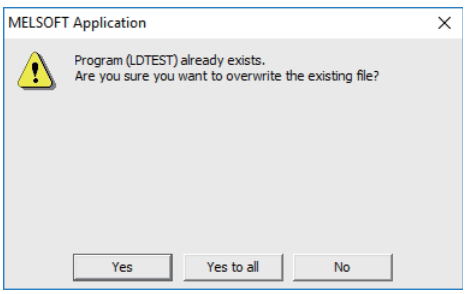
Select read sequence program file, and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].
Click [Refresh] before reading sequence programs.

(Note2) Always click [Refresh] before reading sequence programs

If there is a sequence program file of the same file name on GX Works2, the following dialog is displayed.



(Note) When [Yes] is clicked in the above dialog, the sequence program file on GX Works2 is overwritten and deleted. Execute after thoroughly checking.

"Read from PLC" screen can also be used as the file list function of the CNC controller. The date and time of update and the size of each file are displayed on the right side of the file name.

(2) Operating procedure for simple projects (with labels)

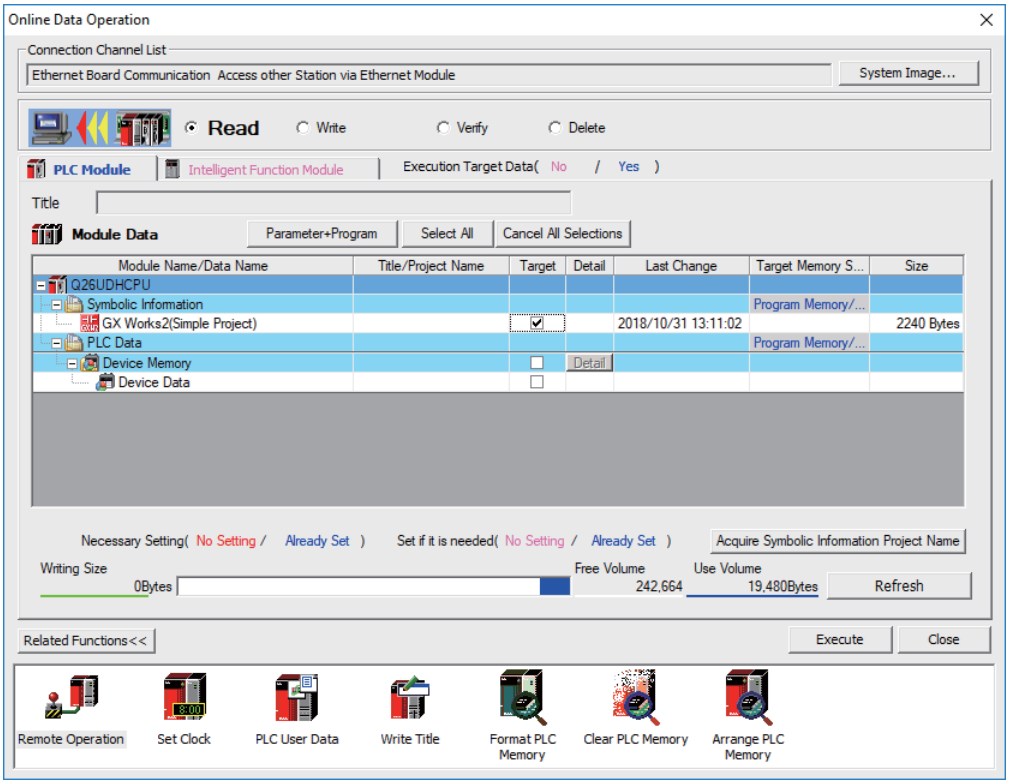
The operating procedure for when “use label” is used is described below.

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

Select [Program Memory/Device Memory] in the target memory setting of symbolic information on the following screen.

Select "GX Works2 (Simple project)", and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

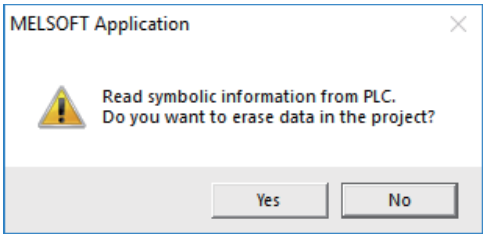
(Note2) Click [Refresh] before reading symbolic information.

(Note3) For details on read parameters before reading symbolic information, refer to "5.5.8.6 Writing and Reading Parameters to CNC Controller".

(Note4) When symbolic information is read, labels and FB are also read as well as sequence programs.

(Note5) When a simple project with labels is selected, a sequence program only by itself cannot be read.

Select [Yes] when the following dialog is displayed. Sequence programs and label data are read.



(Note) When [Yes] is clicked in the above dialog, the sequence program files, labels and FB on GX Works2, are overwritten and deleted. Check thoroughly before executing.
(No prompt for overwrite confirmation is displayed even when there is a file of the same name.)

The "Read from PLC" screen can also be used as file list function of the CNC controller. The date and time of update and the size of each file is displayed on the right side of the file name.

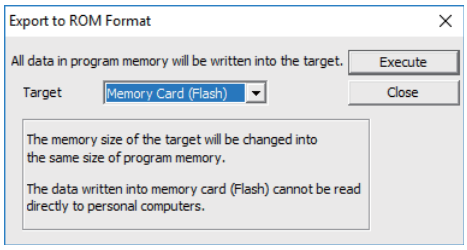
5.6.6 Writing Sequence Programs to ROM in CNC

Sequence programs transferred from GX Works2 and built-in PLC (built-in edit function) to the CNC controller are stored in temporary storage. Data in temporary storage are erased at power OFF. (The sequence programs stored in the ROM in the CNC is enabled by powering ON the CNC controller again.)
To retain data after the CNC is powered ON again, transfer the sequence programs in temporary storage to the ROM in the CNC according to the following procedure.
This section describes how to transfer sequence programs in the temporary storage the CNC controller to the ROM in the CNC on GX Works2.
Write operation to the ROM is not necessary for the user safety sequence.

(Note) When the sequence programs in temporary storage (RAM in CNC) are updated, but not written to the ROM in the CNC, "ROM-Write incomplete" error is generated.

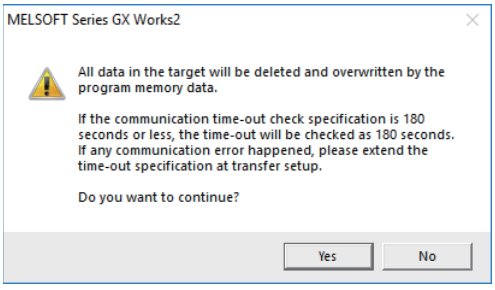
5.6.6.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.
[Online] -> [Export to ROM Format]



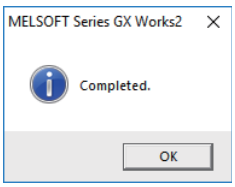
(Note) Only [memory card (Flash)] is valid as [Target].

Click [Execute] to display the following dialog, and click [Yes].



(Note) When [Yes] is clicked in the above dialog, sequence program files on the ROM in the CNC the CNC controller are overwrite and deleted. This should be done with extreme caution.

Writing is completed when the following dialog is displayed. Click [OK].



5.6.7 Verifying Sequence Programs

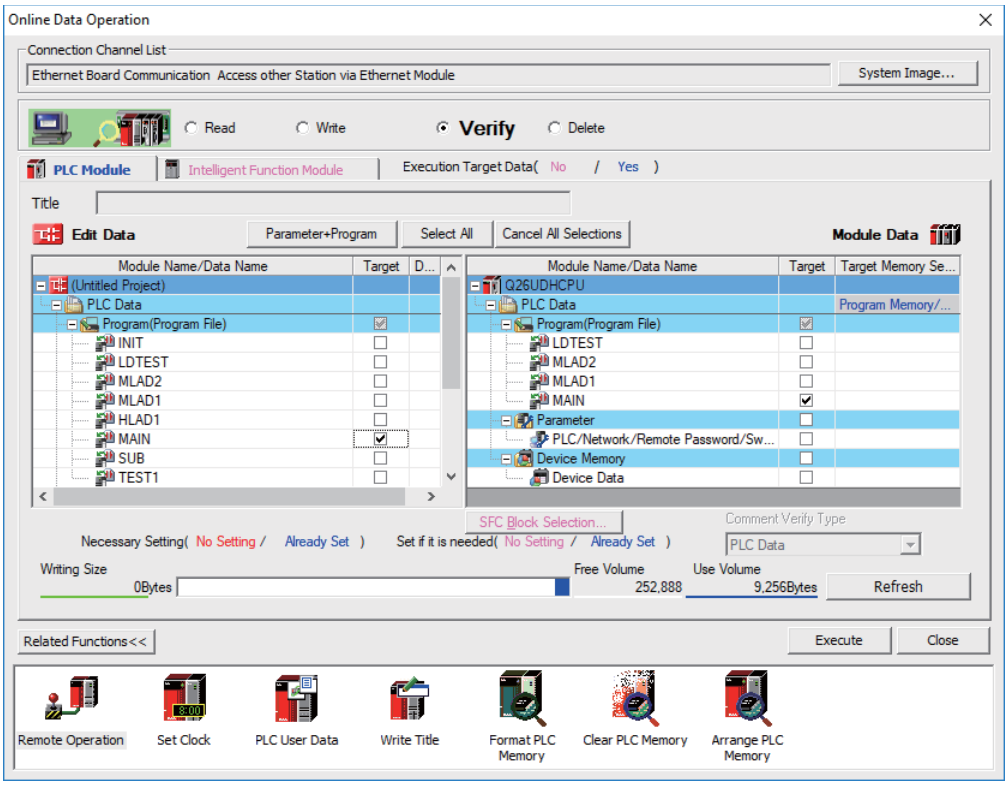
This section describes how to verify sequence programs between the CNC controller and GX Works2.

5.6.7.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Verify with PLC]

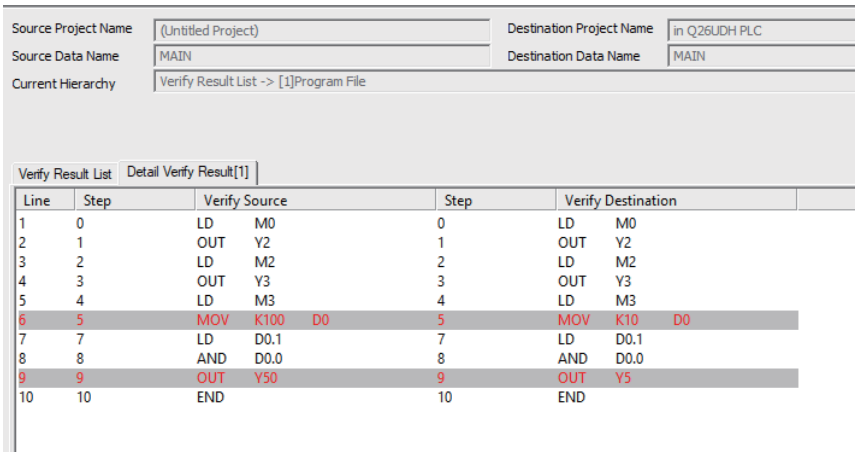
Select the sequence program file to verify on the following screen, and click [Execute].



(Note) The memory that has the file to be verified is valid as [Target Memory Setting].

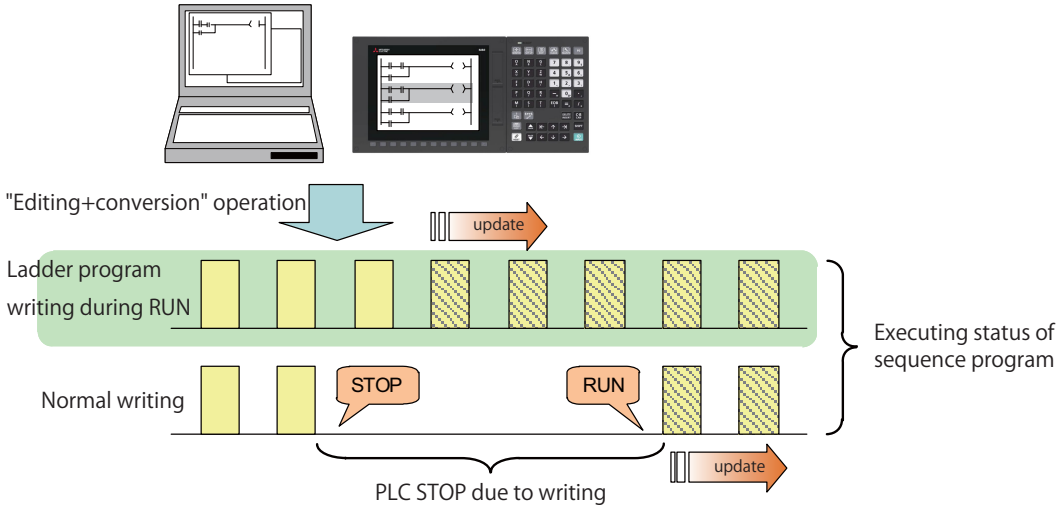
When verification finishes, the verify result screen is displayed. Double-click a file name to display on the screen the detailed result as shown below. Unlike GX Developer, matched places are also displayed on GX Works2. Mismatched contents are displayed in red. Click [Find/Replace] - [Next Unmatch] and [Find/Replace] - [Previous Unmatch] to find previous and next mismatch places. Double-click mismatched contents to display and edit the corresponding parts in the GX Works2 file.

Since the verification with PLC is executed for actual ladder (ladder with labels and functional blocks compiled) after compile, sequence programs with labels displayed cannot be verified.



5.6.8 Executing Ladder Program Writing during RUN

Ladder program writing during RUN (or RUN write/online change) enables to edit and change the sequence program from GX Works2 without stopping PLC operation.
When a ladder program is to be written to a CNC, use the writing command (Online program change) in the [Compile] menu of GX Works2. The ladder program writing during RUN cannot be executed on the [Write to PLC] screen.
For the user safety sequence, ladder program writing during RUN cannot be used.



⚠ CAUTION

Only the person who knows well about sequence programs can execute sequence program writing during RUN.
When the RUN write is enabled, the modification will be immediately effective after the data editing and conversion.
The machine might operate in unexpected way when the sequence program is incomplete.
Consider well the influence of the modification in advance. Also, always make sure that the system's safe operation with the sequence programs.

5.6.8.1 Execution Procedures of Ladder Program Writing during RUN

Ladder program writing during RUN is executed in the following procedure.

Execution procedures		Description	Reference
1	Set parameters of CNC	By setting the bit selection parameter of CNC, enable the ladder program writing during RUN.	5.6.8.2 Setting Ladder Program Writing during RUN
2	Set the options of GX Works2		5.6.8.8 Option Setting Screen for Ladder Program Writing during RUN (Online Change)
3	Read out the sequence programs	The sequence programs are read out from CNC to GX Works2	5.6.5 Reading the Sequence Program from the CNC Controller
4	Edit the sequence programs		GX Works2 Operating Manual
5	Write the sequence programs during RUN	The sequence programs are written to CNC during RUN.	5.6.8.7 Operation method on the GX Works2

5.6.8.2 Setting Ladder Program Writing during RUN

Turn ON the corresponding bit selection parameter and turn the power ON again to enable ladder program writing during RUN.

(1) Bit selection parameter

# No.	Bit	Item	Details	Setting range	Standard value
6455	Bit 6	Enable ladder program writing during RUN (in high-speed processing)	Select whether to permit ladder program writing during RUN to built-in PLC (in high-speed processing). 0: Not permit ladder program writing during RUN 1: Permit ladder program writing during RUN	0,1	0
6455	Bit 7	Enable ladder program writing during RUN	Select whether to permit ladder program writing during RUN to built-in PLC (except in high-speed processing). 0: Not permit ladder program writing during RUN 1: Permit ladder program writing during RUN	0,1	0

(2) Precautions

- These parameters will be enabled after the power is turned ON again.
- When the multi-project function is enabled, the enabled or disabled status of ladder program write during RUN is switched for all the projects.
- Turning ON "#6455 Bit6 (Enable ladder program writing during RUN (in high-speed processing))" alone does not take effect.
  When setting "#6455 bit 6" to "1", also set "#6455 bit 7 (Enable ladder program writing during RUN)" to "1".
- When "Enable ladder program writing during RUN (in high-speed processing)" is set to "1", a high-speed processing program will use 8,000 steps of execution area. Thus, if the program size before the setting change is close to the maximum, the error of insufficient execution area may occur after the setting change.

5.6.8.3 PLC Data Available for Ladder Program Writing during RUN

The following shows the PLC data which can be stored in CNC controller and available for ladder program writing during RUN.

Data type available for RUN write

Data class	Data type	GX Works2	GX Developer	Built-in PLC (built-in edit function)
Sequence program (independent program method)	-	×	×	×
Sequence program (Multi-program method) (*1)	High-speed process	○ (*2)	○ (*2)	○ (*2)
	Main process	○	○	○
	Initialization process	○	○	○
	Standby process	○	○	○
Symbolic information		○	○	×
Parameters device comments message data		×	×	×

(*1) Only the program whose execution order has been registered in the parameter is available.
(*2) There are some restrictions on the contents of high-speed processing programs. For details, refer to later precautions in this chapter.

5.6.8.4 Data Unit for Writing

The following table shows the available data units for the ladder program writing during RUN and specifications of an upper limit of each writing are as follows. Ladder blocks are written at the conversion after edited. When the ladder program writing during RUN is executed from the ladder edit screen, either the single block or the multiple blocks will be written in the ladder program. The writing method to be executed is automatically determined based on the standard stated in (*1) below the table; therefore, the method cannot be selected by users. The ladder program cannot be written to PLC on a file basis with the operation such as selecting [Online] - [Write to PLC].

Available data units for the ladder program writing during RUN

Data units for writing	GX Works2	GX Developer	PLC editing using on-board
Ladder program writing during RUN of single block	○ 512 steps	○ 512 steps	○ 512 steps
Ladder program writing during RUN of multiple blocks (*1)	○ 64 blocks Total 1024 steps	○ 64 blocks Total 1024 steps	×
Ladder program writing during RUN in file units	×	×	×

(*1) For GX Works2, when you edit the definition of FB where multiple instances exist in a single program, the ladder program writing during RUN of multiple blocks will be applied. When you add or delete FB instance, the ladder program writing during RUN of single block will be applied.
For GX Developer, when you edit the definition of FB where an instance exists, multiple-block writing in ladder program during RUN will be applied. When you add or delete FB instance, single-block writing in ladder program during RUN will be applied.

5.6.8.5 Available Number of Steps for Writing

Ladder program writing during RUN is available until the total number of steps needed for executing the sequence program set in the parameter reaches the maximum number of steps of the program execution area. (For the maximum number of steps in the sequence program execution area, refer to the "PLC Programming Manual".)
Note that when RUN write in high-speed processing is enabled, the number of steps in the sequence program execution area will be as shown below.

[When the multi-project function is disabled]
The maximum number of executable steps in a high-speed processing is fixed to 4,000. If this number is exceeded, NC will show an alarm and RUN write will be disabled.
In addition, the maximum number of executable steps in a main processing program decreases by 8,000 steps.
The following shows the relation between the settings and available number of steps for RUN write.

Settings and available number of steps

Setting of "Enable ladder program writing during RUN"		Number of steps available for execution	
High-speed process	Main process	High-speed processing program	Main processing program
ON	ON	High-speed processing program ≦ 4,000 steps	Main processing program ≦ (Number of execution area steps - 8,000 steps.)
OFF	ON	(Total number of steps in high-speed processing program and main processing program) ≦ Number of steps in execution area	
OFF	OFF		

[When the multi-project is enabled]
The maximum number of executable steps in a high-speed processing program is fixed to 4,000 in total of all the projects, regardless of the multi-project parameters. If the number of steps exceeds 4,000, NC will show an alarm and RUN write will be disabled.
In addition, the whole sequence program execution area decreases by 8,000 steps.
The number of steps of sequence program storage area per project is calculated by subtracting 8,000 steps from the total size.
The following shows the relation between the settings and available number of steps for RUN write.

Settings and available number of steps

Setting of "Enable ladder program writing during RUN"		Number of steps available for execution	
High-speed process	Main process	High-speed processing program	Main processing program
ON	ON	[total of whole project] High-speed processing program ≦ 4,000 steps	[per project] Main processing program ≦ ((Number of execution area steps - 8,000 steps) x project percentage)
OFF	ON	[per project] (Total number of steps in high-speed processing program and main processing program) ≦ (Number of steps in execution area multiplied by project ratio)	
OFF	OFF		

If high-speed processing program does not need to be written during RUN, the execution steps for a sequence program in main processing program can be increased by setting OFF the bit selection parameter "Enable ladder program writing during RUN (in high-speed processing)".

5.6.8.6 RUN Write Target Storage Area

The following table indicates the available storage areas for RUN write.
The operation target of RUN write is temporary memory storage. The RUN write is reflected in the PLC processor execution area at the same time and is carried out.
A write to the storage area (in CNC) needs to be done separately using the ROM write operation.
ROM writing operation is available while PLC is running.

RUN write target storage area

	RUN write availability for each development environment		
Storage area	GX Works2	GX Developer	Built-in PLC (built-in edit function)
Temporary memory storage (RAM in CNC)	○ (when converted)	○ (when converted)	○ (when converted)
Storage for execution	○ (when converted)	○ (when converted)	○ (when converted)
Storage area (ROM in CNC)	× (*1)	× (*1)	× (*1)

(*1) Storage area is not updated at the time of conversion.
A write to the storage area (in CNC) needs to be done separately using the ROM write operation.

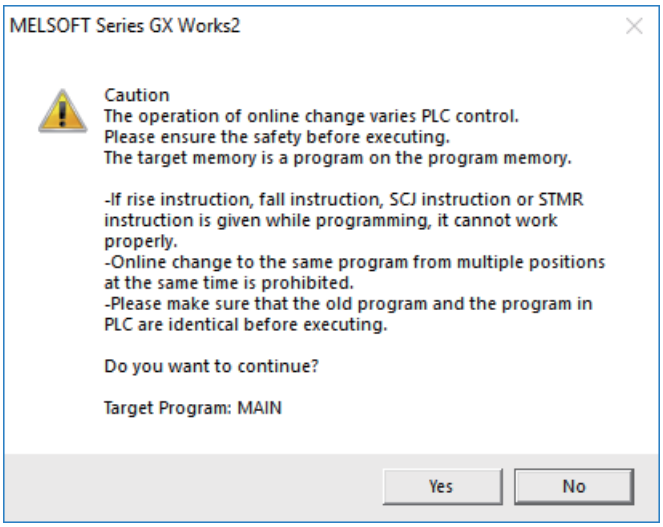
5.6.8.7 Operation method on the GX Works2

There are three ways to execute ladder program writing during RUN with GX Works2.
- Executing [Compile] - [Online program change].
- Set the options for RUN write in "Options" window before executing conversion.
- Execute conversion in "Monitor (write mode)" window.

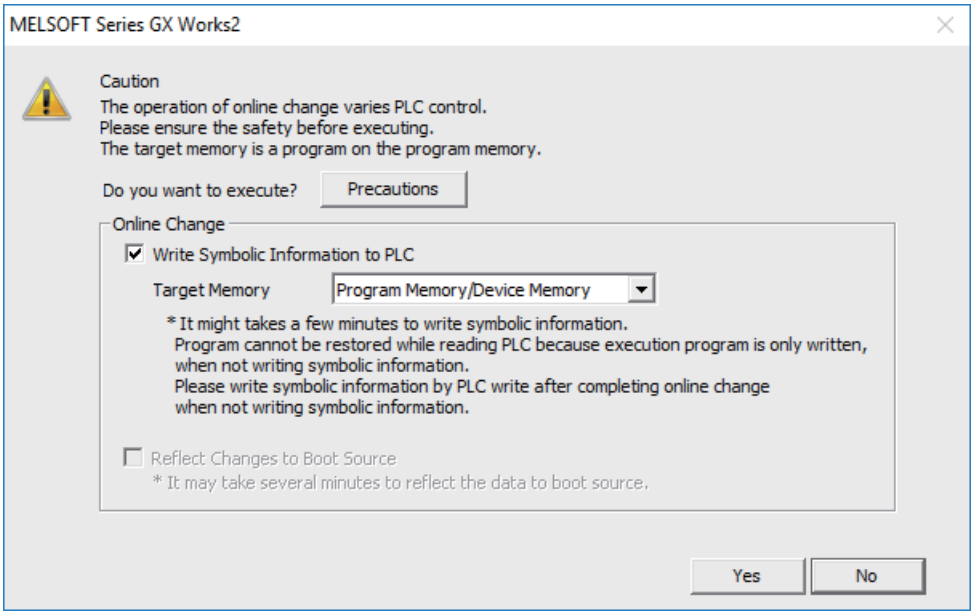
Common Operation while Executing Conversion for Ladder Program Writing during RUN

Conversion procedure in RUN write is the same in any methods. Regardless of PLC status, either "RUN" or "STOP", operation procedure is the same. When conversion is executed, the following dialog box will be displayed.

The dialog displayed for a simple project (without labels)

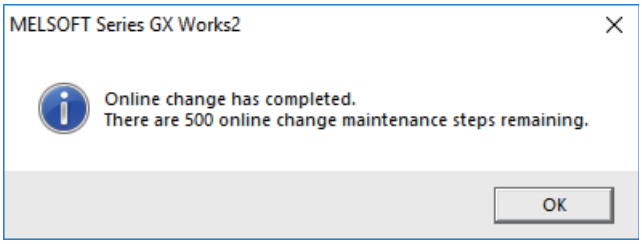


The dialog displayed for a simple project (with labels)



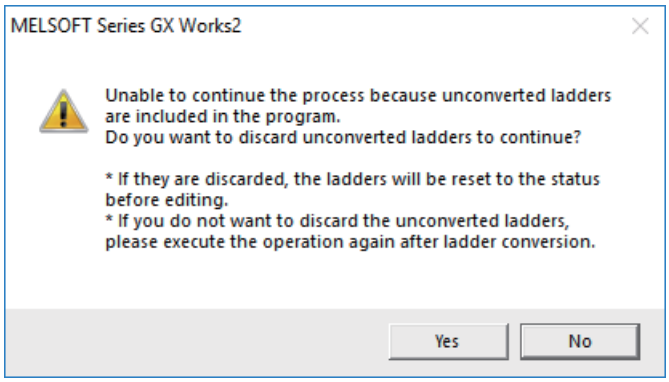
(Note) The symbolic information must be written together with sequence programs during RUN. Otherwise, a mismatch occurs between the symbolic information and sequence programs when "Read from PLC" is executed.

(1) Pressing [Yes] button executes the RUN write, displaying the following dialog box after writing process is completed.
Processing time of RUN write depends on the total number of steps used in the ladder programs and the points where the steps are written in.



Ignore the message "There are xxx RUN write maintenance steps remaining." indicated by (a) in the completion dialog box. CNC does not use such kind of steps.

(2) Pressing [No] button cancels the conversion and the RUN write, displaying the following dialog box.



If you click [Yes], the unconverted ladder is canceled and the previous ladder display returns.
If you click [No], the unconverted ladder is retained.

Executing "Online program change" (Ladder program writing during RUN)

"Online program change" (Ladder program writing during RUN), dedicated to conversion writing, is provided separately from common conversion. After editing ladder program as usual, do either of the following operations for conversion. Further operation is the same as that in "Common Operation while Executing Conversion for Ladder Program Writing during RUN".

- Select [Compile] - [Online program change].
- Press "shift" and "F4" keys simultaneously.

Setting Options for Ladder Program Writing during RUN before Executing Conversion

The following explains how to change the settings to execute ladder program writing during RUN instead of common conversion.
Display the setting screen by selecting [Tool] - [Options] - [Online change].
Check the option "Execute online change by Compile" and then click [OK].
After setting this item, ladder program writing during RUN can be executed with the normal conversion operation. The operation after conversion writing is the same as described in the section "Common Operation while Executing Conversion for Ladder Program Writing during RUN".

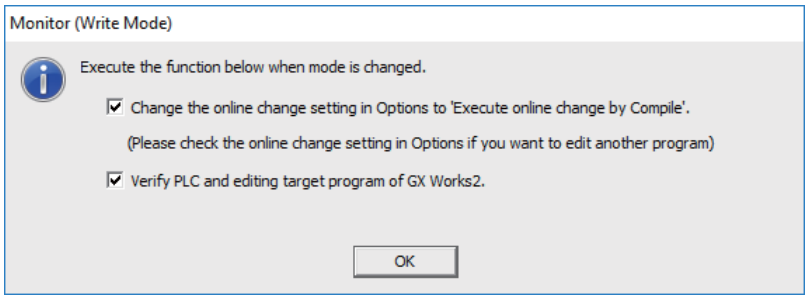
Executing Conversion in "Monitor (Write mode)"

"Monitor (Write mode)" is the mode that enables editing, conversion, and conversion writing while executing ladder monitor.

Do either of the following operations:

- Select [Online] - [Monitor] - [Monitor (Write mode)].
- Press "Shift" and "F3" keys simultaneously.

The following confirmation dialog box will be displayed. Clicking [OK] starts the preparation for the monitor (write mode): compares the program on the GX Works2 ladder screen with the stored files in NC.

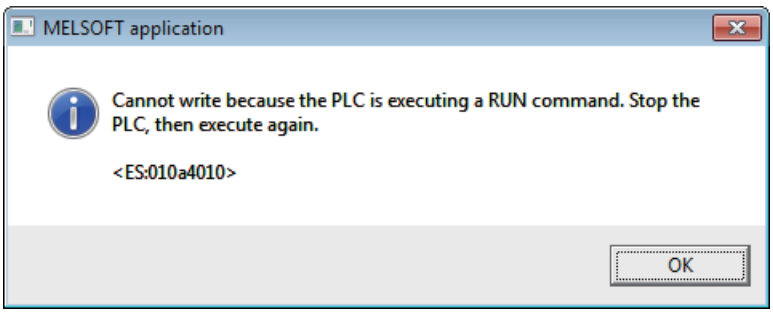


After the comparison, ladder editing can be executed on the ladder monitoring screen. RUN write can also be executed with the common conversion operation. Further operation is the same as described in the section "Common Operation while Executing Conversion for Ladder Program Writing during RUN".

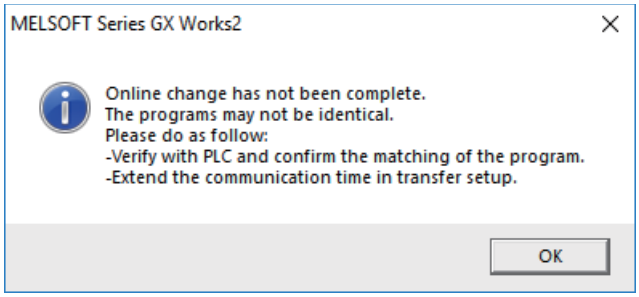
Operation when Ladder Program Writing during RUN is Disabled

Without settings for enabling ladder program writing during RUN, the following error dialog box appears at the RUN write execution. When RUN write is executed the CNC system which does not support the function, the same dialog box appears.

After any operation of "Executing "Online program change" (Ladder program writing during RUN)", "Setting Options for Ladder Program Writing during RUN before Executing Conversion" or "Executing Conversion in "Monitor (Write mode)"", when "Yes" is pressed on the confirmation dialog box described in the section "Common Operation while Executing Conversion for Ladder Program Writing during RUN", the following error dialog box appears.

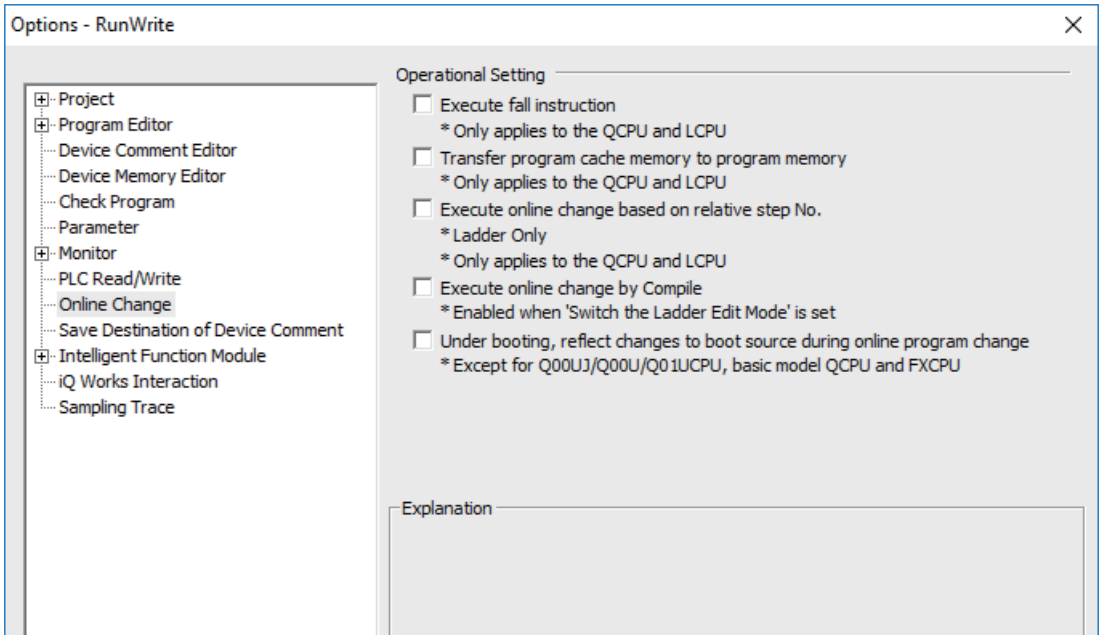


Pressing [OK] displays another error dialog box as follows.



5.6.8.8 Option Setting Screen for Ladder Program Writing during RUN (Online Change)

When the ladder program writing during RUN is to be executed to a CNC, display the setting screen by selecting [Tool] - [Options] - [Online Change] to set the following optional items.



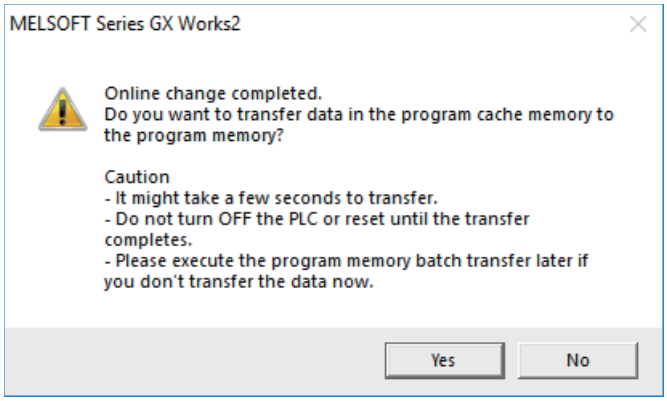
(1) Execute fall instruction

Do not check this item. Regardless of the setting, the first fall instruction is not executed in a CNC after the setting is changed.

(2) Transfer program cache memory to program memory

Check this item.

When this item is not checked, the following dialog is displayed while executing ladder program writing during RUN.



CNC performs RUN write only regardless of whether you choose "Yes" or "No".

(3) Execute online change based on relative step No.

Do not check this item. "Relative step No. by pointer" is not supported.

When a pointer (P) is included in the ladder block to be written during RUN with this item checked, an error will occur.

(4) Execute online change by Compile

Refer to "Setting Options for Ladder Program Writing during RUN before Executing Conversion" in "5.6.8.7 Operation method on the GX Works2", and check this item as necessary.

(5) Under booting, reflect changes to boot source during online program change

Do not check this item. Booting operation is not supported by CNC.

5.6.8.9 Precautions

Limitations on Program Configuration

(1) Limitations on independent program method

Ladder program writing during RUN is not available for the sequence program in independent program method. Bit selection parameter setting is not available. Still, program execution is available.

(2) Limitations on high-speed processing program

If you set the bit selection parameter to enable “ladder program writing during RUN (in high-speed processing)”, a write to a high-speed processing program is enabled during RUN. However, the following limitations are imposed:

(a) Available execution steps

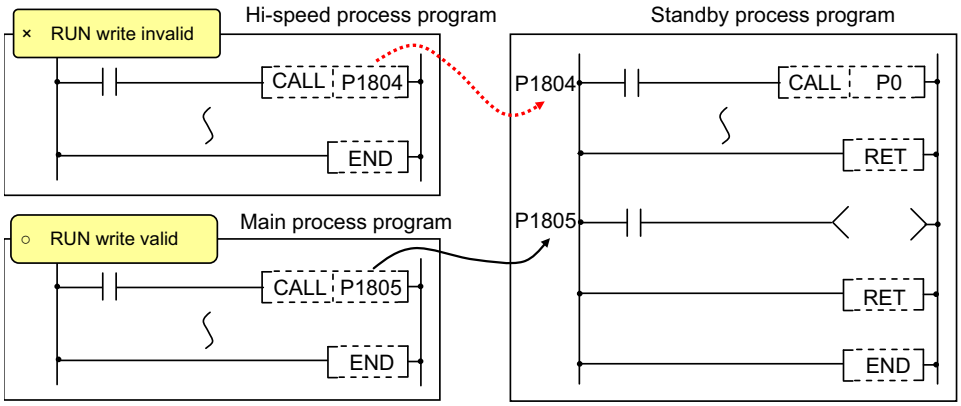
The following is the maximum number of available execution steps for a high-speed processing program.
If the number has been exceeded during RUN write, an error will occur.
- The maximum number of available execution steps is 4,000.
  (When the multi-project function is enabled, the total number of steps for all projects will be 4,000).
- 8,000 steps of execution area will be used regardless of the size of high-speed processing program.

(b) Available number of local labels

The following is the number of available local labels in a high-speed processing program.
If the number has been exceeded during RUN write, an error will occur.
- The maximum number of local labels is 256.
  (When the multi-project function is enabled, the maximum number of local labels will be 256 per project.)
- If the number of local labels is set to 256 or less, the set number will be the maximum number of local labels.

(c) Use of common pointers in high-speed processing program

RUN write is disabled when the common pointer is used in a high-speed processing program. In this case, the bit selection parameter for enabling RUN write will be disabled. Still, program execution is available.
If you perform RUN write for a high-speed processing program, use a local pointer only. The following is an example of the use of common pointer for subroutine call from standby processing program.



(3) Limitations when the multi-project function is enabled

RUN write cannot be performed to different projects through multiple development tools at the same time.
If attempted simultaneously, an error will occur. Try RUN write again after shifting the timing.

(4) Limitations on independent program method

When the multi-project function is enabled and a sequence program in independent program method is included in any project, the ladder program writing during RUN cannot be executed for high-speed processing program in all projects.

Precautions for Command Operation in Ladder Programming Writing during RUN

(1) When commanding rising/ falling edge

When rising or falling edge is commanded in ladder program writing during RUN, the following action will be taken after the command. The rising/falling edge may not always be executed in the first processing cycle due to the change of operation path such as subroutine call or jump junction.

	The first execution after change	The second execution after change
Rising/falling commands in contact system LDP, LDF, ANDP, …, MEP, MEF, … PLS, PLF, FF, MOVP, ～P, …	Command status is OFF	Normal execution

(2) When a device is deleted in the program

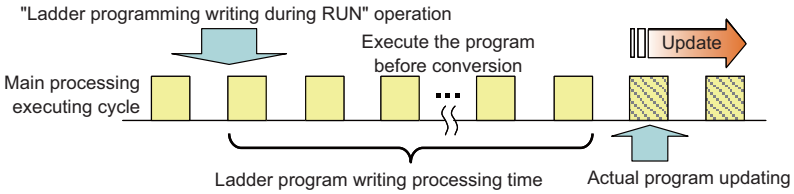
If an output command is deleted in the program, the output status of the device designated by the command will be kept as before the deletion.

(3) When a program error occurs in RUN write

When a program error occurs in the process of RUN write, the display of the error step may be inaccurate regardless of the relation of the command and the error point.

(4) Actual updating timing of program in RUN write

An updated program may not be executed in the cycle right after the RUN write (after executing the ladder conversion). The actual execution of the updated program may be delayed by a few or a few dozens cycles, because the processing time of RUN write depends on the total number of steps used in the sequence programs and the points where the steps are written in.



Other Precautions

(1) Number of steps that can be written during RUN

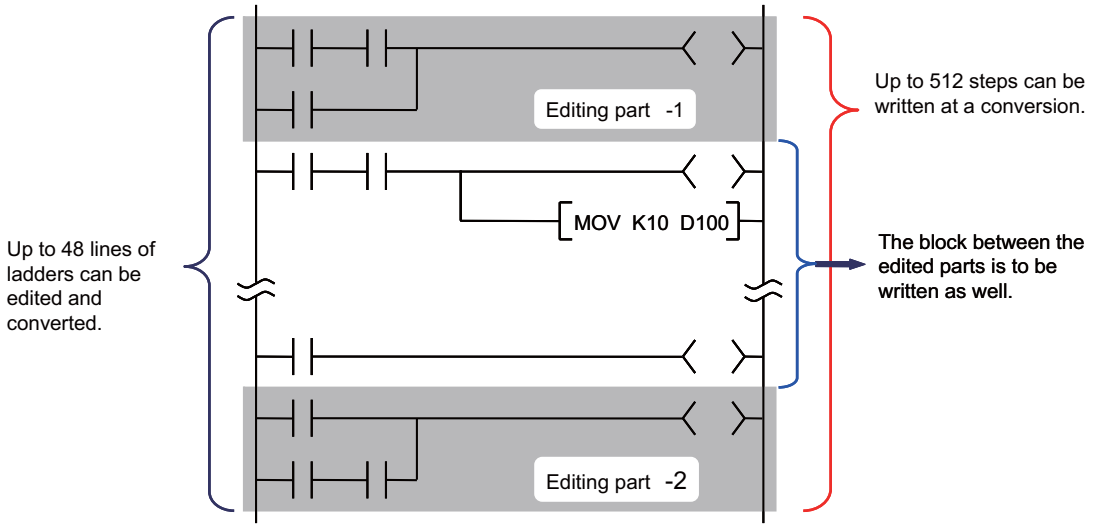
Up to 48 lines of ladders can be edited and converted in GX Works2, GX Developer and PLC on-board edit function.

For the ladder program writing during RUN of a single block, ladder blocks to be written at a conversion include the block between the edited ones. Up to 512 steps can be written during RUN at a conversion.

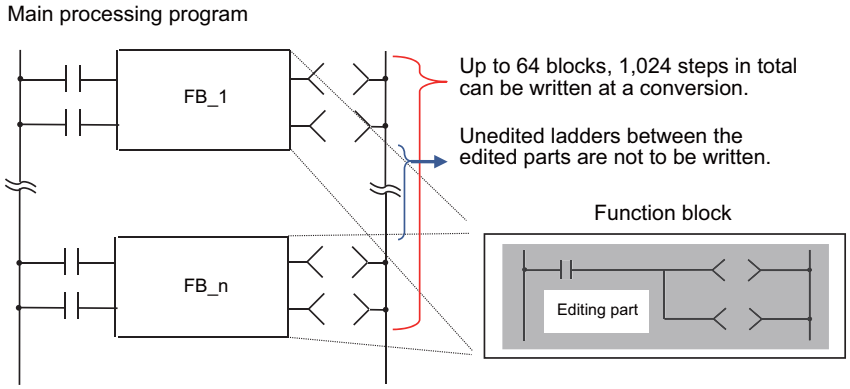
For the ladder program writing during RUN of multiple blocks, when you edit detached ladder blocks, the ladder blocks between the edited parts will not be written. Up to 64 blocks can be written during RUN at a conversion and up to 1,024 steps can be written in the total number of the blocks.

For GX Works2, when you write multiple FB instances in a single file during RUN, the ladder program writing during RUN of multiple blocks is executed. In any other case, the ladder program writing during RUN of a single block is executed.

When editing two or more detached ladder blocks



When editing multiple FB instances



(2) Change of processing time in writing during RUN

The processing time until ladder program writing during RUN completion depends on the total number of steps used in the sequence programs during RUN and the points where the steps are written in.

The process takes up to several minutes. Note that the longer processing time may take when FBs are to be written during RUN.

(3) Change of startup interval of a sequence program in writing during RUN

The startup interval of a sequence program which is currently running may become slower depending on the total number of steps used and step positions to be written. Especially when the ladder program writing during RUN is executed on a project with labels, the startup interval tends to become slower.

(4) Ladder program writing during RUN after compiling all programs

Since compiling all programs is required after any of the following operations is performed, ladder program writing during RUN cannot be executed.

- Changing common pointer No. or the device setting in [PC parameter]
- Changing the automatically-assigned device setting
- Changing PC type
- Changing project type
- Performing "Read from PLC" without creating or opening a new project

Error Occurs at Ladder Program Writing during RUN

If an error occurs at ladder program writing during RUN, refer to "Troubleshooting:List of Errors During GX Works2 Online Operations" to find out the causes and remedies.

When an error occurs, check if the ladders match with the ones in GX Works2 by selecting [Online] - [Verify with PLC], as the ladders in CNC may have changed. When they do not match, the ladder program writing during RUN cannot be executed. After reading ladders by selecting [Online] - [Read from PLC], reedit the ladders and then execute ladder program writing during RUN.

5.6.9 Monitoring Sequence Programs

The monitoring of sequence programs has no operation specific to Mitsubishi Electric CNC. For details on operating procedure, refer to "GX Works2 Operating Manual (Common)". For details on functions that can be used, refer to "5.3.5 Function Support Status (Online)". This section provides the overview of the operating procedure and cautions.

5.6.9.1 Operating Procedure

Start monitoring by the following operation on GX Works2.

(1) Display sequence programs to be monitored, and move to the ladder to be monitored.

(2) Start monitoring by either of the following operations.
- Select [Online] - [Monitor] - [Monitor Mode].
- Press "F3" key.

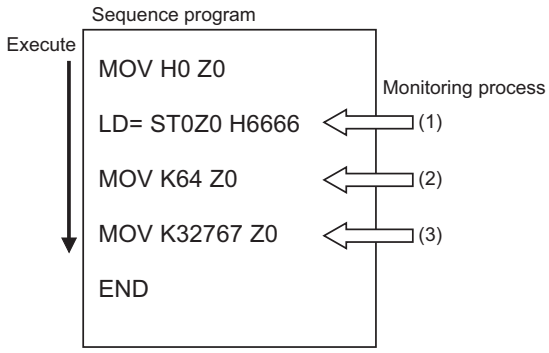
(3) Stop monitoring by either of the following operations.
- Select [Online] - [Monitor] - [Monitor Mode].
- Press "Alt" and "F3" keys simultaneously.

(Note) When the sequence programs running on the CNC controller and the sequence programs displayed on GX Works2 are different, errors are not generated even if monitoring is executed, and monitoring appears to continue normally.
Before executing monitoring, ensure that sequence programs in the CNC controller and GX Works2 are the same.

5.6.9.2 Precautions

The device values displayed in monitoring are not values after ladder execution, but values at the timing when the monitoring process asynchronous with the ladder is operated. (The timing is before, during or after ladder execution.) Therefore, when a device with index modification is monitored, the Z device value at the timing of the monitoring process is displayed as the reference destination value of the device with index modification. (When the same index register is used, the monitor value of the device with the index modification is not the device value at executing instruction.)

The following is an example where the reference destination of the device with index modification is changed depending on the timing of monitoring process.



The value to be displayed in ST0Z0 depends on the timing of monitoring process.

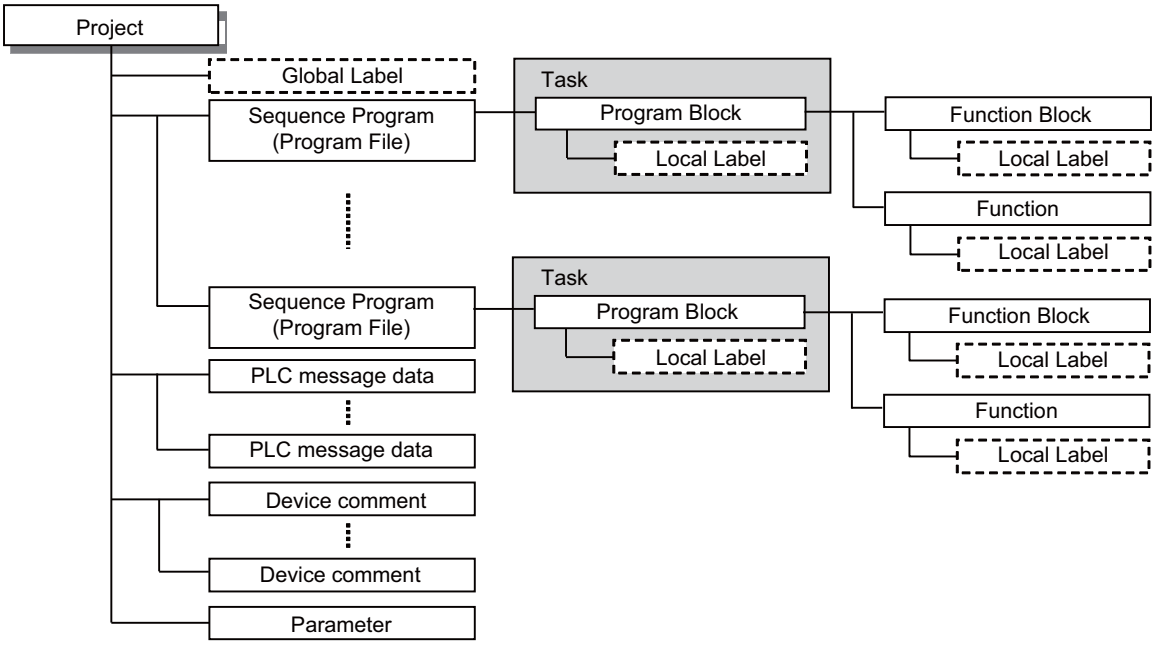
(1) ST0 monitor value
(2) ST64 monitor value
(3) 0 (Because a value out of the device range is referred to.)

5.7 Developing Structured Project

This chapter provides the overview of structured projects and the development procedure focusing on those specific to Mitsubishi Electric CNC.
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".
For details of the program types that can be used in structured project, refer to "5.2.1 Support Status of Project Types, Program Types and POUs".
As unique features of structured project, function blocks (FBs), functions (FCs) and user library can be used. In a ladder program, FB can be nested within FB up to one layer. Note that programs cannot be output with CSV format. For details on labels and FBs, refer to "5.10 Creating Label" and "5.11 Creating Function Block".
For details on how to use FCs and user library, refer to "GX Works2 Operating Manual (Common)" and "GX Works2 Operating Manual (Structured Project)".

5.7.1 Overview of Structured Project

Programs can be created based on structured programming in this project type. By segmenting the control functions and creating components from commonly used parts of programs, this type of programming (structured programming) is easy to understand visually, and created components are highly reusable to other programs.
In structured project, sequence programs can be created using ladder diagram.



Item	Description
Sequence program (Program file)	Sequence program (user PLC) for Mitsubishi Electric CNC. At least one task is required to create in a program. (The created task is controlled by program file to be executed.) When a program file is executed by PLC CPU, set its execution type (e.g. scan or cyclic) by the program setting of the parameter.
Task	Task is an element to assemble multiple POUs and register them as a program file. At least one program in POU is required to register to a task. (Functions and function blocks cannot be registered to the task.)
Program block	Program is an element of the top level in a POU. Program can be edited using functions, function blocks and operators.
Function block	Function block can be edited using functions, function blocks and operators. To use a function block, it can be called from a program or another function block. Note that it cannot be called from a function.
Function	Function can be edited using functions and operators. To use a function, it can be called from a program, another function or a function block.
PLC message data	Defines PLC messages such as alarm messages and PLC switches. PLC messages can be used only in ladder diagram.
Device comment	Comment for devices in sequence programs. There are two types: project-common "Global Device Comment" and program-specific "Local device comment". To change the settings, open [Tools] - [Options] window and select [Program Editor] - [All Editors] - [Device Comments].
Parameter	Set the use range of devices and order of sequence program execution, etc.
Global label	Label variable that becomes valid for all sequence programs when multiple sequence programs are create in a project.
Local label	Label variable that becomes valid only in each sequence program. This is one-on-one setting with an individual sequence program.

5.7.1.1 Symbolic Information

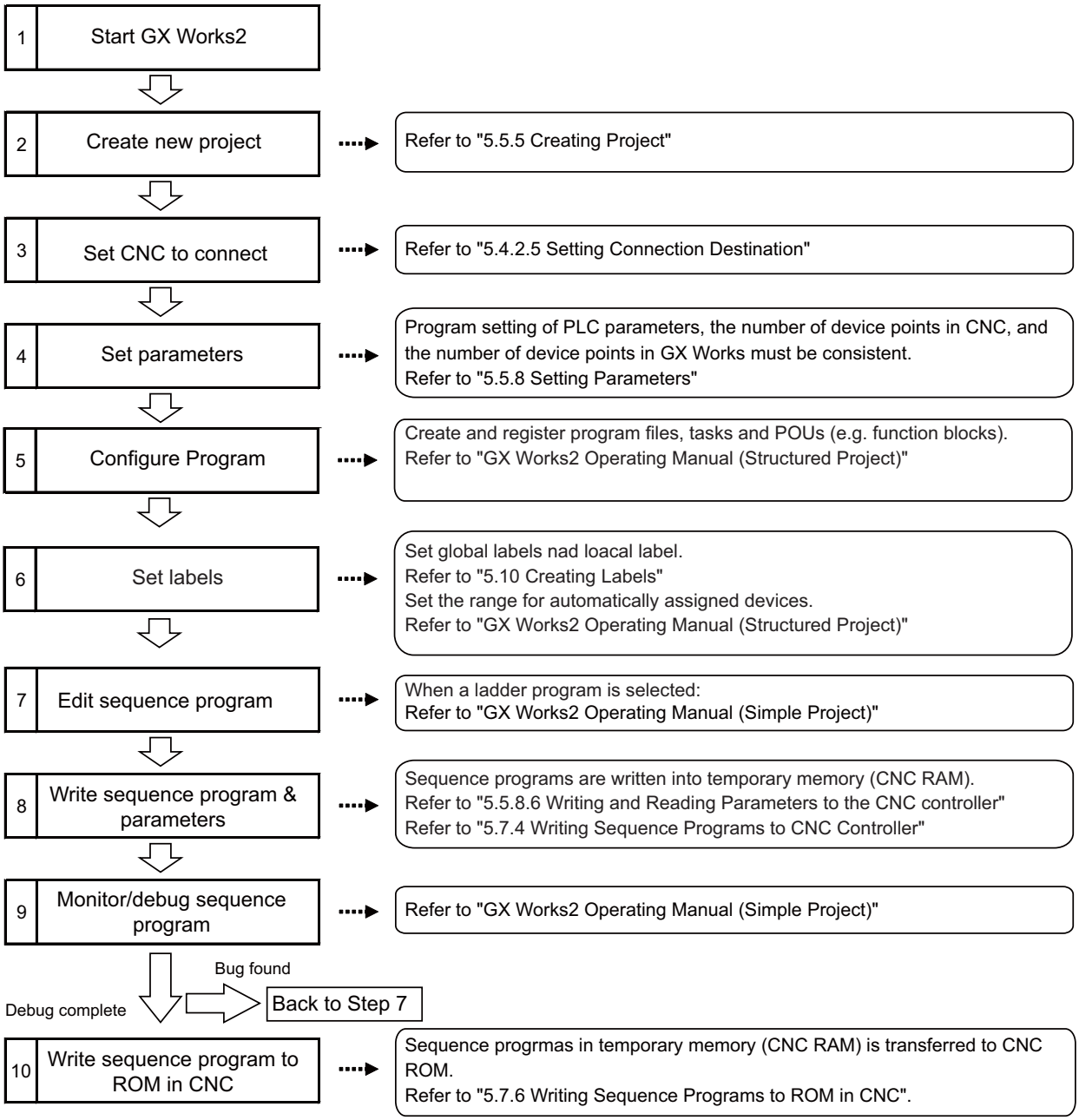
Symbolic information is data storing program configuration such as labels and FB. To read or write labels and FB to the CNC controller, read or write symbolic information.

For details on symbolic information, refer to "GX Works2 Operating Manual (Structured Project)".

5.7.2 Development Procedure

One of the standard procedures for developing structured projects is to create on GX Works2.

5.7.2.1 Developing New Simple Projects on GX Works2



(Note1) If character string that cannot be used, "Label/data name contains invalid character string. Unable to use devices." is displayed when a project is compiled, reserved characters are used in the file name. Change the file name.

(Note2) The timer limit setting must be fixed to "100ms" for low speed or "10.00ms" for high speed. It can be set on [PLC System] tab on the [Q Parameter Setting] setting screen displayed by selecting [Parameter] - [PC Parameter] of the project view. The CNC is not compatible with any other value described above for the timer limit.

5.7.3 Developing Sequence Programs

This section describes how to develop sequence programs in a structured project. There is no basic development procedure that is specific to Mitsubishi Electric CNCs. Refer to "GX Works2 Operating Manual (Structured Project)". This section provides information on CNCspecific considerations.

5.7.3.1 CNC-Specific Considerations

(1) Restriction on use of ANB instruction and ORB instruction

The restriction is the same as that for simple project.

For details, refer to "(1) Restriction on use of ANB instruction and ORB instruction" in "5.6.3.1 CNC-Specific Considerations".

(2) Restriction on MPS instruction use

The restriction is the same as that for simple project.

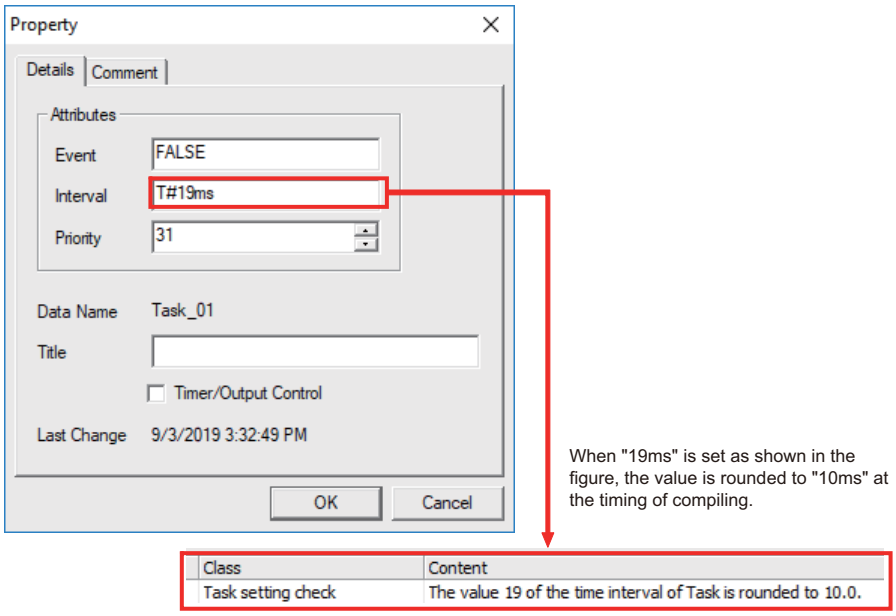
For details, refer to "(2) Restriction on MPS instruction use" in "5.6.3.1 CNC-Specific Considerations".

(3) Cyclic interval of a task

When a task is activated in a cyclic interval, set "10ms" or "100ms" for one cycle.

(For cyclic activation, [FALSE] must be selected for [Event] setting in [Attribute] option on [Details] tab of task property screen.)

When the value is not set to "10ms" or "100ms" as the example below, the set value is rounded to the unit of "10ms" or "100ms".



5.7.4 Writing Sequence Programs to CNC Controller

This section describes how to write sequence programs in a structured projects from GX Works2 to the CNC controller (particularly considerations and operation specific to this CNC).

(Note) This operation writes data to the temporary storage in the CNC (RAM in CNC). Data in temporary storage (RAM in CNC) are not retained after power OFF. To retain data after power OFF, write sequence programs to the ROM in the CNC according to "Writing Sequence Programs to ROM in CNC".

5.7.4.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

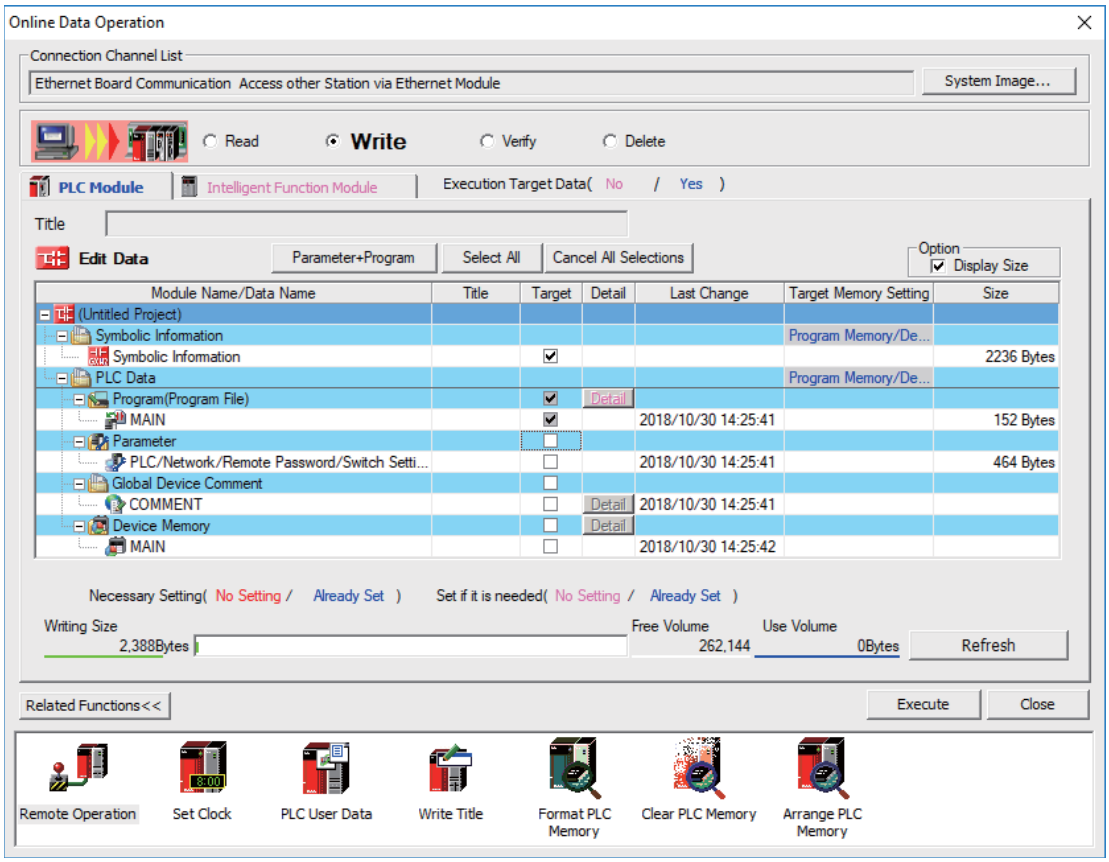
[Online] ->[Write to PLC]

Select [Program Memory/Device Memory] in target memory setting for symbolic information on the following screen.

Select [Program Memory/Device Memory] in the target memory setting for PLC data.

Select symbolic information and sequence program file to be written, and click [Execute].

RUN/STOP of PLC can be instructed by selecting [Related Functions] - [Remote Operation].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) When the symbolic information is written to a CNC, labels, function blocks, etc. included in the sequence program are also written.

5.7.4.2 Write Operation

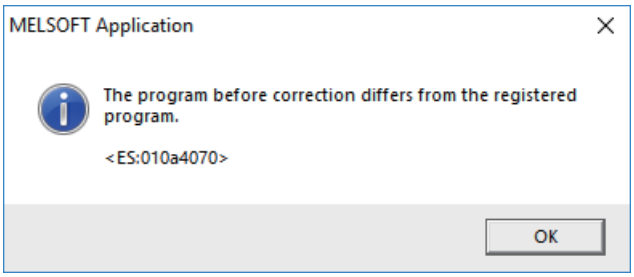
When the writing of ladders to the CNC controller is executed on GX Works2, the CNC controller converts the ladders to ladder machine codes specific to CNC as they are written.
When devices and instruction formats that are not supported by the CNC controller are used, a conversion error is generated. Even if a conversion error is generated, writing is not stopped. Transfer up to the final step is completed by converting the instructions with error into NOP instruction (No operation instruction).

(Note) Ladders with an error cannot be run for safety reasons.

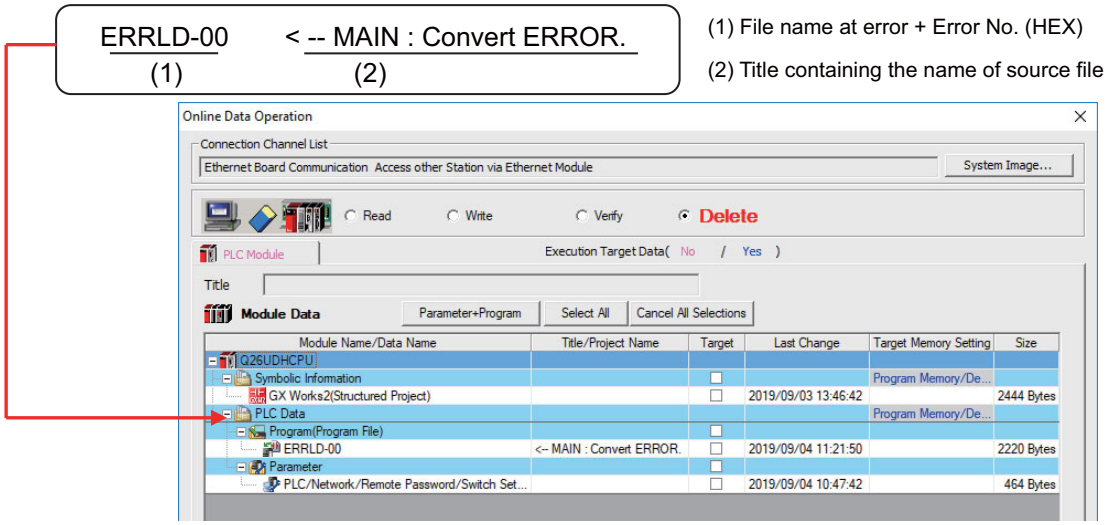
5.7.4.3 Operation and Check on Conversion Error

(1) Operation on conversion error

The following dialog is displayed on the GX Works2 screen on conversion error.



An attempt to run the PLC fails with an alarm on the CNC.
If a program file with a conversion error is displayed on the "Delete PLC Data" screen, the file name and title will change and be displayed as shown below.
ERRLD-XX ("XX" represents the error file number that is sequentially added from 0 in hexadecimal notation.)



(1) File name at error + Error No. (HEX)

(2) Title containing the name of source file

⚠ CAUTION

Do not read to and use on GX Works2 the ladder files for which a conversion error is generated. Unintended data are included, and malfunction may result.

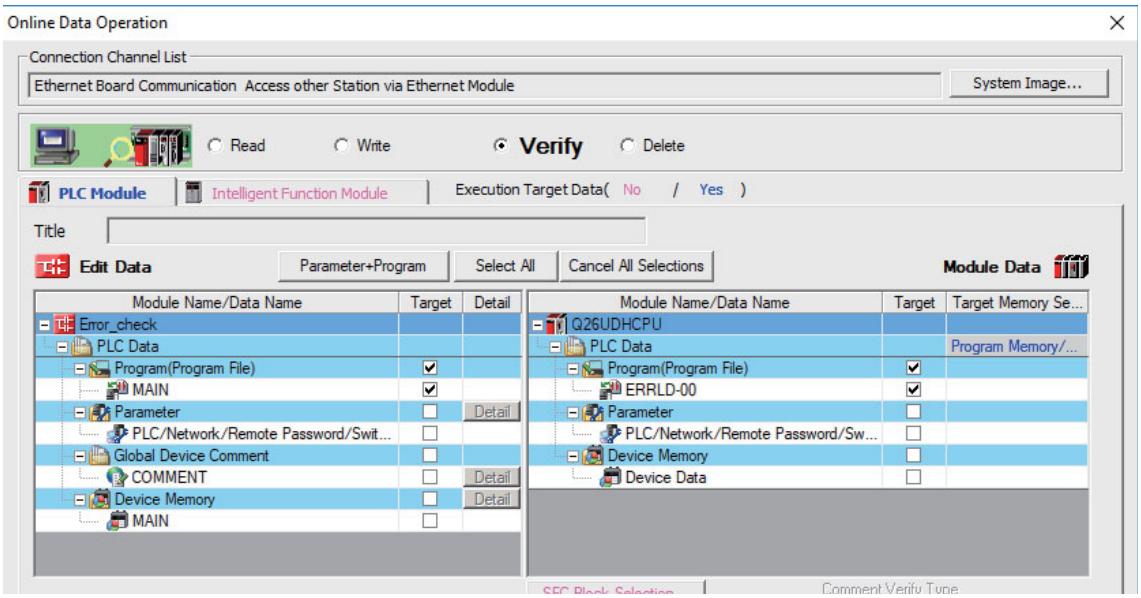
(2) How to check conversion step with an error number

Error steps can be checked using PLC verify function.

For details on PLC verify function, refer to "Verifying Sequence Programs".

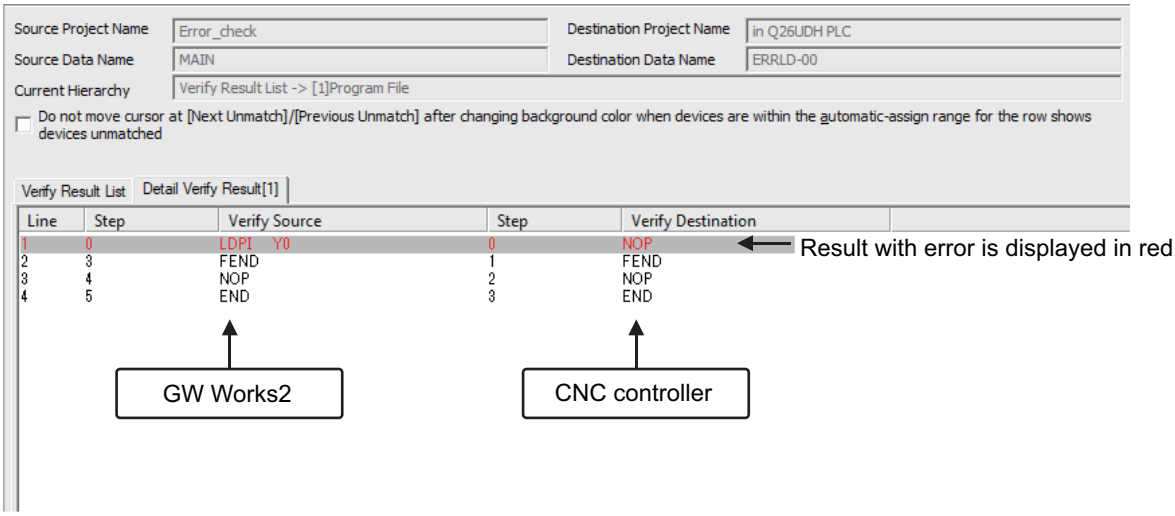
Verify Source: Select transfer source ladder file on GX Works2

Verify Destination: Select ladder with an error file "ERRLD-00" in the CNC controller



When PLC verification is executed, the verify result screen is displayed. When a file name is double-clicked, mismatched contents are displayed as shown in the example below. The NOP instructions on the CNC controller are the steps with conversion errors. Double-click one of them to display and edit the corresponding part on the GX Works2 file.

"<Verify Source>" indicates the GX Works2 side, and "<Verify Destination>" the CNC controller side.



5.7.4.4 Other Operations and Checks on Error

(1) Other errors

This section describes common errors that are generated when sequence programs are written.

Note that messages in displayed dialogs may not indicate the correct error status for CNC because they are for MELSEC PLC center. Status is indicated by the last four digits of displayed number.

For details of other errors, refer to "5.13.1 List of Errors during GX Works2 Online Operation".

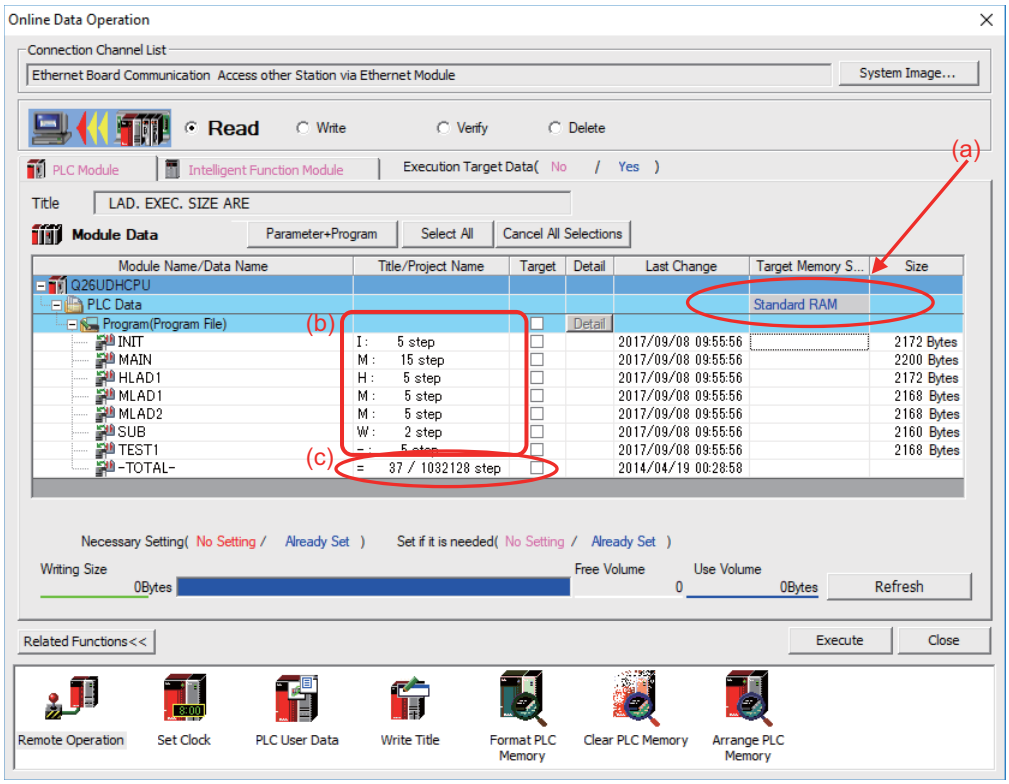
Status	Message	Cause	Corrective Action
4005 (Note1)	Writing of data which exceeds the capacity of the PLC was attempted. Execute again within the capacity of the PLC.	The maximum number of steps that can be executed with NC has been exceeded.	Check the size of execution area. (Refer to (2) of this section.) Reduce the number of steps for the sequence program to be executed according to that value.
4010	Cannot write because the PLC is executing a RUN command. Stop the PLC, then execute again.	The PLC of the NC is running.	After stopping the PLC of the NC, start execution again.
4021	The applicable drive is not ready. Check the applicable drive, then execute again.	The specified target memory does not exist or is not in a usable status.	Change the target memory.
4029	Insufficient file capacity. Execute again after deleting unnecessary files.	An attempt was made to write a file that exceeds the storage capacity.	Examine the file structure so that the data falls within the limited capacity.
4052	The file is write protected. Change the file attributes to enable writing to the file.	The specified target memory is a write-disabled device (CNC ROM).	Specify “Program Memory/Device Memory” as the target memory.
4065	A mismatch occurred between the PLC and peripheral parameters Match the parameters between the PLC and peripherals.	There is a problem in the device setting value.	Set the number of device points. (Refer to 5.5.8)
4070	The program before correction differs from the registered program.	A ladder instruction outside the specification is included.	Execute verify to identify the problematic instructions (Refer to Operation and Check on Conversion Error)

(2) How to check size of area for execution

When "error status (4005): Execution area size over" ((Note1) in the list described previously) is generated, check the size of the execution area as follows. For details on execution area, refer to "PLC Programming Manual".

When [Standard RAM] is selected as [Target Memory] for [PLC Data] on the "Delete PLC Data" screen, the file name and the title are changed and displayed as follows.

(a) shows the set target memory.
(b) shows the numbers of steps when executed with changed titles.
The alphabet at the head of the number of steps indicates the state of parameter designation.
I: Initial H: High speed M: Medium speed W: Standby
-: No parameters or parameters not stored
(c) indicates the total number of steps at execution. (Total of "initial", "high speed", "medium speed" and "wait to be executed.)
The denominator indicates the maximum size of the execution area.
When there is no parameter, the single program method is applied and "TOTAL" will not be displayed.



In the above screen example, adjust the size of the sequence program so that the total number of steps at execution (37) indicated in (c) is smaller than the denominator: the maximum size (1032128) of the execution area.

(Note) Exercise caution not to delete files by mistake when checking the size of the execution area.

5.7.5 Reading Sequence Programs from CNC Controller

This section describes how to read GX Works2 sequence programs from the CNC controller.

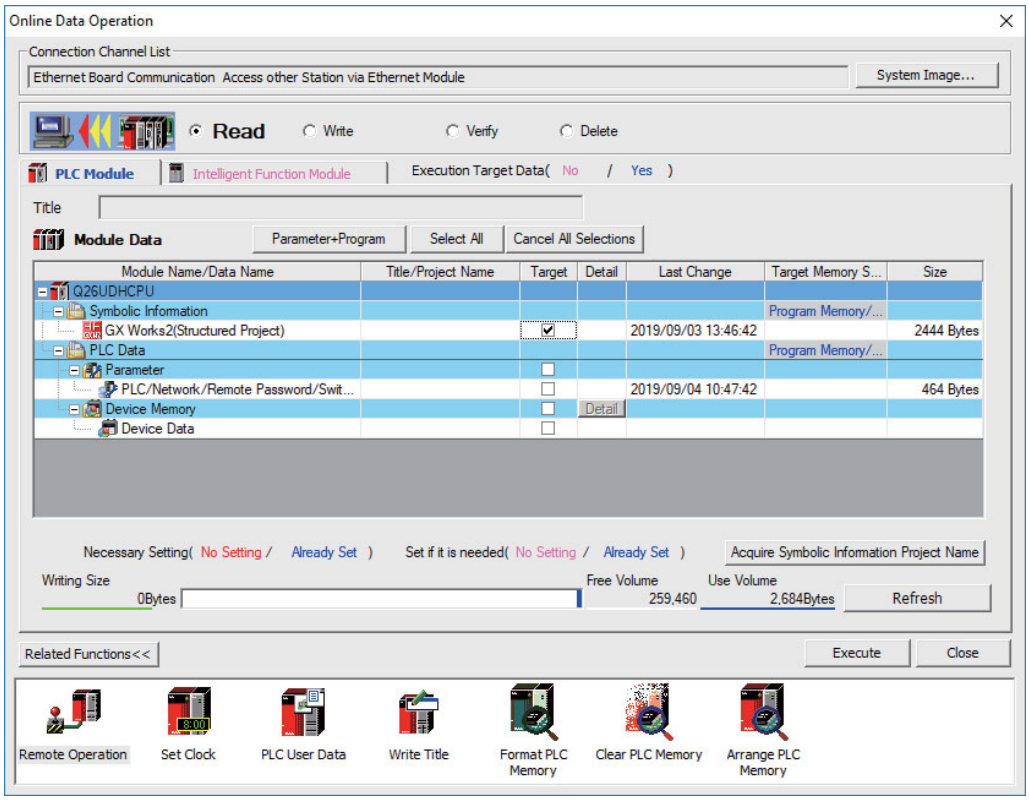
5.7.5.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

Select [Program Memory/Device Memory] in target memory setting for PLC data on the following screen.

Select "GX Works2 (Structured project)", and click [Execute].



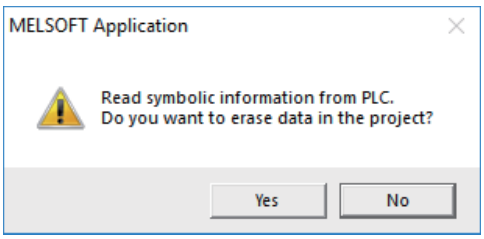
(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) Click [Refresh] before reading symbolic information.

(Note3) For details on read parameters before reading symbolic information, refer to "5.5.8.6 Writing and Reading Parameters to CNC Controller".

(Note4) When symbolic information is read, labels and FB are also read as well as sequence programs.

Select [Yes] when the following dialog is displayed. Sequence programs and label data are read.



(Note) When [Yes] is clicked in the above dialog, the sequence program files, labels and FB on GX Works2, are overwritten and deleted. Check thoroughly before executing.
(No prompt for overwrite confirmation is displayed even when there is a file of the same name.)

The "Read from PLC" screen can also be used as file list function of the CNC controller. The date and time of update and the size of each file is displayed on the right side of the file name.

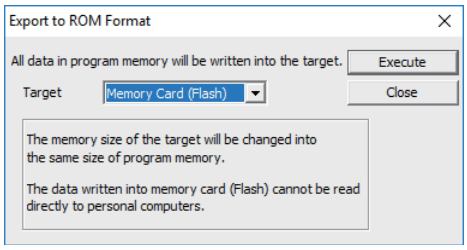
5.7.6 Writing Sequence Programs to ROM in CNC

Sequence programs transferred from GX Works2 and built-in PLC (built-in edit function) to the CNC controller are stored in temporary storage. Data in temporary storage are erased at power OFF. (The sequence programs stored in the ROM in the CNC is enabled by powering ON the CNC controller again.)
To retain data after the CNC is powered ON again, transfer the sequence programs in temporary storage to the ROM in the CNC according to the following procedure.
This section describes how to transfer sequence programs in the temporary storage the CNC controller to the ROM in the CNC on GX Works2.
For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

(Note) When the sequence programs in temporary storage (RAM in CNC) are updated, but not written to the ROM in the CNC, "ROM-Write incomplete" error is generated.

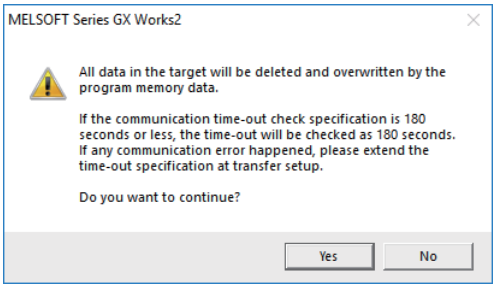
5.7.6.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.
[Online] -> [Export to ROM Format]



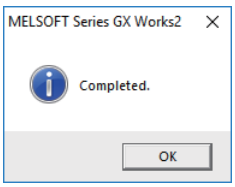
(Note) Only [memory card (Flash)] is valid as [Target].

Click [Execute] to display the following dialog, and click [Yes].



(Note) When [Yes] is clicked in the above dialog, sequence program files on the ROM in the CNC the CNC controller are overwrite and deleted. This should be done with extreme caution.

Writing is completed when the following dialog is displayed. Click [OK].



5.7.7 Verifying Sequence Programs

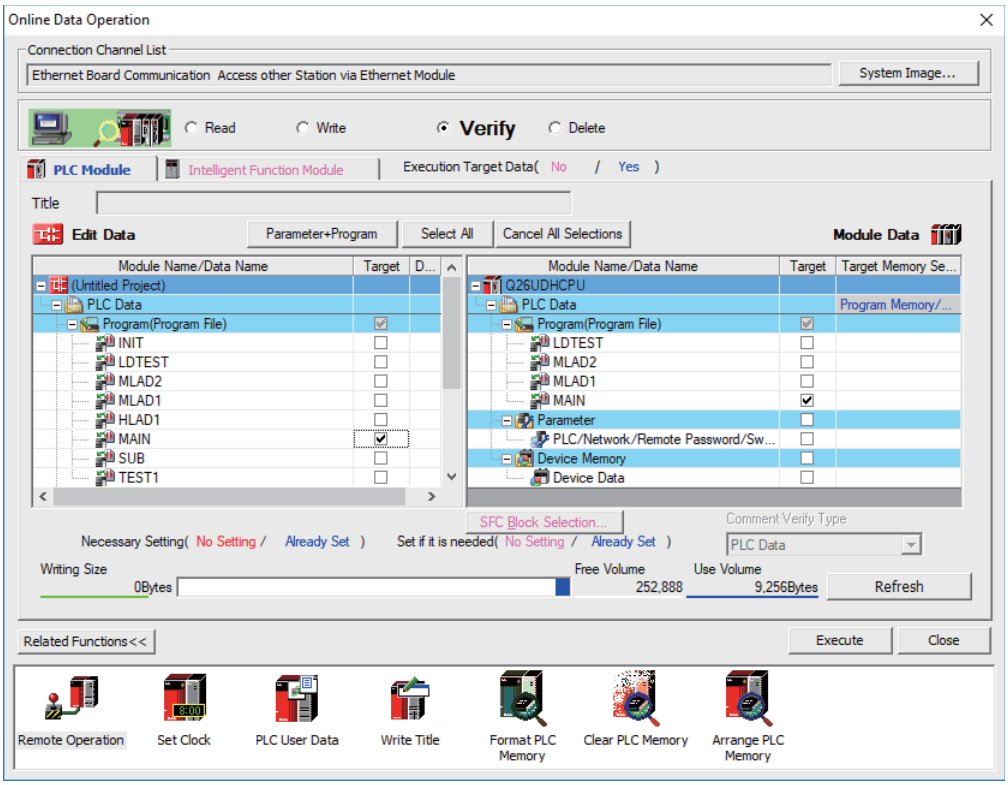
This section describes how to verify sequence programs between the CNC controller and GX Works2.

5.7.7.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

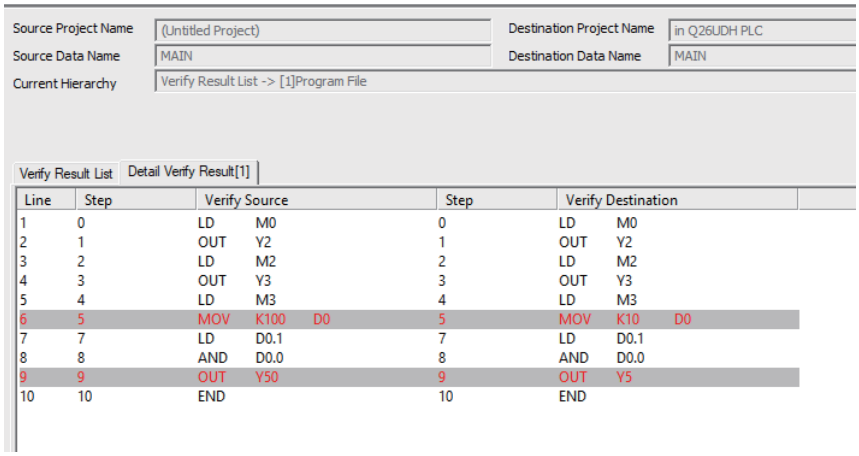
[Online] -> [Verify with PLC]

Select the sequence program file to verify on the following screen, and click [Execute].



(Note) The memory that has the file to be verified is valid as [Target Memory Setting].

When verification finishes, the verify result screen is displayed. Double-click a file name to display on the screen the detailed result as shown below. Unlike GX Developer, matched places are also displayed on GX Works2. Mismatched contents are displayed in red. Click [Find/Replace] - [Next Unmatch] and [Find/Replace] - [Previous Unmatch] to find previous and next mismatch places. Double-click mismatched contents to display and edit the corresponding parts in the GX Works2 file.



(Note) The verification result is displayed by mnemonic codes as shown in the figure above regardless of the setting of programming language.

5.7.8 Monitoring Sequence Programs

The monitoring of sequence programs has no operation specific to Mitsubishi Electric CNC. For details on operating procedure, refer to "GX Works2 Operating Manual (Common)". For details on functions that can be used, refer to "5.3.5 Function Support Status (Online)". This section provides the overview of the operating procedure and cautions.

5.7.8.1 Operating Procedure

Start monitoring by the following operation on GX Works2.

(1) Display sequence programs to be monitored, and move to the ladder to be monitored.

(2) Start monitoring by either of the following operations.
- Select [Online] - [Monitor] - [Monitor Mode].
- Press "F3" key.

(3) Stop monitoring by either of the following operations.
- Select [Online] - [Monitor] - [Monitor Mode].
- Press "Alt" and "F3" keys simultaneously.

(Note) When the sequence programs running on the CNC controller and the sequence programs displayed on GX Works2 are different, errors are not generated even if monitoring is executed, and monitoring appears to continue normally.
Before executing monitoring, ensure that sequence programs in the CNC controller and GX Works2 are the same.

5.8 PLC Message Development

This section describes how to developing PLC messages such as alarm messages, operator messages, and PLC switches as PLC-related data.
Refer to "PLC Programming Manual" on how to display a PLC message on HMI screen.
PLC message function is not available for the user safety sequence.

5.8.1 Adding PLC Message

There are two ways to add PLC messages as shown below.

(1) When writing PLC messages on the standard screen

	Development procedure	Description	Reference
1	Create PLC messages on Text Editor	Develop PLC messages.	"Developing on Standard Screen"
2	Write PLC messages	Transfer PLC messages to CNC controller from HMI screen.	

(2) When writing PLC messages on GX Works2

	Development procedure	Description	Reference
1	Create PLC messages on Text Editor or GX Works2	Develop PLC messages.	"Developing on GX Works2"
2	Write PLC messages	Transfer PLC messages to built-in ROM using GX Works2	

* PLC messages are written directly to built-in ROM when GX Works2 is used. Writing to ROM is not required.

(Note) PLC messages are written as different types of files depending on whether (1) or (2) above is used.
When a PLC message is in both files, the one written on the standard screen is used first.

5.8.2 Developing on Standard Screen

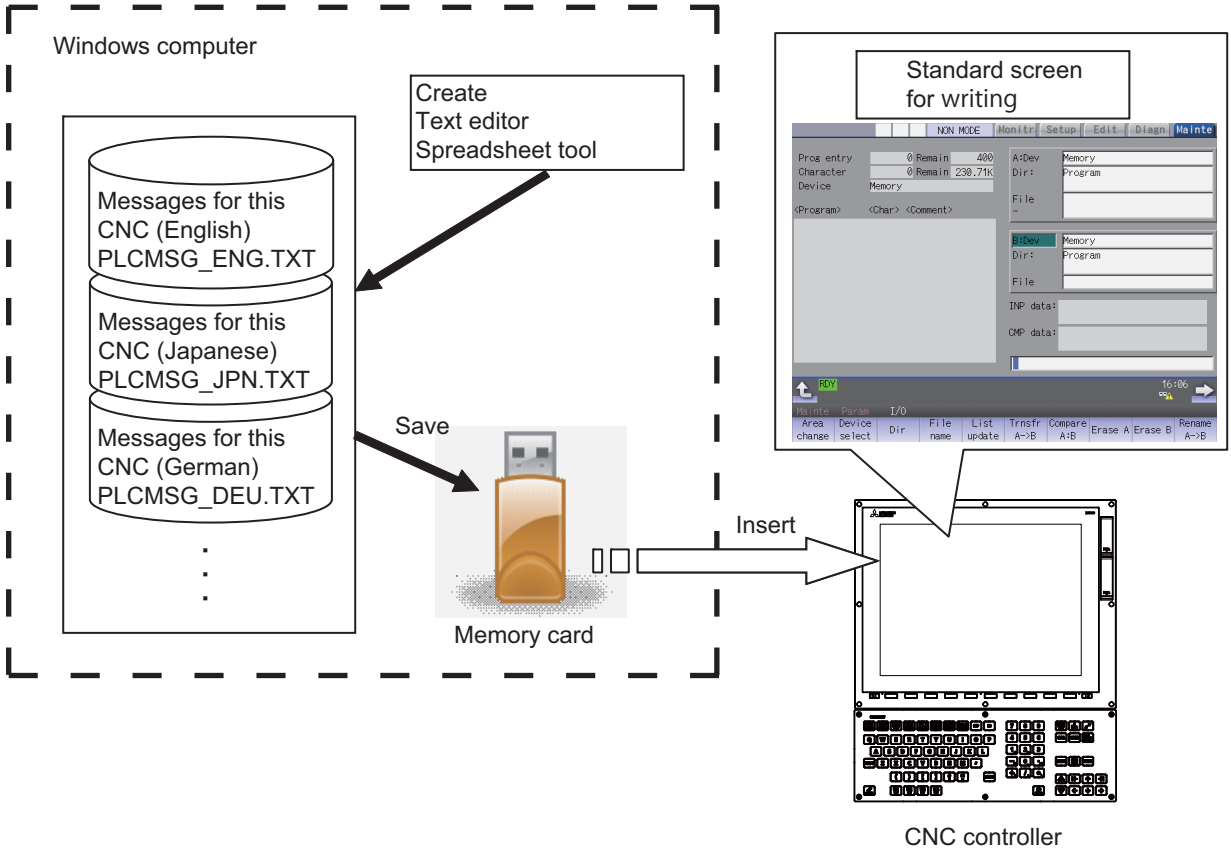
This section describes how to develop message data.

(1) Create

Create message data using a generally available text editor. The written format and how message data are described follow.

(2) Write

Write to the CNC controller using the input/output screen of the standard screen.



5.8.3 Writing Message Data

Message data can be written as text data using generally available text editor and commercial spreadsheet software.
Message files are described with half-width alphanumeric characters or multi-byte characters according to the language.
The format of message data are different between GX Works2 and GX Developer.

5.8.3.1 Description format

Message data is described in the description format shown below.
A comma (,) is used as a seperator between description elements.
The description format cannot be omitted. Even if the message text is blank, comma (,) and line feed code are required.

Message classification	Description format				
Alarm message	A ,	Index No. ,	Data register No.,	Message character string	Line feed code
Operator message	O ,	Index No. ,	Data register No.,	Message character string	Line feed code
PLC switch	P ,	Switch No.,	Message character string	Line feed code	
Comment message	M ,	Device,	Device No.,	Message character string	Line feed code
Macro alarm message	M ,	Index No. ,	Alarm No.,	Message character string	Line feed code

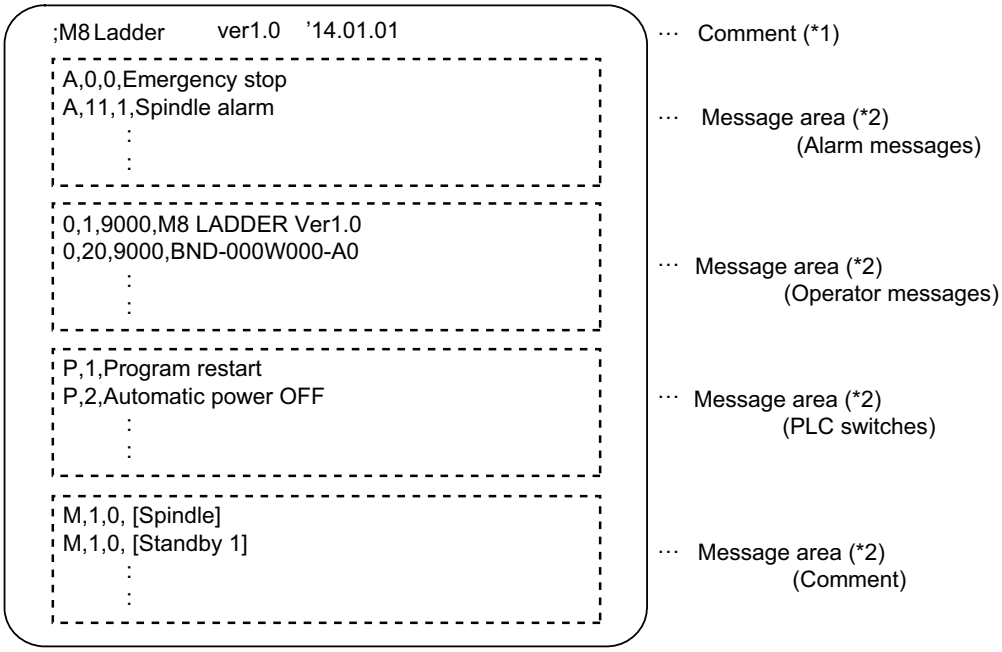
Message classification code	:	A one-byte alphabetic character expressing each message classification
Index No.	:	One-byte numeric character
Data register No.	:	One-byte numeric character
Switch No.	:	One-byte numeric character
Device	:	One-byte numeric character (1: Spindle/standby name)
Device No.	:	One-byte numeric character (Always "0" if the device is the spindle/standby name)
Alarm No.	:	One-byte numeric character
Message character string (*1)	:	One-byte numeric character, or multi-byte character
Line feed code	:	(CR/LF) or (LF)

(*1) Semicolons, commas, spaces, and tabs can be used. Note that the tab at the head of the message character string is ignored.
For details on the maximum number of characters in a message, refer to "5.7.3.4 Caution".

5.8.3.2 Description Method

The message data is described as text data by the following description format.
The applicable character code is different depending on the target language. For details, refer to "5.7.3.3 File Name Rule".

(1) Example for the description of alarm message, operator message, PLC switch and comment



(*1) Comment

A line begins with a semicolon (;) is regarded as a comment.

```
; comment character string ［LF］
```

(*2) Message area

Describe messages of the same type together. When the same elements (e.g. index No.) are included, the latter description is enabled.

(2) Example for the description of macro alarm message

```
M,0,1,CALL #PROGRAMMER #TEL590
M,1,2,CALL #PROGRAMMER #TEL560
M,9,10,CALL #PROGRAMMER #TEL550
        :
        :
M,511,9999,CALL #PROGRAMMER #TEL520
```

(*1) When there are duplicate index Nos. or alarm Nos., the one appears later on the file is enabled.
(*2) The index Nos. need not be in sequential order, if they are within the designated range. Also, there is no restriction for the description order (in ascending or descending order).
(*3) When an alarm message is consist of 32 characters or more, the 32nd or later character is not displayed. If the 31st character is 2-byte character, the 31st character is not displayed.
(*4) A blank character (a space character) can be used for the alarm message string.
(*5) A line matches any of the following conditions is regarded as invalid data.
- The classification code is set to other than "M".
- Index No. is not in the range from 0 to 511.
- Alarm No. is not in the range from 1 to 9999.
- Other incorrect format is described in the file.
- Description for one line is exceeded 128 characters.

5.8.3.3 File Name Rule

The following table shows the names of files written to the CNC controller and the character codes used to describe messages.

The CNC controller switches the file for PLC message display in accordance with the setting of parameter for the display language ("#1043 lang").

#1043 lang		File name: Alarm message, operator message, PLC switch or comment	File name: Macro alarm message	Character code
0	English	PLCMSG_ENG.TXT	MCRMSG_ENG.TXT	Windows-1252
1	Japanese	PLCMSG_JPN.TXT	MCRMSG_JPN.TXT	Shift-JIS
11	German	PLCMSG_DEU.TXT	MCRMSG_DEU.TXT	Windows-1252
12	French	PLCMSG_FRA.TXT	MCRMSG_FRA.TXT	Windows-1252
13	Italian	PLCMSG_ITA.TXT	MCRMSG_ITA.TXT	Windows-1252
14	Spanish	PLCMSG_SPA.TXT	MCRMSG_SPA.TXT	Windows-1252
15	Chinese (traditional)	PLCMSG_CHI2.TXT	MCRMSG_CHI2.TXT	Big5
16	Korean (Hangeul)	PLCMSG_KOR.TXT	MCRMSG_KOR.TXT	KS C 5601-1987
17	Portugese	PLCMSG_POR.TXT	MCRMSG_POR.TXT	Windows-1252
18	Dutch	PLCMSG_DUT.TXT	MCRMSG_DUT.TXT	Windows-1252
19	Swedish	PLCMSG_SWE.TXT	MCRMSG_SWE.TXT	Windows-1252
20	Hungarian	PLCMSG_HUN.TXT	MCRMSG_HUN.TXT	Windows-1250
21	Polish	PLCMSG_POL.TXT	MCRMSG_POL.TXT	Windows-1250
22	Chinese (simplified)	PLCMSG_CHI1.TXT	MCRMSG_CHI1.TXT	GB2312
23	Russian	PLCMSG_RUS.TXT	MCRMSG_RUS.TXT	Windows-1251
24	Turkish	PLCMSG_TUR.TXT	MCRMSG_TUR.TXT	CP1254
25	Czech	PLCMSG_CZE.TXT	MCRMSG_CZE.TXT	Windows-1250
31	Indonesian	PLCMSG_IND.TXT	MCRMSG_IND.TXT	Windows-1252
32	Vietnamese	PLCMSG_VIE.TXT	MCRMSG_VIE.TXT	Windows-1258

5.8.3.4 Precautions

(1) Priority of message files in each language

When PLC message files for display languages are not in the CNC controller, English message files are used.

(2) Maximum values of message data

The maximum value of the described messages is shown below.

Message type	Maximum message length (number of characters)	Maximum number of messages
Alarm message	46 bytes	1024
Operator message	60 bytes	512
PLC switch	14 bytes	96
Comment	60 bytes	5
Macro alarm messages	31bytes	512

Even though a message data exceeds the maximum message length, no error occurs. The excessive characters are not displayed.

Even though the total number of messages exceeds the maximum number, no error occurs. The excessive messages are not displayed.

A full-width character is handled as two characters (2 bytes).

(3) Macro alarm messages are displayed with the following priority.

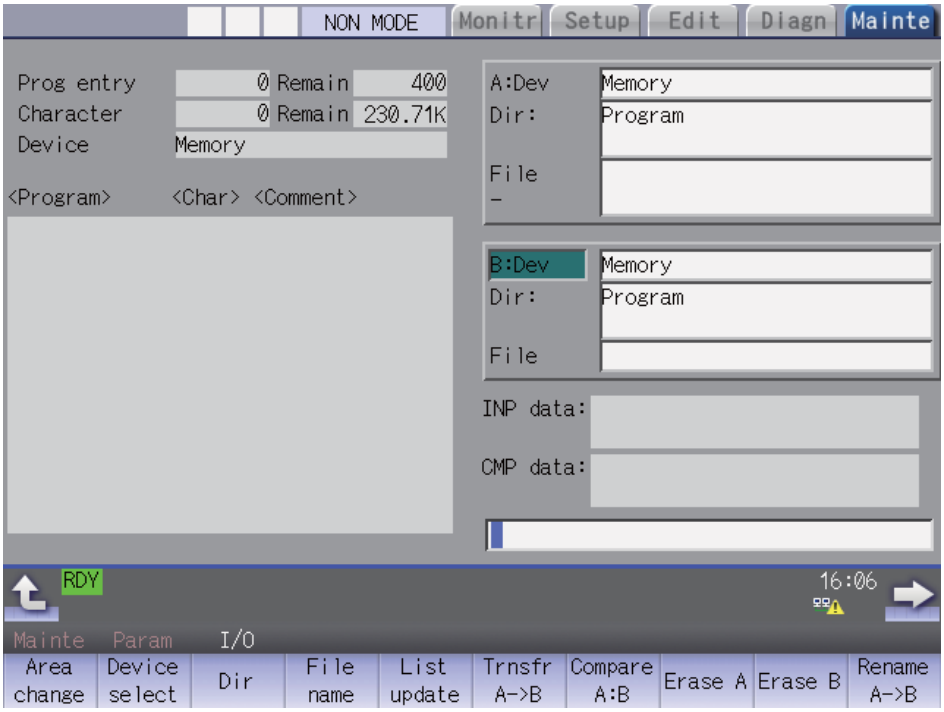
Priority	Details
1	Displays the macro alarm message of corresponding alarm No. which is described in the macro alarm message file of the display language. However, the macro alarm message of the second priority is displayed in the following cases: - No macro alarm messages file for the display language - No corresponding alarm No. in the macro alarm message file
2	Displays the macro alarm message of corresponding alarm No. which is described in the macro alarm message file of the default language (English). However, the macro alarm message of the third priority is displayed in the following cases: - No macro alarm messages file for English - No corresponding alarm No. in English macro alarm message file
3	Displays the macro alarm message described on a machining program.

5.8.4 Writing Message to CNC Controller on Standard Screen

The following operation procedure shows how to write massages to the CNC controller from the standard screen.
For details on the operation on the input/output screen, refer to the instruction manual of the CNC controller.
File names and directory names of PLC messages differ depending on by whom they are used (MTB or users).
PLC messages for users are displayed when "E/U mode" is enabled.
For details on the "E/U mode", refer to "9.1 Enhanced PLC Security Mode".

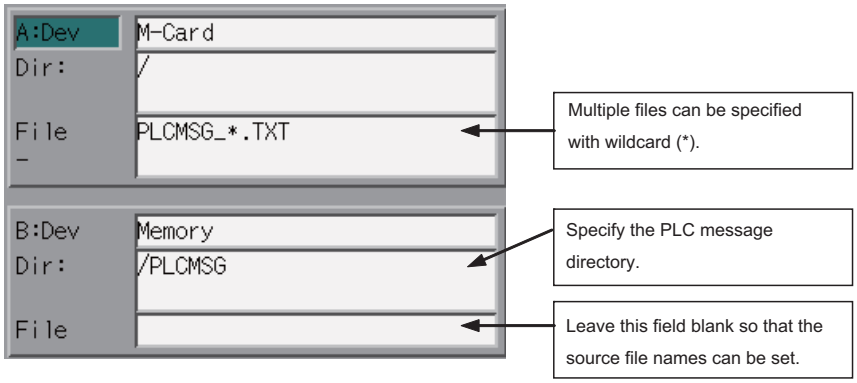
5.8.4.1 Operation Procedure

(1) Press [I/O] menu on the maintenance screen.

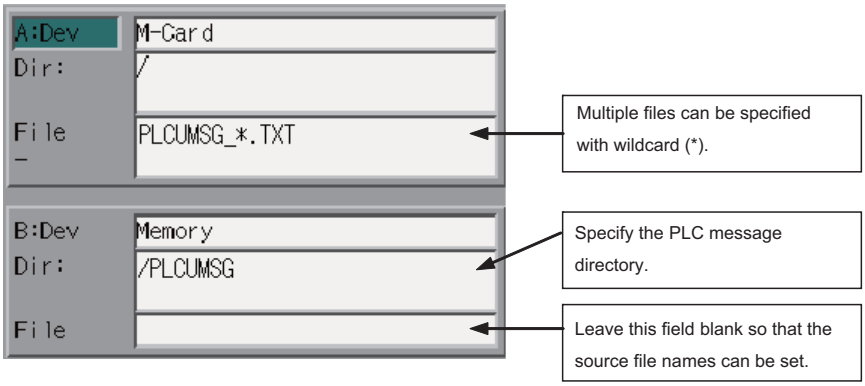


(2) Specify the source file to be transferred, and set the device name, directory and file name of the destination as follows.

(a) Display example of a PLC message file for MTB



(b) Display example of a PLC message file for users



(3) Press the menu key [Trnsfr A->B] to start file transfer.

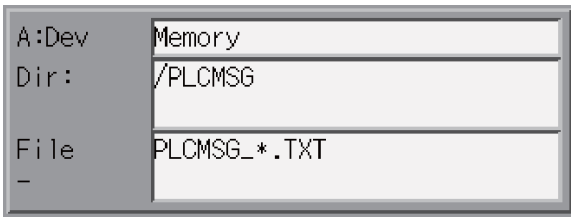
5.8.5 Reading out from CNC Controller on Standard Screen

5.8.5.1 Operating Procedure

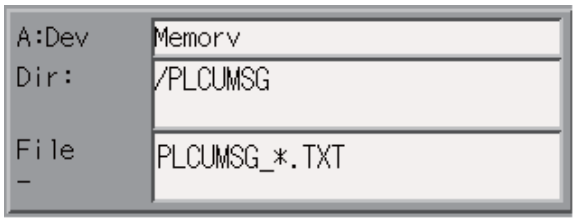
(1) Press [I/O] menu on the maintenance screen.

(2) Set the device name, directory and file name of the source as follows. Specify the output file in the destination field.

(a) Display example of a PLC message file for MTB



(b) Display example of a PLC message file for users

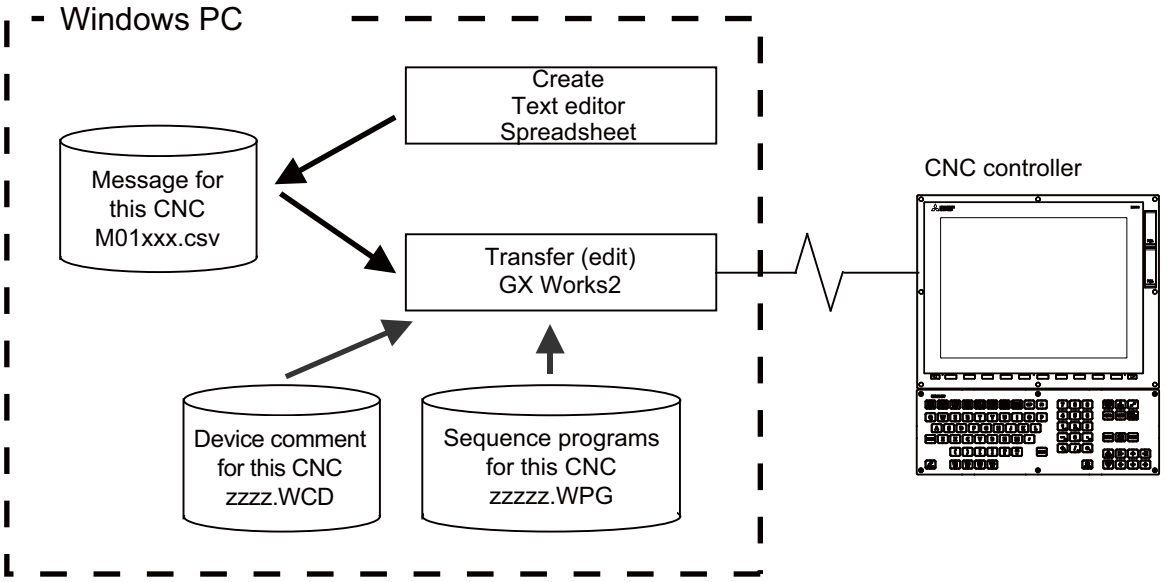


(3) Press the menu key [Trnsfr A->B] to start file transfer.

5.8.6 GX Developing on GX Works2

There are two types of development procedure using GX Works2 as follows.

(1) Transform for GX Works2 using a generally available text editor and spreadsheet.
(When managing the large amount of message data using a commercial tool)
(2) Input messages directly on GX Works2.
(When adding and correcting the small amount of message data)



(Note) In GX Works2, only CSV files can be read. Unlike GX Developer, TXT files cannot be read.
CSV files of GX Works2 projects with label settings cannot be read, in which case, PLC message can only be developed by inputting messages directly from GX Works2.

5.8.6.1 Development Using Text Editor

(1) Create
Describe data using a generally available text editor message. The written formats and how to describe follow.

(2) Transfer
In GX Works2, message data is treated as line statements of sequence programs, and can be edited. Like sequence programs, message data is transferred from GX Works2 to the CNC controller.

5.8.6.2 Inputting Messages Directly from GX Works2

(1) Create
Describe message data directly on GX Works2. In GX Works2, message data is treated as line statements of sequence programs. The written formats and how to describe follow.

(2) Transfer
Like sequence programs, message data is transferred from GX Works2 to the CNC controller.

5.8.7 Writing Message Data

Aside from being directly input on GX Works2, message data can be described as text data on generally available text editor and commercial spreadsheet software. Create text data with Unicode (with BOM) character code, and use ".csv" as the extension.

5.8.7.1 Written Form

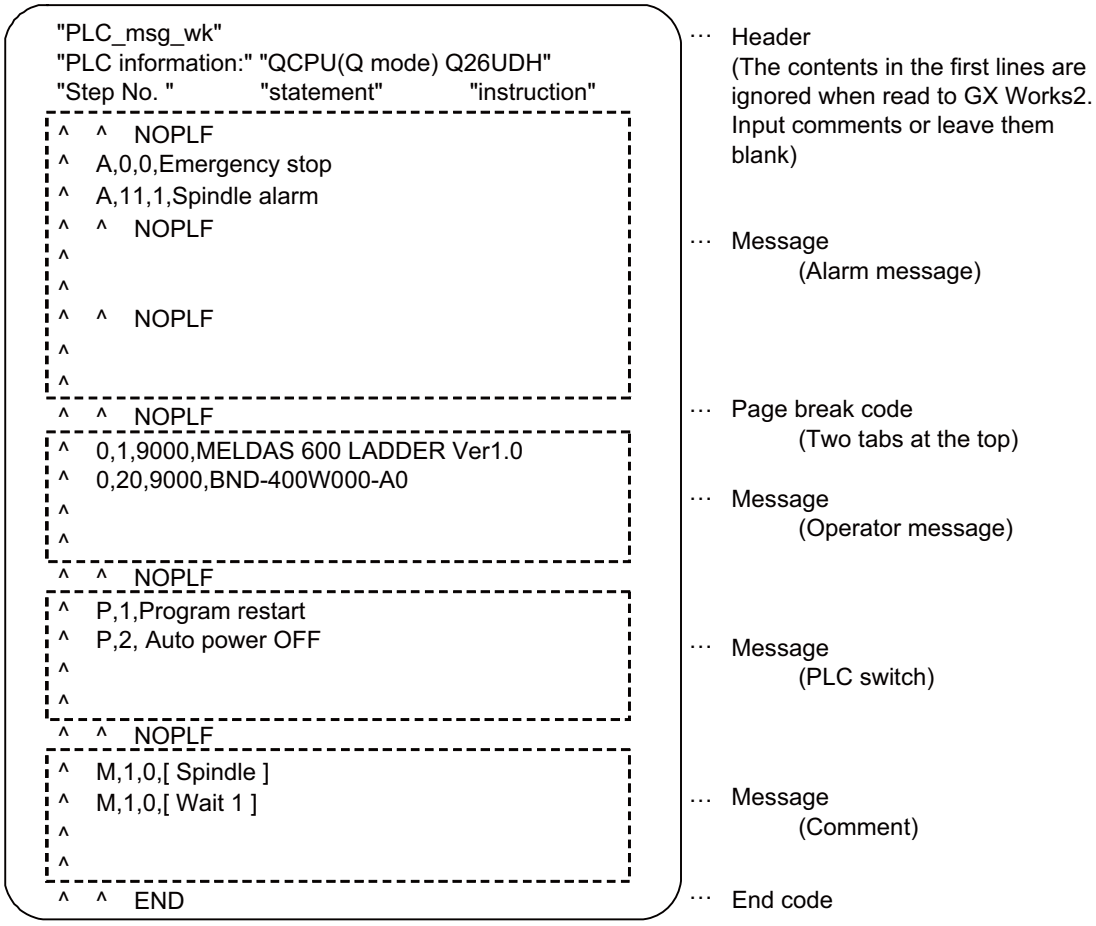
Message data is described in the written formats shown below.
The written format cannot be omitted. Even when a message text is blank, tab (^), comma (,), and [CR+LF] are needed to be written.

Message type	Written form				
Alarm message	^ A ,	index number,	data register number,	message text	[CR+LF]
Operator message	^ O ,	index number,	data register number,	message text	[CR+LF]
PLC switch	^ P ,	switch number,	message text	[CR+LF]	
Comment message	^ M ,	device,	device number,	message text	[CR+LF]

Message type code	: One half-width English letter that represents the type of the message
Index number	: Half-width numeric character (between 0 and the maximum number of messages -1)
Switch number	: Half-width numeric character (between 0 and the maximum number of messages -1)
Data register number	: Half-width numeric character
Device	: Half-width numeric character (1 or 2)
Device number	: Half-width numeric character (0 to 10)
Message character string	: Half-width alphanumeric (character), shift JIS the first level character, the number of characters for the maximum message length. Semicolons, commas, spaces, and tabs can also be used. The tab at the top of a message text is ignored.
Tab (^)	: Message data identification code. Add one at the top of message data.
Comma (,)	: Delimiter of description elements (Use only comma to make message text is blank)
[CR+LF]	: Line feed code, (CR+LF).
Backslash (\)	: Continue to the next line. When the end of a description is a backslash, continue to the top character of the next line.

5.8.7.2 How Message Data are Described

Message data is described as text data in the written format shown below.



(1) Header
The first three lines of the file are skipped when read to GX Works2.

(2) Message
Messages of the same type are describe together. No order is set for descripting within messages. If there are more than one description with the same element (index number, etc.), the last description is enabled.

(3) Page break code
A page break code is described at one or more places approximately every 15 lines in the setting area and message area.The message data may skip if there is no page break code.

(4) End code
Describe the end code at the end of a description. The description after end code is ignored. If there is no end code, an error occurs.

(5) Others description
When the number of the tabs (^) at the top of the line is wrong, an error occurs. If the format of a description does not following the above, an error occurs. For details on the CSV file formats that can be read to GX Works2, refer to "GX Works2 Operating Manual (Simple Project)".

5.8.7.3 Caution

This subsection describes the number of characters, the considerations on the number, handling of the information outside the settings and of the information outside the formats.

(1) Maximum values of message data

This table lists the maximum values of message that can be written.

Message type	Maximum message length (number of characters)	Maximum number of messages
Alarm message	46 bytes	1024
Operator message	60 bytes	512
PLC switch	14 bytes	96
Comment	60 bytes	100

When the maximum number of characters is exceeded: no error is generated, characters that exceed the threshold are not displayed.

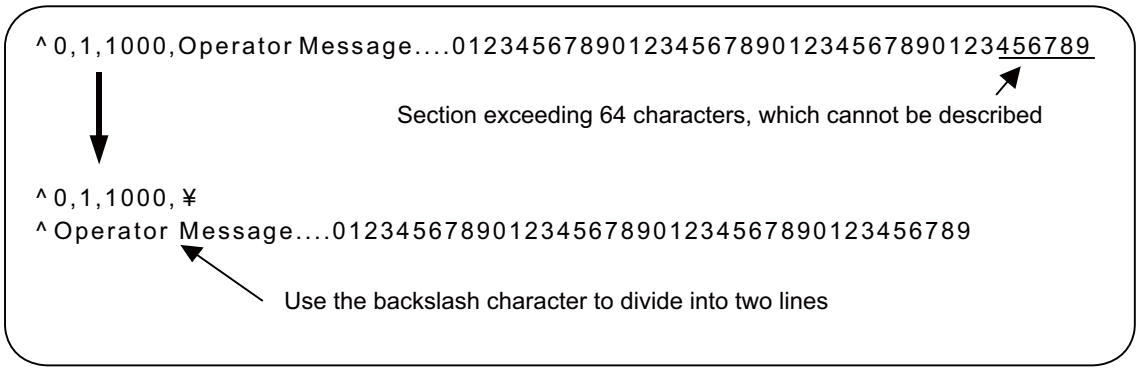
When the maximum number of messages is exceeded: an error occurs when written.

(Note) A full-width data in a message text is counted as 2 characters.

(2) When message cannot be described on one line

In GX Works2, up to 64 characters can be input as line statement in one line. Since this includes information other than message texts (e.g. message type code, index number, data register number), a message text consisting of 60 characters cannot be described in one line.

By dividing a line into two using backslash (\) as the last character of the line, the description of 60 characters become possible.



(Note) If the first character of the second line is an asterisk (*) when a line is divided into two, 60 characters cannot be described. In this case, use another character like space instead.

(3) When created multiple message data have the same index number or switch number

When multiple message data include the same index number or switch number in a message file, the message data closest to the END instruction is displayed.

(4) When dealing with multi-language message

When the language used to describe message data is different from the region setting on Windows, characters will corrupt when written to the CNC, and cannot be read properly by a built-in edit function.

To avoid this issue, change the region setting on Windows to the one appropriate for the language used to describe message data, before reading message data in the CSV format to GX Works2.

Refer to "5.15.3 Multi-Language Data" for details.

(5) Differences from message data for GX Developer

The format of message data used in GX Works2 is different from that used to write to GX Developer. GX Works2 cannot read message data created for GX Developer.

For information on how to enable GX Works2 to read message data for GX Developer, refer to "5.7.12 How to Use on GX Works2 Message Data for GX Developer".

(6) When multiple messages are set for the same language

Only one message data file can be stored for the same language. If a project has multiple message data with the same language, only one file will be stored in a CNC controller and the others will be deleted. In this case, simple projects (with labels) and structured projects are not compiled since the projects differ from the original projects. Uncompiled projects cannot be opened with PLC on-board. Make sure a project does not have multiple message data with the same language.

5.8.8 Reading Message Data on GX Works2

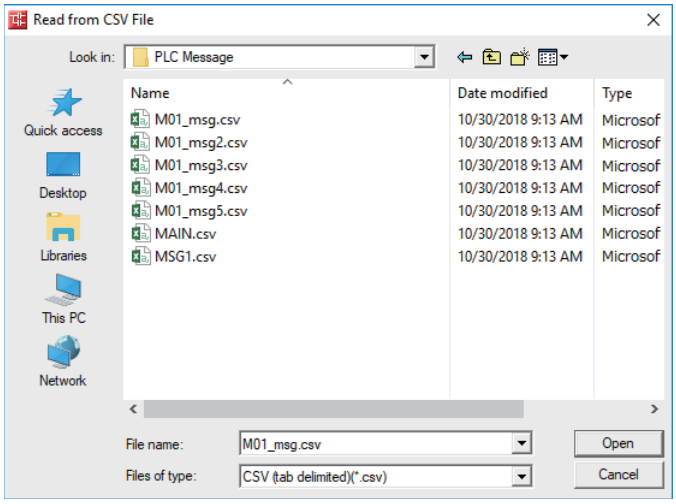
This section describes how to read on GX Works2 message data written with a text editor or other tools.

5.8.8.1 Reading to GX Works2

Open the following screen by the following operation in the navigation window on GX Works2.

[Project] -> [POU] -> right-click [Program] -> [Read from CSV File]

Select a desired message data file (M01_msg.csv) on the following screen, and click [Open].



5.8.8.2 Caution

Read from project with labels

Since CSV files cannot be read when a simple project (with labels) is selected, message data cannot be read.

When reading message data to a project with labels, follow the procedure below.

(1) Create a project as a simple projects (without labels).

(2) Read message data to the project in (1).

(3) Change the project in (2) to a simple projects (with labels) using [Project] -> [Change Project Type] function.

(4) Copy the message data of the project in (3) to the project in which the data is to be stored.

5.8.9 Inputting and Editing on GX Works2

Message data in GX Works2 is treated as "integrated line statement" of sequence programs. "Integrated line statements" are interline comments that help understanding of sequence programs. Those which are transferred to a controller along with sequence programs are called "integrated".
"Line statement" can be displayed and edited on the "Program Editor" screen.

5.8.9.1 Displaying Line Statements

(1) Display programs

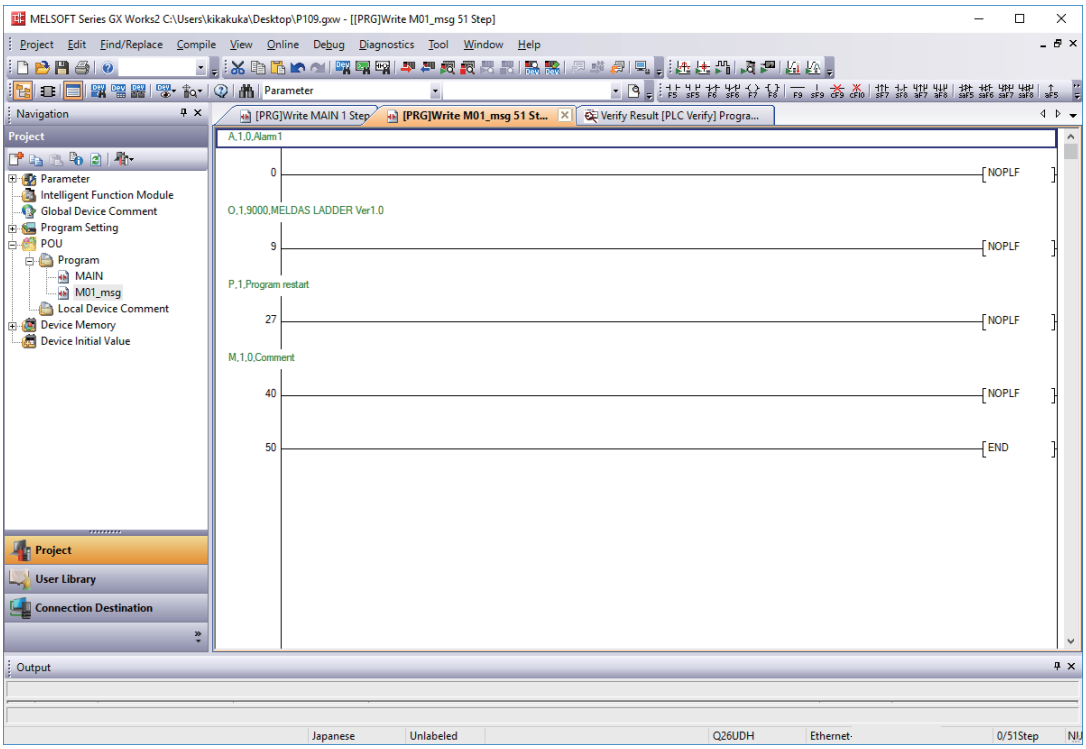
Display the "Program Editor" screen from the navigation window of GX Works2 by the following operation. The normal ladder screen is displayed first.

[Project] -> [POU] -> [Program] -> Double-click [program name to display]

(2) Display message data

Display message data that is integrated line statement by the following operation.

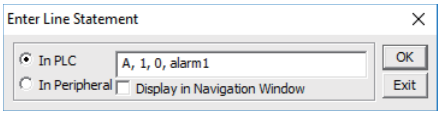
[View] -> [Statement]



5.8.9.2 Editing Integrated Line Statement

(1) Ladder display

Double-click the line statement to edit on the ladder display screen displaying the integrated line statements to display the following dialog. Edit on the dialog, and click [OK] or input [Enter].

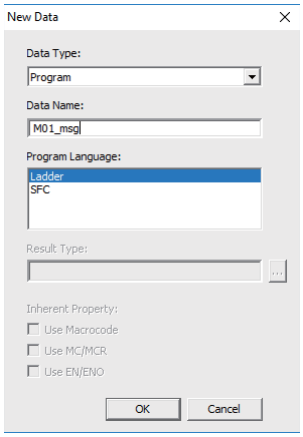


(2) Inputting new message data

- Display new edit screen

Display "New Data" dialog on the navigation window by the following operation, and set the [Data Name]. Click [OK].

[Project] -> [POU] -> Right-click [Program] -> [Add New Data]



- Create line statement.

Create a line consisting of only NOPLF instruction on the "Program Editor" screen, and the following operation line statements can be edited.

Click [Edit] -> [Documentation] -> [Statement]

When a line containing an NOPLF instruction is double-clicked while editing line statement is permitted, a dialog is displayed like (1). Write message data on the dialog, and click [OK] or input [Enter].

5.8.10 Writing CNC Controller on GX Works2

This section describes how to transfer messages from GX Works2 to the CNC controller. The transfer procedure is the same as the transfer of sequence programs.

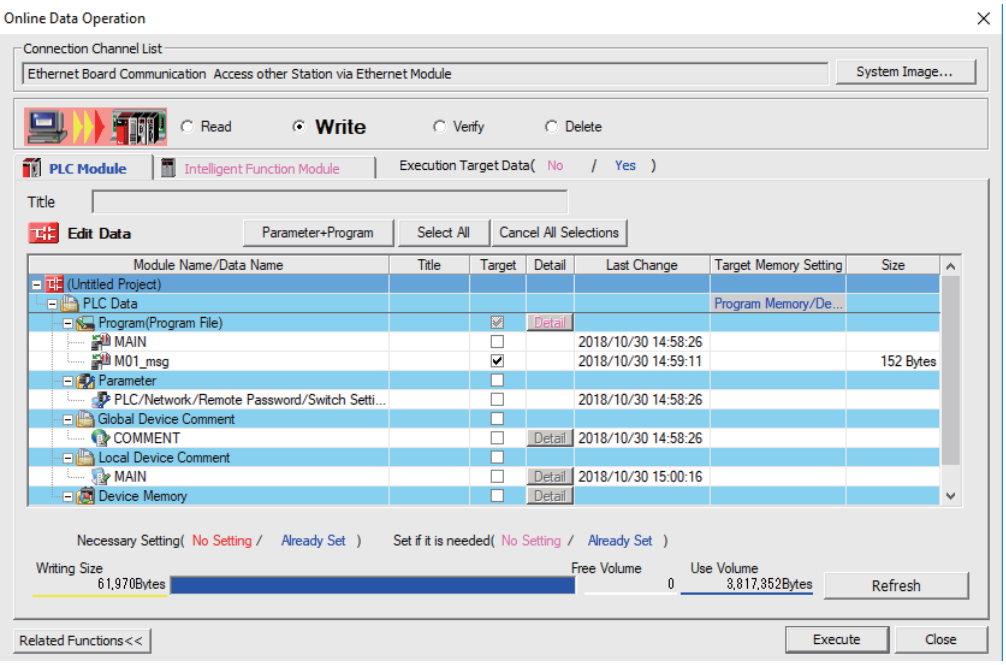
5.8.10.1 Operating Procedure

Display the "Write to PLC" screen by the following operation, and select the files to write.

[Online] -> [Write to PLC]

This subsection provides an example to transfer message data file M01_msg.WPG for Japanese display.

Set the target memory in [(SRAM) Memory].



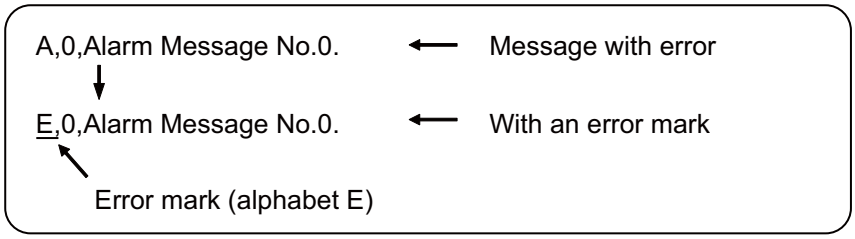
(Note1) Only one file of message data can be stored in the same language. When message data with different file names in the same language are overwritten, overwrite confirm dialog is displayed.

(Note2) A message data password-protected file cannot be overwritten with a message data file of the same language with different file name. Write a new file after canceling the password of the stored message file or deleting the file.

5.8.10.2 Write Operation

When messages are written from GX Works2, the CNC controller checks the data.

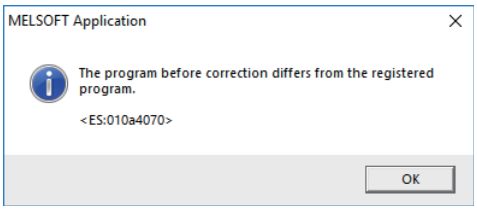
When a description deviates from specifications, a conversion error is generated. An error mark will be added to the description section in which the error occurred, and the data will be transferred to the last step.



(Note) The CNC controller does not display the message data file for which an error is generated.

5.8.10.3 Operation on Write Error

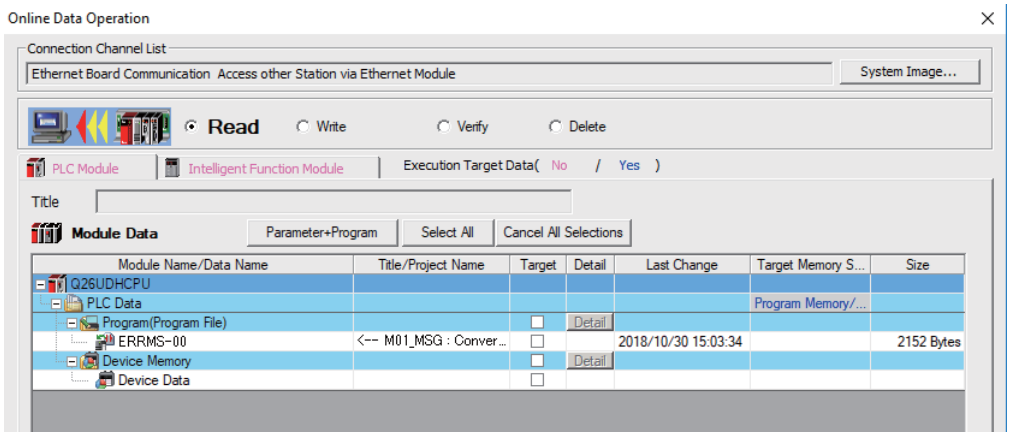
When a conversion error is generated, the following dialog is displayed on the GX Works2 screen.



When a message file with a conversion error is displayed by Read from PLC operation on the file selection tab, its file name and title change, and displayed as follows.
If this message files are read to GX Works2, they are stored with file name of ERRMS-00.
("ERRMS-XX": XX is an error file number added from 0 in hexadecimal.)

ERRMS-00 (1) <-- M01 MSG : Convert ERROR. (2)

(1) File name at error + Error No. (HEX)
(2) Title containing the original file name



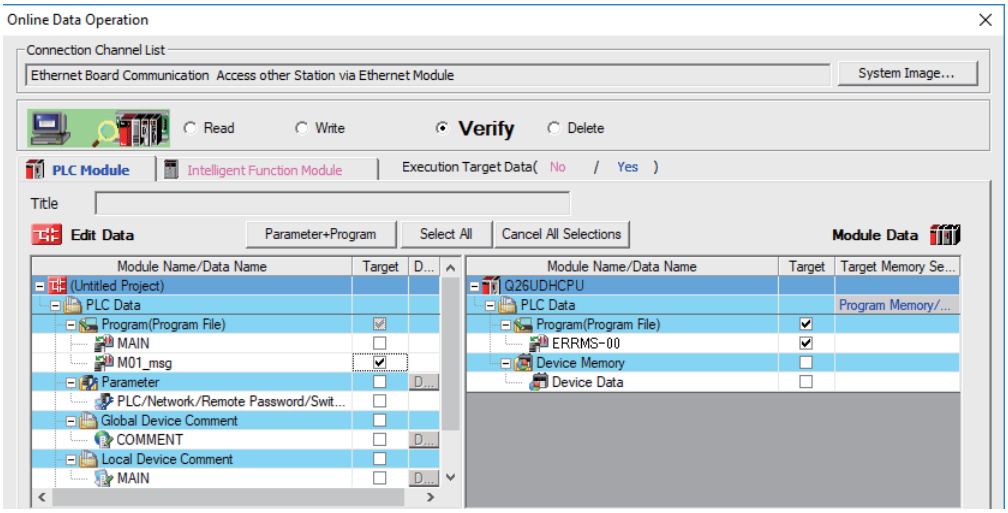
⚠ CAUTION

Do not read and use on GX Works2 message files for which a conversion error is generated. Unintended data are included, and malfunction may result.

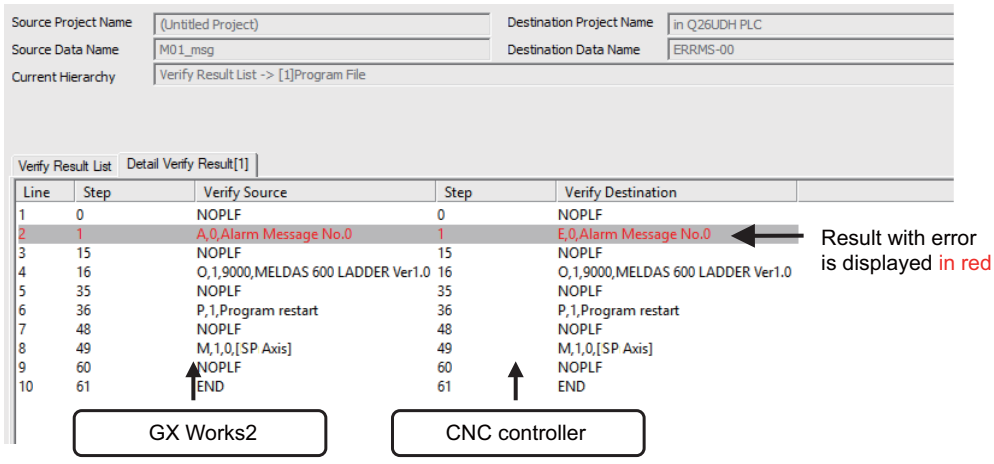
5.8.10.4 Checking Errors

Errors can be checked using PLC verification function. For details of PLC verification function, refer to "5.6.7 Verifying Sequence Programs".

Target Memory Setting: Select the data area storing the message data files.
Edit Data: Select transfer source message files in GX Works2.
Module Data: Select in the CNC controller the message file "ERRMES-00" for which error is generated.



When PLC verification is executed, the verify result screen is displayed. Double-click a file name to display mismatched contents as shown in the example below. The PLC messages in the CNC controller are the steps with errors. Double-click mismatched part to display and edit the corresponding part on GX Works2 file.
"<Memory>" indicates the GX Works2 side, and "<PLC>" the CNC controller side.



5.8.11 Reading and Verifying Message Data on CNC Controller

This section describes how to read messages from the CNC controller to GX Works2 and verify them.
The procedure for reading and verifying is the same as reading and verifying sequence programs.

5.8.11.1 Menu Selection and Screen Operation

For details of the operating procedures, refer to the following sections.

Read: 5.6.5 Reading Sequence Programs from CNC Controller

Verify: 5.6.7 Verifying Sequence Programs

5.8.12 How to Use on GX Works2 Message Data for GX Developer

Message data created for GX Developer can be used on GX Works2 in two ways according to the save format of the original message data.

5.8.12.1 When Data are Saved in Format Used in General Tools

(1) Transform the message data to CSV file on GX Converter. (*1)
(2) Add three blank lines to the top of the CSV file in (1).
(3) Transform the character code of the CSV file in (2) to Unicode.
(4) Read the CSV file in (3) on GX Works2. (*2)

*1 For detail on how to transform message data on GX Converter, refer to "4 Peripheral Development Environment (GX Developer)".

*2 Set the language on Windows appropriate for the language which the message data are written in.

5.8.12.2 When Data are Saved in GX Developer Format

(1) Open the GX Developer format project storing the message data on GX Works2.
(2) Copy the message data in (1) to the GX Works2 project in which the data to be stored.

*1 For details how to open GX Developer format project on GX Works2, refer to "5.5.10 Reading Sequence Programs in GX Developer Format on GX Works2".

5.9 Creating Device Comment

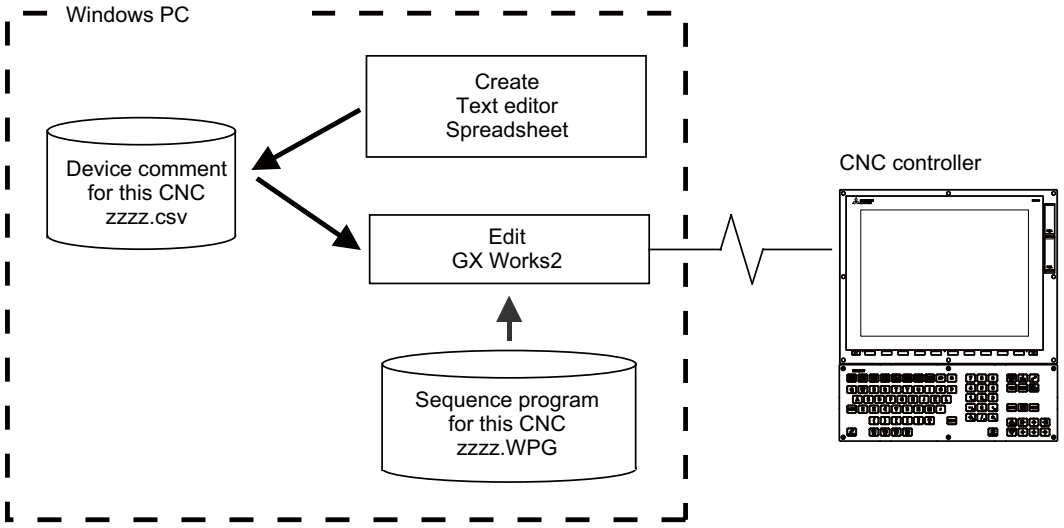
None of device comment specifications is specific to Mitsubishi Electric CNC. For details of development procedures, refer to "GX Works2 Operating Manual (Common)". This chapter provides the overview of the procedure for developing device comments including the development procedure and input/output procedure using general-purpose tool.

5.9.1 Development Procedure

There are two types of standard procedure for developing device comments as shown below.

(1) Indirect input

This is a method to transform for GX Works2 using a generally available text editor and spreadsheet as well as a data conversion package. It is used when the amount of device comments is large and managed with commercial tools.



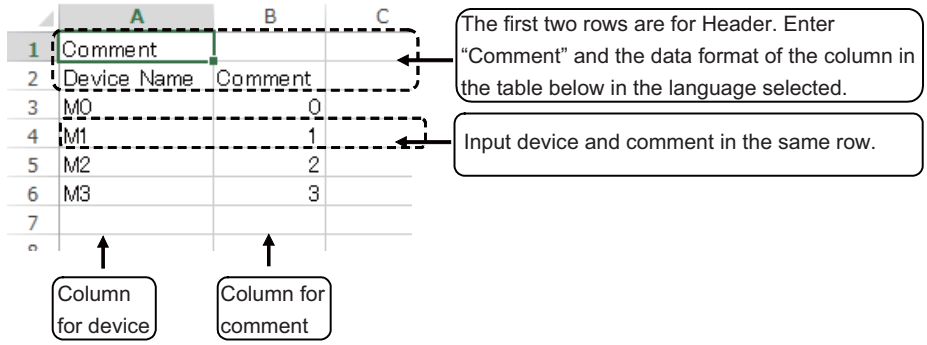
(Note) Only CSV files can be read. Unlike GX Developer, TXT files cannot be read.

(2) Direct input

To input device comment directly from GX Works2 method. It is used when the amount of device comments is small and add and correct them.

5.9.2 Writing Method of Indirect Input

This section describes how to describe when creating using tools like spreadsheets. The following example is a device comment written with a spreadsheet.



Data format of columns	Description
Device	(1) Input of device is mandatory. Conversion cannot be done without device. (2)Use half-width characters.
Comment	(1) Describe comment - If device in the same row is blank or incorrect, comment is not registered. (2)Up to 32 half-width characters can be described.

(Note) Device names cannot be set on GX Works2.

Save the above data in the Unicode format, and change the extension to ".csv". The following example displays the above data with a text editor.

```
Comment
 Device Name      Comment
M0 0
M1 1
M2 2
M3 3
```

5.9.3 Reading Comment Data on GX Works2

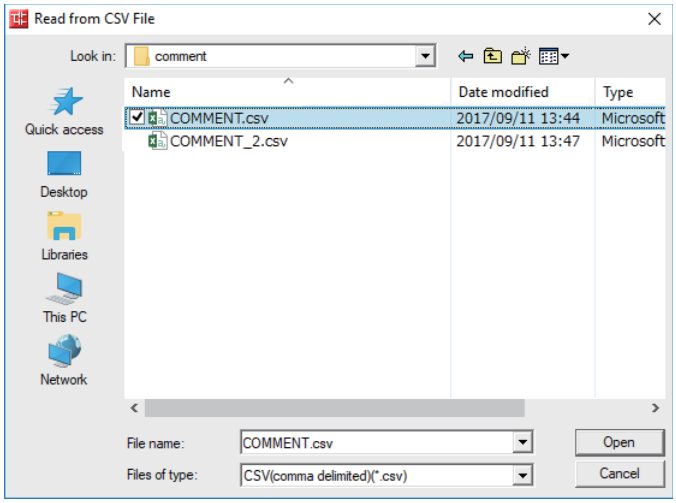
The comment data (CSV format) created with tools such as spreadsheet is read to GX Works2 as follows.

5.9.3.1 Reading to GX Works2

Open the following screen by either of the following operations in the navigation window on GX Works2.

- [Project] -> Right-click [Global Device Comment] -> [Read from CSV File]
- [Project] -> [POU] -> Right-click [Local Device Comment] -> [Read from CSV File]

Select a comment file (e.g. COMMENT.csv) on the following screen, and click [Open].



5.9.3.2 Caution

If the region settings for the language in which comment files are written is different from that on Windows, characters are corrupted when written to the CNC, and cannot be read properly by built-in edit function.
To avoid this issue, change the region setting on Windows to the one appropriate for the language to write comment files in before reading comment file in the CSV format to GX Works2.
Refer to "5.15.3 Multi-Language Data" for details.

5.9.4 Writing Device Comments to CNC Controller

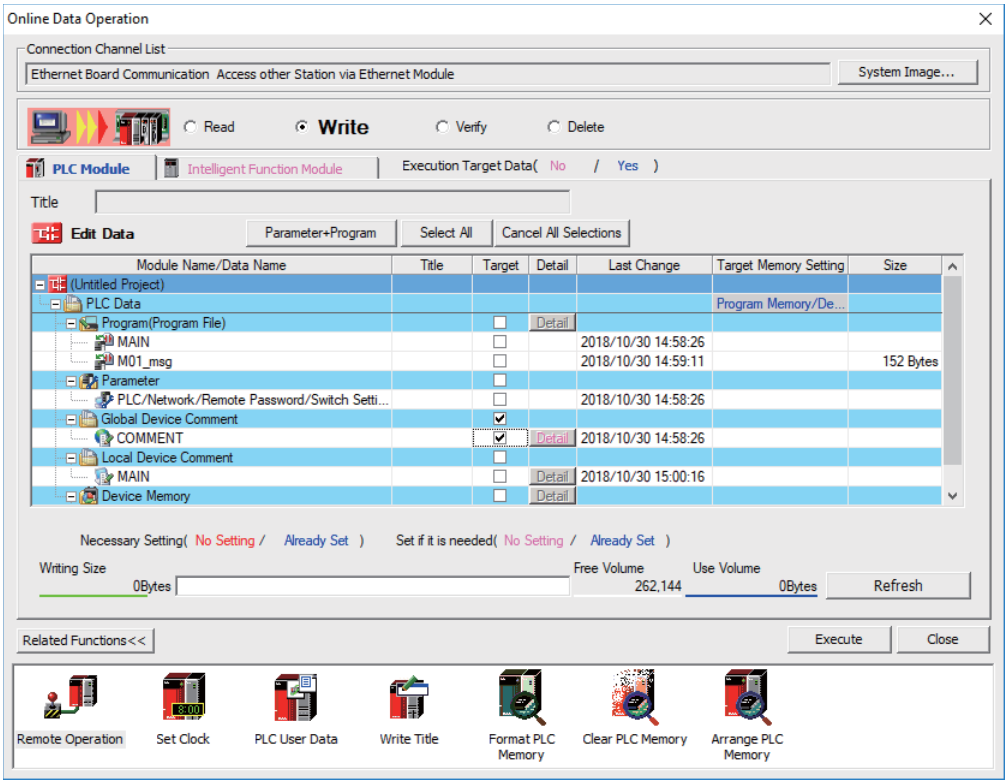
This section describes how to write device comments from GX Works2 to the CNC controller.

5.9.4.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Write to PLC]

Select [Program Memory/Device Memory] from [Target Memory Setting] on the following screen, select device comment files to write, and click [Execute].



(Note) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

5.9.5 Reading Device Comments from CNC Controller

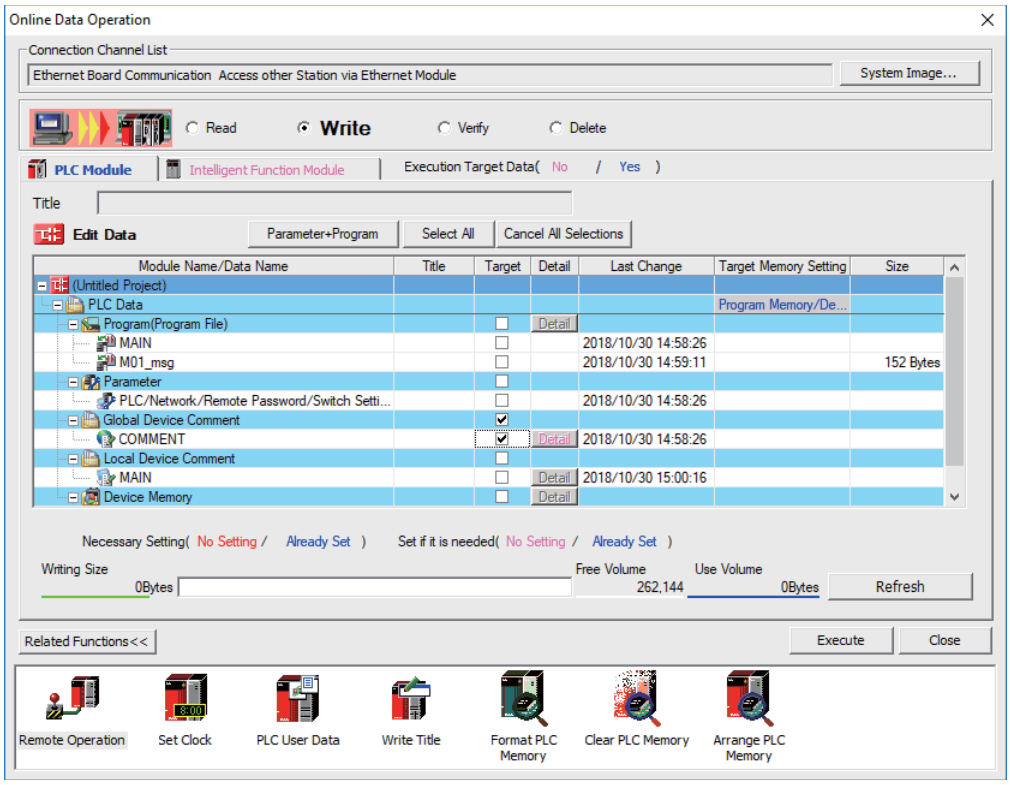
This chapter describes how to read device comments to GX Works2 from the CNC controller.

5.9.5.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

After selecting [Program Memory/Device Memory] as [Target Memory Setting] on the following screen, select device comment file to be read, and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) Click [Refresh] before reading data.

5.10 Creating Label

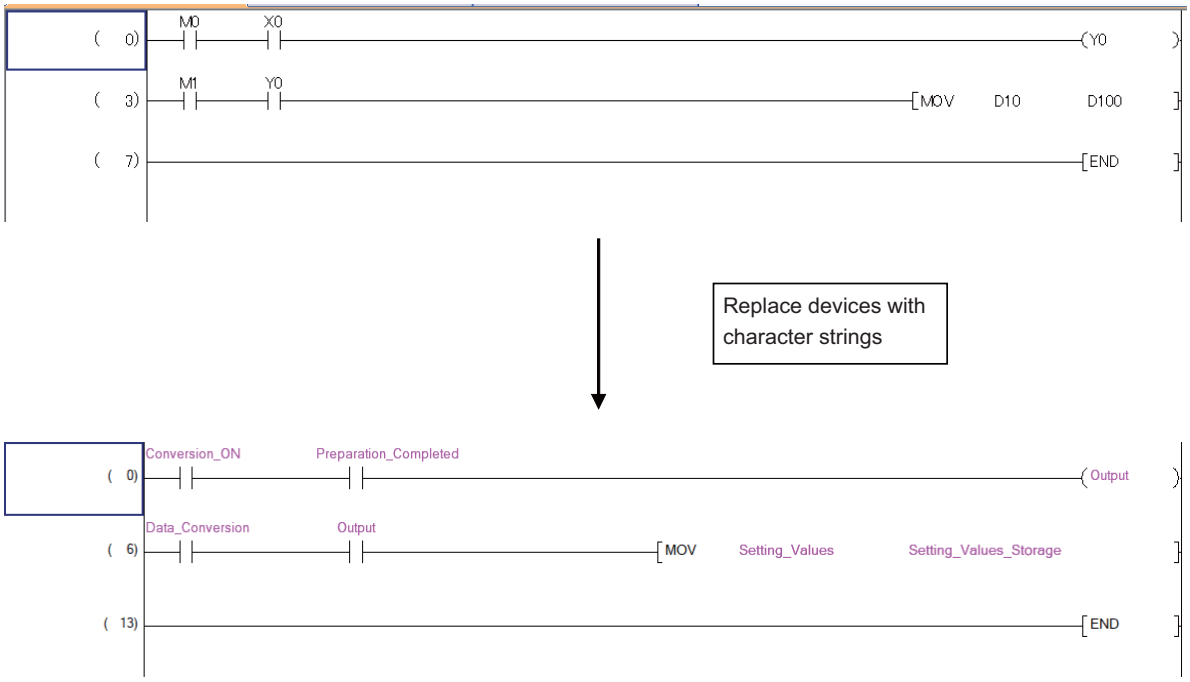
None of label specifications is specific to Mitsubishi Electric CNC. For details on basic development procedure, refer to "GX Works2 Operating Manual (Simple Project)" and "GX Works2 Operating Manual (Structured Project)". This section outlines labels and describes development procedure, as well as the development procedure and input/output procedure using general-purpose tool.

(Note) Labels can be used when simple project (with labels) or structured project is selected.

5.10.1 Overview of Label

Labels are character strings representing devices. Labels enables sequence programs to be created without thinking of devices, and makes it easy to use sequence programs in different systems.

This section provides an example of sequence program when labels are used with ladder diagram.



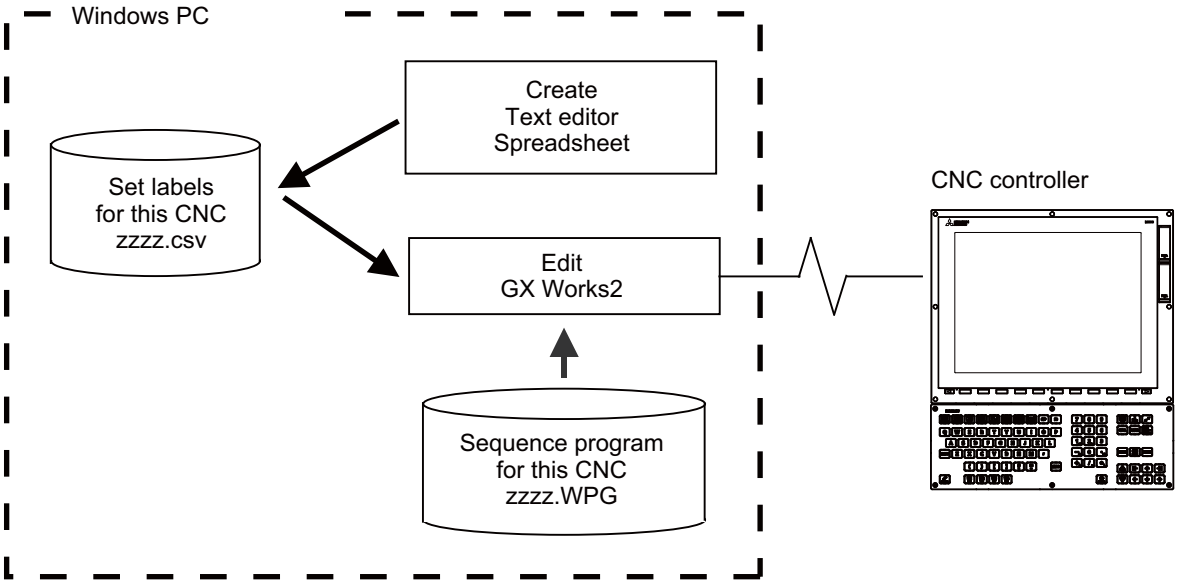
5.10.2 Development Procedure

There are two types of standard procedure for developing labels.

(1) Indirect input

Transform for GX Works2 using a generally available text editor or spreadsheet as well as data conversion package.

Used when the amount of setting labels is large and managed with commercial tools.



(Note) Only CSV files can be read. Unlike GX Developer, TXT files cannot be read.

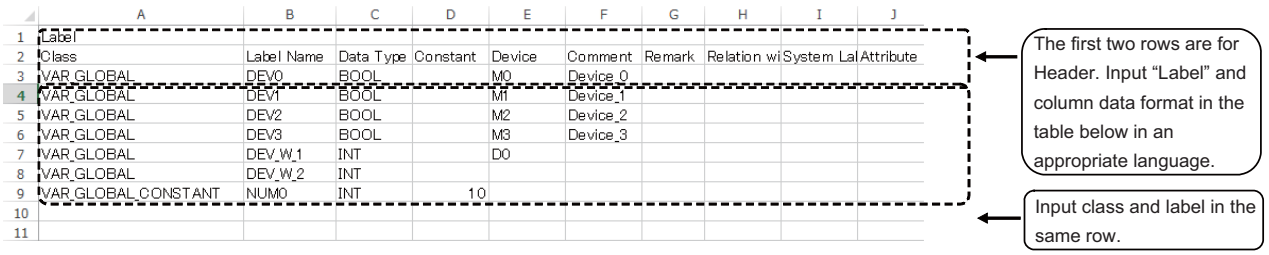
(2) Direct input

This is the method to set labels directly on GX Works2. It is used when adding and correcting a small number of labels.

5.10.3 Writing Method of Indirect Input

This section describes how to describe when creating label settings using tools like spreadsheet for each label type. The following example shows the label setting using spreadsheet.

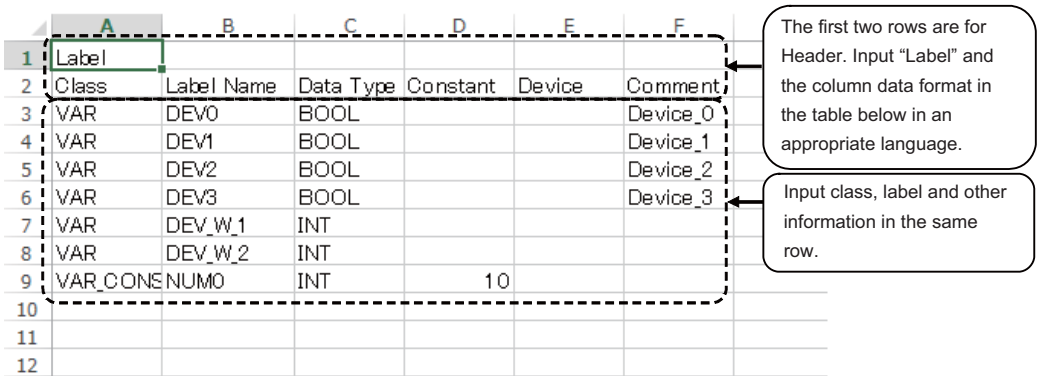
(1) Global label



Column data format	Description
Class	(1) Describe the class name of label. Conversion cannot be done without class name. (2) Types of class are described later
Label name	Describe label name. Conversion cannot be done without label. Up to 32 half-width characters can be described. Actual device names and reserved characters cannot be used.
Data type	Describe the data type of label. Conversion cannot be done without data type. Data types are described later.
Constant	Describe the numeric value assigned to label when the class is VAR_GLOBAL_CONSTANT.
Device	Describe devices assigned to label. Automatically assigned when device is blank.
Comment	Describe comment of label. Up to 1024 half-width characters can be described.
Remark	Describe supplementary information for comment of label. Up to 1024 half-width characters can be described.
Relation with system label	Item related to system labels. Not supported by CNC controllers.
System label name	Item related to system labels. Not supported by CNC controllers.
Attribute	Item related to system labels. Not supported by CNC controllers.

Save the above data in the Unicode format, and change the extension to ".csv".

(2) Local label for program

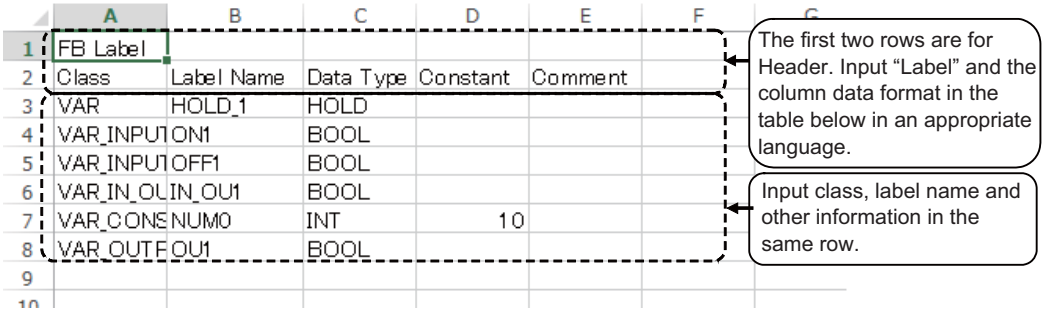


	A	B	C	D	E	F
1	Label					
2	Class	Label Name	Data Type	Constant	Device	Comment
3	VAR	DEV0	BOOL			Device_0
4	VAR	DEV1	BOOL			Device_1
5	VAR	DEV2	BOOL			Device_2
6	VAR	DEV3	BOOL			Device_3
7	VAR	DEV_W_1	INT			
8	VAR	DEV_W_2	INT			
9	VAR_CONS	NUM0	INT	10		
10						
11						
12						

Data format of column	Description
Class	(1) Describe the class name of label. Conversion cannot be done without class name. (2) Types of class are described later
Label name	Describe the name of the label. Conversion cannot be done without label name. Up to 32 half-width characters can be described. Actual device name and reserved characters cannot be used.
Data type	Describe the data type of the label. Conversion cannot be done without data type. (2) Types of data type are described later.
Constant	Describe numeric value assigned to label when the class is VAR_CONSTANT.
Device	Cannot be set for local label.
Comment	Describe comment of label. Up to 1024 half-width characters can be described.

Save the above data in the Unicode format, and change the extension to ".csv".

(3) Local label for function block



Column data format	Description
Class	(1) Describe the class name of label. Conversion cannot be done without class name. (2) Types of class are described later.
Label name	Describe the name of the label. Conversion cannot be done without label name. Up to 32 half-width characters can be described. Actual device names and reserved characters cannot be used.
Data type	Describe the data type of label. Conversion cannot be done without data type. Data types are described later.
Constant	Describe the numeric value assigned to the label when the class is "VAR_CONSTANT".
Device	Cannot be set for local labels.
Comment	The comment for the label. Up to 1024 half-width characters can be described.

Save the above data in the unicode format, and change the extension to ".csv".
For details on function blocks (FB), refer to "5.11 Creating Function Block", "GX Works2 Operating Manual (Simple Project, Function Block)" and "GX Works2 Operating Manual (Structured Project)".

5.10.4 Reading Label Setting on GX Works2

Label setting (CSV format) created using tools such as spreadsheet is read to GX Works2 as follows.

5.10.4.1 Reading to GX Works2

Open the read screen by the following operation in the navigation window on GX Works2.

(1) Global label

[Project] -> Right-click [Global Label] -> [Read from CSV File]

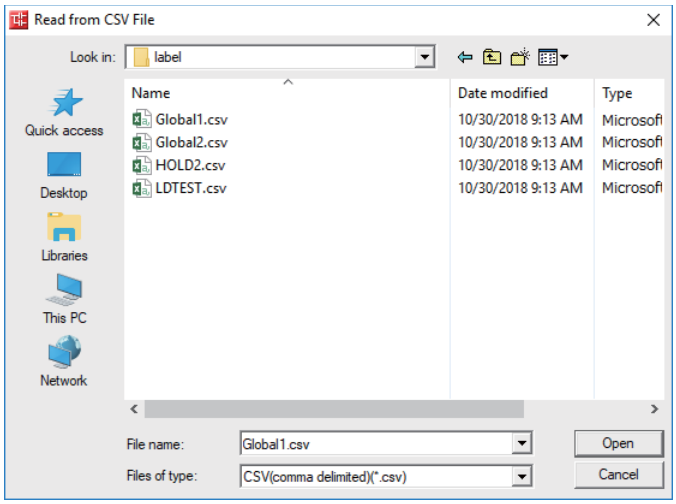
(2) Local label for program

[Project] -> [POU] -> [Program] -> [Program Name] -> Right-click [Local Label] -> [Read from CSV File]

(3) Local labels for function blocks

[Project] -> [POU] -> [FB_Pool] -> [FB name] -> Right-click [Local Label] -> [Read from CSV File]

Select a label setting file on the following screen, and click [Open].



5.10.4.2 Caution

If the language the label setting file is written in is different from the region setting on Windows, the characters will corrupt when written to the CNC, and cannot be read properly by built-in edit functions.
To avoid this issue, change the Windows region setting to the appropriate one for the language of the label setting file, before reading the label setting file in the CSV format to GX Works2.
Refer to "5.15.3 Multi-Language Data" for details.

5.10.5 Writing Label Setting to CNC Controller

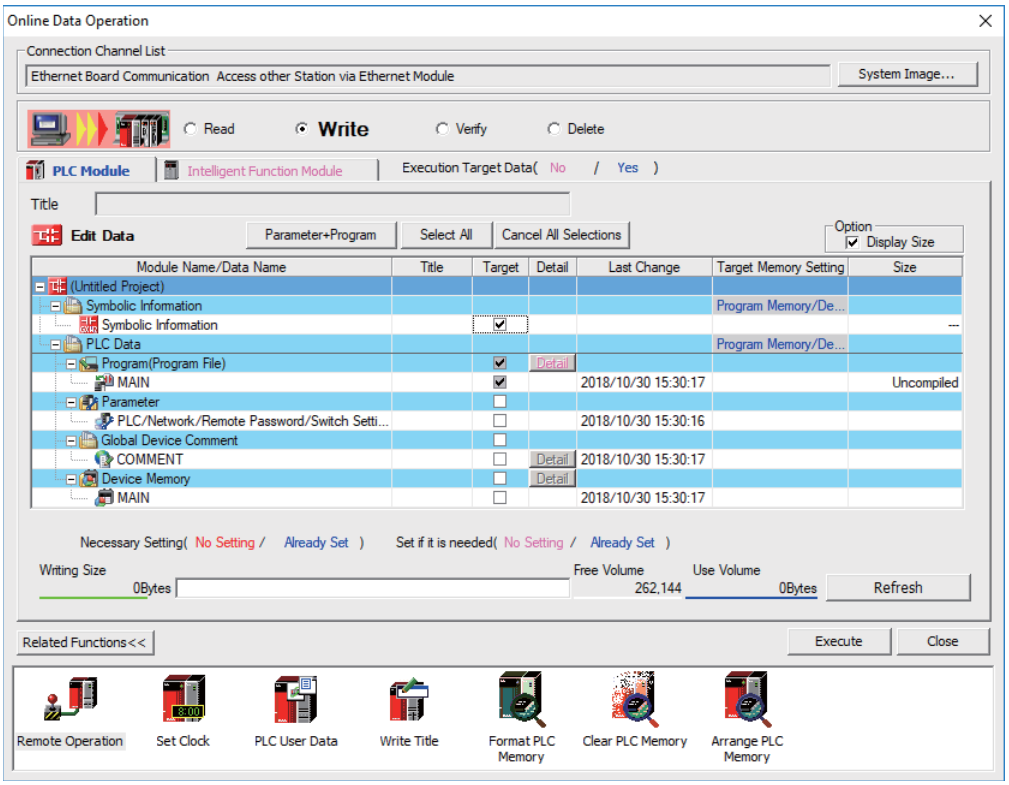
This section describes how to write label setting from GX Works2 to the CNC controller (particularly considerations and operation specific to this CNC).

5.10.5.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Write to PLC]

After selecting [Program Memory/Device Memory] as the symbolic information as [Target Memory Setting] on the following screen, [Program Memory/Device Memory] as [Target Memory Setting] of PLC data, select the symbolic information file, and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) When symbolic information is written, sequence programs and FB are written as well as labels.

5.10.6 Reading Label Setting from CNC Controller

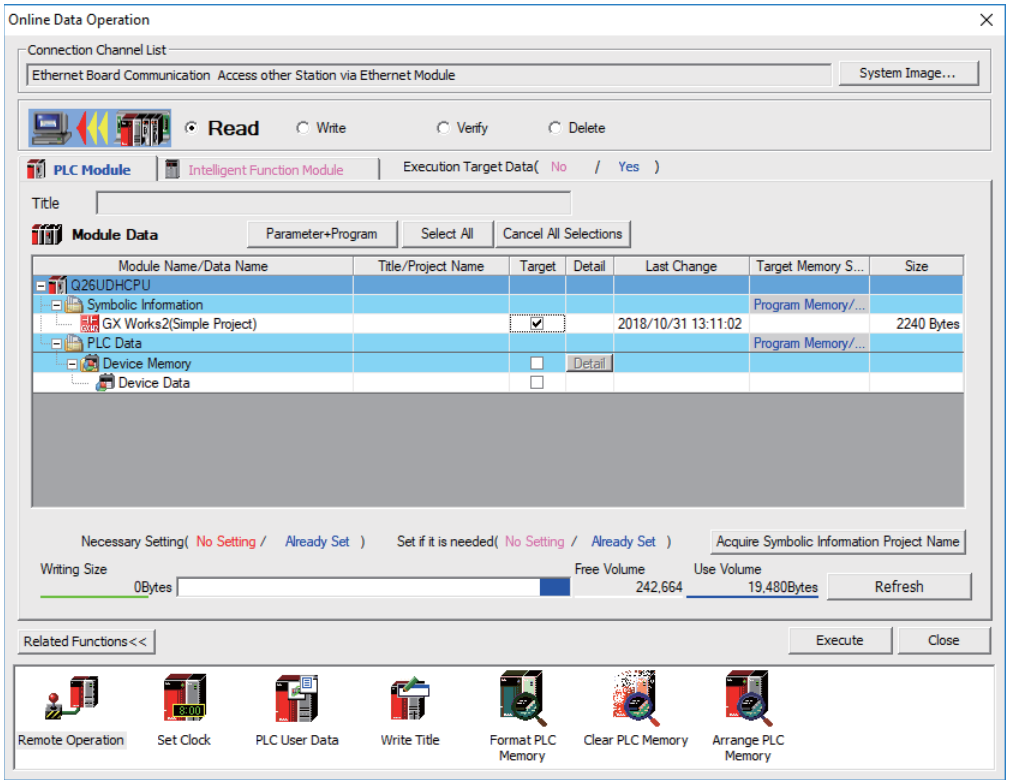
This section describes how to read label setting from the CNC controller to GX Works2 (particularly considerations and operation specific to this CNC).

5.10.6.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

After selecting [Program Memory/Device Memory] from [Target Memory Setting] on the following screen, select "GX Works2 (Simple project)", and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) Click [Refresh] before reading data.

(Note3) Read parameters before reading symbolic information by referring to "5.5.8.6 Writing and Reading Parameters to CNC Controller".

(Note4) When symbolic information is read, sequence programs and FB are also read as well as labels.

5.10.7 Considerations

The use of label setting on M8 series CNC controller has the following considerations. Exercise caution because if these considerations are not observed, sequence programs malfunction may result.

(1) Built-in edit function

Even when label setting is written to the CNC controller, labels cannot be displayed or confirmed by built-in edit functions of the CNC.

(2) System label

The CNC controller cannot use system labels.

(3) Types of class

This table lists the class name that can be used in label setting on a CNC controller and the types of labels that can select each class name. Latch type labels cannot be used.

○: Selectable, ×: Not selectable

Class name	Description	Labels that can be selected		
		Global label	Local label for program	Local label for function block
VAR_GLOBAL	Global label assigned to device	○	×	×
VAR_GLOBAL_CONSTANT	Global label assigned to constant	○	×	×
VAR	Local label assigned to device	×	○	○
VAR_CONSTANT	Local label assigned to constant	×	○	○
VAR_RETAIN *	Latch type local label	×	×	×
VAR_INPUT	Label used for inputting FB	×	×	○
VAR_OUTPUT	Label used for outputting FB	×	×	○
VAR_IN_OUT	Label used for inputting/outputting FB	×	×	○

* To use latch devices on the CNC controller, assign user areas for L device and R device in "VAR_GLOBAL", and select latch as device set in the parameter.

(4) Data types

This table lists the data types that can be used in label setting on the CNC controller. Besides these, the names of FBs, arrays and structures used can be set as data types.

For details on arrays and structures, refer to "GX Works2 Operating Manual (Common)".

○: Selectable, ×: Not selectable

Data type on GX Works2	Data type in CSV file	Number of array elements	Support on the CNC controller (ladder)
Bit	BOOL	1 to 32768	○
Word [signed]	INT	1 to 32768	○
Double word [signed]	DINT	1 to 16384	○
Word [unsigned]/Bit string [16 bit]	WORD	1 to 32768	×
Double word [unsigned]/Bit string [32 bit]	DWORD	1 to 16384	×
FLOAT (Single Precision)	REAL	1 to 16384	×
FLOAT (Double Precision)	LREAL	1 to 8192	×
String (32)	STRING[32]	1 to 1927	×
Time	TIME	1 to 16384	×
Timer	TIMER	1 to 32768	○
Counter	COUNTER	1 to 32768	○
Retentive timer	RETENTIVETIMER	1 to 32768	○
Pointer	POINTER	Cannot be set	○

(5) Devices assigned automatically

This table lists devices that can be assigned automatically to labels on the CNC controller along with cautions.Do not use devices not listed here as devices assigned automatically.

Data type of device	Usable device	Precaution
Word device	D device, W device	Do not set the range set for project-common device as device assigned automatically
Bit device	M device, B device	Do not set the range set for project-common device as device assigned automatically
Pointer	P device	To set device assigned automatically, set common pointer No in [PLC Parameter] -> [PLC System]
Timer	T device	Do not set the range set for device assigned automatically as a variable time
Accumulated timer	ST device	Do not set the range set for device assigned automatically as a variable timer
Counter	C device	Do not set the range set for device assigned automatically as variable counter

5.11 Creating Function Block

None of function block (FB) specifications is specific to Mitsubishi Electric CNC. For details on basic procedures for developing and using FB, refer to "GX Works2 Operating Manual (Simple Project, Function Block)" and "GX Works2 Operating Manual (Structured Project)". This section provides the overview of FB, as well as the procedure for inputting to and outputting from the CNC controller.

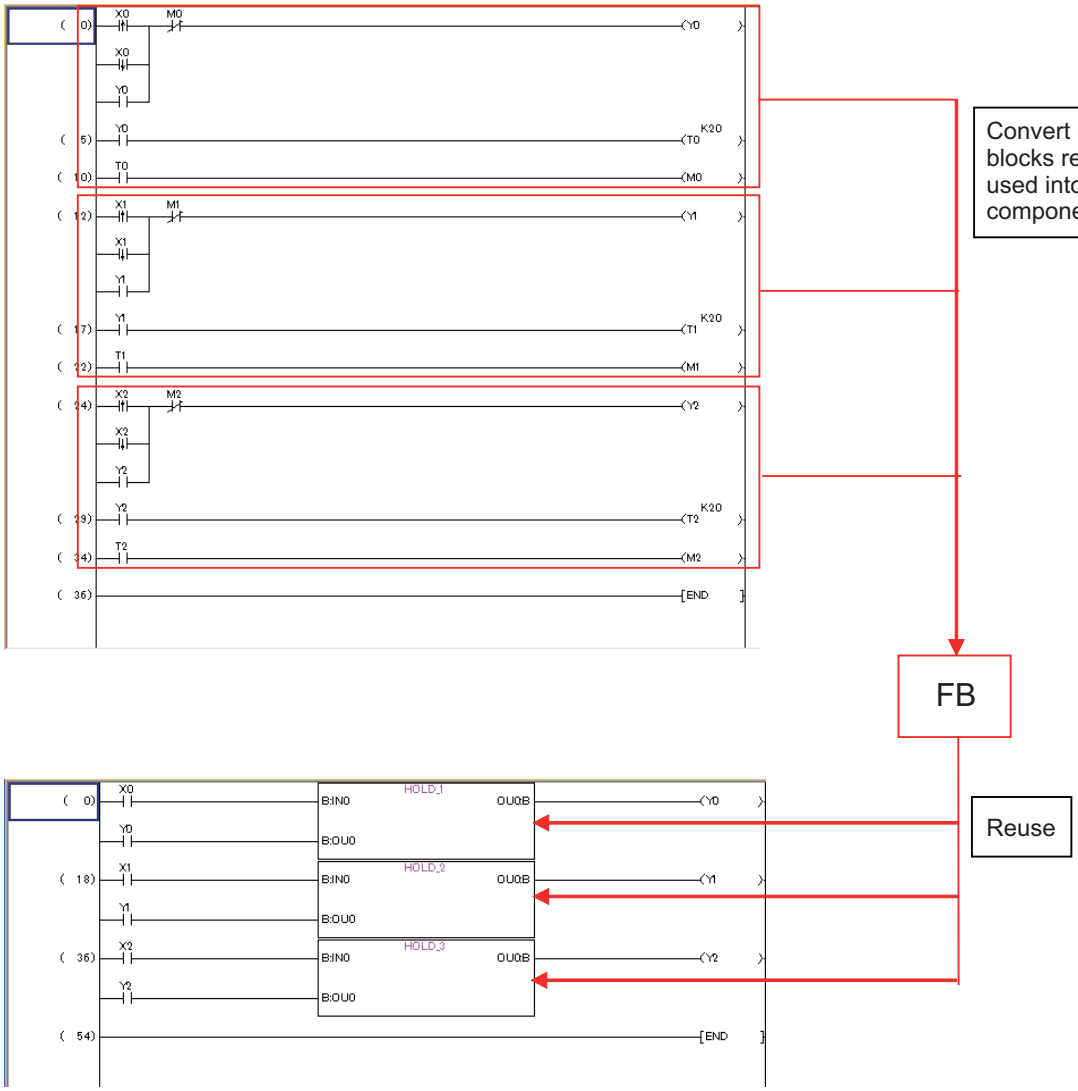
(Note1) FB can be used only when simple project (with labels) or structured project is selected.

(Note2) GX Works2 does not support the macro function of GX Developer. Use FB instead.

5.11.1 Overview of Function Block

An FB is designed to convert a ladder block, which is used repeatedly in a sequence program, into a component to be utilized in a sequence program. FB improves the readability and efficiency in creating sequence programs, although the use of FB does not reduce the number of steps in sequence programs.

This section provides an example of sequence program using FB.



5.11.2 Write Function Block to CNC Controller

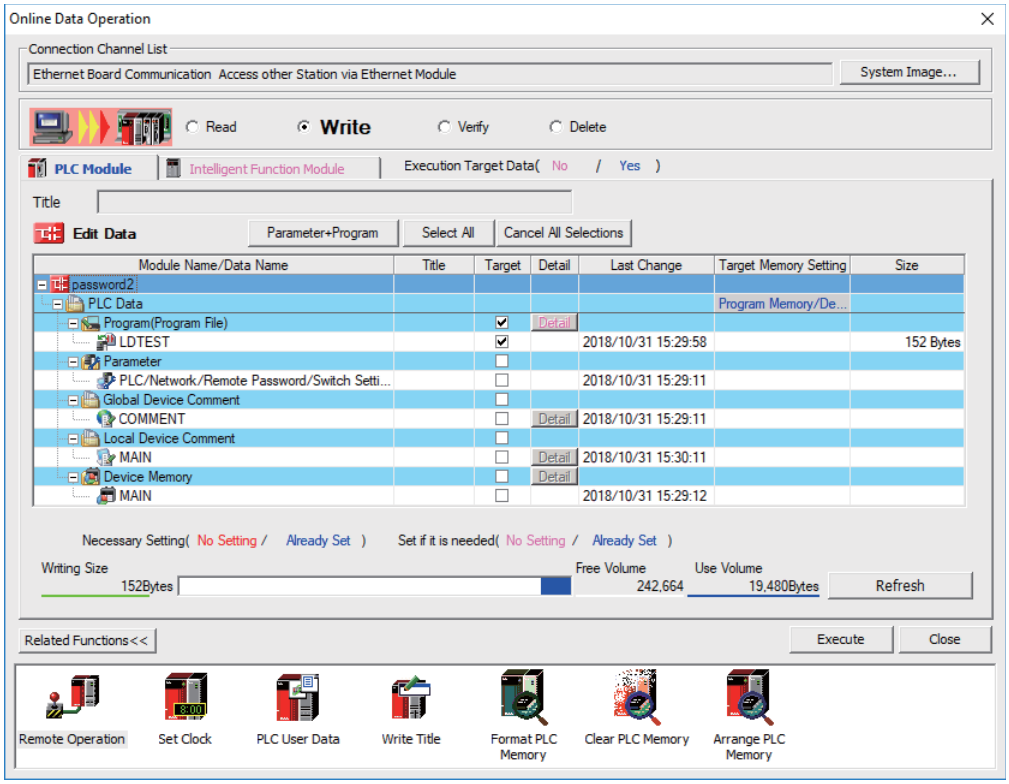
This section describes how to write FB from GX Works2 to the CNC controller (particularly considerations and operation specific to this CNC).

5.11.2.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Write to PLC]

Select [Program Memory/Device Memory] as [Target Memory Setting] of the symbolic information and [Target Memory Setting] of the PLC data on the following screen, specify the symbolic information file, and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) When symbolic information is written, sequence programs and labels are also written as well as FB.

5.11.3 Reading Function Blocks from CNC Controller

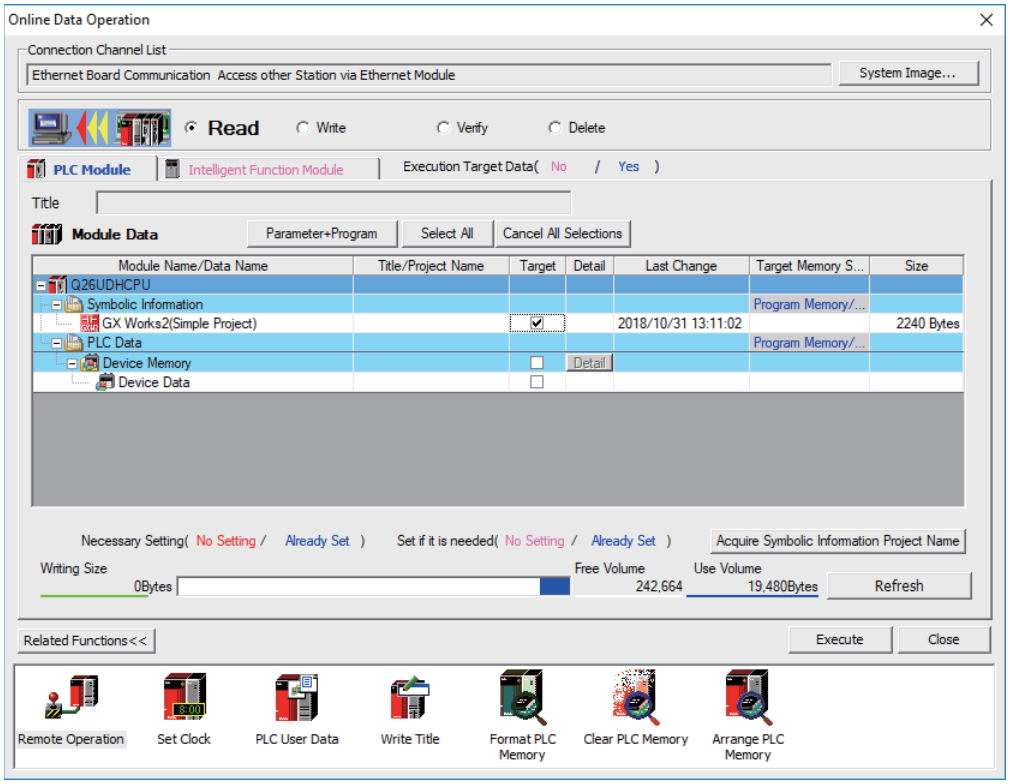
This section describes how to read FB from the CNC controller to GX Works2 (particularly considerations and operation specific to this CNC).

5.11.3.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

[Online] -> [Read from PLC]

Select [Program Memory/Device Memory] as [Target Memory Setting] on the following screen, select "GX Works2(Simple Project)" or "GX Works2(Structured Project)", and click [Execute].



(Note1) [Program Memory/Device Memory] is the only valid option for [Target Memory Setting].

(Note2) Click [Refresh] before reading the data.

(Note3) Read parameters before reading symbolic information by referring to "5.5.8.6 Writing and Reading Parameters to CNC Controller".

(Note4) When symbolic information is read, sequence programs and labels as well as FB are read.

5.11.4 Considerations

The use of FB on M8 series CNC controller has the following restrictions. Exercise caution because if these considerations are not observed, malfunction of sequence programs may result.

(1) Built-in edit function

Even when sequence programs with FB are written to the CNC controller, FB is not displayed on the built-in edit function of the CNC, but actual ladder (ladder with labels and functional blocks compiled) is displayed.

(2) Nesting of FB

FB can be nested within FB. Nesting level of ladder diagram for each project is as follows.

	Simple project (without labels)	Simple project (with labels)	Structured project
Ladder Diagram	—	One layer	One layer

(Note) You can select macro-type FB or subroutine-type FB only in structured project.

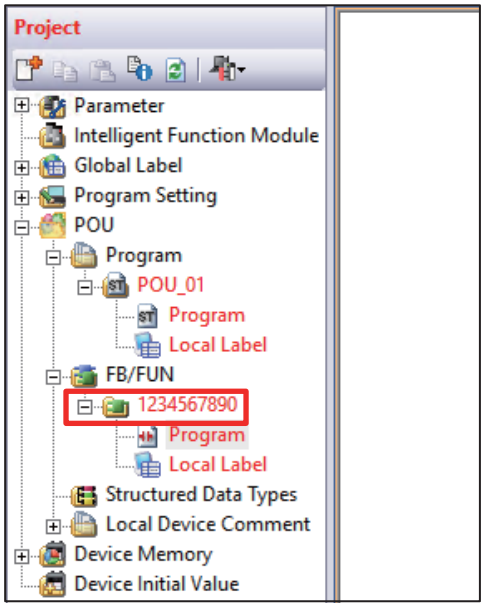
FB of simple project (with labels) is macro-type.

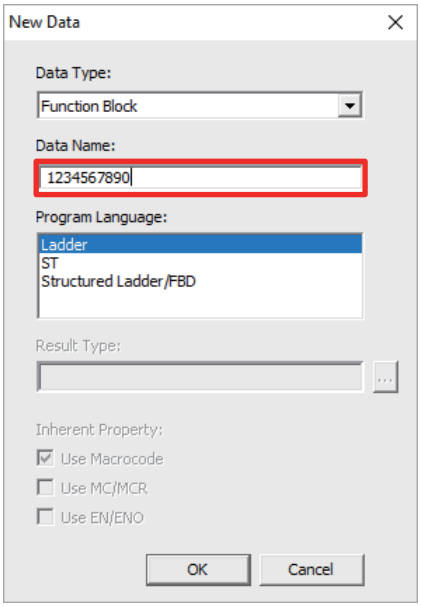
In structured project, subroutine-type FB cannot be called from the program whose programming language is ladder diagram.

(3) FB name

When only one-byte numerics are set to FB name, set 10 or less characters.

If more than 10 characters are set, an error occurs during write to the CNC controller.





5.12 File Password Function

File password function prevents programs and other data in the CNC from being read or written by programming tools. A different password can be assigned to each file.
There are some differences in the file password function specifications between GX Works2 and GX Developer. For details, refer to "5.12.6 File Password: Cautions on Setting".

5.12.1 File Password: Scope

File password can be set for sequence programs, device comments, and PLC messages in the CNC controller to read- or write-protect them. A password is 4 half-width alphanumeric characters (case sensitive).

5.12.2 File Password: Functions

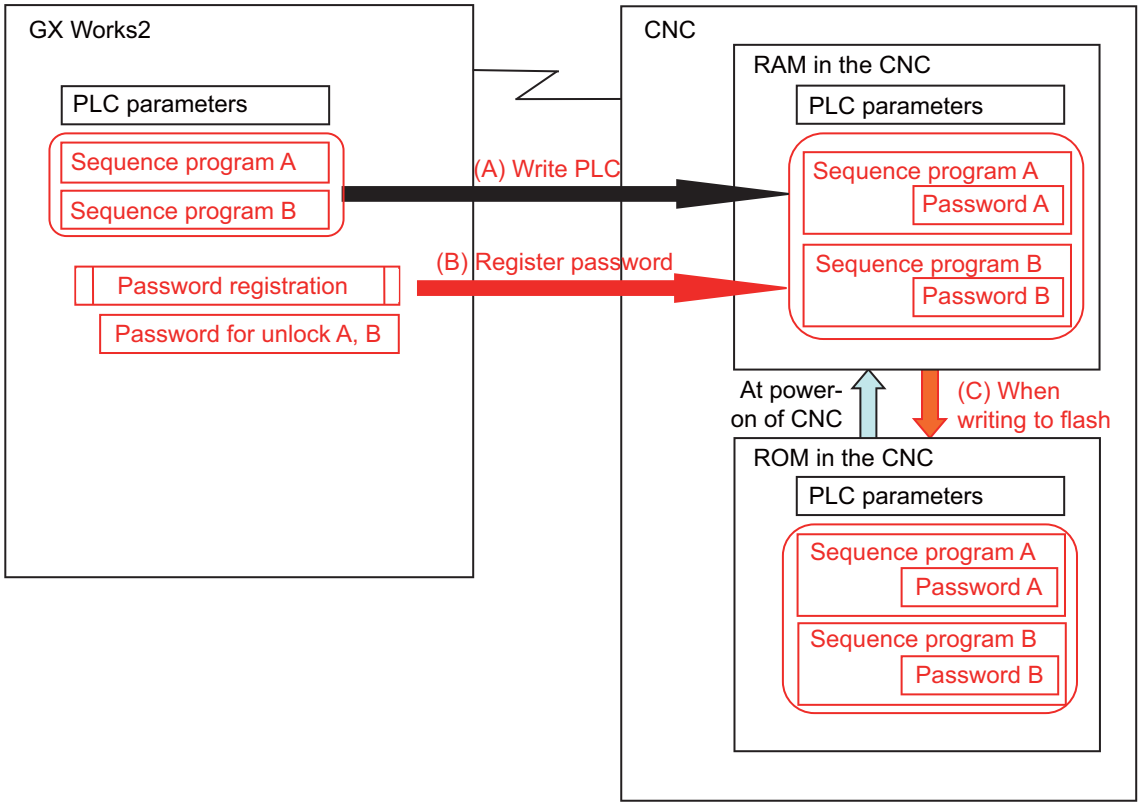
Passwords can be registered, changed, deleted, and unlocked from GX Works2.
- Registration and change of a file password sets a password.
- Deletion of a file password deletes a password.
- Unlock of a file password temporarily unlocks a password set for a program file.

5.12.3 File Password: Attributes

A file password has write attribute (Write Protection) and read attribute (Read/Write Protection).
The following attributes can be set from GX Works2.
- Write Protection: Writing and editing are prohibited
- Read/Write Protection: Reading, verifying, writing, and editing are prohibited

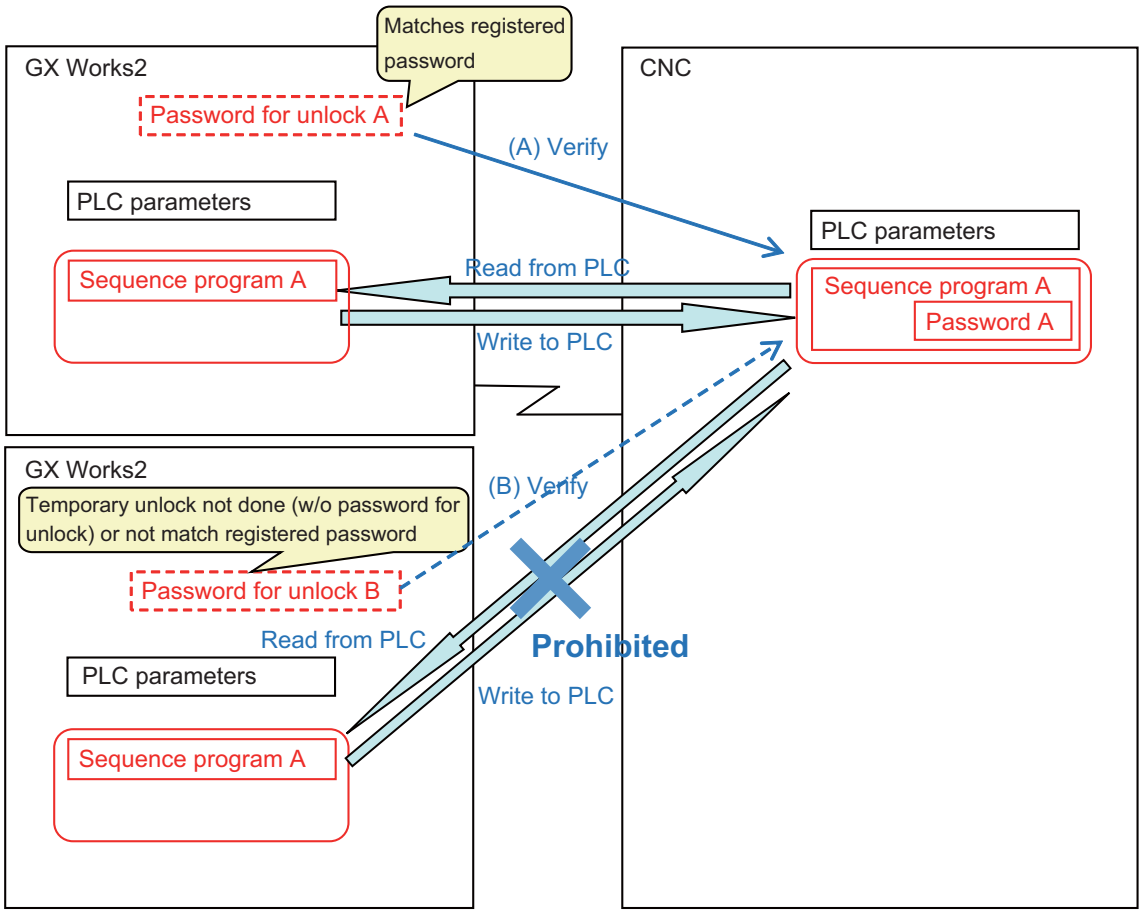
5.12.4 File Password: Outline of Setting

(1) Register file password



(A) Save sequence programs in the RAM in the CNC by writing to PLC.
(B) To read- or write-protect a file, register a file password. Registering a file password on GX Works2 sets the file password information (file password and file password attribute) of each sequence program in the CNC.
(C) When PLC is written to flash ROM, data containing file password information is saved in the ROM in the CNC.

(2) Work with a password-protected file

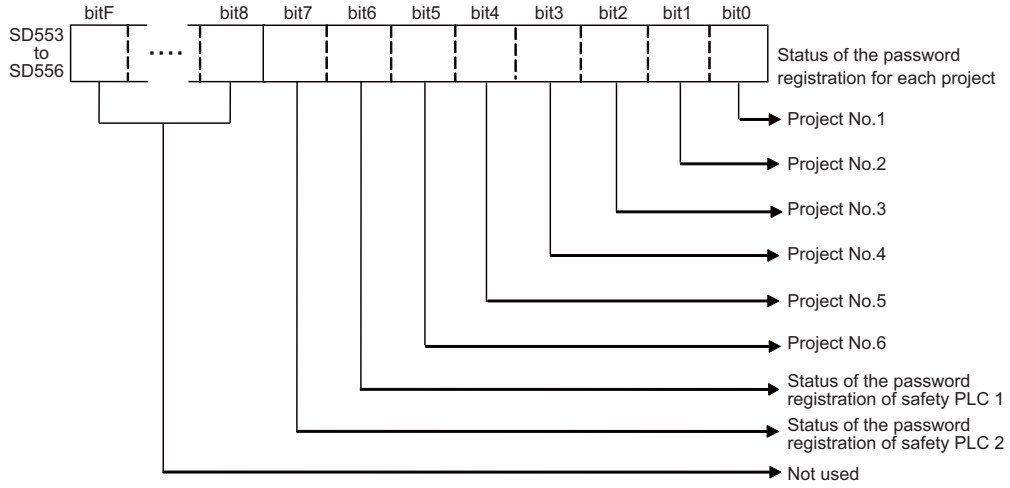


(A) To work with a password-protected file, temporarily unlock the file password. A file password for unlock is set in GX Works2 when a file password is temporarily unlocked. A file password can be temporarily unlocked only on the GX Works2 on which a password for unlock was set. When GX Works2 on which a password for unlock was set is restarted, temporarily unlock a file password again. When the file is worked with on GX Works2, a password for unlock is sent to the CNC. The CNC verifies this password for unlock by comparing it with the registered password. When the password is authenticated, the CNC executes the file operation.
(Note) Password setting is retained even after a password-protected file is overwritten.

(B) When temporary unlock of a file password is not done on the GX Works2, or when the password for unlock is different from the previously registered password, password verification fails, and file operation is not executed.

5.12.5 Checking the File Password Registration Status

You can check that a password is registered to a file in the CNC by using the values of special registers SD553 to SD556. Monitoring the values of the special registers prevents you from forgetting to resister the password.
The password registration can be checked by a project basis. Bit0 to bit5 of each special register correspond to the project Nos. 1 to 6. The corresponding bit value of each project changes depending on the status of the password registration.



The values of the special registers change depending on the status of the password registration for stored file. However, the target file of the register and condition to change the value differ for the respective registers. For details, refer to the following table.

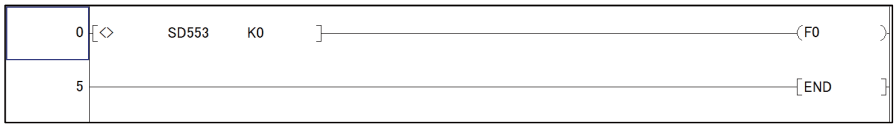
Special register No.	Target file	Bit value and its condition corresponding to project No.
SD553	Sequence program	0 (When at least one password is registered) 1 (Other cases)
SD554	Sequence program	0 (When all files are protected by passwords) 1 (Other cases)
SD555	PLC message, device comment	0 (When at least one password is registered) 1 (Other cases)
SD556	PLC message, device comment	0 (When all files are protected by passwords) 1 (Other cases)

Note that when no target file is stored in the project, the bit which corresponds to the project is "0".

Including each special register in a sequence program enables the CNC to stop the operation or to display an alarm, when a password has not been registered.
In the example below, PLC message is displayed when no password is registered for the ladder file of project 1. This prevents you from forgetting to register the password. (Refer to "5.8 PLC Message Development".)

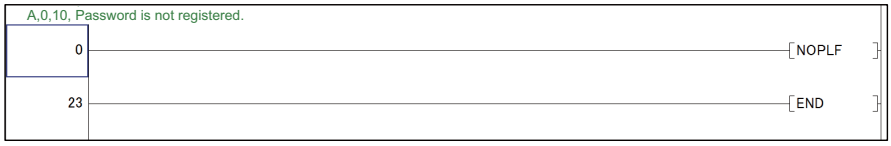
Example of a sequence program

When the value of SD553 is not "0", "F0" is turned ON.



Example of a PLC message

When "F0" is turned ON, an PLC message is displayed.



5.12.6 File Password: Cautions on Setting

Forgotten password operation

If a registered password is forgotten, file operation other than Format PLC Memory becomes impossible.
Format PC memory if the registered password is forgotten. Not only the password but all data will be cleared; recover data by opening deleted file on GX Works2 and write it to PLC again.

When reading file

When password-protected files are read from the CNC controller to GX Works2, password information is not read. This means that password is not set even if the read file is written to the CNC controller again.

Precaution for setting file password to simple project (with labels)

When at least one file password is registered to a sequence program which was written to a CNC from simple project, programs with no password set also are required to input password to be read or written, not only the program protected by the password.
When a sequence program is created by simple project, password registration only for the specific program cannot be performed.

Differences of password operation between GX Works2 and GX Developer

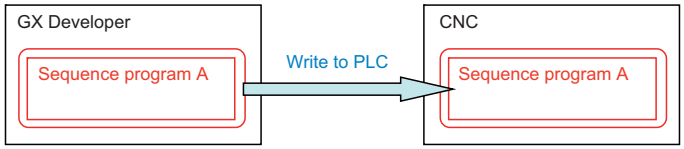
There are some differences for password operation between GX Works2 and GX Developer. Read the following contents thoroughly, and make sure not to forget the password registration.

(1) Behavior when a password is registered and a project is restarted

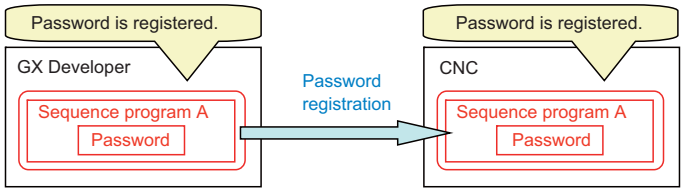
When you use GX Developer, a password can be set and saved for a sequence program of GX Developer project which has been written to a CNC. Whereas a password is canceled for a sequence program of GX Works2 project when the same operation is performed using GX Works2.

(i) Behavior of GX Developer

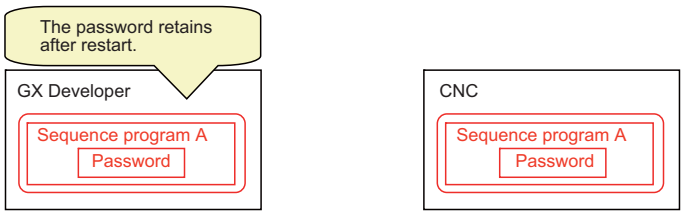
1. Write a file to a CNC from GX Developer.



2. Register a password from GX Developer.

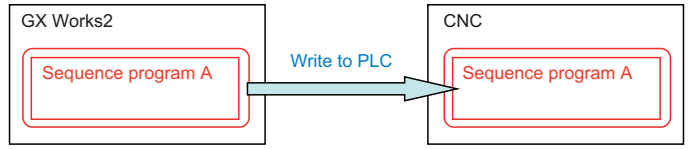


3. Save the project and restart GX Developer.

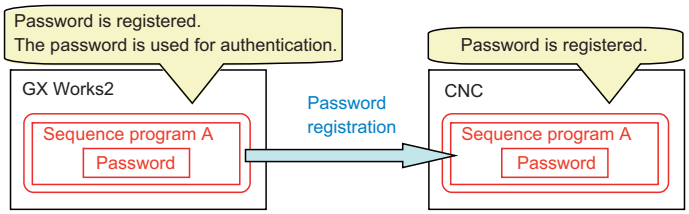


(ii) Behavior of GX Works2

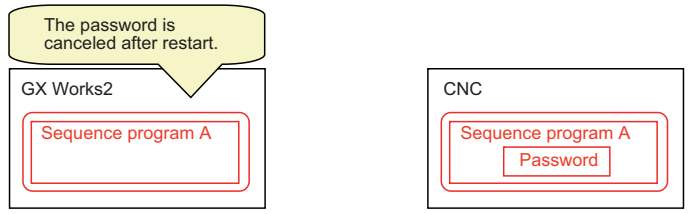
1. Write a file to a CNC from GX Works2.



2. Register a password from GX Works2.



3. Save the project and restart GX Works2.



(2) Behavior after a CNC is formatted

When a file protected by a password is read to GX works2 from a CNC, and then the file is written to the same CNC again after formatting the CNC, the password of the file is canceled.

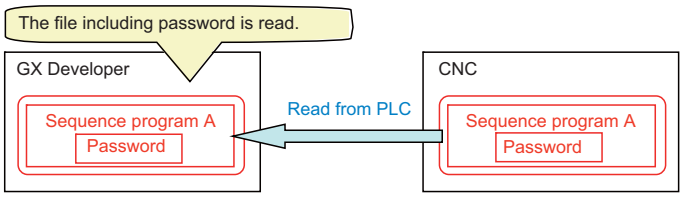
When GX Developer is used in the same situation, the password retains for the file in the CNC.

When you use GX Works2, make sure not to forget to register a password again after write to PLC.

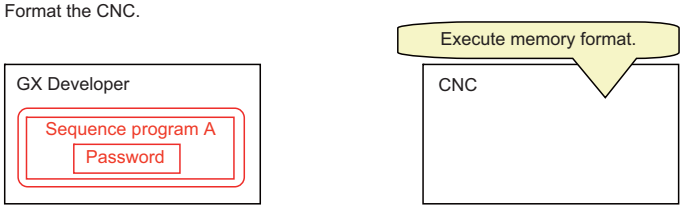
When no password is registered to the file, the bit values of the special registers SD553 to SD556 corresponding to the project are "1". Refer to "Checking the file password registration status".

(i) Behavior of GX Developer

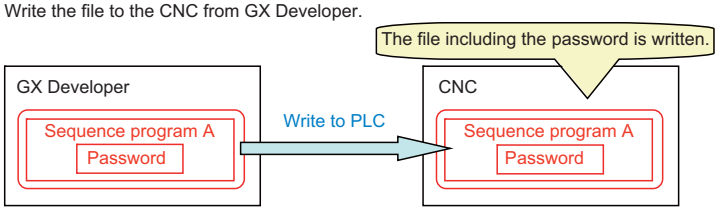
1. Read a file protected by a password to GX Developer from a CNC.



2. Format the CNC.

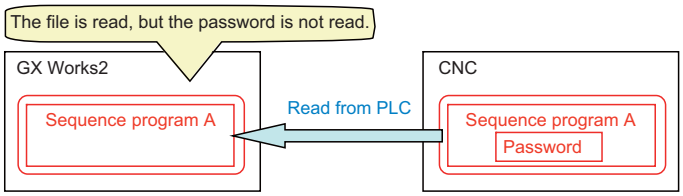


3. Write the file to the CNC from GX Developer.

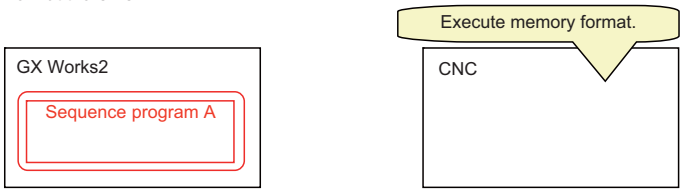


(ii) Behavior of GX Works2

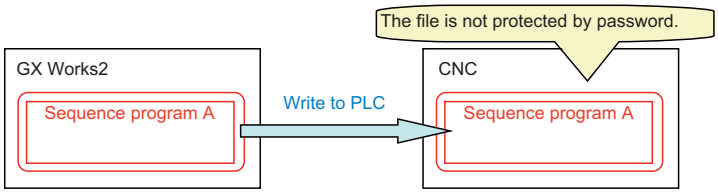
1. Read a file protected by a password to GX Works2 from a CNC.



2. Format the CNC.



3. Write the file to the CNC from GX Works2.



(3) Behavior when an existing file is to be copied to another CNC

When a file protected by a password is read to GX works2 from a CNC, and then the file is written to another CNC, the password of the file is canceled.

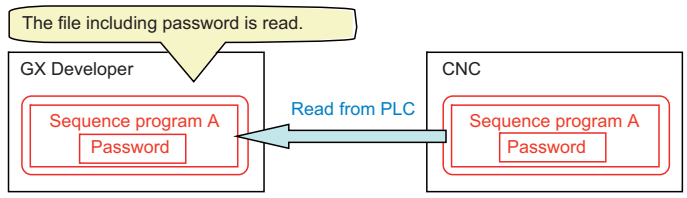
When GX Developer is used in the same situation, the password retains for the file in another CNC.

When you use GX Works2, make sure not to forget to register a password again after write to PLC.

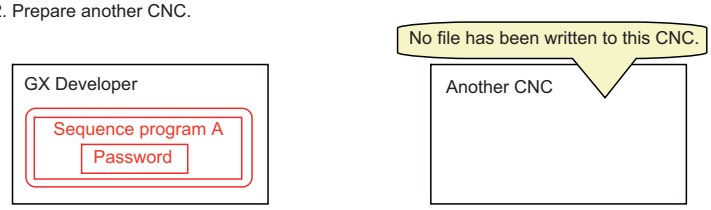
When no password is registered to the file, the bit values of the special registers SD553 to SD556 corresponding to the project are "1". Refer to "Checking the file password registration status".

(i) Behavior of GX Developer

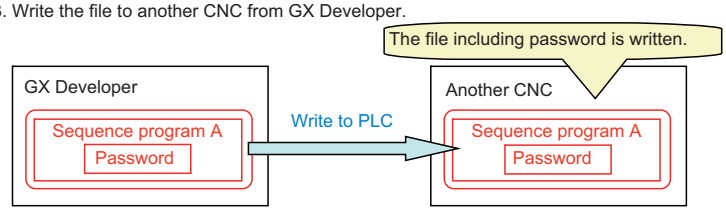
1. Read a file protected by a password to GX Developer from a CNC.



2. Prepare another CNC.

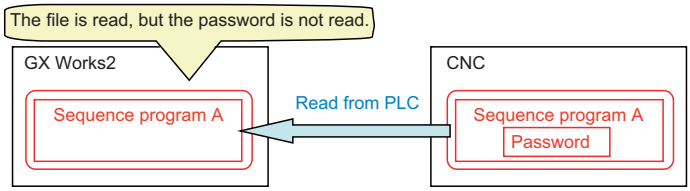


3. Write the file to another CNC from GX Developer.

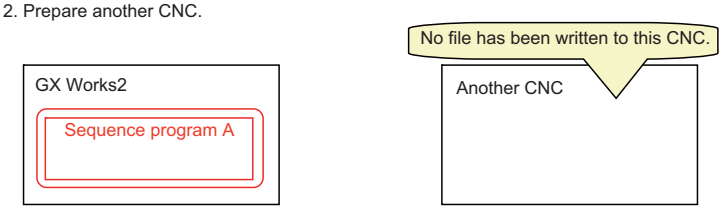


(ii) Behavior of GX Works2

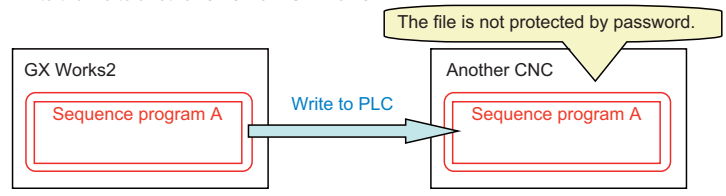
1. Read a file protected by a password to GX Works2 from a CNC.



2. Prepare another CNC.



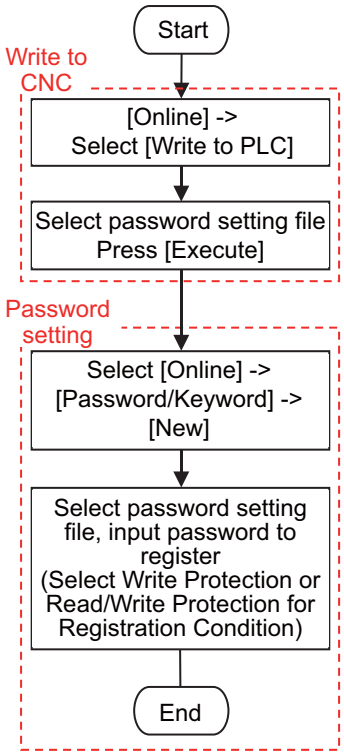
3. Write the file to another CNC from GX Works2.



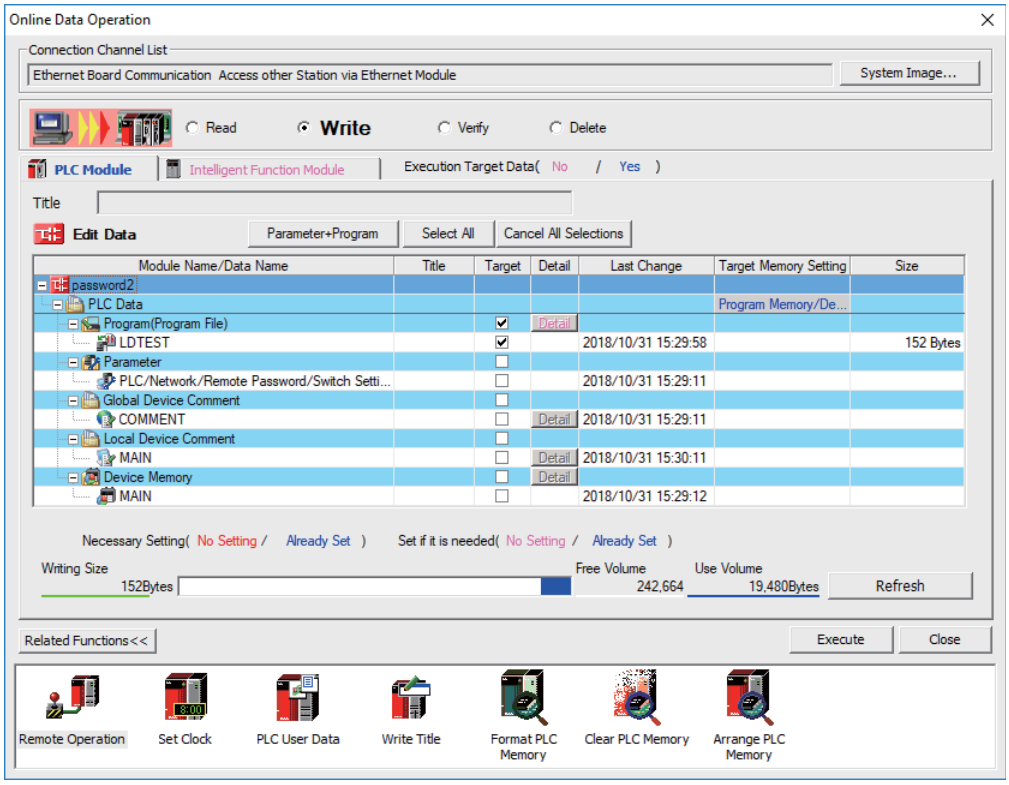
5.12.7 Setting File Password

5.12.7.1 File Password: Register

The flow of file password new setting procedure is as follows.



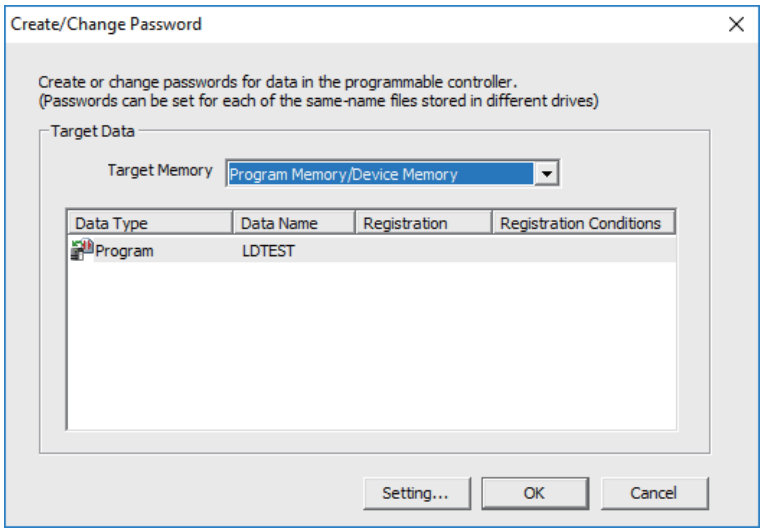
(1) Select [Online] - [Write to PLC] to display the following "Online Data Operation" screen.



(2) Set [Target Memory Setting], select a file to store, and click [Execute].

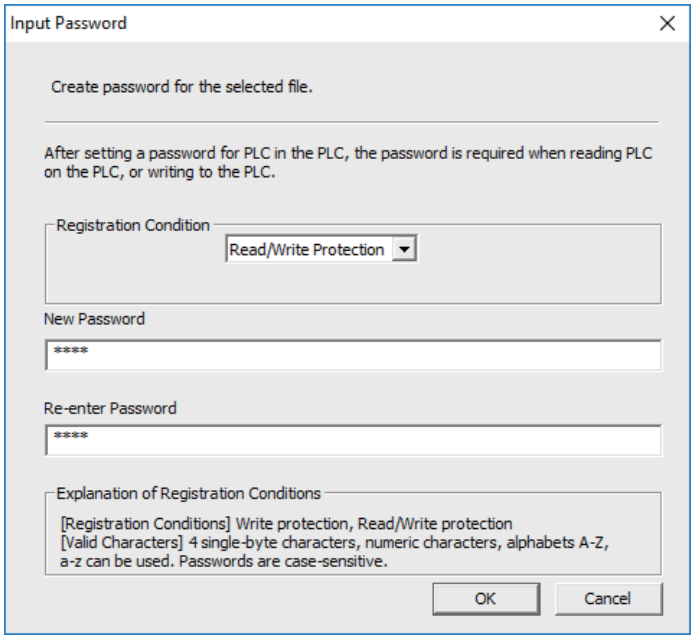
(3) When writing is completed, close the "Online Data Operation" screen.

(4) Select [Online] - [Password/Keyword] - [New] to open the following "Create/Change Password" screen.

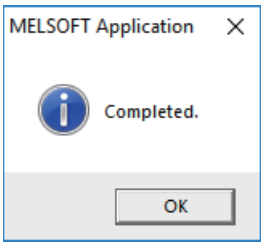


(5) Select data area storing the file to be protected with password in [Target Memory], file list is displayed. Select the target file from the file list, click [Setting...].
Multiple files can be selected by clicking them while pressing [Ctrl]. The same password can be registered in a batch.

(6) On the displayed "Input Password" screen, select [Registration Condition], input 4 half-width alphanumeric characters (case sensitive) in the New Password field and Re-enter Password field. Click [OK] after inputting them.

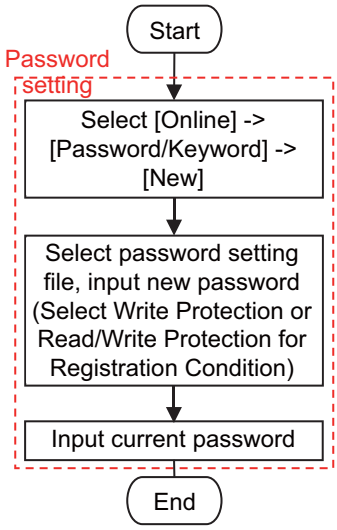


(7) Click [OK] on the "Create/Change Password" screen. When the following dialog is displayed, registration is complete.
To save password registration status of the sequence programs after CNC restart, execute [Online] - [Export to ROM Format].

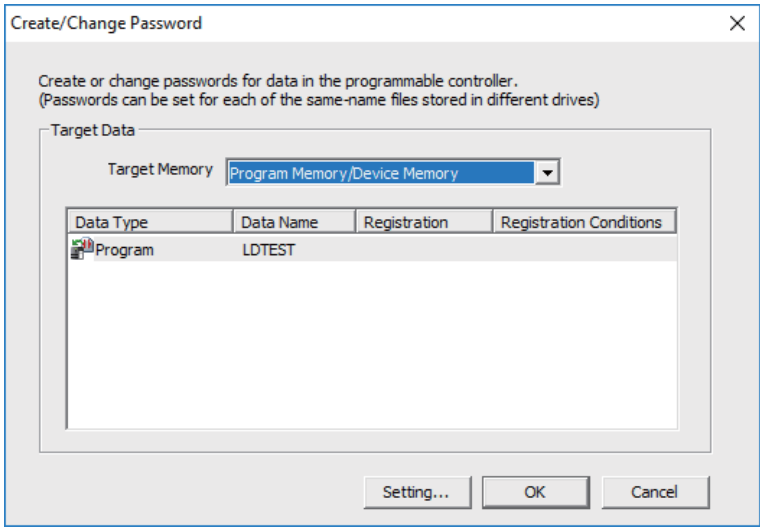


5.12.7.2 File Password: Change

Change passwords as follows. In this example, the password setting file is already stored in the CNC.

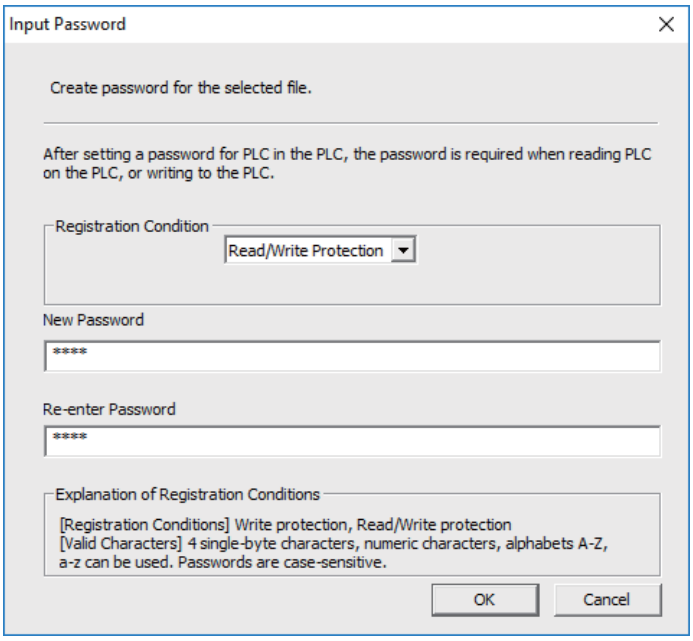


(1) Select [Online] - [Password/Keyword] - [New], open the following "Create/Change Password" screen.

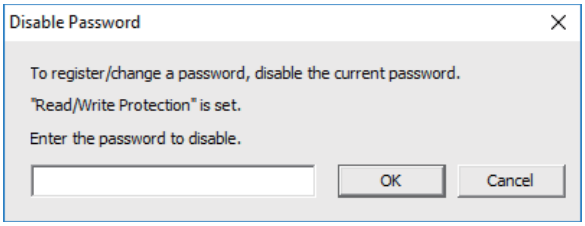


(2) Select the data area storing the file password to be changed in [Target Memory] to display the file list. Select a desired file from the file list, and click [Setting...].
Multiple files can be selected by clicking files while pressing [Ctrl]. The same password can be registered in a batch.

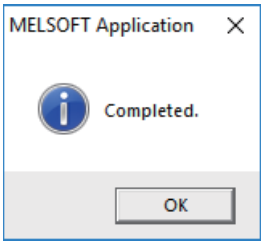
(3) Select [Registration Condition] on the displayed "Input Password" screen, input the password after change that is 4 half-width alphanumeric characters long (case sensitive) in the "New Password" field and "Re-enter Password" field. Click [OK] after input.



(4) When the following "Disable Password" screen is displayed, input the password before change and click [OK].

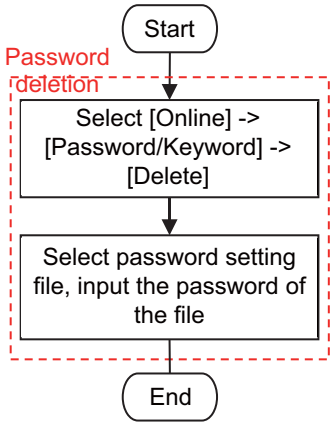


(5) Click [OK] on the "Create/Change Password" screen. When the following dialog is displayed, change is completed. To save the changed password of sequence programs after CNC restart, execute [Online] - [Export to ROM Format].

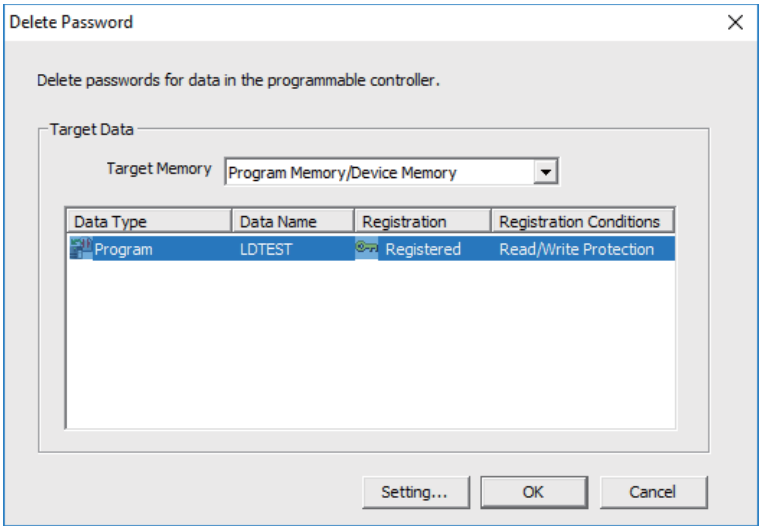


5.12.7.3 File Password: Delete

Delete passwords as follows. In this example, the password setting file is already stored in the CNC.

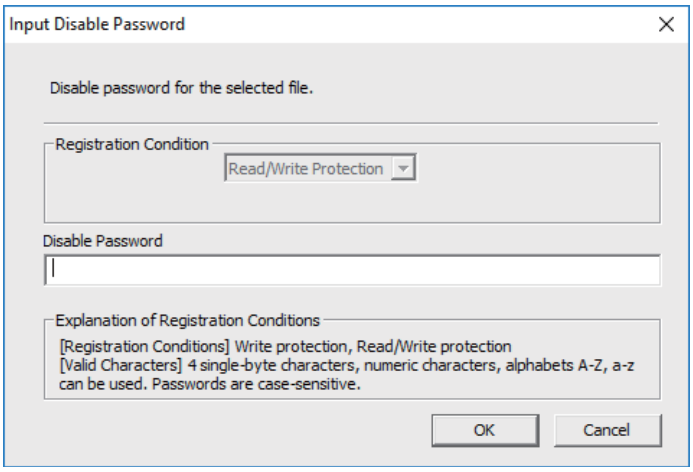


(1) Select [Online] - [Password/Keyword] - [Delete] to open the following "Delete Password" screen.

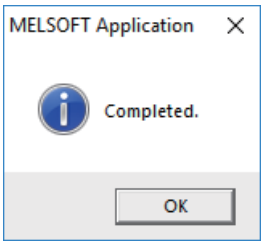


(2) Select the data area storing the file to delete password for as [Target Memory] to display a file list. Select target file from the file list, click [Setting...].
Multiple files can be selected by clicking files while pressing [Ctrl]. If the files share the same password, password can be deleted in a batch.

(3) When the following "Input Disable Password" screen is displayed, input the password for the file, and click [OK].



(4) Click [OK] on the "Delete Password" screen. When the following dialog is displayed, deletion is completed.
Execute [Online] - [Export to ROM Format] to retain the state, which the password of the sequence program has been deleted, even after CNC is restarted.

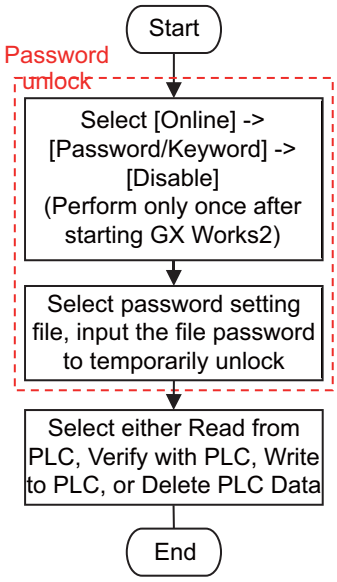


5.12.7.4 File Password: Temporary Unlock

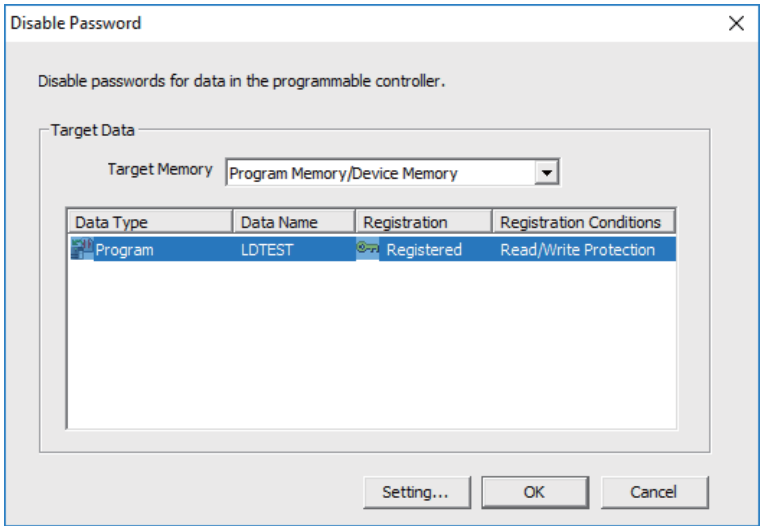
To work with a password-protected file on GX Works2 for the following operations, temporarily unlock the file password. The temporary unlock of a file password is achieved by inputting the registered file password for verification and temporarily disable unlock for file operation. Operation is not executed unless password verification is successful, as shown in the following table.
For instance, when read-protecting a program file with password on a certain session of GX Works2, and then reading from PLC on another session of GX Works2, temporarily unlock the file password by verifying it.
Temporary password unlock is valid only in the GX Works2 program on which the file password is unlocked. To work with a file on a separately started session of GX Works2, temporarily unlock the file password again. Temporary password unlock is valid until the GX Works2 program in which the file password was unlocked is ended.

Operation on GX Works2	Necessity of password unlock
[Online] -> [Read from PLC] [Online] -> [Verify with PLC]	When a file password to prohibit read is set, the password needs to be temporarily unlocked.
[Online] -> [Write to PLC] [Online] -> [Delete PLC Data]	When file password for Read/Write Protection or Write Protection is set, temporary password unlock is required.

A file password is temporarily unlocked as follows. In this example, the password setting file is already stored in the CNC.

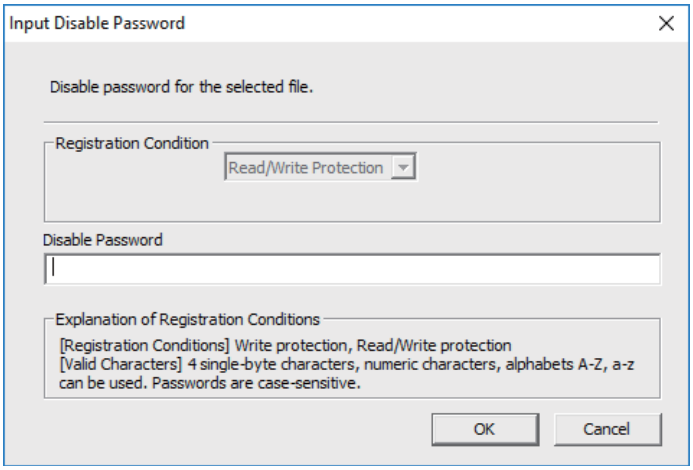


(1) Select [Online] - [Password/Keyword] - [Disable] to open the "Disable Password" screen below.

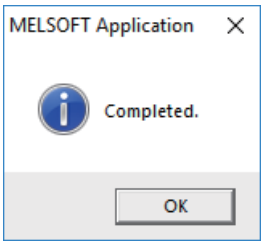


(2) Select data area storing the desired file for temporarily password unlock in [Target Memory] to display a file list.
Select the target file from the file list, and click [Setting...].
Multiple files can be selected by clicking files while pressing [Ctrl]. If the files share the same password, passwords can be unlocked in a batch.

(3) When the following "Input Disable Password" screen is displayed, input the password for the file, and click [OK].



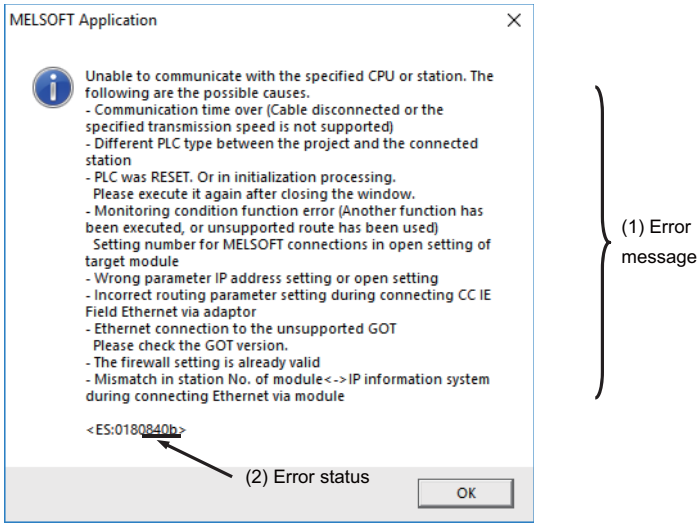
(4) Click [OK] on the "Disable Password" screen. When the following dialog is displayed, temporary unlock is completed.



5.13 Corrective Actions to Resolve Errors

5.13.1 List of Errors during GX Works2 Online Operation

When an error is generated on GX Works2, the following dialog is displayed. The dialog displays error messages and error status. Note that error status inappropriate for CNC may be displayed since some displayed error messages are meant for MELSEC PLC. Status is displayed as the last 4 digits of the display number.



> **⚠ CAUTION**
>
> **When an error is generated in GX Works2 online function, error messages may not represent the error status of the CNC controller correctly.**
> **Refer to the following error list.**

The following table shows the cause and remedy of errors generated during online operation with CNC controllers. For information on other errors, refer to "Help of GX Works2".

Status	Message	Cause	Corrective Action
2056	The executed function is not supported. Please check the manual and other documentation.	The writing during RUN function was executed.	Do not execute the writing during RUN function.
4001 **4002**	The executed function is not supported. Please check the manual and other documentation.	An operation not supported by the specifications was attempted.	Check the operating procedures.
4005	Writing the data exceeding the size of PLC was attempted. Execute again within the range of PLC size.	Maximum number of steps that can be executed with NC has been exceeded.	Check the size of execution area (see 5.6.4.4) Reduce the number of steps for the relevant sequence program to be executed with reference that value.
4010	Cannot write because the PLC is executing a RUN command. Stop the PLC, then execute again.	The PLC of the NC is running.	After stopping the PLC of the NC, start execution again.
4021	The applicable drive is not ready. Check the applicable drive, then execute again.	The specified target memory does not exist or is not in a usable status.	Change the target memory.
4022	A file which does not exist in the PLC was specified.	Ladder program writing during RUN was attempted to nonexistent sequence program.	Check the editing program whether it exists in NC or not.

Status	Message	Cause	Corrective Action
4024	The executed function is not supported. Please check the manual and other documentation.	(1) Writing unavailable files (files except sequence program, comment, message, and parameters) was conducted. (2) Writing to the file created by structured project was executed.	(1) Check the operating procedures. (2) Check the project type of the file to be written.
4025	Processing is in progress from another peripheral device. Please wait until the other processing is completed, then execute again.	Multiple peripheral development tools (Built-in PLC edit function/GX Works2) were accessed to the same file.	Standby for completion of access from other peripheral development tool, then execute again.
4029	Insufficient file capacity. Execute again after deleting unnecessary files.	An attempt was made to write a file that exceeds the storage capacity.	Examine the file structure so that the data falls within the limited capacity.
4031	The specified device No. exceeds the permissible range. Specify a device No. that is within the range set in the parameter.	(1) The access request given is outside the accessible device range. (2) "Device memory" was written by "Write to PLC" function.	(1) Check the number range of each device. (2) Remove the check mark of "Device memory", and then execute "Write to PLC" function again.
4052	The file is write protected. Change the file attributes to enable writing to the file.	The specified target memory is a write-disabled device (internal ROM).	Specify "Program Memory/Device Memory" as the target memory.
4065	A mismatch occurred between the PLC and peripheral parameters. Match the parameters between the PLC and peripherals.	There is a problem in the device setting value.	Set the number of device points. (see 5.5.8)
4070	The program before correction differs from the registered program.	(1) In writing into PLC, an unspecified sequence instruction is included in the program. (2) In ladder program writing during RUN, the program before the modification does not match with the one in the NC.	(1) Verify the program and specify the instruction which has caused the error. (2) Check whether the target program is the same as the running one in the NC. Check the device setting in PC parameter as well.
4080	Factor and Treatment Write both the parameter and program file to the CPU module because it might make an error of CPU if only the programs were written to the CPU module. Please check this function in the manual because the data specifying is mistake.	When executing "Read from PLC" or "Verify PLC" function: Data not included in the specifications was found in the designated file.	The sequence program or message data in the CNC controller may be damaged. Delete the corresponding file and start again, or initialize the PLC data storage area. If the problem cannot be resolved, contact the Mitsubishi System Department.
		When executing "Write to PLC": Multiple END instructions were found in the designated sequence program file.	Edit the sequence program in the list mode to delete END instructions except only one at the last line.
		FB name used in the sequence program consists of one-byte numerics and contains 11 or more characters.	Set the FB name that consists of onebyte numerics and contains 10 or less characters.
41c5	Selected operation could not be performed. Some possible causes are. - Symbolic information data does not exist. - Symbolic information data is corrupted.	Files which are not stored in NC were written/read.	Press "Refresh view" button on write/read menu to update the file list.
8008	An unusable port or IP address was specified, or the number of settable connections for MELSOFT exceeded its maximum. Please execute again after checking the following settings. - Port/IP address setting - Setting number for MELSOFT connections in open setting of target module - IP address duplication on network	The Ethernet setting on the GX Developer is incorrect.	Check the Ethernet setting, or check the cable connection.
8201	Cannot communicate with the specified CPU or station. The following are possible causes. Please review the manual. - Cable trouble. (bad connection, a break) - PLC power is off or in reset state. - The hardware failure of power module, CPU module, I/O module, Intelligent module, Network module, base unit or extension cable.	The serial communication cable is faulty - disconnected - DTR signal off	Check the serial port setting, or check the cable connection.

Status	Message	Cause	Corrective Action
8301	Cannot communicate with the PLC. Execute again after checking the connections with the PLC. For Ethernet connection, please check the following settings. - Port/IP address setting - Setting number for MELSOFT connections in open setting of target module - IP address duplication on network	There was no response from the NC connected with Ethernet.	Check the following: - CNC status - Cable connection - Ethernet address setting - Inhibiting GX Developer/GX works2 connection setting
840b	Unable to communicate with the specified CPU or station. The following are the possible causes. - Communication time over (Cable disconnected or the specified transmission speed is not supported) - Mismatch between PLC types for project and connected station - RESET of PLC Please execute it again after closing the window. - Monitoring condition function error (Another function has been executed, or unsupported route has been used) Setting number for MELSOFT connections in open setting of target module - Wrong parameter IP address setting or open setting - Incorrect routing parameter setting during connecting CC IE Field Ethernet via adaptor - Ethernet connection to the unsupported GOT Please check the GOT version.	There is no response from the NC. -The CNC has not started properly. -The connection channel of the CNC side serial port is different. - The serial cable outside the specifications is used for signal connection. - An incorrect Ethernet address is set on the NC side	Check the following. - CNC side status - Cable connection - Bit selection: GPP communication valid - Set the Ethernet address

(Note) Interpret the "PLC" in the messages to "CNC controller".

5.13.2 Checking PLC Alarms on CNC Controller

When an error is generated while sequence programs is starting up or being executed, the status is in user PLC alarm state. The details of the alarm can be checked by one of three methods:

- Alarm screen on the setting and display unit of the CNC controller
- PLC diagnosis screen of built-in PLC edit function
- PLC diagnosis screen of GX Works2

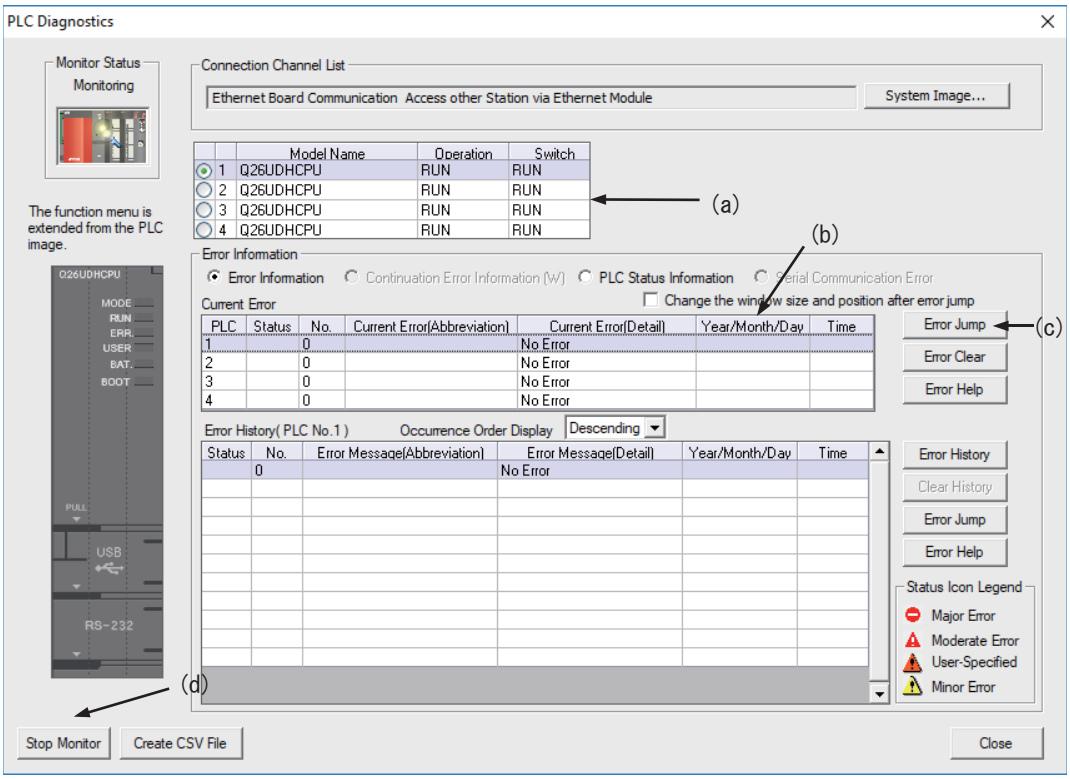
The PLC diagnosis screen of GX Works2 provides information as clearly as the alarm screen on the setting and display unit of the CNC controller, and also displays ladders in which errors occured.

5.13.2.1 Operating Procedure

Start the "PLC Diagnostics" screen on GX Works2 by the following operation.

[Diagnostics] -> [PLC Diagnostics]

The following screen is displayed. Error information is displayed in (a) and (b).



(a) CPU operating status: RUN/STOP status of PLC is displayed here.

(b) Error information: Error No. and error occurrence time are displayed here.

- If there is no error, "No error" is displayed
- Error No. is the high-order 2 digits of the CNC side alarm sub status1
- Further detail is available upon double-click (described later).
- When the multi-project is enabled, different CPU modules are displayed depending on the project where the error is generated.

(c) Error jump button: Displays ladders in which errors occurred (described later).

(d) Error display, start monitor and stop monitor button:Stops error information monitoring.

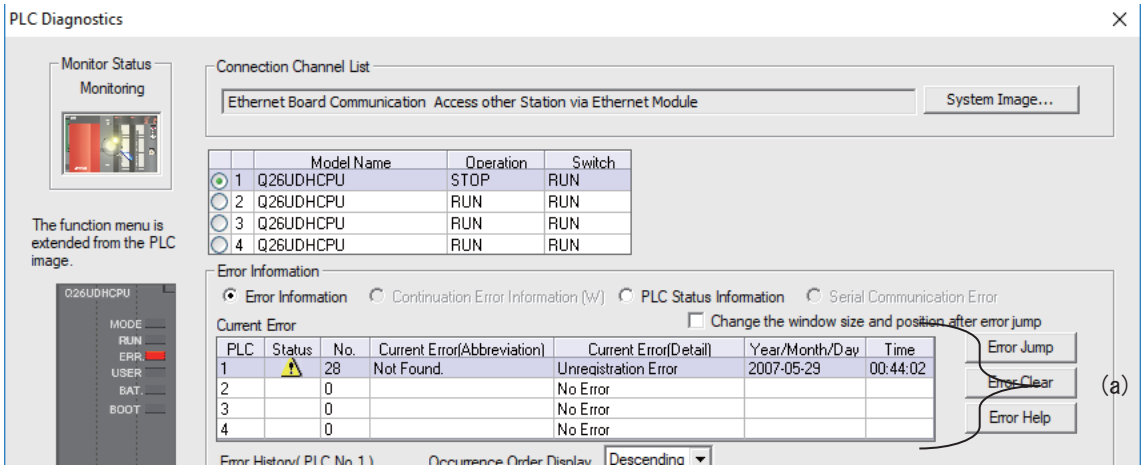
(Note1) Other displays and buttons than (a) to (d) above and [Close] are not supported.

5.13.2.2 Details on Error Information Display

Error information is generated and cleared according to the following rules.

- The latest error after PLC RUN is displayed until a new error is generated.
- Error display is cleared only when RUN is executed from PLC STOP.
- When multi-project is enabled and errors are generated in multiple projects, the error to be displayed is of the project that is the last in the order of project execution among projects with errors.
- The errors that were generated before the execution of PLC are displayed sequentially from project 1.
- Errors that are common to all projects (e.g. PLC system error) are displayed on CPU No.1.

Where the information of CPU module is displayed differs depending on the project where errors are generated, as shown below.



The position of CPU module display (a) changes depending on the project that GX Works2 is connected to.

- When connected to projects 1 to 4: Errors of project 1 to 4 are displayed in CPU 1 to CPU 4.
- When connected to projects 5 and 6: Errors of project 5 and 6 are displayed in CPU 1 to CPU 2.

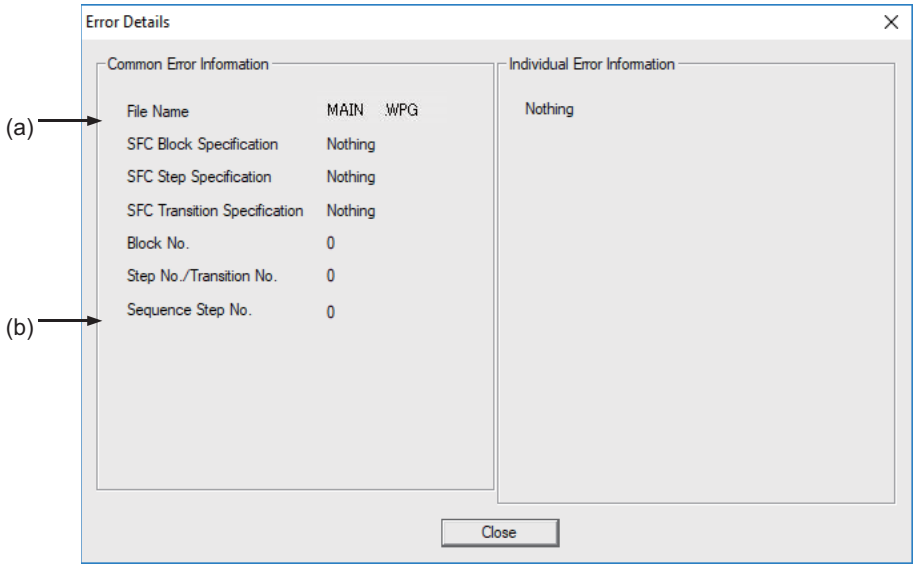
5.13.2.3 Displaying Detailed Error Information

The detailed error information can be displayed on the "PLC Diagnostics" screen by the following operation.

Double-click [(b) error information] on the "PLC Diagnostics" screen

The following "Error Details" screen is displayed.

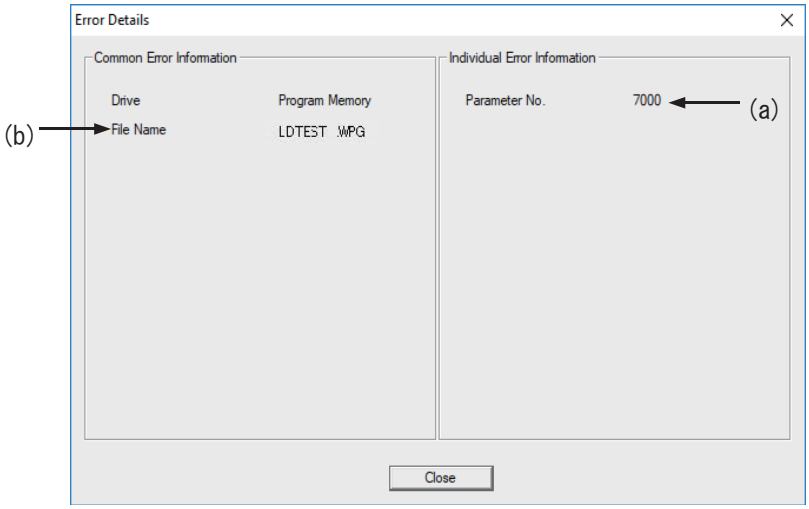
(1) When the sequence program is responsible for the error



(a) File name: Displays the file name of the sequence program where the error is generated.

(b) Sequence step No.: Displays the step No. in which the error is generated in (a).

(2) When parameter setting is responsible for the error



(a) Parameter No.: Displays the parameter No. that has the wrong setting.

1005: Common Pointer No.

7000: Program setting

(b) File name: Displays the name of the parameter setting file related to the error.

(Note) In (1) and (2) above, other displays than (a) and (b) have no meaning.

The contents of (a) and (b) may not be displayed depending on the cause for an error.

5.13.2.4 Displaying of the Ladder in Which an Error Occurred

The ladder in which an error has occurred is displayed on the "PLC Diagnostics" screen. By following the operations below, the ladder in which an error occurred which exists in the project currently opened with the GX Works2 can be displayed in the edit mode.

Click [Error Jump] (c) on the "PLC Diagnostics" screen

The ladder of the file in which an error has occurred is displayed on another window. Then the cursor moves to the step where the error has occurred.

The following conditions are required to accurately display the ladder in which an error occurred section.

- The file name and sequence program No. must be displayed in the "Error details" screen.
  (In this case, no response or error dialog display will be given even if the button is clicked.)
- A project including the sequence program currently in operation in the CNC controller side must be opened.
  (Even when a project not in operation is opened, if the same program name already exists, a ladder different from the actual one in which an error occurred is displayed. So, be careful.)
- Depending on the type of error, sequence step No. does not show the ladder in which an error occurred accurately.

5.13.3 Initializing PLC Data Storage Area

Initialize temporary storage of the CNC controller and redo from the beginning if any of the following conditions applies. This initialization operation does not initialize the ROM in the CNC. To retain redone status after the power OFF, it needs to be stored in the ROM in the CNC.

- When an error is generated during write to the CNC controller
- When return is not possible even after remedy for the error is performed
- When stored data are erased at once

Initialization operation initializes the following area and data.
For details on PLC data storage area, see "5.5.3 PLC Data Storage Area".

Target data	Target Memory	Target area
Sequence program Parameter	Program Memory/Device Memory	sequence program storage area/ temporary storage (RAM in CNC)
Device comment PLC message Symbolic information (*1)	Program Memory/Device Memory memory card (SRAM)	data storage area/ storage area (ROM in CNC)

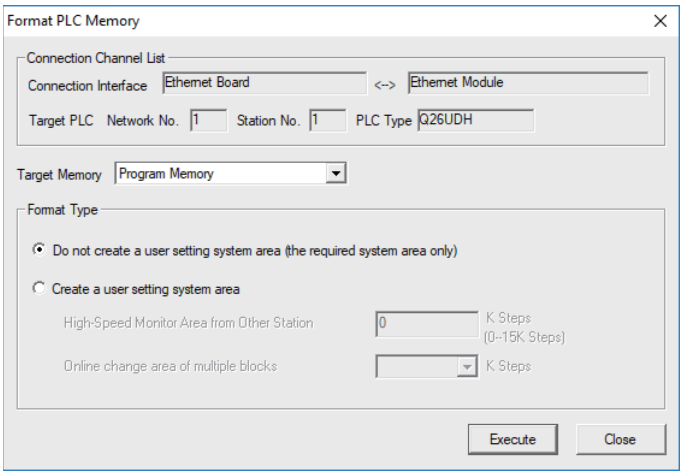
(*1) The file to be written when simple project (with labels) or structured project is selected.

5.13.3.1 Operating Procedure

Start the operation screen by the following operation on GX Works2.

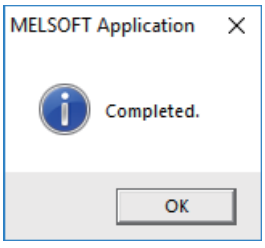
[Online] -> [PLC Memory Operation] -> [Format PLC Memory]

Click [Execute] on the following screen.



(Note) [Program Memory/Device Memory] is the only valid option for [Target Memory].
[Format Type] does not must be set.

When the following dialog is displayed, formatting is completed. Click [OK]. The data stored in the area selected in Target Memory are all deleted and initialized.



5.14 Backing Up Sequence Programs and Other Data

This section describes how to back up developed sequence programs and PLC-related data to a personal computer.

5.14.1 Backup of Entire PLC-Related Data

This section describes how to back up entire PLC-related data.
When the multi-project function is active, data for all projects are backed up in a batch.

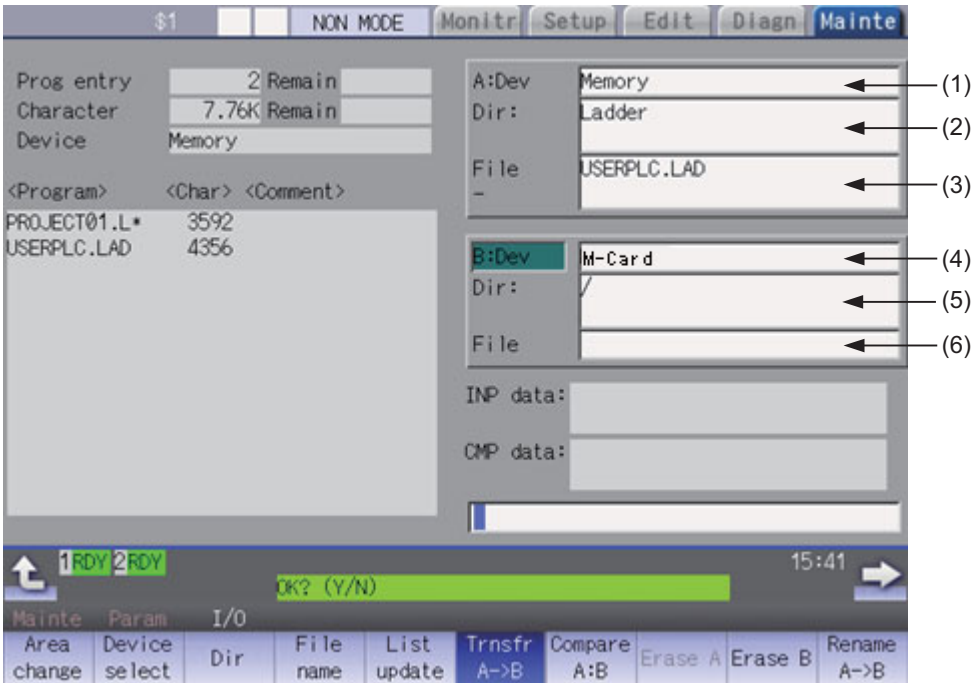
5.14.1.1 Backup Target Data

The following five types of data can be backed up.

	Related data type	Remark
1	Sequence programs	Sequence program code
2	Parameter	Execution order setting information, etc.
3	Sequence programs comment	GX Works2 comment data
4	Message	Message data such as alarm messages, operator messages and PLC switches in each language
5	Multi-project setting parameter	Multi-project function setting information
6	Symbolic information	Information about labels, FB, structure, etc.

5.14.1.2 Backup Procedure

Backup is executed on the input/output screen of the CNC controller.
back up sequence programs stored in the ROM in the CNC to the personal computer by selecting transfer symbolic information (CNC controller side) and the transfer target information (personal computer side) on the input/output screen and transferring.
This subsection describes the input/output screen example and operating procedure.



For details on the input/output screen, refer to the instruction manual for your model.

Setting for the CNC controller

Set the device name, directory, and file name for [A:Dev].

(1) Set [A:Dev]
Select "Memory" with menu keys.

(2) Set [Dir:]
Input the character string "/LAD".

(3) Set [File]
"USERPLC.LAD" is automatically set when [Dir:] is set.
For the user safety sequence, input "SAFEPLC1.LAD" or "SAFEPLC2.LAD".

Setting for the personal computer (device name, directory, and file name)

Set the device name, directory, and file name for [B:Dev].

(4) Set [B:Dev]
Select "HD" with menu keys.

(5) Set [Dir:]
Input the character string "/".

(6) Set [File]
Set the file name to be stored. When omitted, [USERPLC.LAD] is assigned.

Transmission

The backup process starts when the menu key [Trnsfr A->B] is pressed.

5.14.1.3 Backup Data Restoration

To restore backup data, perform the reversed backup operation (Enter the setting for the personal computer in [A:Dev], and the setting for CNC controller in [B:Dev]).
The PLC must be STOP before restoration is started.

5.14.1.4 Caution

Precautions for input/output between different NC models or between systems with different additional specification status

When the large PLC capacity (256 kilo steps) or large PLC capacity (512 kilo steps) option is enabled, the size of sequence programs that can be stored in the CNC is increased.
USERPLC.LAD output while Large PLC capacity (256 kilo steps)/Large PLC capacity (512 kilo steps) option is enabled may not be input to the system in which the enabling/disabling of Large PLC capacity option is switched, depending on the size of the sequence programs stored when output.

Large capacity PLC additional specification, type of input USERPLC.LAD, and operation

	Inputting USERPLC.LAD that was output when it contained more than 256 kilo steps sequence programs.	Inputting USERPLC.LAD that was output when the following was true: "128 kilo steps < Number of contained sequence program steps ≦ 256 kilo steps"
Large capacity PLC additional specification is disabled in M800 series	The the error "Can't write file for dev B" is generated.	The the error "Can't write file for dev B" is generated.
Large capacity PLC (256 kilo steps) additional specification is enabled in M800 series	The the error "Can't write file for dev B" is generated.	Writing and PLC execution is possible.
Large capacity PLC (512 kilo steps) additional specification is enabled in M800 series	Writing and PLC execution is possible.	Writing and PLC execution is possible.

When the PLC project extension (3 projects)/PLC project extension (6 projects) option is enabled, the number of projects and device points that can be used increases when the multi-project function is active.
The USERPLC.LAD output while the PLC project extension (3 projects)/PLC project extension (6 projects) option is enabled may not be input to the system whose PLC project extension option is switched between enabling/disabling, depending on the the number of projects and device points set at the time of the output of USERPLC.LAD file.

PLC project extension additional specification, type of input USERPLC.LAD, and operation 1

	Inputting USERPLC.LAD that was output when the maximum project No. was set to 4 or larger	Inputting USERPLC.LAD that was output when the maximum project No. was set to 2 or 3
PLC project extension additional specification is disabled in M800 series	The error "Can't write file for dev B" is generated.	The error "Can't write file for dev B" is generated.
PLC project extension (3 projects) additional specification is disabled in M800 series	The error "Can't write file for dev B" is generated.	Writing and PLC execution is possible.
PLC project extension (6 projects) additional specification is disabled in M800 series	Writing and PLC execution is possible.	Writing and PLC execution is possible.

PLC project extension additional specification, type of input USERPLC.LAD, and operation 2

	Inputting USERPLC.LAD that was output when a number which was larger than the standard (Note1) was set as the number of device points.
PLC project extension additional specification is disabled in M800 series	The error "Can't write file for dev B" is generated.
PLC project extension (3 projects) additional specification is disabled in M800 series	The error "Can't write file for dev B" is generated.
PLC project extension (6 projects) additional specification is disabled in M800 series	Writing and PLC execution is possible.

(Note1) The size of standard device points and extended device points is as follows.
(The following shows the total number of points that are set in all projects.)

Device	Device points (standard)		Device	Device points (extended)
M	61440		M	122880
L	1024		L	2048
F	2048		F	4096
SB	1024		SB	2048
B	57344		B	114688
SM	6144		SM	12288
V	256		V	1024
SW	1024		SW	2048
SD	6144		SD	12288
T	2048		T	4096
ST	128		ST	256
C	512		C	1024
D	4096		D	8192
W	12288		W	24576
Z	60		Z	120
N	48		N	96
P	12288		P	24576

Precautions for inputting or outputting to or from CNC of different version

Do not store data written to the CNC on GX Works2 in a system of D1 or an earlier version.

5.14.2 Batch Backup of PLC-Related Data for Each Project

This section describes how to back up PLC-related data in batch for each project when the multi-project function is active.

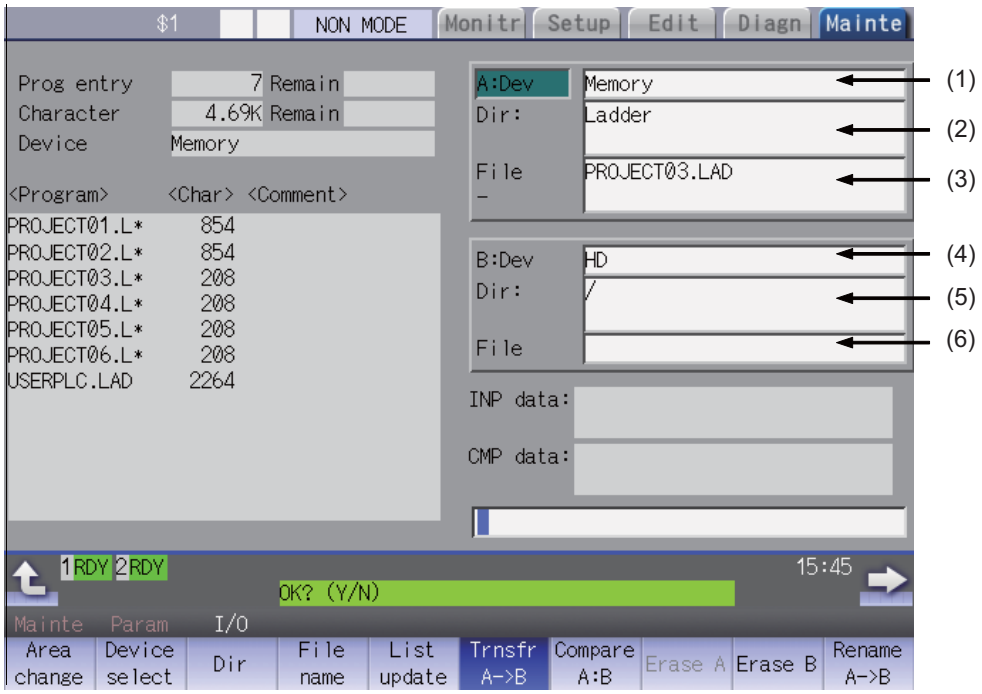
5.14.2.1 Backup Target Data

Six types of data shown below can be backed up.
Only the data of the project that is specified at backup is output.

	Related data classification	Remark
1	Sequence programs	Sequence programs code
2	Parameters	Execution order setting information, etc.
3	Sequence program comments	GX Works2 comment data
4	Messages	Message data such as alarm messages, operator messages and PLC switches in each language
5	Multi-project setting parameters (Device points settings only)	Device points setting information for multi-project function
6	Symbolic information	Information on labels, FB, structures

5.14.2.2 Backup Procedure

Backup data from the CNC controller's input/output screen.
Select the transfer symbolic information (CNC controller side) and the transfer target information (personal computer side), to be transferred on the input/output screen. When transmission is started, the data such as sequence programs of the specified project stored in the CNC ROM will be backed up in the personal computer.
An example of the input/output screen and the operating procedure are described below.



For details on the input/output screen, refer to the instruction manual of your model.

Setting for the CNC controller

Set the device name, directory, and file name for [A:Dev].

(1) Set [A:Dev]
Select "Memory" with menu keys.

(2) Set [Dir:]
Input the character string "/LAD".

(3) Set [File]
Select [From list] with menu keys and select "PROJECTxx.LAD" (xx: project number to be output) from the file list, and press [INPUT].

Setting for the personal computer (device name, directory, and file name)

Set the device name, directory, and file name for [B:Dev].

(1) Set [B:Dev]
Select "HD" with menu keys.

(2) Set [Dir:]
Input the character string "/".

(3) Set [File]
Set the file name to be stored. When omitted, "PROJECTxx.LAD" (xx: project number to be output) is assigned.

Transmission

The backup process starts when the menu key [Trnsfr A->B] is pressed.

5.14.2.3 Backup Data Restoration

To restore backup data, perform reversed backup operation (Enter the setting for the personal computer in [A:Dev], and the setting for CNC controller in [B:Dev]).

The PLC must be STOP before restoration is started.

5.14.2.4 Caution

Considerations for input/output with the conditions in the CNC

The backup data for each project (PROJECTxx.LAD) may not be input depending on the status in the CNC such as stored sequence programs, and data size.

This section describes the causes and remedies for the issues where backup for each project data (PROJECTxx.LAD) cannot be input.

Causes and remedies for when backup data for each project cannot be input

Causes	Error details	Corrective Action, cause
Exceeds the device size that can be used in all projects	The data size has exceeded the available device size.	The size of empty/vacant/reserved device is not sufficient. Correct the multi-project parameter (device points) to increase empty/vacant/reserved size.
An attempt to input the data to unavailable project.	Input has been attempted for an unavailable project.	Input the data to an available project.
Size of data to input is greater than the storage area.	Data to input is too large.	Correct the multi-project parameter (project percentage) to increase the storage area size to be greater than the PLC data (sequence program and comment) of the project-based backup data.

Precautions for inputting or outputting to or from CNC in different version

Do not store the data written from GX Works2 to CNC in a system of D1 or an earlier version.

5.15 Project Protection Function

Project protection function prevents unauthorized users from changing GX Works2 projects, sequence programs in a CNC, etc. without permission.
This section explains how to protect projects without using the file password function.

5.15.1 Project Protection Function of GX Works2

The table below shows the protection functions of GX Works2 which are supported by MITSUBISHI CNC. For details of the file password function, refer to "5.12 File Password Function". Since the other protection functions of GX Works2 do not have exclusive specifications for MITSUBISHI CNC, refer to "GX Works2 Operating Manual (Common)" and "GX Works2 Operating Manual (Simple Project)" for detailed information of these functions.

List of project protection function

○ : Supported; × : Not supported

Function	Machine sequence support	User safety sequence support	Remarks
Security	○	○	
Soft security key	×	×	
Block password settings	○	○	(*1)
Remote password settings	×	×	
File password	○	○	

(*1) After FB which has a block password and sequence program which has a function are written to the CNC, when the sequence program is read with the simple project (without labels), the area where the block password is set is read as an actual ladder (ladder with labels and functional block compiled). To read a ladder with labels and functional blocks, set a file password.

5.15.2 Project Protection Function of CNC

Parameters related to project protection

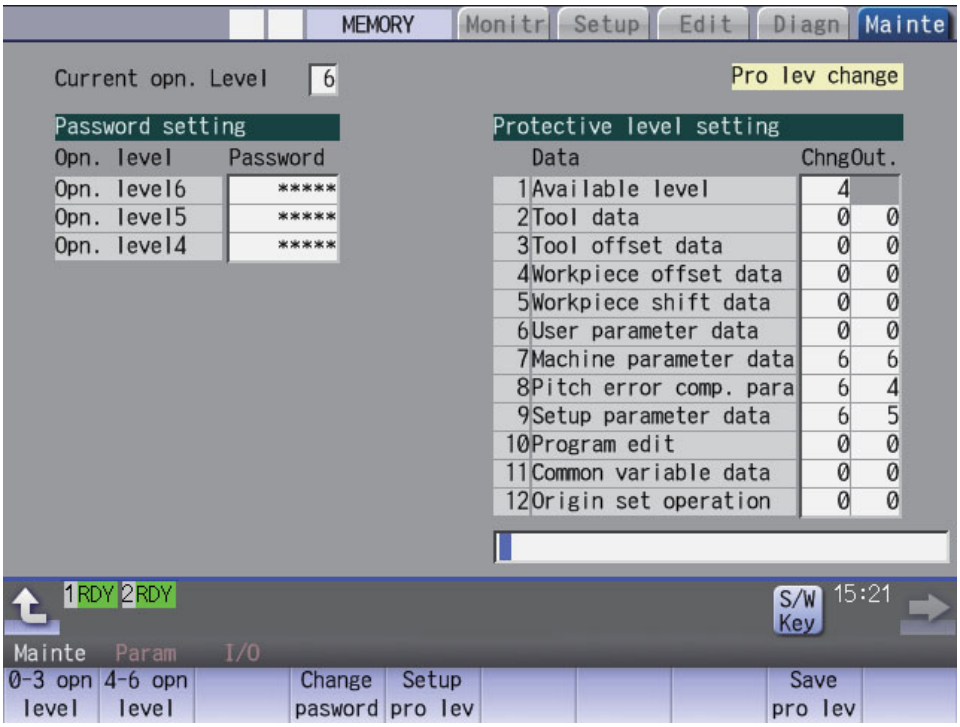
Startup of PLC on-board and connection from GX Developer or GX Works2 can be restricted by setting the following parameters. This prevents unauthorized users from changing or deleting sequence programs of built-in PLC, etc.

Parameter	Function	Explanation	Setting value
#6451 bit0	PLC on-board enabled	Starts-up the PLC on-board by pressing "F0" key.	0: Disabled
#11094	GX Restriction	Blocks the connection from GX Developer or GX Works2.	1: Block the connection

[Mainte] - [Protect setting] screen

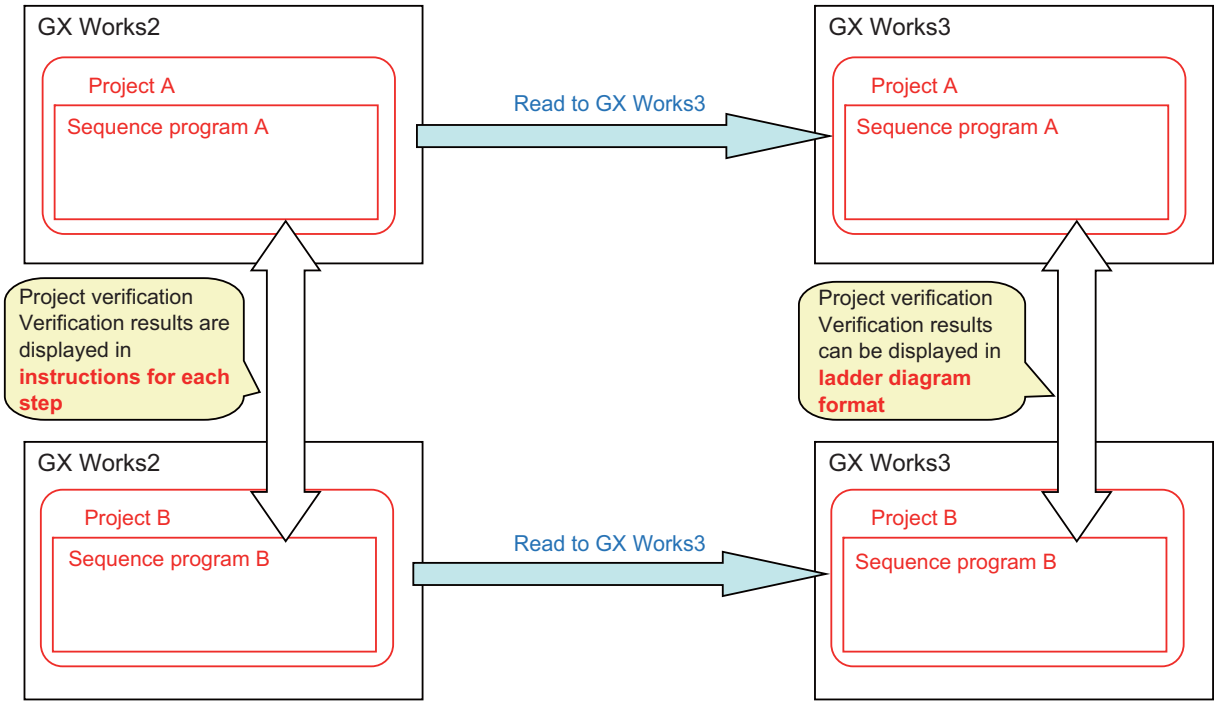
A password can be changed on the protection setting screen of the CNC displayed by selecting [Mainte] - [Protect setting]. This prevents users who are not informed of the password from changing parameter settings and staring up the PLC on-board.

For details, refer to "Connection and Setup Manual".



5.16 Didplaying Project Verification Result in Ladder Diagram (GX Works3)

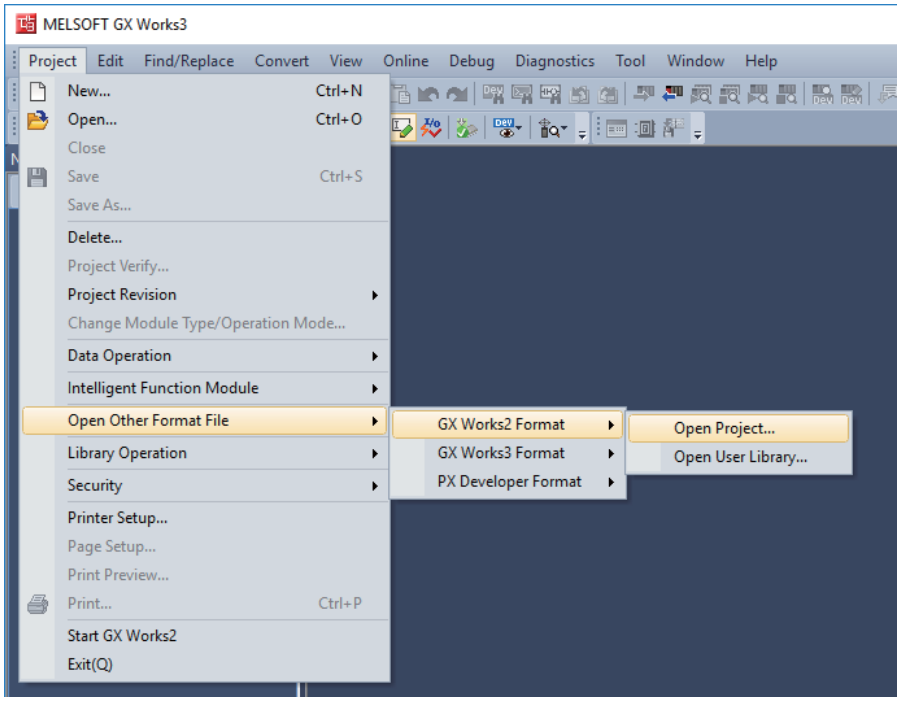
In GX Works2, the result of project verification can be displayed in instruction for each step.
By reading projects created by GX Works2 to GX Works3, verification result can be displayed in ladder diagram.



5.16.1 Operating Procedure

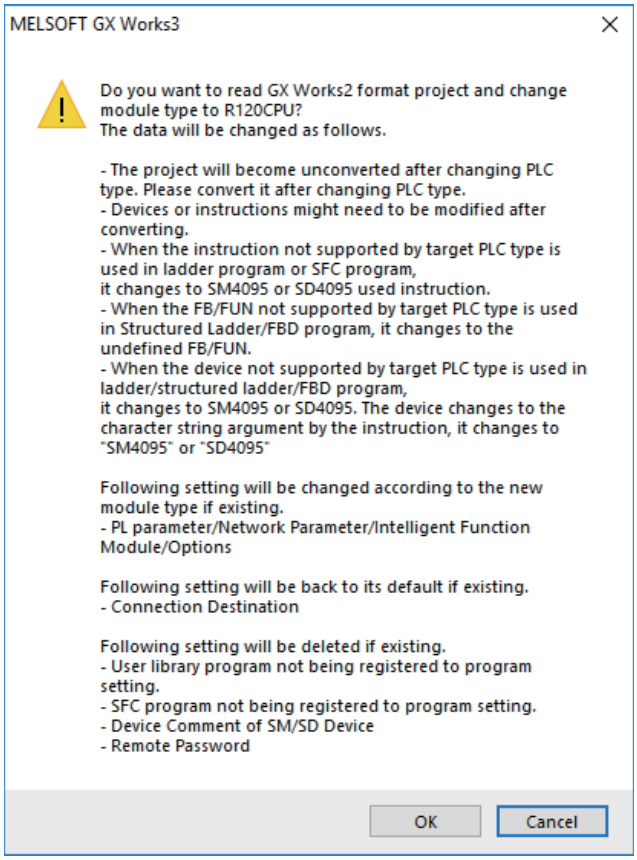
(1) Save two GX Works2 project data that are the verification targets.

(2) On GX Works3, read the GX Works2 project data that are the verification targets by the following operation.
Select [Project] - [Open Other Format File] - [GX Works2 Format] - [Open Project].



Select GX Works2 project data that is the verification targets.

Click [OK] in the dialog to confirm the change.



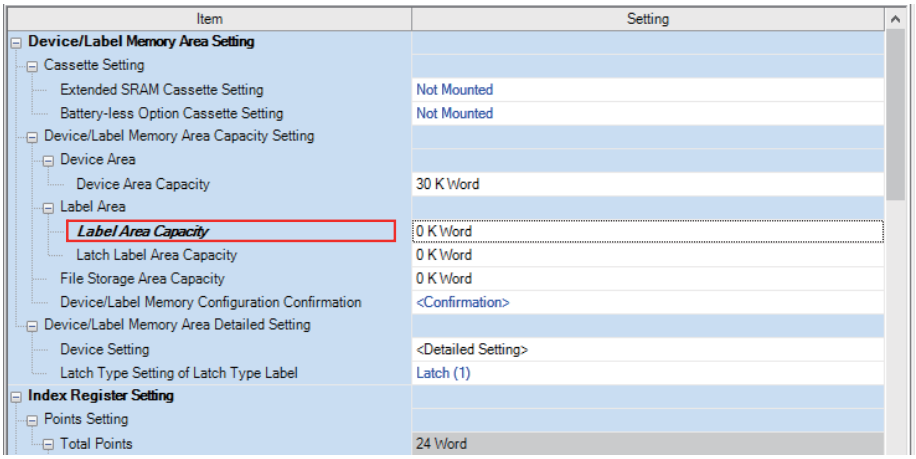
(3) Execute [Convert] - [Convert], and save the project.

When you convert the project with labels set, the following procedures are required before conversion.

(a) Select [Parameter] - [C120CPU] - [CPU Parameter] on the "Navigation" window.

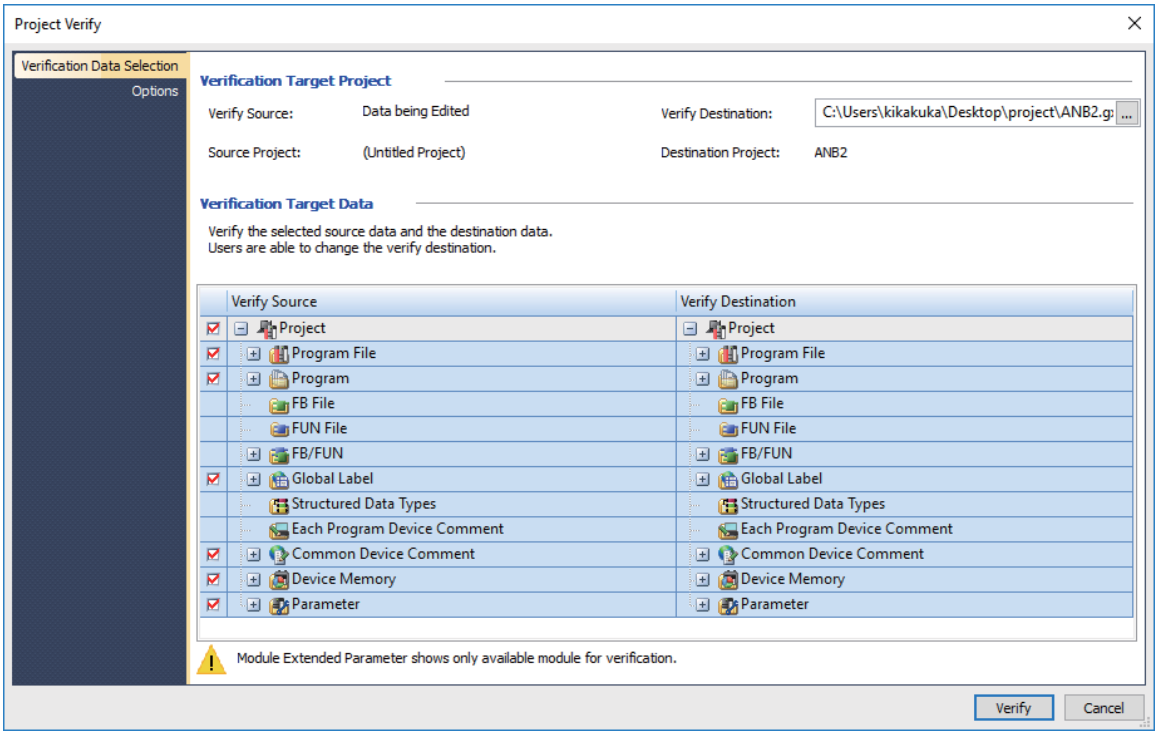
(b) Select [Memory/Device Setting] - [Device/Label Memory Area Setting] on the "Setting Item List".

(c) Select [Device/Label Memory Area Capacity Setting] - [Label Area] - [Label Memory Area Capacity], and set a value larger than "0 K" to this item.

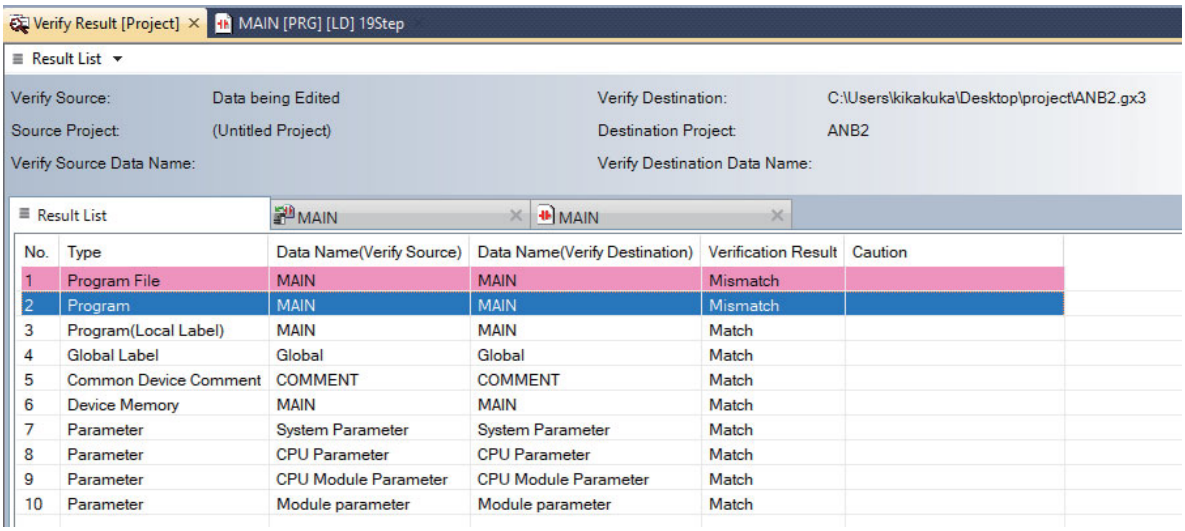


(4) Open [Project] - [Project Verify] on the other project of the verification targets.

(5) Set the other project in [Verify Destination], and click [Verify].



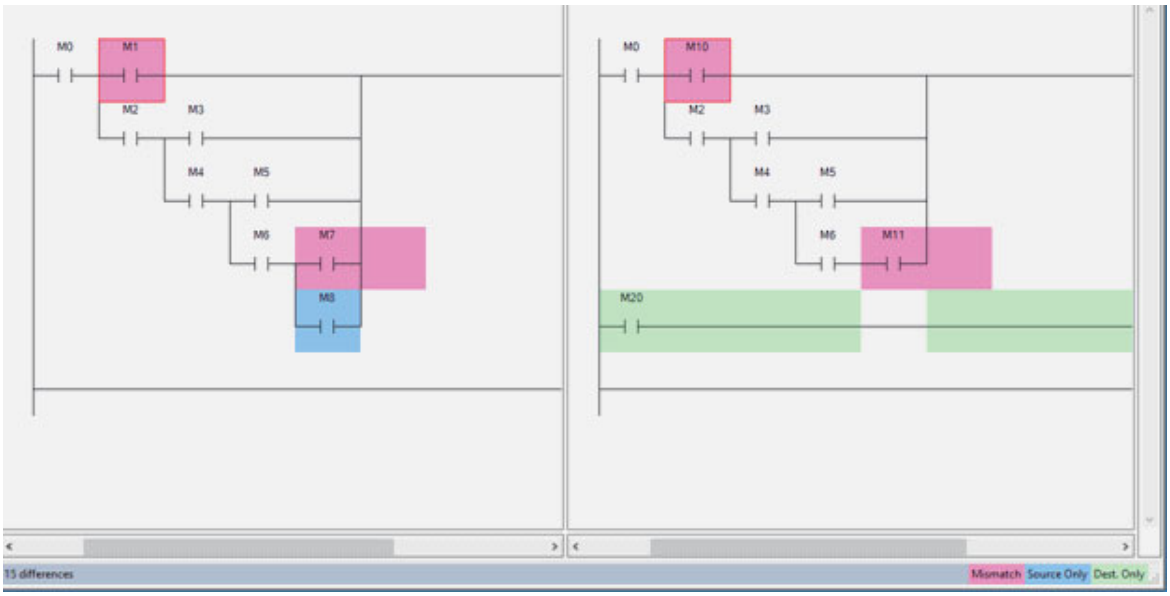
(6) Double-click [Program] to be displayed in a ladder diagram from [Result List].
(Note that it is not [Program File].)



No.	Type	Data Name(Verify Source)	Data Name(Verify Destination)	Verification Result	Caution
1	Program File	MAIN	MAIN	Mismatch	
2	Program	MAIN	MAIN	Mismatch	
3	Program(Local Label)	MAIN	MAIN	Match	
4	Global Label	Global	Global	Match	
5	Common Device Comment	COMMENT	COMMENT	Match	
6	Device Memory	MAIN	MAIN	Match	
7	Parameter	System Parameter	System Parameter	Match	
8	Parameter	CPU Parameter	CPU Parameter	Match	
9	Parameter	CPU Module Parameter	CPU Module Parameter	Match	
10	Parameter	Module parameter	Module parameter	Match	

(7) Verification result is displayed in ladder diagram.
Mismatched places are indicated in red, places existing only in verification source are indicated in blue, and places existing only in verification target are indicated in green.

[Example of ladder program]



5.17 Restrictions

5.17.1 Considerations in Comparison with MELSEC PLC

5.17.1.1 Overall Considerations

Considerations	Related item
Only sequence programs can be used. ST language (including inline ST), SFC language, structured ladder cannot be used.	5.2.1 Support Status of Project Types, Program Types and POUs
Only up to 7 ANB instructions and ORB instructions can be used consecutively. When FB is used, hours of use become unclear.	5.6.3 Developing Sequence Programs
Only up to 7 MPS instructions can be used consecutively. When MPP instruction is used, one more MPS instruction becomes available. When FB is used, hours of use become unclear.	5.6.3 Developing Sequence Programs
When a sequence program with more than 211 contacts is written to the CNC controller on GX Works, it may not be displayed correctly by built-in edit functions.	5.15.4 Built-In PLC (Built-In Edit Function)
When [Sampling Trace] - [Write to PLC] is used, only trace setting is written, and trace result is not written on the CNC controller.	5.5.11 Sampling Trace of Device
When the capacity of [memory card (SRAM)] is calculated by [Tool] - [memory capacity calculation], a dialog is displayed. The displayed calculation result is not affected.	5.5 Common Items

5.17.1.2 Considerations on Simple Projects (with Labels)

Considerations	Related item
In a sequence program, FB can be nested in another FB; however, the nesting depth is limited to one level.	5.2.1 Support Status of Project Types, Program Types and POUs 5.6.Developing Simple Project 5.10.4 Considerations
When symbolic information is written to CNC, sequence programs cannot be edited by built-in edit function.	5.15.4 Built-In PLC (Built-In Edit Function)

5.17.2 Differences from GX Developer

Considerations	Related item
GX Works2 has no macro functions. Use FB.	5.10 Creating Function Block
Device names cannot be set for devices in GX Works2. Use the label function. When symbols (e.g. +, -) that cannot be used in labels are required, use full-width symbols.	5.9.3 Writing Method of Indirect Input
Sequence programs cannot be displayed as a list in GX Works2.	5.2.1 Support Status of Project Types, Program Types and POUs
The CNC controller does not support the "conversion" + "writing during RUN" function of GX Works2.	5.6.8 Writing during RUN
Passwords are set only for the CNC controller programs, and not for GX Works2 programs.	5.11 File Password Function
When a program with a password stored in the CNC controller is read to GX Works2, password information is not read.	5.11.5 File Password: Cautions on Setting
Passwords for files cannot be set while IC memory card image data is being written in GX Works2.	5.13 Backing Up Sequence Programs and Other Data
The format of text input/output such as PLC messages and device comments is different. (The primary differences are as follows: - GX Developer uses SJIS while GX Works uses UNICODE. - GX Developer uses the term "comma/fixed length delimiter" while GX Works uses the term "tab delimiter". - GX Developer and GX Works have different header formats.)	5.7 Developing PLC Message 5.8 Creating Ddevice Comment 5.9 Creating Label
While trace execution is in progress, trace result cannot be read or displayed.	5.5.11 Sampling Trace of Device
CSV output formats of trace data are different between GX Works2 and GX Developer. Output formats cannot be selected in GX Works2.	5.5.11 Sampling Trace of Device
In GX Developer, when an attempt is made to write sequence programs without writing parameters on the "Write to PLC" screen during PLC RUN, the message "Do you want to write to PLC after remote stop?" is displayed. In GX Works2, When an attempt is made to write sequence programs without writing parameters on the "Write to PLC" screen during PLC RUN, the message "PLC is running. Do you want to force write of the files?" is displayed. If [Yes] is clicked, an error dialog is displayed and sequence programs are not written. If [No] is clicked, "Do you want to write to PLC after remote stop?" is displayed.	5.5.6 Writing Data to CNC Controller 5.6.4 Writing Sequence Programs to CNC Controller

5.17.3 Multi-Language Data

5.17.3.1 Creating Multi-Language Data

To create PLC messages and device comments in a specific language, perform the following steps.
Note that GX Works2 supports only Japanese, English, Chinese (Simplified Chinese characters), Chinese (traditional Chinese characters), and Korean. Other languages cannot be used in creating PLC messages and device comments.

(1) Install the preferred language version of Windows OS
Install the Windows OS that supports the preferred language on the machine.
(2) Set Windows display language
Change the display language of Windows OS to the preferred language from [Control Panel] - [Languages] on Windows.
* Usually the default setting does not need to be changed.
(3) Set GX Works2 language
Open GX Works2, and select the preferred language from [Tool] - [Language Selection].
(4) Create PLC messages and device comments, and write them to CNC
For details on how to create and write PLC messages to CNC, see chapter 7.
For details on how to create and write device comments to CNC, see chapter 8.
(Note) When handling PLC messages and device comments in a specific language, ensure that the language of the OS, the display language of the OS, and GX Works2 language are all the same.

5.17.3.2 Using Multi-Language Data

To use GX Developer format projects containing PLC messages and device comments created in a specific language on GX Works2, configure the setting according to the procedure (1) to (3) in "5.15.3 Multi-Language Data", and then perform the procedure described in "5.5.10.1 Reading Sequence Programs in GX Developer Format on GX Works2".
Note that GX Works2 supports only Japanese, English, Chinese (Simplified Chinese characters), Chinese (traditional Chinese characters), and Korean.
PLC messages and device comments created in other languages cannot be used.

5.17.4 Built-In PLC (Built-In Edit Function)

To use built-in PLC (built-in edit function) to edit the sequence programs created and edited on GX Works2, the following restrictions must be taken into account.

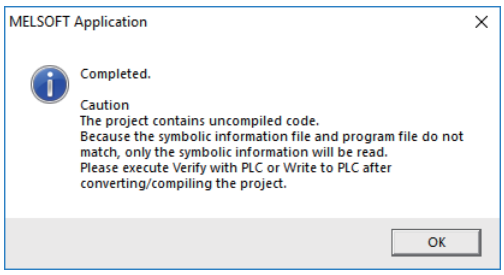
(1) Overall considerations

When a sequence program containing more than 11 contacts is written to the CNC controller, the built-in edit function may display it incorrectly.

(2) Considerations when creating programs with labels

When a program is created after simple project (with labels) is selected on GX Works2, built-in PLC (built-in edit function) does not display labels and function blocks, and display the actual ladder (ladder with labels and functional blocks complied) to which actual device is assigned.

Since symbolic information cannot be modified by built-in PLC (built-in edit function), when sequence programs are read to GX Works2 again after editing, symbolic information and sequence program do not match, resulting in the following error. Do not edit sequence programs with the built-in edit function when writing symbolic information.



5.17.5 Smart safety observation

User safety sequence program can be created with GX Works2.

For the user safety sequence, refer to "M800/M80 Series Smart safety observation Specification manual".

5.17.6 Enhanced PLC Security Mode

When enhanced PLC security mode is enabled on a CNC, some functions of GX Works2 which communicate with the CNC are restricted.

For details on the enhanced PLC security mode, refer to "9.1 Enhanced PLC Security Mode".

5.18 Troubleshooting and FAQ

#	Item	Details
1	Trouble	When sequence programs in the GX Developer format are read to GX Works2, symbolic information, PLC message, and device comment cannot be written to the CNC controller.
	Scenario	When the setting for writing symbolic information in the [Symbolic Information] option under [Tool] -> [Options] on GX Works2 is [High Speed Mode], symbolic information is written to CNC as two files, whereas symbolic information was written as one file in GX Developer. If the number of files to be written to the data area is the maximum in GX Developer, when read to GX Works2, the number of files exceeds the maximum.
	Corrective Action	Select [Compatible mode] in the setting for writing symbolic information in the [Symbolic Information] option under [Tool] -> [Options] on GX Works2, and write to the NC.

6

Explanation of Built-in Editing Function (PLC On-board)

6.1 Outline

This chapter describes the PLC (built-in editing function) built into the Mitsubishi Electric CNC M8 Series products. (Operations related to the PLC carried out with the CNC unit are collectively referred to as "on-board" and hereinafter referred to as PLC On-board.)
The M8 series PLC On-board is easy to use as it retains the operation system from the M700V/M70V series. It also provides enhanced support for working together with the MELSEC series PLC development tool (GX Developer/GX Works2), a robust ladder monitoring function as well as improved ladder editing operation.
When this function is started on the NC system version D0 or later where "smart safety observation function (*)" is enabled, the user safety sequence "SafePLC1" and "SafePLC2" are displayed in the project list on the main screen. Select the project or the user safety sequence to switch the operation target.
(* The function to achieve high safety on M800 series. For details, refer to "M800/M80 Series Smart safety observation Specification manual".)
The on-board functions and function availability for each operation target are listed as follows.
(Note) GX Works2 project data is not supported by PLC On-board.

Function	Purpose of function	Operation target	
		Project	User safety sequence
■ Ladder monitoring (*1)			
Monitor	This switches to the ladder monitor mode.	○	○
Entry Device Monitor	This monitors the ladder and the status of any registered devices simultaneously.	○	○
Entry Ladder Monitor	This monitors the ladder and any registered ladders simultaneously.	○	○
Register Monitor	This registers desired devices and ladders to the device registration monitor and the ladder registration monitor.	○	○
Registered Ladder All Delete	This deletes all the ladders registered in the entry ladder monitor.	○	○
Device Test	This turns the bit devices on/off and changes the current values of word devices.	○	×
Current Value Monitor Changeover (10/16)	This changes the display of the current device values on the ladder monitor between decimal and hexadecimal.	○	○
■ Ladder editing			
Edit	This changes to the ladder edit mode.	○	×
Insert Line	This inserts a blank line at the cursor position.	○	×
Delete Line	This deletes the line at the cursor position.	○	×
Mark	This selects the desired range of ladders.	○	×
Copy & Paste	This copies the ladders in the selected range and pastes these ladders to the specified position.	○	×
Edit Ladder	This edits ladders.	○	×
Statement Edit	This edits statements.	○	×
Note Edit	This edits notes.	○	×
Convert Ladder	This converts edited circuits and enables them to be executed. The behavior is different according to the setting of ladder program write during RUN (#6455 bit6/bit7). [When ladder program writing during RUN is disabled] The conversion is done only when PLC is in STOP state. If PLC is running, the conversion will be done after PLC is stopped. [When ladder program writing during RUN is enabled] The conversion can be done when PLC is running or stopped.	○	×
Undo	This undoes the last edit operation.	○	×

(*1) The user safety sequence has only a function of monitoring.
PLC on-board does not support the user safety sequence with labeled projects nor structured project; therefore, only the actual ladder (ladder with labels and functional blocks compiled) is displayed.

Function	Purpose of function	Operation target	
		Project	User safety sequence
■ Ladder searching			
Find	This searches for specified devices, specified device contacts, and specified device coils.	○	○
Find Step No.	This searches specified step numbers.	○	○
Contact Coil Usage List	This displays the index position, usage status, and step number used by specified devices.	○	○
List of Used Devices	This displays the usage list for each device type as a batch.	○	○
■ Ladder display			
Comment Display Setting	This configures the display of comments, statements, notes, and device names.	○	○
Ladder Display	This sets the ladder display size and the maximum number of contacts for each line.	○	○
Switch Program	This changes the programs in the current display.	○	×
Zoom Display	This switches the ladder display size between three sizes.	○	○
	- Reduced [Equivalent to a full-screen display of 11 contacts at 640 x 480 resolution]	○	○
	- Standard [Equivalent to a full-screen display of 11 contacts at 1024 x 768 resolution]	○	○
	- Enlarged (120%) [Equivalent to a full-screen display of 11 contacts at 1280 x 1024 resolution]	○	○
Comment ON/OFF	This switches the display of comments as configured by [COMMENT DISPLAY SETTING].	○	○
Monitor Value Display	This changes displays of the current value for the device on the ladder monitor between on/off.	○	○
■ Ladder checks			
Check Program	This checks programs (ladders).	○	×
■ PLC data operation			
Add New Data	This adds new PLC data.	○	×
Delete Data	This deletes PLC data.	○	×
Rename Data	This changes the name of PLC data.	○	×
■ Device operation			
Device Batch Monitor	This monitors from the specified device on one screen.	○	○
Entry Device Monitor	This monitors devices at separated positions in circuits or different types of devices simultaneously on one screen.	○	○
Sampling trace	This traces (data collection) PLC device signals and displays the trace result in chronological order. Also this saves the trace data to external media, and writes or reads the trace file for external media.	○	○
■ Parameters			
Program Setting	This configures the execution order of sequence programs.	○	×
Device Setting	This configures the range of devices used in a project.	○	×
Common Pointer Setting	This enables confirmation of common pointer settings used in a project.	○	×
Multiple Project Parameters	This configures parameters related to the operation of multiple projects.	○	×
■ NC file operation			
PLC data auto load	This automatically reads PLC data from temporary memory upon startup.	○	○
Open	This displays the PLC data in temporary memory at the on-board editing area.	○	○
ROM Write	This saves the PLC data in temporary memory to ROM.	○	×
Delete	This deletes PLC data in temporary memory.	○	×
Format	This formats the temporary memory.	○	×
PLC RUN/STOP	This runs and stops the PLC.	○	×
PLC Version up	This rewrites the PLC data in the on-board editing area, temporary memory area and built-in ROM area with the version upgrade data on external media.	○	×

Function	Purpose of function	Operation target	
		Project	User safety sequence
■ External file operations			
External -> NC	This reads PLC data on external media into the NC and opens it on the on-board.	○	×
NC -> External	This saves NC PLC data to external media.	○	×
Delete Project	This deletes projects on external media.	○	×
Verify Project	This verifies NC PLC programs and PLC programs on external media.	○	×
■ Diagnosis			
PLC diagnosis	This displays errors that occur during program (ladder) execution.	○	×
■ Environment setting			
Connect NC changing	This switches CNC connected to the display unit.	○ (* For Windows-based display only)	○ (* For Windows-based display only)
■ Others			
Key/Touchscreen history	This records the information input with the key or the touchscreen. * This is enabled only when the operation history function in the Mitsubishi standard screen is enabled.	○	○

6.2 Screen Configuration

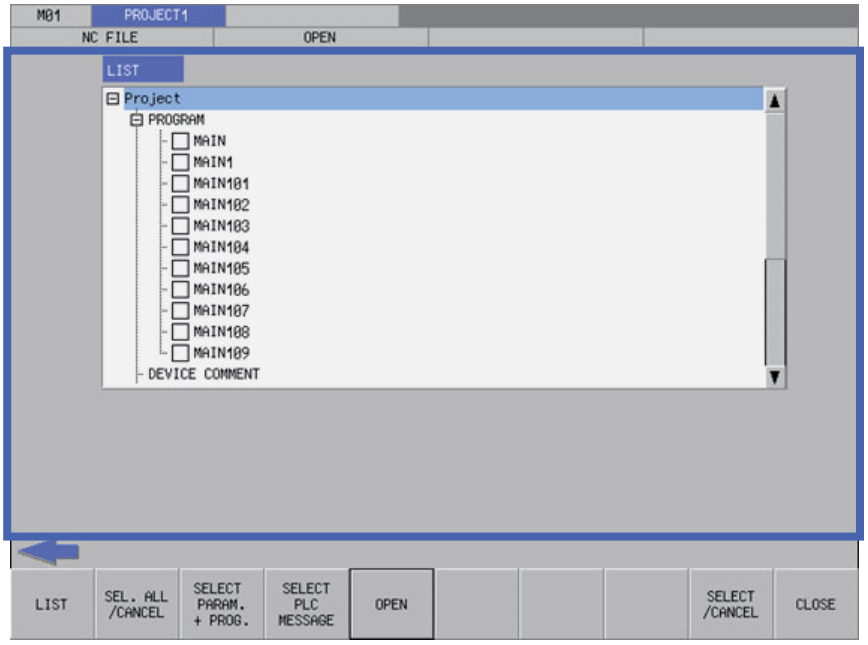
6.2.1 Type

The following three types of screens are used to configure the PLC On-board.

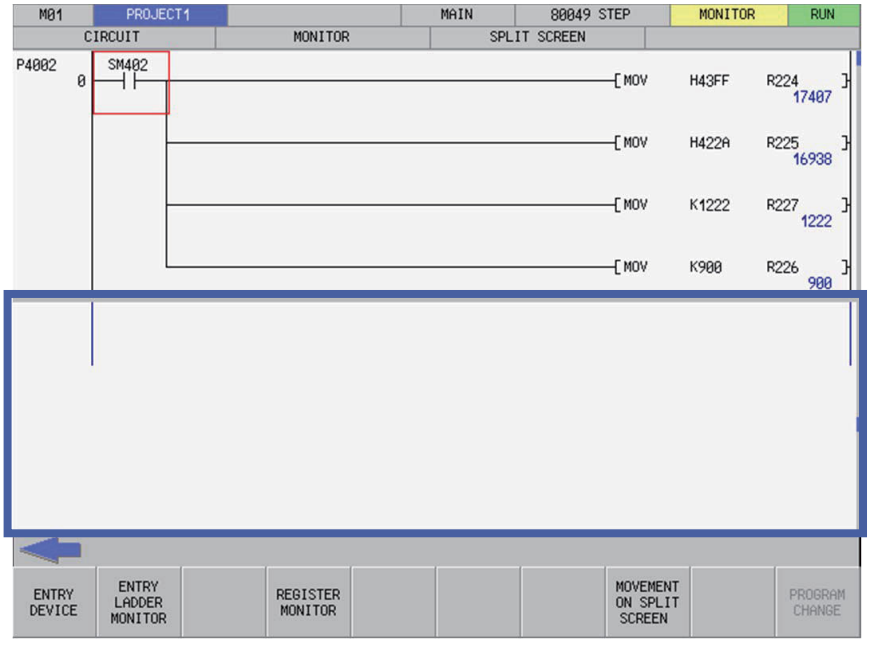
Full screen	This screen is used to display the entire screen.
Split screen	This screen splits the full screen into two areas and displays.
Popup screen	This screen is displayed over the full screen display or split screen.
Message screen	This screen displays confirmation messages, error messages, and other messages.

The following diagrams illustrate examples of these screens. The area inside the blue lines in each diagram represents the screen.

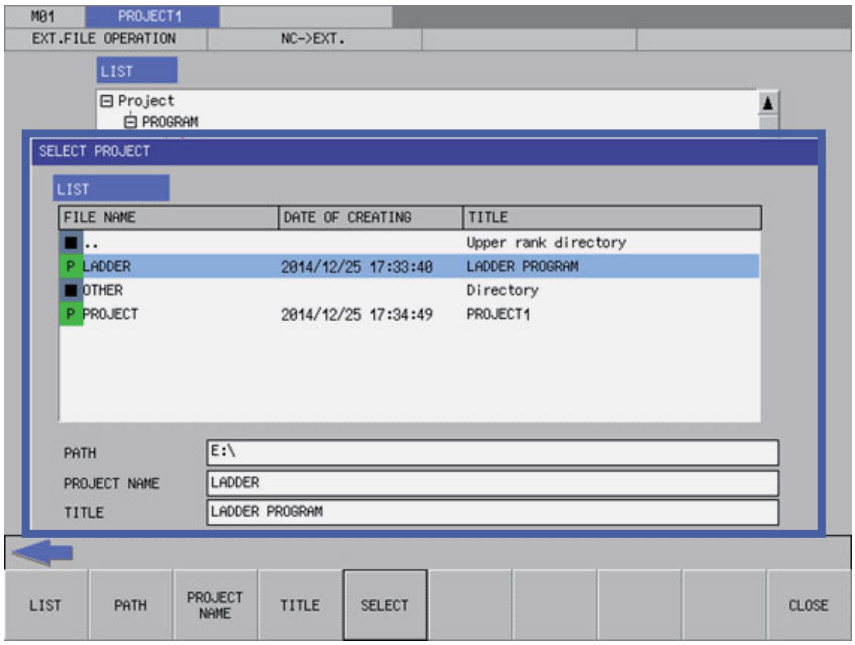
- Full screen



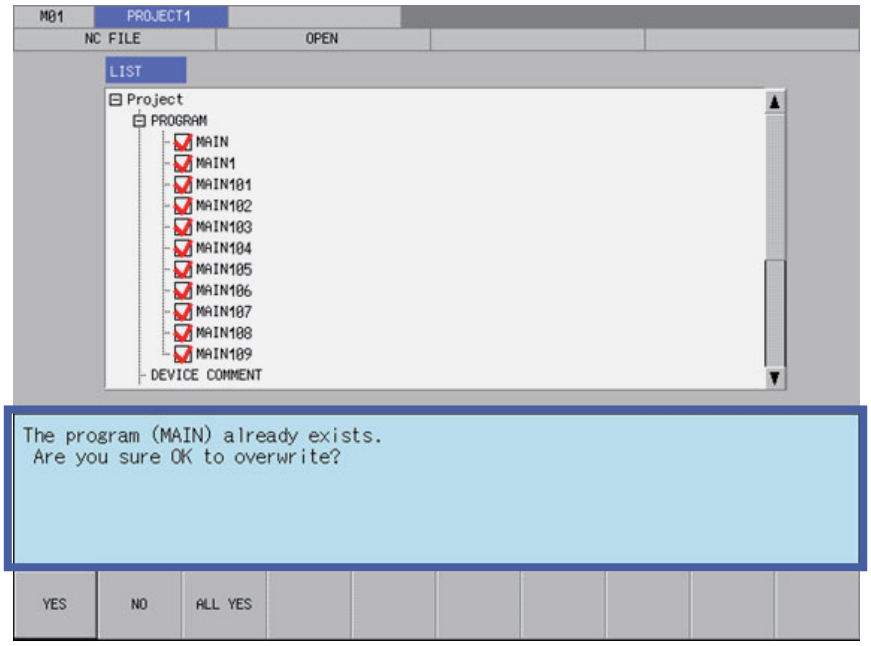
- Split screen



- Popup screen



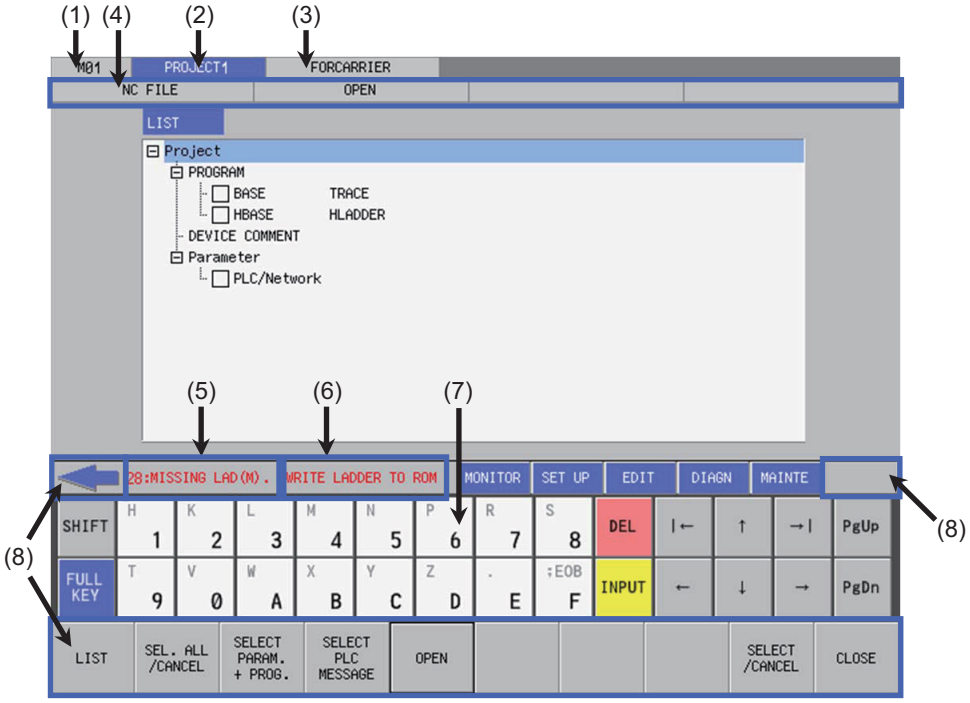
- Message screen



6.2.2 Configuration

6.2.2.1 Common Screen Items

The following diagram illustrates the common screen items.

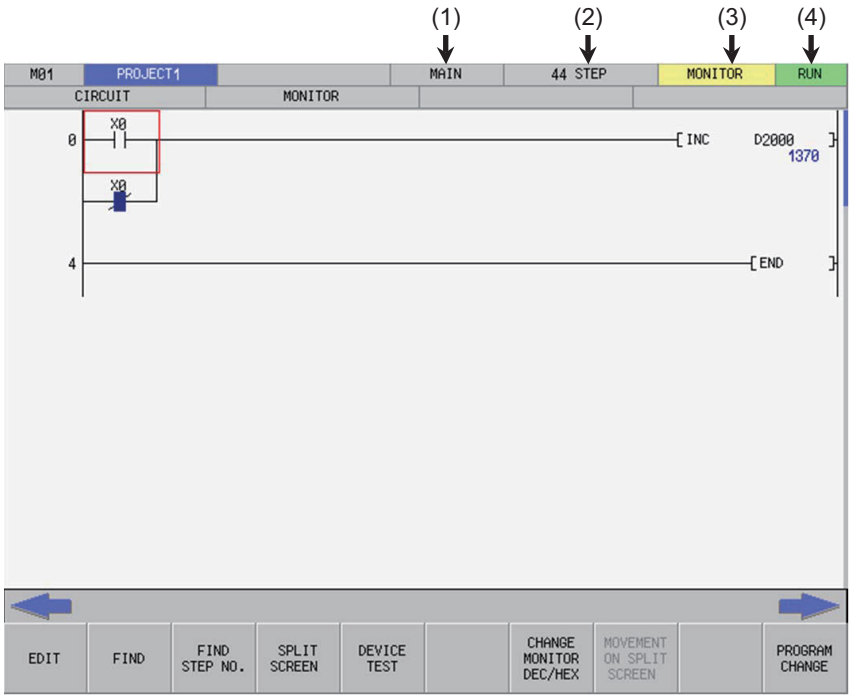


No.	Item name	Description
(1)	Connected NC name	This displays the name of the connected NC.
(2)	Current project No.	This displays the current project number. However, if the user safety sequence is set to the operation target, "SafePLC1" or "SafePLC2" is displayed.
(3)	Current project label	This displays labels assigned to projects. However, if the user safety sequence is set to the operation target, this section is always blank.
(4)	Menu position display	This displays the menu position for the currently displayed full screen.
(5)	PLC alarm message	[For project] The alarm message is displayed when the user sequence occurred illegally. For details, refer to "Peripheral Development Environment Description: Checking PLC Alarms on the CNC Controller". [For user safety sequence] "SAFE PLC ALARM" is displayed when the user sequence occurred illegally. For the contents of PLC alarm, refer to "NC message" of "Alarm MSG" on the diagnosis screen of Mitsubishi standard screen. Use "Diagn" key described in "7.18.3 Special Keys" to move to the diagnosis screen of Mitsubishi standard screen. For the contents of messages, refer to "M800/M80 Series Smart safety observation Specification manual".
(6)	Unsaved data alarm message	This displays alarm messages when data has not been saved to the internal ROM.
(7)	Soft keyboard	Soft keyboard (only when the soft keyboard parameter is enabled)
(8)	Menu keys	This menu is used to operate screens.

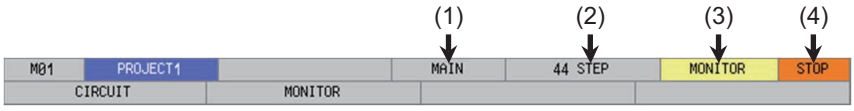
6.2.2.2 Items Displayed on the Ladder Screen

The following diagram illustrates the items displayed on the ladder screen.

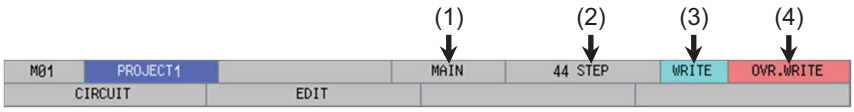
- Ladder screen (Monitor (RUN))



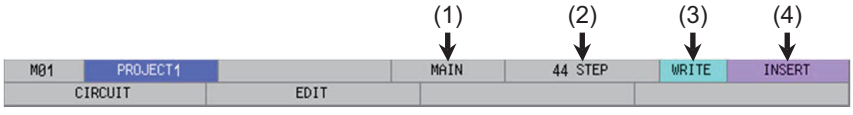
- Ladder screen (Monitor (STOP))



- Ladder screen (Edit (Overwrite))



- Ladder screen (Edit (Insert))

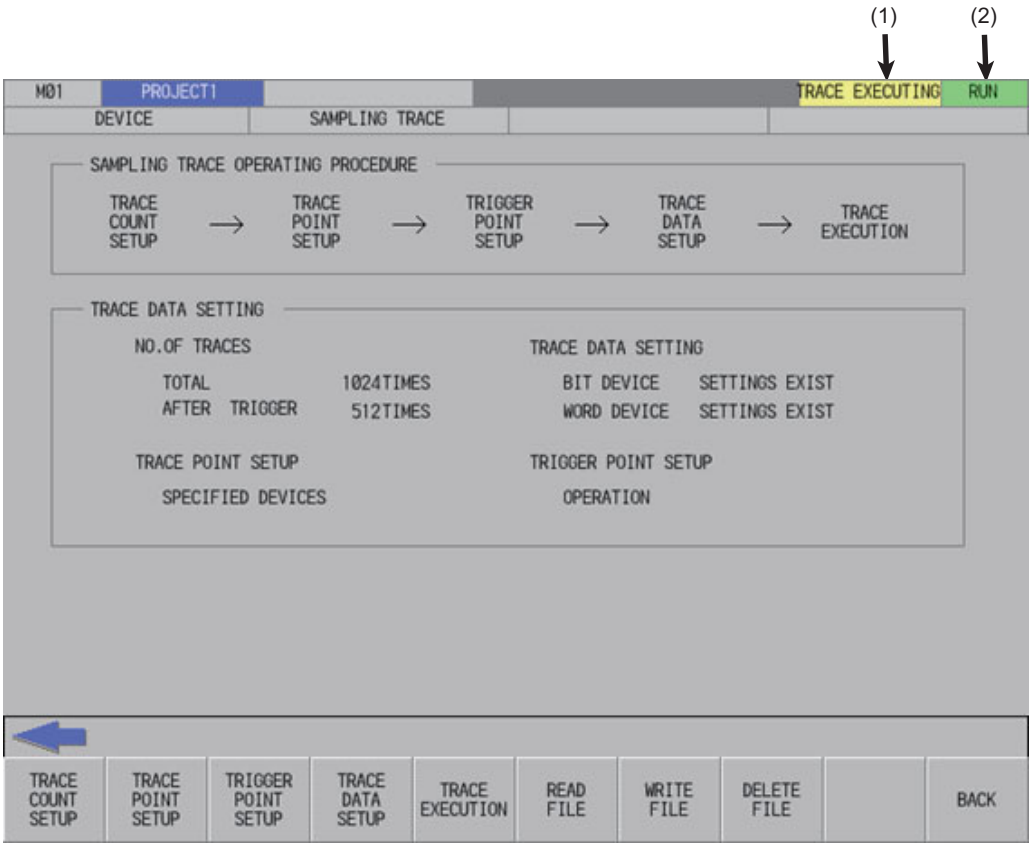


No.	Item name	Description
(1)	Program name	This displays the name of the currently displayed program.
(2)	Step number	This displays the step number of the currently displayed program.
(3)	Monitor/Edit display	This displays whether the current ladder screen is in the monitored state or the edit state.
(4)	Monitored: PLC status display (RUN/STOP) Edit: Overwrite/Insert display	This displays the PLC status (RUN/STOP) when the ladder screen is in the monitored state. This displays whether the edit mode is in overwrite or insert mode when the ladder screen is in the edit state.

6.2.2.3 Items Displayed on the Sampling Trace Screen

The following diagram illustrates the items displayed on the ladder screen.

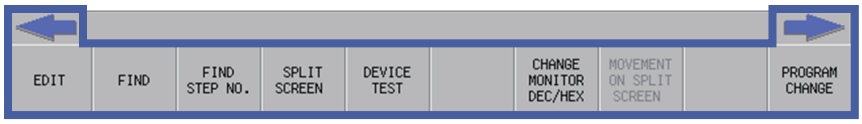
- Sampling trace screen (main)



No	Item name	Description
(1)	Trace status	This displays the trace status (execution failed, trace executing, trace suspend or trace finished).
(2)	PLC status (RUN/STOP)	This displays the PLC status (RUN/STOP).

6.2.3 Menu Keys

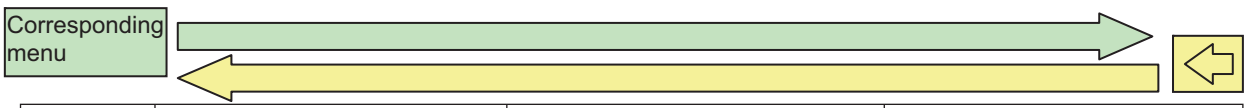
The menu keys consist of the 10 buttons arranged on the bottom of the PLC On-board and the arrow keys arranged on the left and right edges. (area inside the blue lines)
The menu keys may be enabled (black character display) or disabled (gray character display) depending on the state of the NC and the PLC On-board.



Item name	Description
Menu keys	These execute functions and the display of screens corresponding to the menu names written on the buttons. Blank menu keys are disabled.
Left arrow key	This closes displayed popup screens (described later) and transitions to upper-tier menus.
Right arrow key	This transitions to same-tier menus.

6.2.3.1 Menu Key Tiers and Transitions

The menu keys are divided into several tiers. Pressing corresponding menu keys enables transitions to lower tiers. Pressing the left arrow key enables transitions to higher tiers, and pressing the right arrow key enables transitions on the same tier.
The following table summarizes each menu tier.



Level 1	Level 2	Level 3	Level 4
Main	NC file operation		
	External file operation		
	Circuit	Monitor 1 Monitor 2	
		Edit 1 Edit 2	Circuit symbol 1
			Circuit symbol 2
			Copy/Insert line
	Device	Device batch monitor	
		Device register monitor	
		Sampling trace	
	Parameters	Multi-project parameter	Project settings
			Device settings
	PLC diagnosis		
	Environment settings		


Switch pages
Transition to same-tier menus

6.2.3.2 Menu Key Details

Developer Mode Menu Keys

The following describes the menu keys in each tier. (The enabled/disabled status of each menu key is described later.)

(1) [MAIN] menu keys

This is the highest tier of the PLC On-board menu. Other types of functions are called from this menu.

- This is the menu available when the sequence program is stored in the connected project.

NC FILE	This changes to the [NC FILE] menu keys.
EXT.FILE OPERATION	This changes to the [EXT. FILE OPERATION] menu keys.
LADDER	This displays the ladder screen and starts the monitor.
DEVICE	This changes to the [DEVICE] menu keys.
PARAM.	This changes to the [PARAM.] menu keys.
PLC DIAGNOSIS	This displays the PLC diagnosis screen.
ENVIRON. SETTING	This changes to the [ENVIRON. SETTING] menu keys.
SELECT PROJECT	This selects the current project. *This is enabled when using multiple projects and smart safety observation function is enabled.

- This is the menu available when the sequence program is not stored in the connected project.

FILE OPE.	This displays the file operation screen.
EXE.->NC	This displays the "EXT.->NC" screen.
ROM WRITE	This displays the rom write popup screen.
PROJECT SETTING	This displays the project setting screen.
DEVICE SETTING	This displays the device setting screen.
PLC DIAGNOSIS	This displays the diagnosis screen.
CONNECT NC CHANGING	This displays the connect NC change screen.
SELECT PROJECT	This selects the current project. *This is enabled when using multiple projects and smart safety observation function is enabled.

(2) [NC FILE] menu keys

This menu contains various operations for files stored in the NC such as opening files stored in and confirming information of files stored in the NC.

LIST	This displays the file list screen.
OPEN	This displays the open screen.
FILE OPE.	This displays the file operation screen.
FORMAT	This displays the format popup screen.
ROM WRITE	This displays the rom write popup screen.
PLC RUN/STOP	This displays the PLC RUN/STOP popup screen.
PASSWORD CANCEL.	This displays the password cancellation popup screen.
PLC VERSION UP	This displays the plc version up screen.
BACK	This returns to the main menu keys.

(3) [EXT.FILE OPERATION] menu keys

This menu contains various operations for external files such as saving files stored in SD cards and USB memory devices into NC.

EXT.->NC	This displays the "EXT.->NC" screen.
NC->EXT.	This displays the "NC->EXT." screen.
DELETE EXT. FILE	This displays the delete external file screen.
VERIFY EXT. FILE	This displays the verify external file screen.
PLC RUN/STOP	This displays the PLC RUN/STOP popup screen.
PASSWORD CANCEL.	This displays the password cancellation popup screen.
BACK	This returns to the main menu keys.

(4) [LADDER] menu keys

(4-1) [MOINTOR] menu

This menu contains functions used to monitor circuits.

- First page

- Second page

EDIT	This switches to the edit mode.
FIND	This displays the find popup screen.
FIND STEP NO.	This displays the find step No. popup screen.
SPLIT SCREEN	This displays the [SPLIT SCREEN] menu.
DEVICE TEST	This displays the device test popup screen.
CHANGE MONITOR DEC/HEX	This changes the current value display between decimal and hexadecimal.
MOVEMENT ON SPLIT SCREEN	This transitions the focus between the split screens.
PROGRAM CHANGE	This changes to the selected program.
CROSS REF. LIST	This displays the contact coil usage popup screen.
LIST OF USED DEVCES	This displays the list of used devices popup screen.
COMMENT ON/OFF	This turns the device comment display ON and OFF.
ZOOM DISPLAY	This changes the display magnification of the ladder screen.
PLC RUN/STOP	This displays the PLC RUN/STOP popup screen.

(4-2) [SPLIT SCREEN] menu

This menu contains functions used to operate the split screen.

ENTRY DEVICE	This turns the entry device monitor screen ON and OFF.
ENTRY LADDER MONITOR	This turns the entry ladder monitor screen ON and OFF.
REGISTER MONITOR	This registers the ladder on the cursor position in the ladder registration monitor.
MOVEMENT ON SPLIT SCREEN	This transitions the focus between the split screens.
PROGRAM CHANGE	This changes to the selected program.

(4-2-1) [ENTRY DEVICE] (split screen) menu

This menu contains functions used to operate the device registration monitor (split screen).

DEVICE TEST	This displays the device test popup screen.
16BIT/32BIT	This switches the current value display between 16 bits/32 bits.
DEC/HEX	This changes the current value display between decimal and hexadecimal.
MOVEMENT ON SPLIT SCREEN	This transitions the focus between the split screens.
PLC RUN/STOP	This displays the PLC RUN/STOP popup screen.
CLOSE	This closes the entry device monitor screen.

(4-2-2) [ENTRY LADDER MONITOR] (split screen) menu

This menu contains functions used to operate the Entry Ladder monitor (split screen).

FIND	This displays the find popup screen.
DEVICE TEST	This displays the device test popup screen.
ENTRY LADDER ALL DEL.	This deletes all circuits registered in the Entry Ladder monitor.
DEVISION RATIO CHANGE	This changes the ratio of the split screens for the ladder registration monitor.
MOVEMENT ON SPLIT SCREEN	This transitions the focus between the split screens.
ZOOM DISPLAY	This changes the display magnification of the ladder screen.
PLC RUN/STOP	This displays the PLC RUN/STOP popup screen.
CLOSE	This closes the entry ladder monitor screen.

(4-3) [EDIT] menu

This menu contains functions used to edit circuits.

- First page

- Second page

MONITOR	This switches to the monitor mode.
LADDER SYMBOL1	This switches to the [LADDER SYMBOL1] menu.
LADDER SYMBOL2	This switches to the [LADDER SYMBOL2] menu.
COPY/INSERT	This switches to the [COPY/INSERT] menu.
FIND	This displays the find popup screen.
FIND STEP NO.	This displays the find step No. popup screen.
CONVERT LADDER	This converts edited circuits.
UNDO	This returns the pre-converted ladder to the last previous state while editing.
PROGRAM CHANGE	This changes to the selected program.
CROSS REF. LIST	This displays the contact coil usage popup screen.
LIST OF USED DEVCES	This displays the list of used devices popup screen.
CHECK PROGRAM	This opens the check program popup screen.
COMMENT ON/OFF	This turns the device comment display ON and OFF.
CANCEL EDIT LADDER	This discards the unconverted ladder.
ZOOM DISPLAY	This changes the display magnification of the ladder screen.
OVR.WRITE/INSERT	This switches the edit mode between overwrite and insert mode.

(4-3-1) [LADDER SYMBOL1] menu, [LADDER SYMBOL2] menu

This menu contains ladder symbols used to edit circuits.

- [LADDER SYMBOL1] menu

- [LADDER SYMBOL2] menu

Ladder symbols other than the following	This opens the enter symbol popup screen.
- (Horizontal bar)	Writes the horizontal bar to the cursor position.
| (Vertical bar)	Writes the vertical bar to the cursor position.
| DELETE (Vertical bar)	This deletes the vertical bar at the cursor position.
CONVERT LADDER	This converts edited circuits.
UNDO	This returns the pre-converted ladder to the last previous state while editing.

(4-3-2) [COPY/INSERT] menu

This menu contains the copy, paste, line insert, and line delete functions.

MARK	Ladder groups are selected by designating start points and end points.
COPY	This copies the ladder in the designated range.
PASTE	This pastes copied circuits at the cursor position.
INSERT LINE	This inserts one blank line at the cursor position.
DELETE LINE	This deletes the line at the cursor position.
CONVERT LADDER	This converts edited circuits.
UNDO	This returns the pre-converted ladder to the last previous state while editing.

(5) [DEVICE] menu keys

This menu contains functions used to monitor desired devices.

DEVICE BATCH	This opens the device batch monitor screen.
ENTRY DEVICE	This displays the entry device monitor screen.
SAMPLING TRACE	This displays the sampling trace screen.
BACK	This returns to the main menu keys.

(6) [PARAM.] menu keys

This menu contains functions used to configure operation of programs and multiple projects.

PROGRAM SETTING	This displays the program setting screen.
COMMON POINTER SETTING	This displays the common pointer setting screen.
MULTI PROJECT PARAM.	This switches to the [MULTI PROJECT PARAM.] menu keys.
BACK	This returns to the main menu keys.

(7) [ENVIRON. SETTING] menu keys

This menu contains functions used to configure the PLC On-board usage environment such as ladder screen settings and locations to store device comments.

COMMENT DISPLAY	This displays the comment display screen.
LADDER DISPLAY	This screen displays the ladder display screen.
CONNECT NC CHANGING	This displays the connect NC changing screen.
BACK	This returns to the main menu keys.

6.3 Operation Key List

6.3.1 Basic Operation Keys

The following table lists the keys used to operate the PLC On-board.

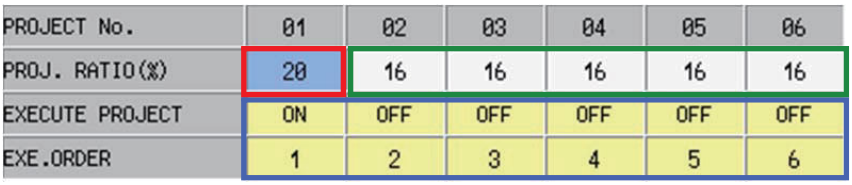
Key	Description
A to Z, 0 to 9	These keys are used to enter data.
INSERT	This key changes the edit mode when editing circuits between the overwrite and insert modes.
DELETE	This key deletes the last character input that has not yet been issued.
C.B	This key deletes input character strings that have not yet been issued.
INPUT	This key issues the input data. It also selects data.
↑ , ↓ , → , ←	These keys are used to move the cursor up, down, left and right and to select items.
→|	This key moves screen items in the forward order.
|←	This key moves screen items in the reverse order.
 or ESC	These keys transition to the next highest menu tier and close popup windows.
	This transitions to same-tier menus.
Page Up	This key moves screens up in pages.
Page Down	This key moves screens down in pages.
SP	This key enters and removes checks from check boxes.
<,>	The "<,>" key may not be available depending on the specific model. In such a case, use the "(,)" key as a substitute.
EOB	This key turns the display of device comments on the ladder screen ON and OFF.
#	This key switches between screens when using the split screen display.

6.3.2 Screen Items (Control)

Table background colors

Some of the tables used in PLC On-board screens contain both areas where values are input and areas where values are selected. For this reason, different background colors are used to visually distinguish between input areas and selection areas. The following table describes these background colors.

Background color	Description
White	Indicates areas where values are input. (area inside the green lines in the following diagram)
Yellow	Indicates areas where values are selected. (area inside the blue lines in the following diagram)
Light blue	Indicates the position of the current selection under focus. (area inside the red lines in the following diagram)
Gray	Indicates areas where values cannot be input or selected.



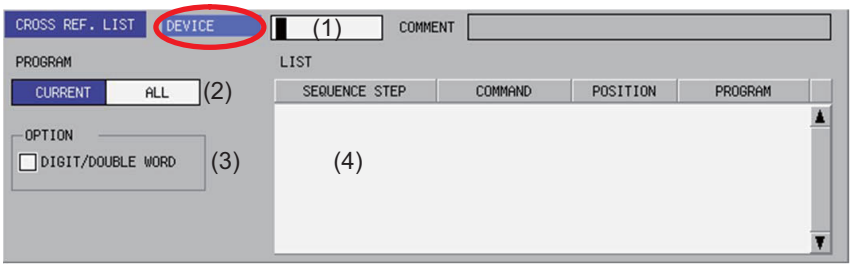
Selecting input and selection items

There are two methods used to select input and selection items.

(1) Select using the Tab keys (→|,|←)

Select and enable items that can be input or selected in a predetermined order. The background color of the title of a selected item changes to blue. (Refer to the area of the following diagram with a red circle.)

(Example) "CROSS REF. LIST" screen

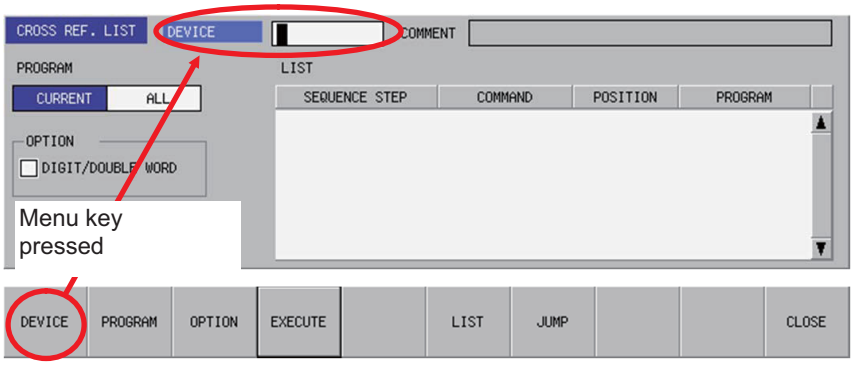


Operation	Description
Press [→ |]	Selects items in forward order from (1) to (4), returning back from (4) to (1).
Press [| ←]	Selects items in reverse order from (4) to (1), returning back from (1) to (4).

(2) Select using menu keys

Select and enable input and selection items by pressing the menu keys corresponding to the input and selection items. The background color of the title of a selected item changes to blue.

(Example) "CROSS REF. LIST" screen



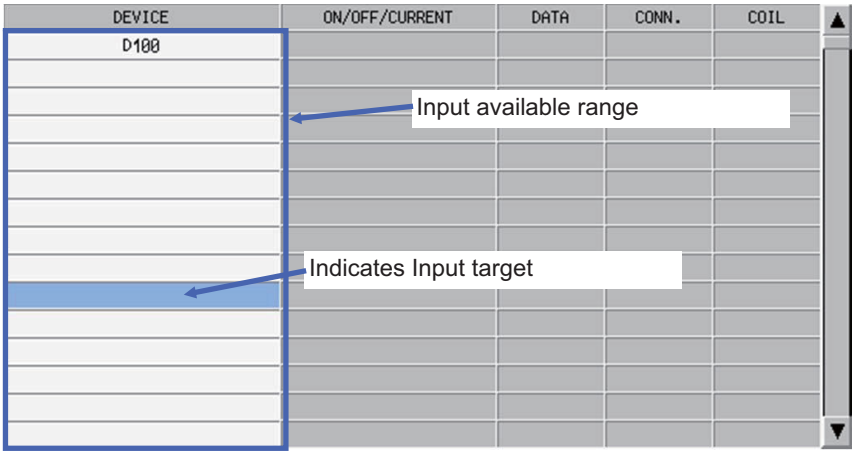
Selecting the input position

There are multiple input positions when inputting values into lists and tables. Select the desired input position by using the following method.

(1) Select the item such as a list or table. (Refer to "Selecting input and selection items")

(2) Use the [↑], [↓], [←], and [→] keys to move to the desired input position.

(Example) Lists within the entry device monitor screen



Inputting values

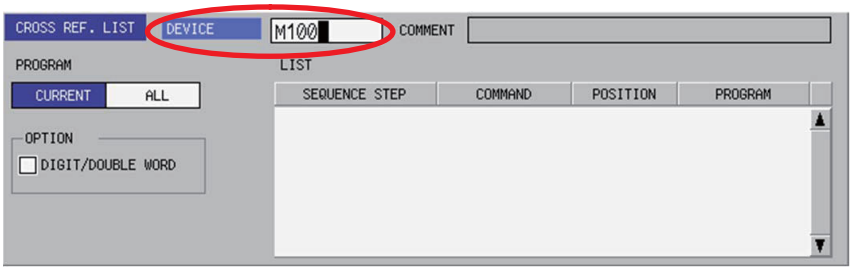
(1) Items that can be input directly

Perform the following operation to input values (text strings and numbers) into direct-input items such as that marked by the red circle in the following diagram.

(a) Select the input item. (Refer to "Selecting input and selection items")

(b) Use the keyboard to input values.

(Example) "CROSS REF. LIST" screen



*Press the [INSERT] key to switch between the two edit modes (overwrite/insert). Switching the edit mode changes the shape of the cursor.

Overwrite [INSERT] key pressed Insert

(2) Items that cannot be input directly

Perform the following operation to input values (text strings and numbers) into input items not capable of direct input such as lists.

(a) Select the input position in the list. (Refer to "Selecting the input position")

(b) Use the keyboard to issue the [INPUT] key.

Issuing the [INPUT] key displays and selects the input item (area inside the blue lines in the following diagram).

(3) Use the keyboard to input values.

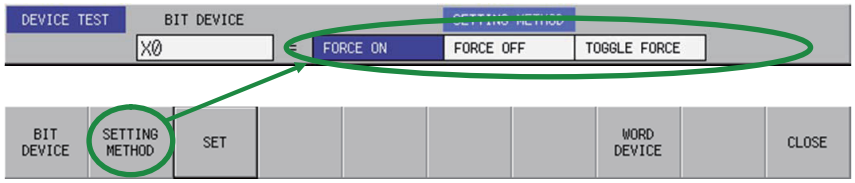
(4) Use the keyboard to issue the [INPUT] key.

Issuing the [INPUT] key closes the input item and displays the input item at the selected position.

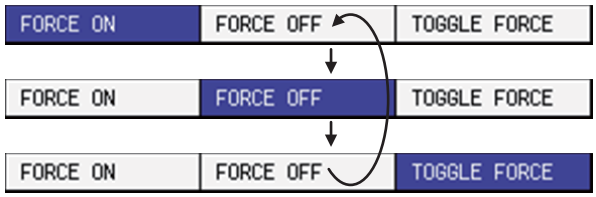
Configuring unique selection items

Only one data item is selected from two or more data items. The highlighted data is the currently selected item. There are two methods used to change selections.

(1) Press the menu key with the same name as the item to move the selection data move in the right direction. The selection will move to the left-most position when the currently selected item is at the right-most position.

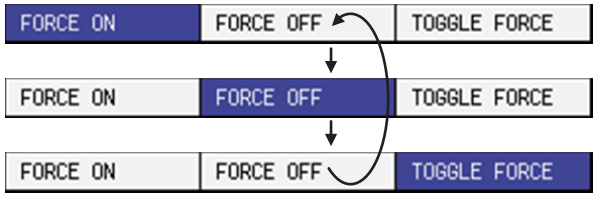


Pressing the applicable menu key moves the selection as illustrated in the following diagram.

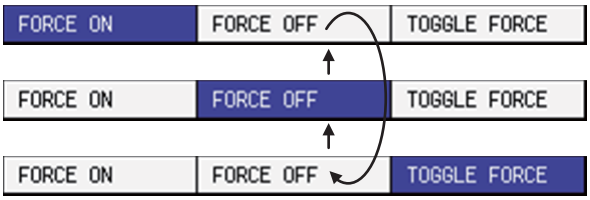


(2) After selecting an item with the Tab key, press the [←] and [→] to move the selection. If the currently selected item is at the right-most position, the selection moves to the left-most position. If the currently selected item is at the left-most position, the selection moves to the right-most position.

The selection moves to the right as illustrated in the following figure when the [→] key is pressed.

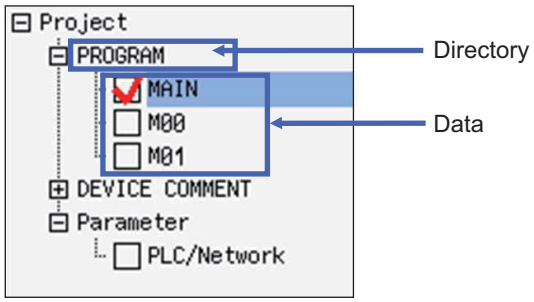


The selection moves to the left as illustrated in the following figure when the [←] key is pressed.



Selecting tree-structure data

Tree-structure data is configured of directories and data.
Directories and data are illustrated in the following diagram.



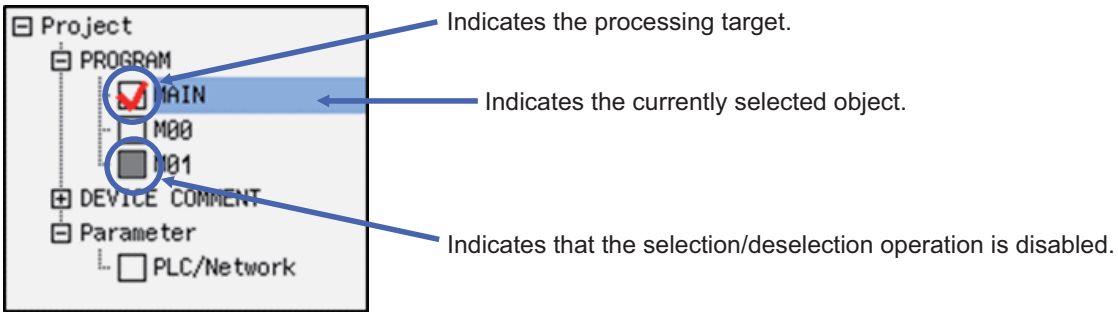
<Transitioning between/selecting directories and data>

Use the [↑], [↓], [←], and [→] arrow keys to move between and select data one unit at a time. Use the [Page Up] and [Page Down] keys to move between pages one at a time and to select data.

<Enabling and disabling data to be processed>

The check box has two types of statuses: where the selection/deselection is enabled (white rectangle) or disabled (gray rectangle).
There are two methods used to enable and disable selections.

- Move to and select the data to be set and press the [SP (space code)] key.
  Selections that are checked are enabled and selections that are not checked are disabled.
  Each press of the [SP] key switches between the enabled and disabled state.
- Move to and select the data to be set and press the [SELECT/CANCEL] menu key.
  Selections that are checked are enabled and selections that are not checked are disabled.
  Each press of the [SELECT/CANCEL] menu key switches between the enabled and disabled state.



<[+] and [-] symbols next to directories>

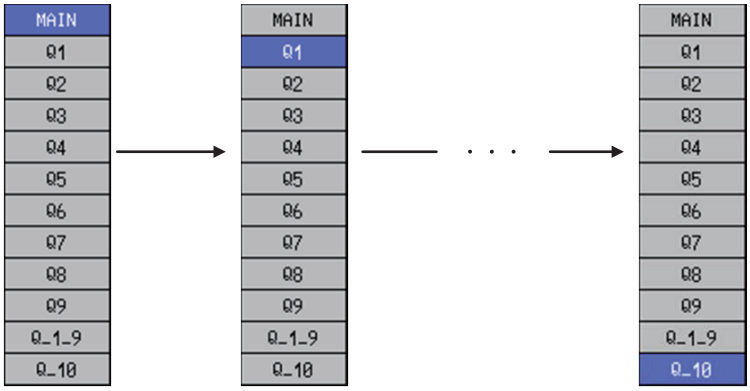
- Pressing the [→] key for directories marked with the [+] symbol expands the directory to display the data within.
- Pressing the [←] key for directories marked with the [-] symbol collapses the directory to no longer display the data within.

Setting selection items in lists

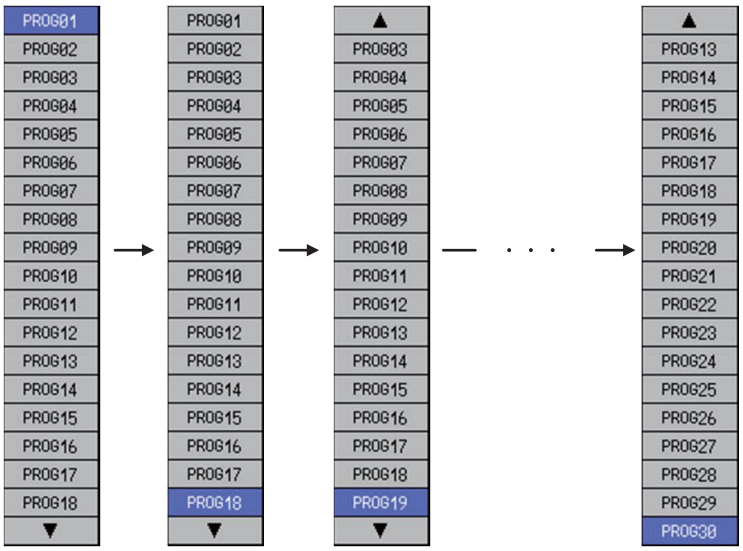
Select one item of data from lists containing multiple entries of data. The example used to describe the selection method is a screen containing UI elements for selecting data from a list.

(1) Switching between programs or other types of data

Pressing the [SWITCH PROGRAM] menu key displays the name of the programs stored in NC in the list. The currently displayed data is selected (highlighted). Use the [↑] and [↓] arrow keys to change the selected data. Press the [INPUT] key to issue the selection.

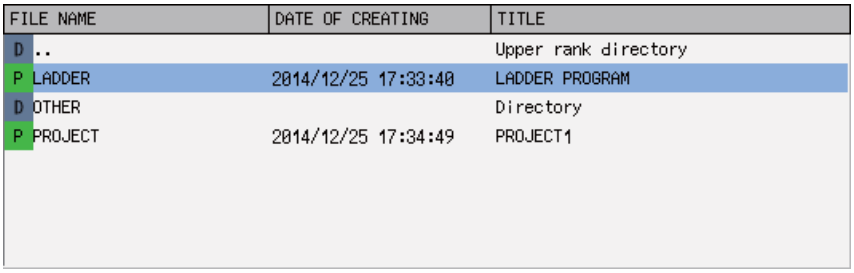


If there are multiple stored programs that cannot be displayed on one screen, a triangle pointing down is displayed under the final data display on the screen as illustrated in the following diagram. As illustrated in the preceding diagram, use the [↑] and [↓] arrow keys to move the selection to the triangle pointing downward and display the next page. Repeat this operation to move to the last page.



(2) Selecting external projects or other data

Directories and project data displayed in the [LIST] can be selected and the contents of directories can be displayed.



Use the [↑] and [↓] arrow keys to change selections when lists as in the preceding diagram are displayed. The background color of selected items is light blue.

Select items marked with the [■] icon in the name display column and labeled as [DIRECTORY] in the title column and press the [INPUT] key or "Select" menu key to display the information within the selected directory. Select directory icons indicated by ".." and press the [INPUT] key to display information in parent directories.

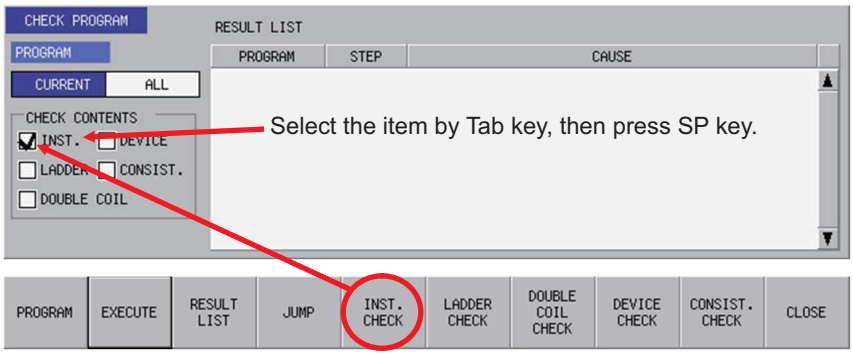
Items indicated by the icon [P] in the name display column indicate GX Developer project data. Use the [↑] and [↓] arrow keys to select data and then operate the menu keys on the screen to issue the selection.

Enabling and disabling selected parameters

You can enable and disable various parameters. There are two methods used to make these settings.

(1) Press the menu key with the same name as the parameter to select the parameter if not already selected. Press the same menu key again to enable (add a check mark to) the parameter. If the parameter is already selected, the parameter is enabled (check mark is added) when the menu key is pressed. Pressing the menu key when the parameter is enabled disables (clears the check mark from) the parameter. Continually pressing the same menu key switches between the enabled and disabled state.

(2) After selecting the parameter with the Tab key, press the [SP] key to switch between the enabled and disabled state.



6.4 Touch Gestures

Touch gestures are available for touch panel display devices.

The available touch gestures are listed below.

Gesture		Description
Name	Operation	
Tap	A gesture to tap the screen to touch for a moment	Selects items that can be input or selected.
Double-tap	Tap twice quickly	Displays the find popup screen in the ladder monitor.
		Displays the enter symbol popup screen in the ladder edit.
Flick	Quickly run your fingertip along the screen vertically or horizontally	Scrolls the screen.
Pan	Put your fingertip on the screen and move it vertically or horizontally while keeping it touching the screen	Scrolls the screen.
Pinch-in	A gesture to pinch a target between the thumb and index finger on the screen	Reduces the screen in the ladder monitor/ladder edit.
Pinch-out	A gesture to spread the thumb and index finger on the screen	Enlarges the screen in the ladder monitor/ladder edit.

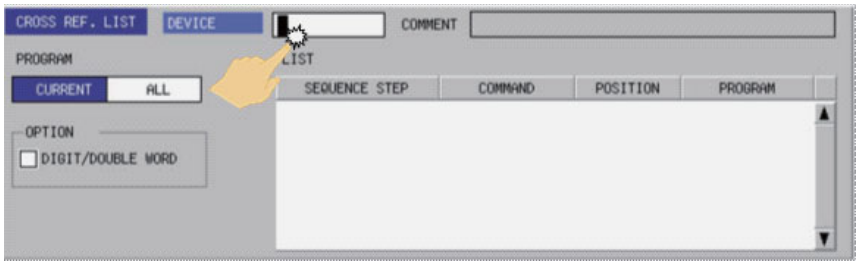
6.4.1 Tap

The behavior differs for each tap item.
See more details below.

Items that can be input or selected

"Selecting input and selection items" with keys can also be executed by tapping.
When you tap the item that can be input or selected, the item is selected and enabled.

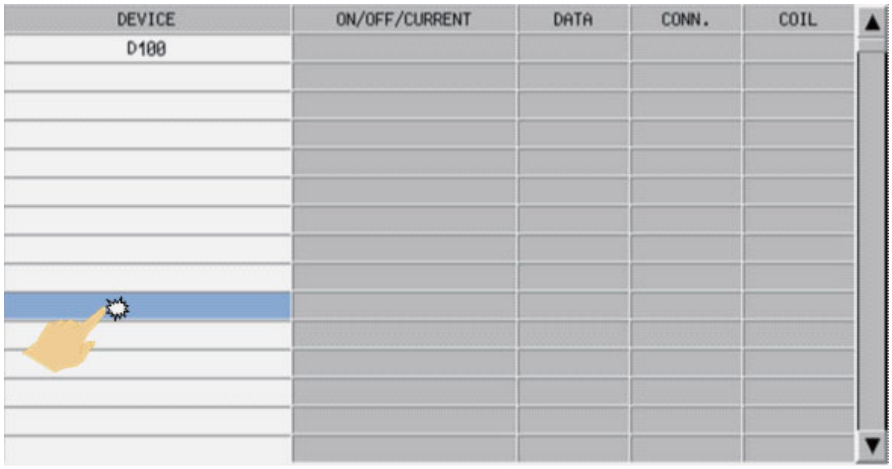
(Example) "CROSS REF. LIST" screen



Items with multiple input positions such as lists and tables

"Selecting the input position" with keys can also be executed by tapping.
Select the input position for items with multiple input positions such as lists and tables.

(Example) Lists and tables in the entry device monitor screen



Unique selection items

"Configuring unique selection items" with keys can also be executed by tapping.
Tapped data is selected and others are not selected.

(Example) "DEVICE TEST" popup screen

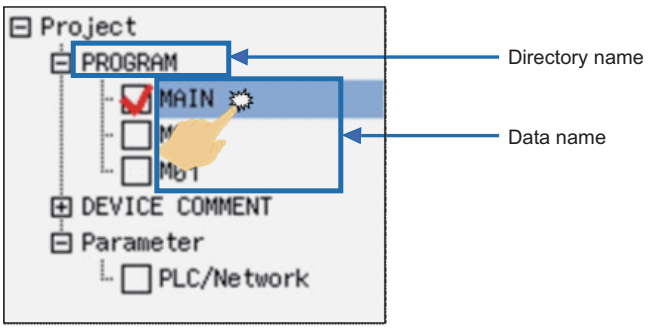
Tree-structure

"Selecting tree-structure data" with keys can also be executed by tapping.

Tree-structure data is configured of directories and data. Thus the behavior differs depending on the part to be tapped.

< When tapping a name >

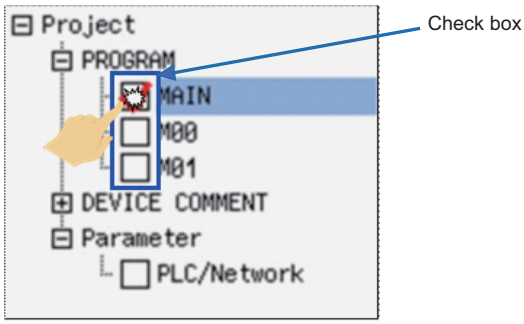
When tapping the name of the data or directory name, the tapped data or directory is selected.



< When tapping a check box >

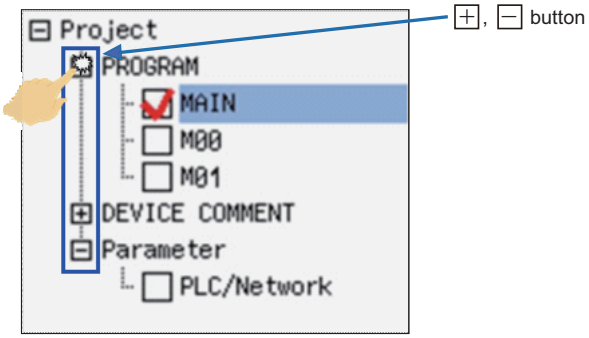
Everytime you tap the check box, a tick is added to or removed from the box.

The box with a tick mark means enabled, whereas the box without a tick means disabled.



< When tapping [+] or [-] >

Everytime you tap the [+] or [-] button, the data in the directory is shown or hidden.

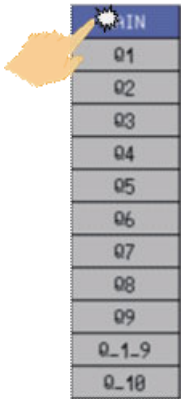


Selection items in lists

"Setting selection items in lists" with keys can also be executed by tapping.

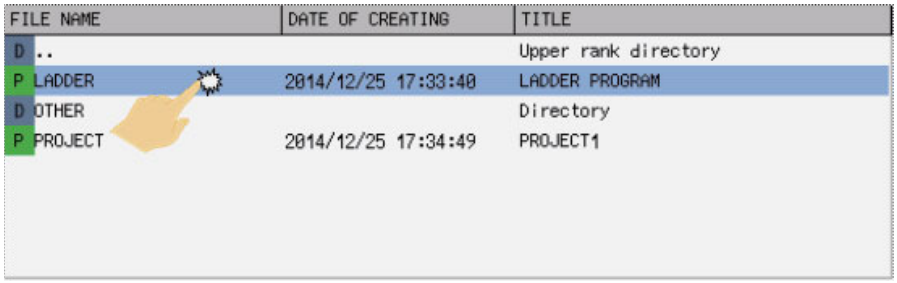
(1) Switching between programs or other types of data

By tapping a program on the switch program screen, the program is switched to the tapped one.



(2) Selecting external projects or other data

Directories and project data displayed in the [LIST] can be selected.



Enabling and disabling selected items

"Enabling and disabling selected items" with keys can also be executed by tapping.

You can enable or disable various items by tapping.

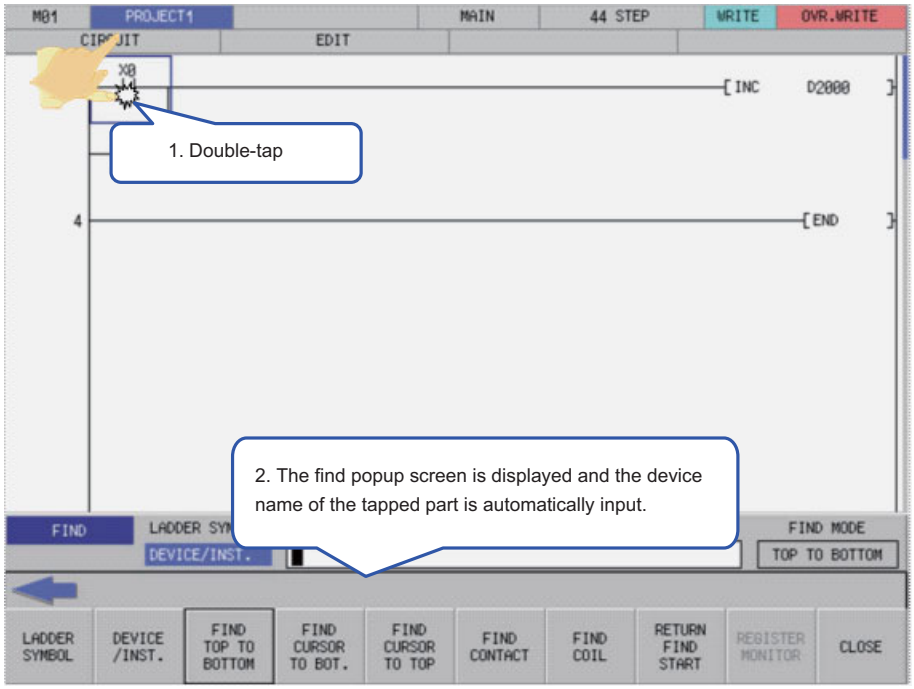
(Example) "CHECK PROGRAM" popup screen

6.4.2 Double-tap

Double-tap on ladder diagrams is available for the ladder monitor/ladder edit.
See more details below.

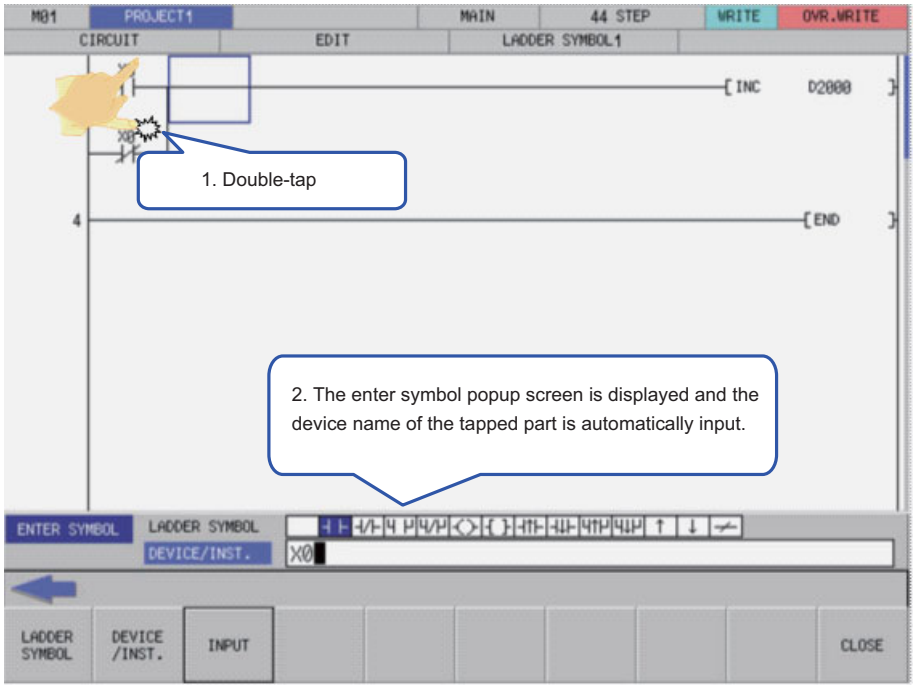
Ladder monitor

The find popup screen is displayed by double-tapping.
Refer to "Ladder Menu: Find Popup Screen" for details of the find popup screen.



Ladder edit

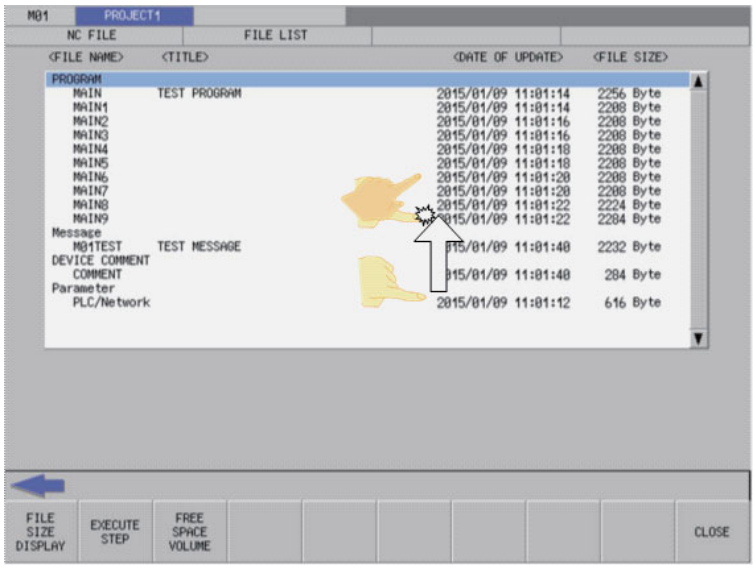
The enter symbol popup screen is displayed by double-tapping.
Refer to "Editing Ladders" in "Ladder Menu: Editing Ladders" for details of the enter symbol popup screen.



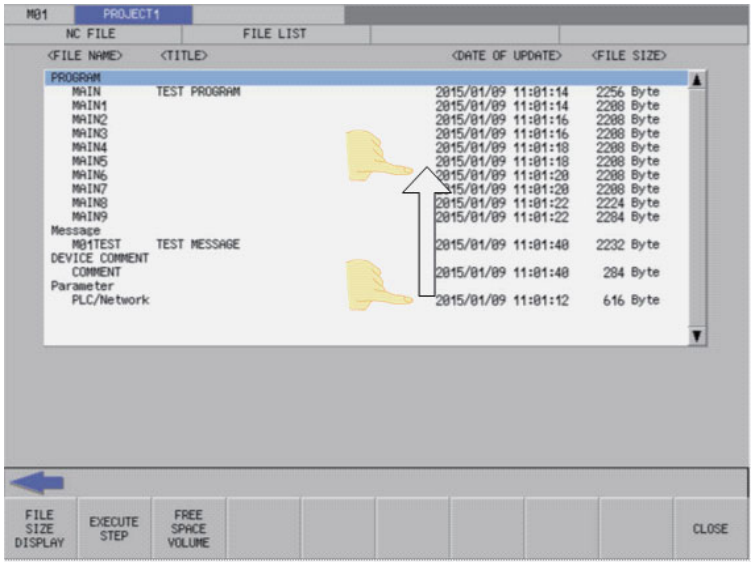
6.4.3 Flick/Pan

For scrollable items, the screen can be scrolled by flick or pan.

(Example) "FILE LIST" screen (Flick)



(Example) "FILE LIST" screen (Pan)

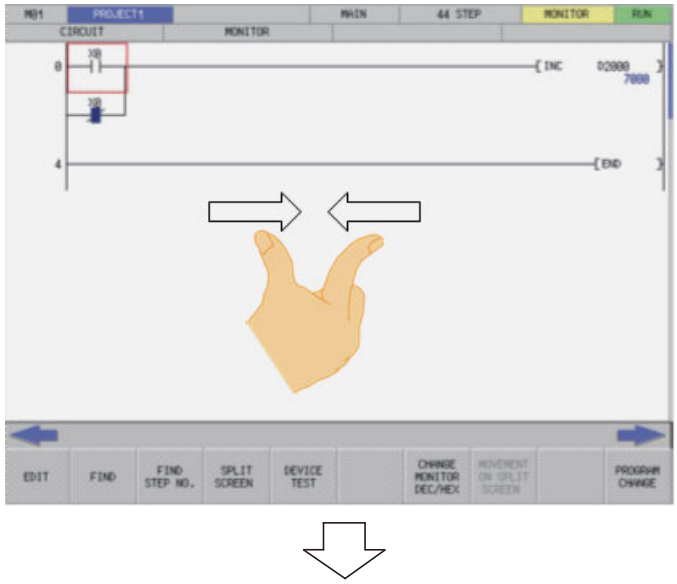


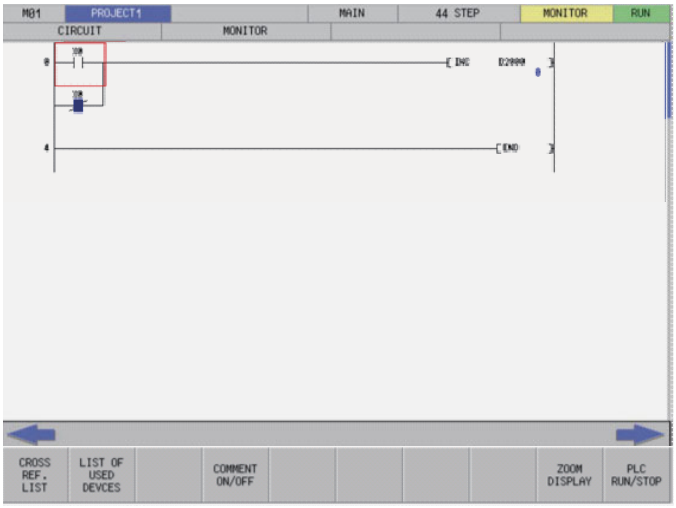
6.4.4 Pinch-in/Pinch-out

When zoom display menu is enabled in the ladder monitor/ladder edit, reduced display by pinch-in (Enlarged -> Standard -> Reduced) and enlarged display by pinch-out (Reduced -> Standard -> Enlarged) are available.
Refer to the following for the condition to enable the zoom display menu.

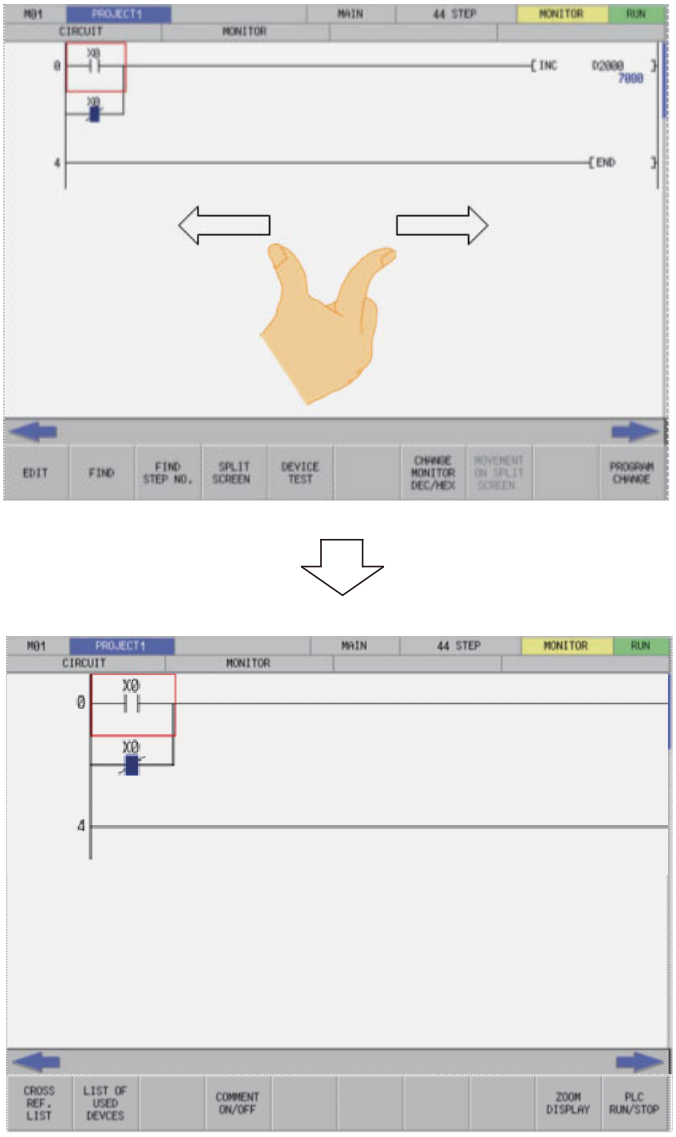
Ladder monitor: "Enabled/Disabled State of Menu Keys" in "Ladder Menu: Ladder Monitor"
Ladder edit: "Enabled/Disabled State of Menu Keys" in "Ladder Menu: Editing Ladders"

(Example) Ladder monitor screen (Reduced by pinch-in)





(Example) Ladder monitor screen (Enlarged by pinch-out)



6.5 Language

6.5.1 Screen Display Language

The various menus and error messages displayed by the PLC On-board can be changed by the parameter "#1043 lang" (Select language displayed) settings as shown in the following table.
The following table describes the timing at which additional languages can be changed.

Timing to change additional languages
Startup and display of the PLC On-board after changing the language parameter

Language parameter	Screen additional languages
0: English display	Displayed in English.
1: Japanese display	Displayed in Japanese.
22: Chinese (simplified)	Displayed in Chinese (simplified).
Language parameters other than the above	Displayed in English.

6.5.2 Language for Device Comments, Statements, Notes, and Machine Names

Each data of device comments, statements, notes and machine names can be changed by the parameter "#1043 lang" (Select language displayed) settings as shown in the following table.

Language parameter	Additional languages
0: English display	English data can be displayed. Data other than English data is not guaranteed to be displayed.
1: Japanese display	Japanese data and English data can be displayed.
22: Chinese (simplified)	Chinese data and English data can be displayed.
Language parameters other than the above	English data can be displayed. Data other than English data is not guaranteed to be displayed.

6.6 PLC Data

6.6.1 PLC Data Used by the PLC On-board

The PLC On-board uses the same data as GX Developer/GX Works2 as illustrated in the following table.

Data type	Data name	Application
Sequence programs	Data names are configured by up to eight one-byte uppercase alphanumeric characters (*1).	The user PLC, statements, and notes are stored.
PLC messages	Data names are configured by up to eight one-byte uppercase alphanumeric characters (*1) and in accordance with PLC message naming conventions (*3).	PLC messages (alarms, operators, PLC switches, and comments) are stored.
Device comments	Data names are configured by up to eight one-byte uppercase alphanumeric characters (*1).	Comments and device names are stored.
Parameters	Parameter names are fixed and cannot be changed.	Program execution sequences and such are stored.
Trace files	Data names are configured by up to eight one-byte uppercase alphanumeric characters (*1).	The trace conditions and results are stored.
CSV files	Data names are configured by up to eight one-byte uppercase alphanumeric characters (*1).	The trace results are stored in CSV file format.

*1: Characters that cannot be used in data names

- Reserved characters (AUX, CON, PRN, NUL, COM1 to COM9, LPT1 to LPT9, and CLOCK$)
- Data names that include these characters result in error: " = | : ; , \ [ ] + * ? < > . /.

The following characters also cannot be used.

- Special NEC selected IBM extended characters (character codes: 0xED40 to 0xEEEC)
- IBM extended characters (character codes: 0xFA40 to 0xFC4B)
- Characters of character codes that have the same appearance as NEC selected IBM extended characters and IBM extended characters within the range of character codes 0x849F to 0x879C

  Example: Roman numerals (I to X), ≡, ∫, Σ, √, Δ, ∩, and №

If any of these characters are used, processing that uses PLC data (opens, saves, etc.) will not execute correctly.

*2: Characters that can be used to set data names

Alphanumeric characters, Kana (Japanese syllabaries), Chinese characters, and these characters: _ $ ~(tilde) ! # % & ( ) - { } @ '.

*3: Use the following method to change names of PLC message data.

(1) Specify bits 0-2 (3 bits) of bit selection parameter #6453 (Language selection method using only the PLC).

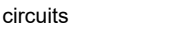
Data type	Data name	Details of data
Program	M1xxxxxx	PLC message in the 1st language
	:	
	M7xxxxxx	PLC message in the 7th language
	M8xxxxxx	PLC message in the 8th language

(2) Specify with the display language selection parameter (Base specification parameter #1043 (Method linked with language selection on the setting and display screens)).

Data type	Data name	Details of data
Program	M00xxxxxx	PLC messages for language parameter 0 (English)
	M01xxxxx	PLC messages for language parameter 1 (Japanese)
	:	
	M25xxxxx	PLC messages for language parameter 25 (Czech)

6.6.1.1 Sequence Program Details

The following details for created data can be saved as program data.

Saved details	Outline
Program (ladder) circuits	This is data used to edit and monitor the user PLC with ladder diagrams of  .
Statements	Statements are text strings added to each program ladder block to make it easier to understand the flow of the entire program. Statements include integrated statements that can be stored in the NC and peripheral statements that cannot be stored in the NC. (Refer to *1)
Notes	Similar to statements, notes are text strings added to each coil and function instruction in the program ladder to make it easier to understand the flow of the entire program. Notes include integrated notes that can be stored in the NC and peripheral notes that cannot be stored in the NC. (Refer to *1)

*1: Integrated statements, notes, and peripheral statements

Integrated type	Integrated types can be saved in the NC. Note that the program data takes up a large amount of memory when stored in the NC.
Peripheral types	Peripheral types are deleted when saved to the NC. For this reason, when using peripheral statements or notes, they must be managed as GX Developer/GX Works2 projects.

6.6.1.2 PLC Message Details

The following table lists the PLC message types.

Saved details	Outline
Alarm messages	PLC alarm messages displayed on the NC.
Operator messages	PLC operator messages displayed on the NC.
PLC switches	Text strings used to name PLC switches.
Comment messages	PLC comment text strings displayed on the NC.

6.6.1.3 Device Comment Details

The following table lists the device comment types and details.

Saved details	Outline
Device comments	Text string data added to each device. Programs are easier to understand when comments are assigned to the devices.
Aliases	These text strings are displayed in place of the device name. These text strings make it easier to visually distinguish between programs.

6.6.1.4 Parameter Details

The following table lists the parameter types and details.

Saved details	Outline
Program settings	These are execution sequences for multiple programs (ladders).
Common pointer settings	These are numbers placed at the beginning of common pointers.

6.6.1.5 Trace File Details

The following details can be saved as the trace file.

Saved details	Outline
Trace conditions	Sampling trace conditions such as the number of trace times, trace points, trigger points, trace data, etc.
Trace results	Trace data of the bit device and word device.

6.6.1.6 CSV Format File Details

The following detail can be saved in CSV format.

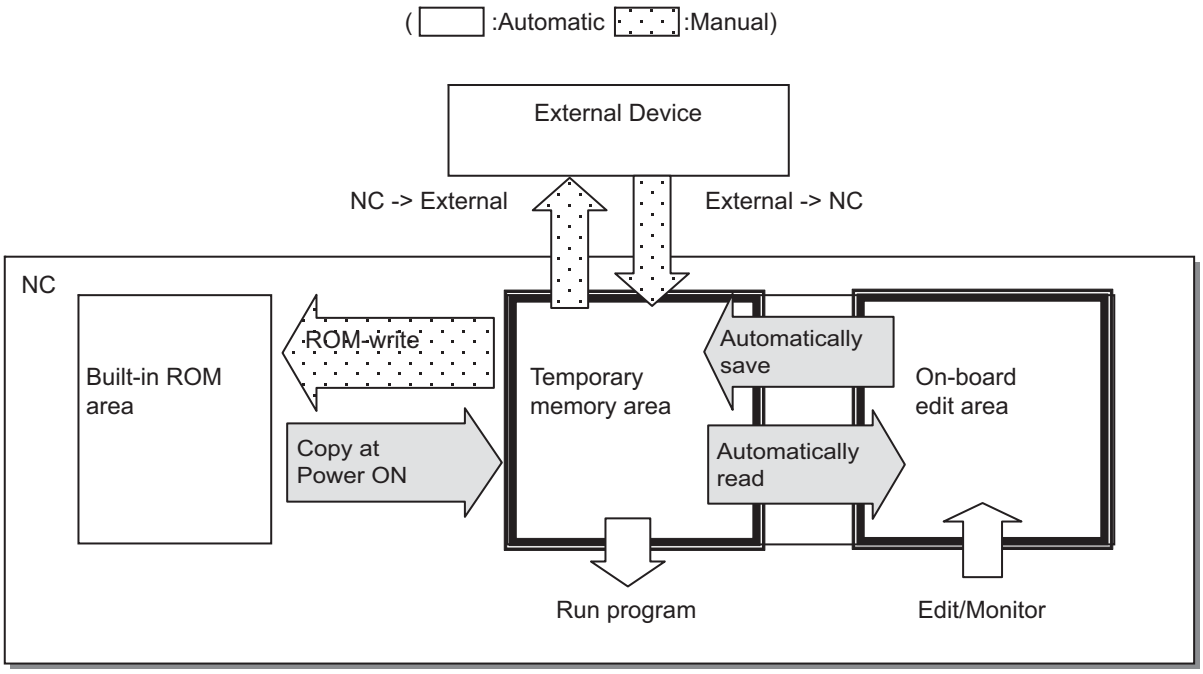
Saved details	Outline
Trace results	Trace data of the bit device and word device stored in CSV format.

6.6.2 PLC Data Storage Areas

PLC data used by the PLC On-board is stored in the following locations.

Storage area	Application
Temporary memory area	This area stores data used to execute the PLC. This data is editable with the PLC On-board and GX Developer/GX Works2 but is deleted when power to the NC is turned off.
Internal ROM area	This area stores the PLC data. The data in this area is not lost when the power to the NC is turned off. (Note) The data in the temporary memory is lost when power to the NC is turned off, so always save the data in the internal ROM area.
On-board editing area	This area is used when editing and monitoring the PLC data with the on-board. When editing or monitoring, open the PLC data that is in the temporary memory into the on-board editing area.
External devices (SD cards/USB memory)	PLC data can be read from external devices to the on-board editing area and the temporary memory area. GX Developer project data can be read.

Configuration diagram of the PLC data storage areas



6.6.2.1 Readable PLC Data with PLC On-board

Tables below are the guidelines for readable PLC data size with PLC on-board in M800S or M80.

[For M800S]

Program		Device comment(Note)	
Number of steps	Storage capacity	File size	Storage capacity
1000 steps	120 pcs	250 KB	4 pcs
25000 steps 5000 steps 2000 steps	2 pcs 5 pcs 5 pcs	250 KB	4 pcs
128000 steps	1 pc	250 KB	4 pcs

[For M80/E80]

Program		Device comment(Note)	
Number of steps	Storage capacity	File size	Storage capacity
1000 steps	60 pcs	250 KB	4 pcs
25000 steps 5000 steps 2000 steps	2 pcs 2 pcs 2 pcs	250 KB	4 pcs
64000 steps	1 pc	250 KB	4 pcs

(Note) The file size of device comments shall be around 1 MB in total.

When the on-board editing area capacity becomes small because the stored PLC data size is larger than above tables, a message "Remaining capacity of the PLC on-board is insufficient. Processing suspended." will be displayed and the process in execution may stop.
Even when the process was suspended, PLC on-board is performed with the data which process was completed.
When necessary data are not processed, you need to format the storage and store the only necessary data to the NC in reference to above tables, and then execute the process again.

The number of ladder files and PLC message files available on one project

Maximum number of ladder files and PLC message files available on one project is as follows: number of ladder files + number of PLC message files < 125. (The 125th and subsequent files cannot be read.)

If the total of ladder files and PLC message files exceeds 125, develop the project in either of the following methods:
- Read only the necessary PLC message files to the PLC on-board. (PLC message files are not read automatically when you start PLC on-board. Thus select [NC FILE] - [OPEN] to read them.)
- Use the multi-project function to set the number of files per project to 124 or less.

6.6.3 Passwords for PLC Data Files

Passwords are set on some PLC data files to protect PLC data.
Passwords for PLC data files stored in the NC can be temporarily cleared by the PLC On-board.
*The PLC On-board cannot be used to register, change, or delete file passwords.
Perform the following operations on GX Developer/GX Works2.
Refer to "Peripheral Development Environment Description: File Password Function".

6.6.3.1 File Password Attributes

File passwords have write attributes (writes allowed/not allowed) and read attributes (reads allowed/not allowed). The following table describes the operation restrictions corresponding to these attributes.

Attribute	Restricted operation
Writes not allowed	PLC data cannot be overwritten, deleted or changed after editing circuits.
Reads and writes not allowed	In addition to the preceding restrictions, PLC data cannot be read or viewed.

6.6.3.2 Clearing File Passwords

As illustrated in the following table, the screen used to cancel passwords is displayed in accordance with the proper matching of operations performed and file attributes marked with "Yes" in the [Attribute criteria].
Data protection mechanisms can be temporarily cleared by entering the password on the screen.

Operations			Attribute criteria	
			Writes not allowed	Reads and writes not allowed
NC File Operation ->	Open -> Open		-	Yes
	File Operation ->	Delete Data -> Delete	Yes	Yes
		Rename Data name -> Change	Yes	Yes
	Password Cancellation		Not relevant	
	PLC version up		Yes	Yes
External File Operation ->	External -> NC -> Execute		Yes	Yes
	NC -> External -> Execute		-	Yes
	Verify External File -> Execute		-	Yes
	Password Cancellation		Not relevant	
Edit ladder -> Perform edits -> Change			Yes	Yes

Refer to "Canceling File Passwords" for information on clearing file passwords.

6.6.3.3 Valid Period of File Password Clears

The password cancel state is valid until the PLC On-board is restarted or the connected project is changed.
Passwords do not need to be entered again when reading PLC data again or overwriting PLC data for which passwords have been cleared.
Passwords must be entered again and cleared when passwords for PLC data are changed in GX Developer/GX Works2.

6.6.3.4 Precautions for File Password Setting

If you forgot or rewrite the password, refer to "Peripheral Development Environment Description: File Password Function".

6.6.3.5 Simultaneous connection of PLC on-board and GX Developer/GX Works2

Do not connect PLC on-board and GX Developer/GX Works2 simultaneously.
The operation for PLC data in the NC if reading and writing are performed with GX Developer/GX Works2 and PLC on-board simultaneously cannot be guaranteed.
The monitor function such as circuit monitor can be used simultaneously.

6.7 Starting

6.7.1 Starting the On-board

There are two methods used to start the PLC On-board.

(1) Start from the Mitsubishi standard display

There is a [Ladder Monitor] menu on the save screen in the Mitsubishi standard display. (area inside the red lines in the following diagram)

Selecting this menu starts the PLC On-board and displays the main screen.

(2) Start by pressing the [F0] key

Pressing the [F0] key when the bit selection parameter that enables the PLC On-board is set starts the PLC On-board and displays the main screen.

6.8 Ending the PLC On-board and Transitioning to the Mitsubishi Standard Display

6.8.1 Ending the PLC On-board

There is no end menu in the PLC on-board. For this reason, to end the PLC On-board, transition to the Mitsubishi standard display or turn off the power to the NC.

6.8.2 Transitioning to the Mitsubishi Standard Display

6.8.2.1 Method to transition to the Mitsubishi standard display

The following table describes the method used to transition from the PLC on-board to the Mitsubishi standard display.

Method to transition to the Mitsubishi standard display
Press the [MONITOR], [SET UP], [EDIT], [DIAGNOSIS], or [MAINTENANCE] key on the NC hardware keyboard to transition to the screen corresponding to the Mitsubishi standard display.
Press the [OPERATE], [ARRANGE], [EDIT], [DIAGNOSIS], or [SAVE] key on the PLC on-board soft keyboard to transition to the screen corresponding to the Mitsubishi standard display.

(*1) When you transit to Mitsubishi standard screen while a pop up screen such as the one for writing data to ROM is displayed, and then transit to the PLC on-board screen, the displayed pop up screen is closed.

(*2) You cannot transit to Mitsubishi standard display if any of the following conditions is met. To transit to Mitsubishi standard display, close the screen once.

- Progress bar is displayed
- Message box is displayed
- The setting area to cancel the file password individually is displayed
- When an unconverted ladder is displayed on the ladder edit screen and you did not accept the message confirming whether to delete the unconverted ladder

6.9 Basic Operation

This section describes the basic operational procedures to use the PLC on-board. Refer to the operational procedures for each screen (described later) for information on operating specific screens.

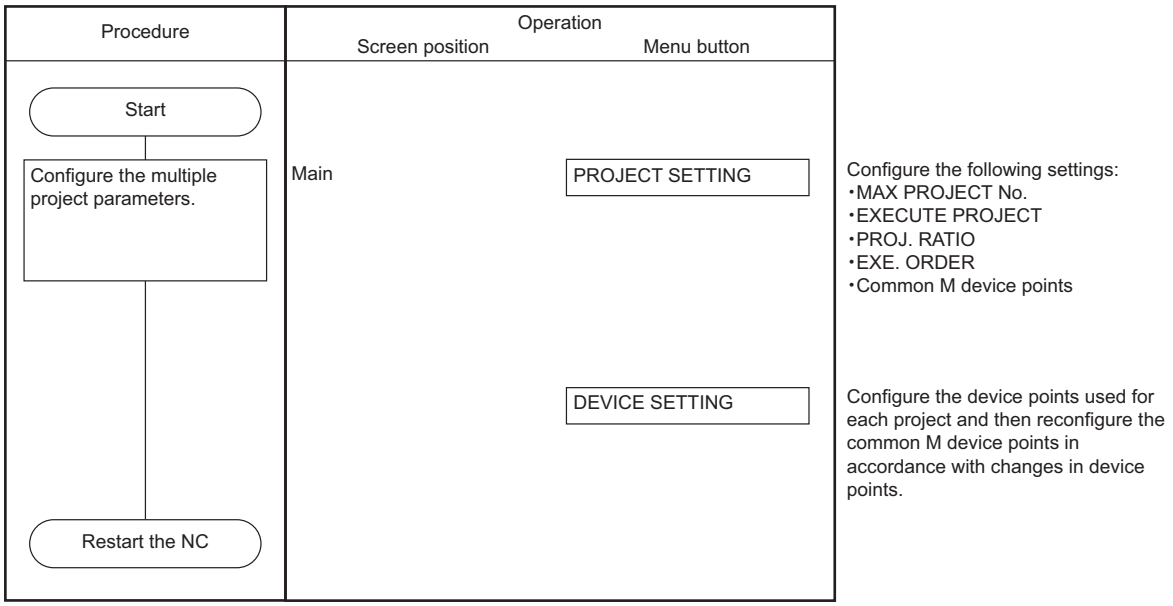
6.9.1 Basic Operation 1 (Configuring Multiple Project Parameters)

The following information describes the configuration procedure when using multiple projects.

6.9.1.1 Cases in which sequence programs are not stored

If the sequence programs are not stored, the menu key used to configure multiple project parameters is displayed on the main screen.

*The NC must be restarted to update the multiple project parameter configuration.



6.9.1.2 Cases in which sequence programs are stored

If the sequence programs are stored in the NC, use the following procedure to configure the multiple project parameters.

Procedure	Operation
1	Backing up the sequence programs
2	Configure the multiple project parameters

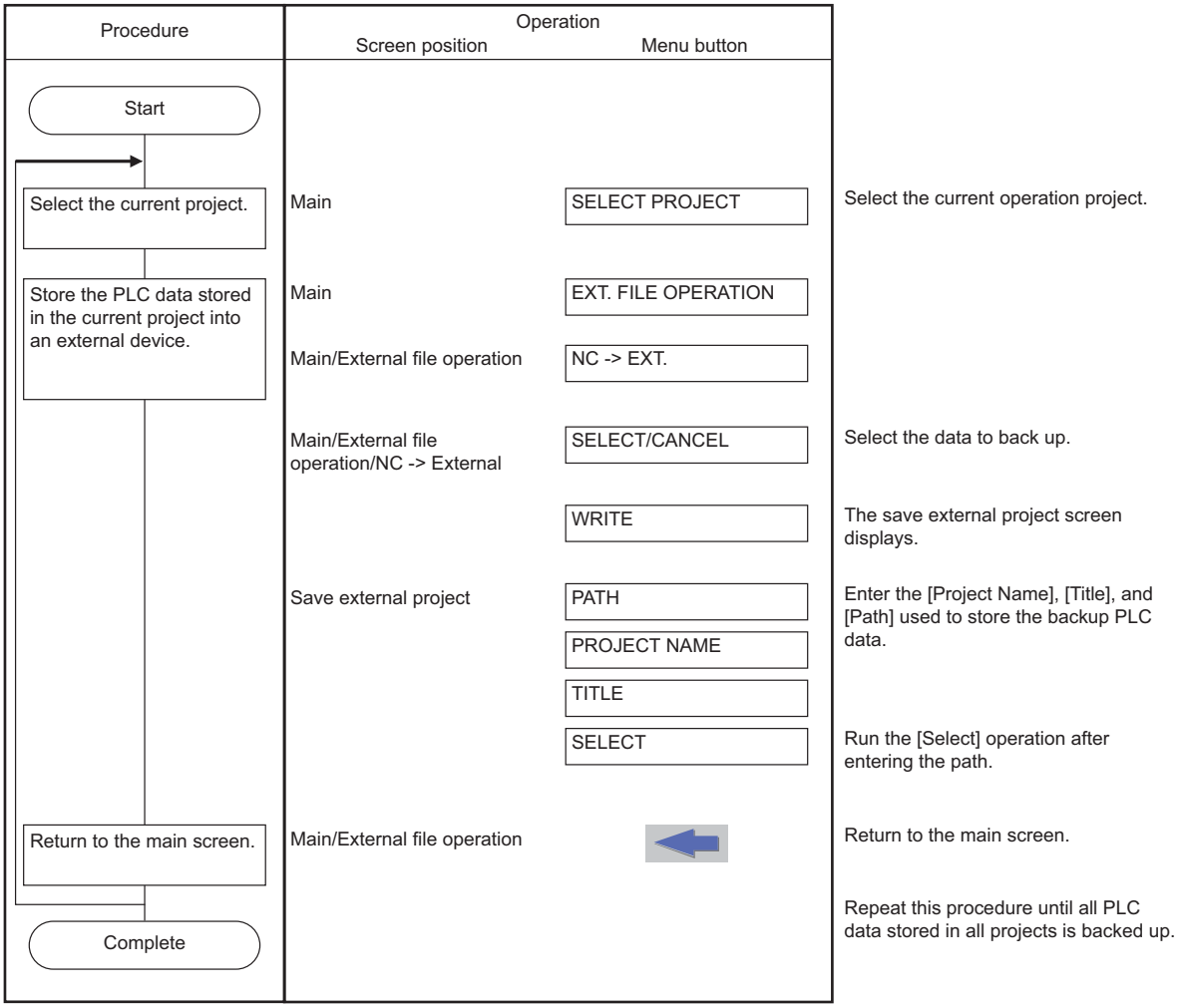
Backing up the sequence programs

An external device such as an SD card or USB memory is required to backup sequence programs. Perform these operations after mounting an external device.

(1) To use only one project

Procedure	Operation Screen position	Menu button	
Start	After the PLC on-board starts, the system automatically reads PLC data and transitions to the ladder screen. The monitor also starts.		
Return to the main screen.	Ladder		
PLC data stored in the NC is stored in external devices.	Main	EXT. FILE OPERATION	
	Main/External file operation	NC -> EXT.	
	Main/External file operation/NC -> External	SELECT/CANCEL	Select the data to back up.
		WRITE	The save external project screen displays.
	Save external project	PATH	Enter the [Project Name], [Title], and [Path] used to store the backup PLC data.
		PROJECT NAME	
		TITLE	
		SELECT	Run the [Select] operation after entering the path.
Return to the main screen.	Main/External file operation		Return to the main screen.
Complete			

(2) To use multiple projects



6.9.2 Basic Operation 2 (Creating Your First Program)

If the sequence programs are not stored in the NC, follow the sequence of operations as described in the following table to create your first sequence program.

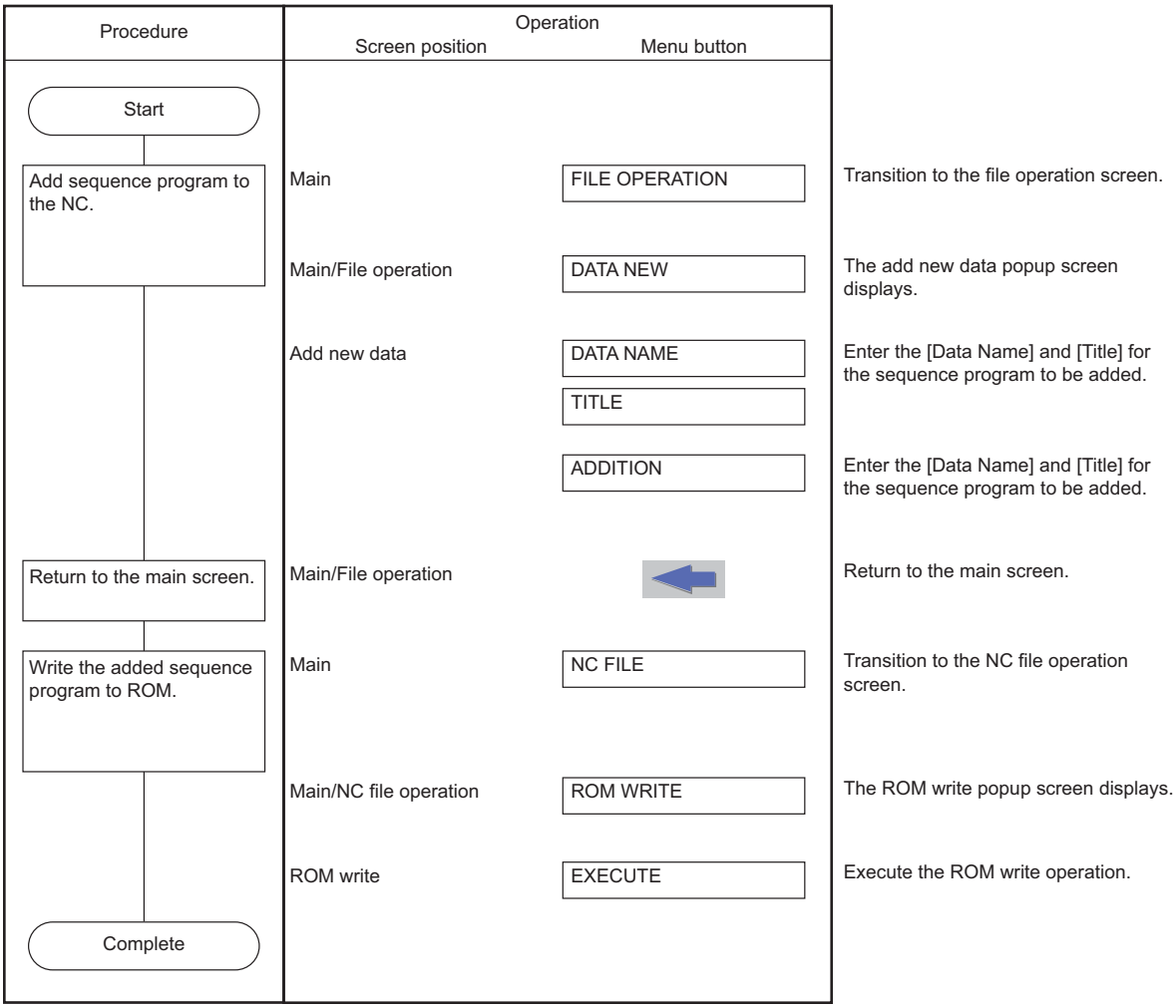
Procedure	Operation
1	Create a new sequence program
2	Edit the sequence program
3	Monitor the sequence program

*The procedure described is an example when using only one sequence program.
An example of using multiple programs will be described later.

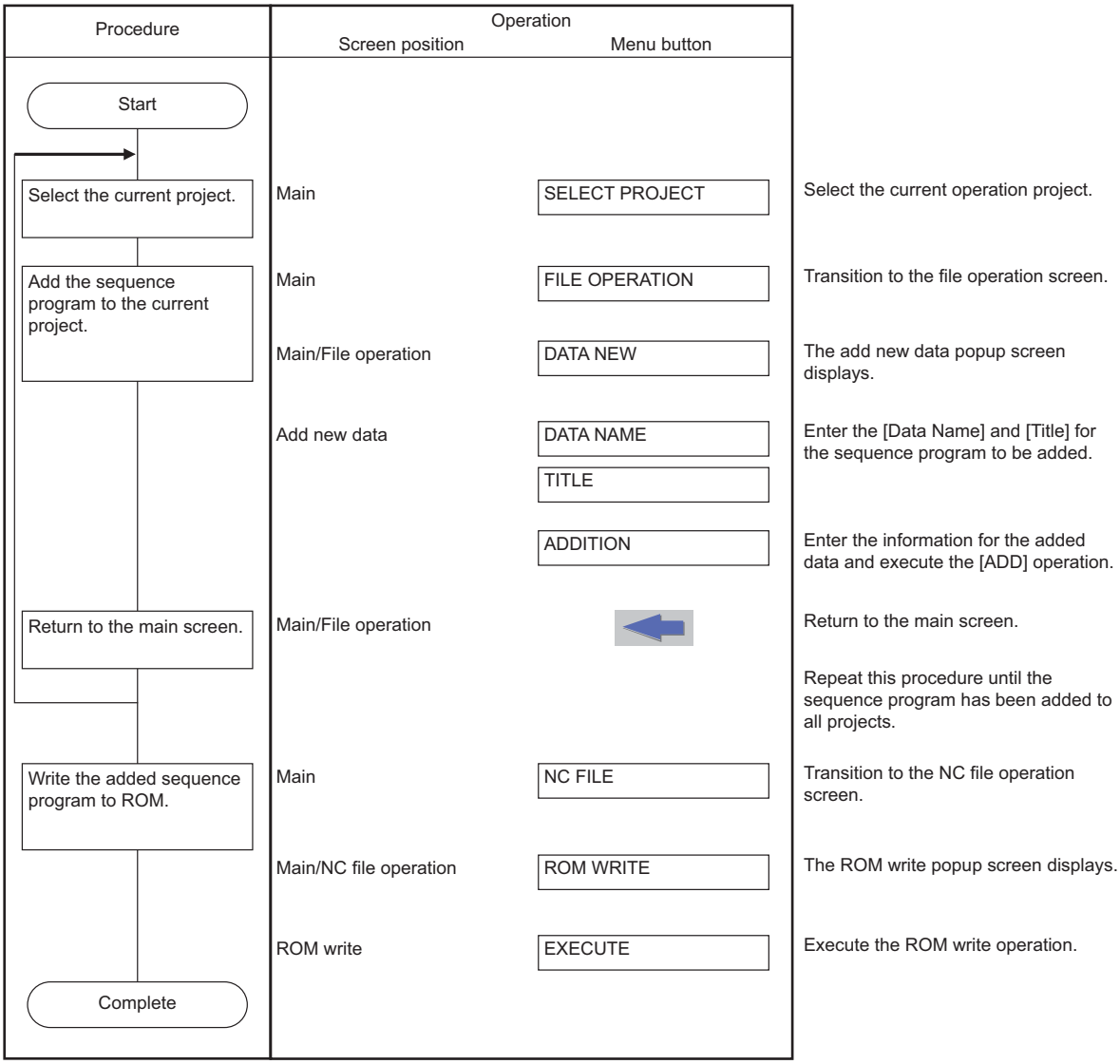
6.9.2.1 Adding New Sequence Programs

The following diagrams illustrate the procedure to add new sequence programs.

To use only one project



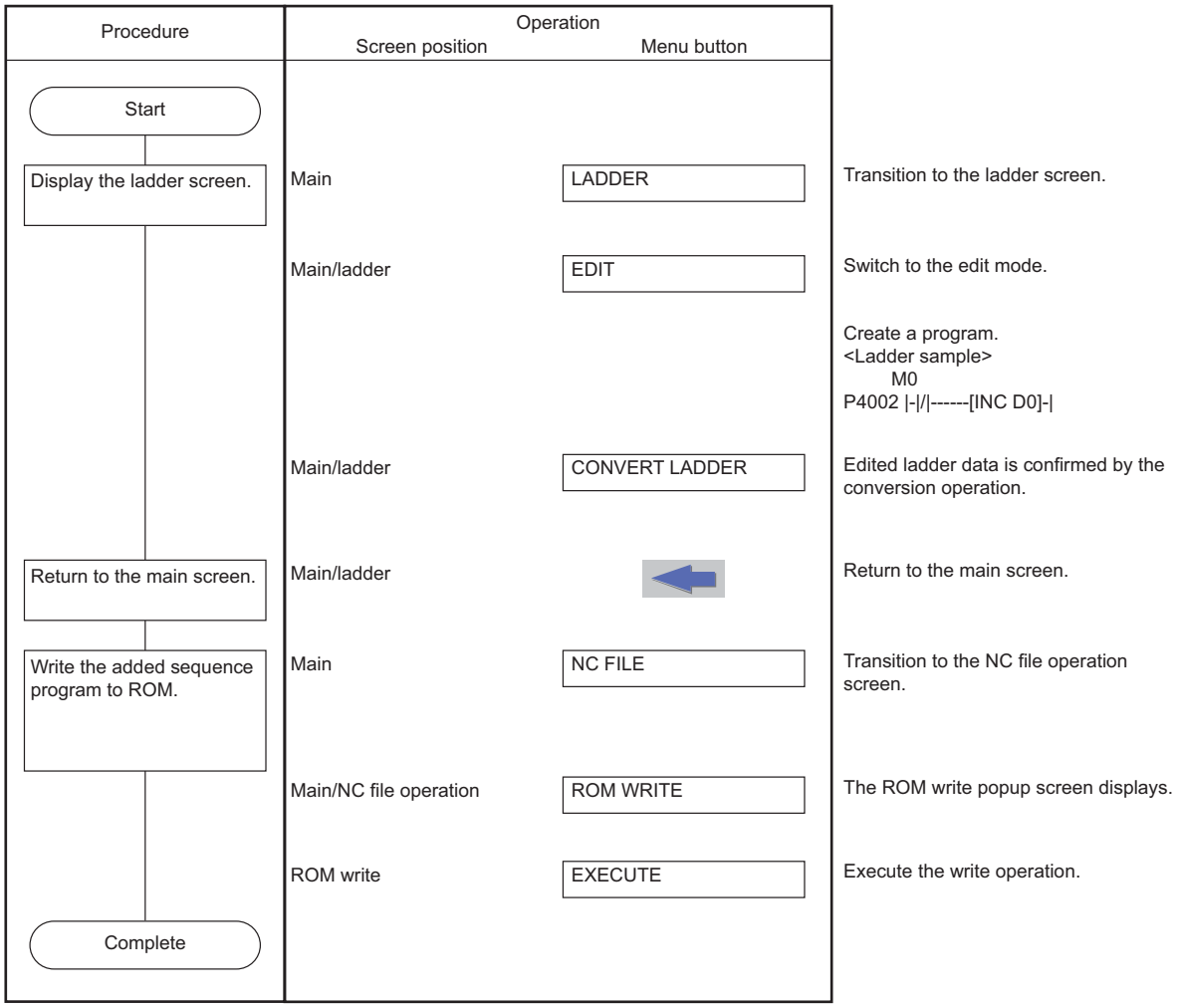
To use multiple projects



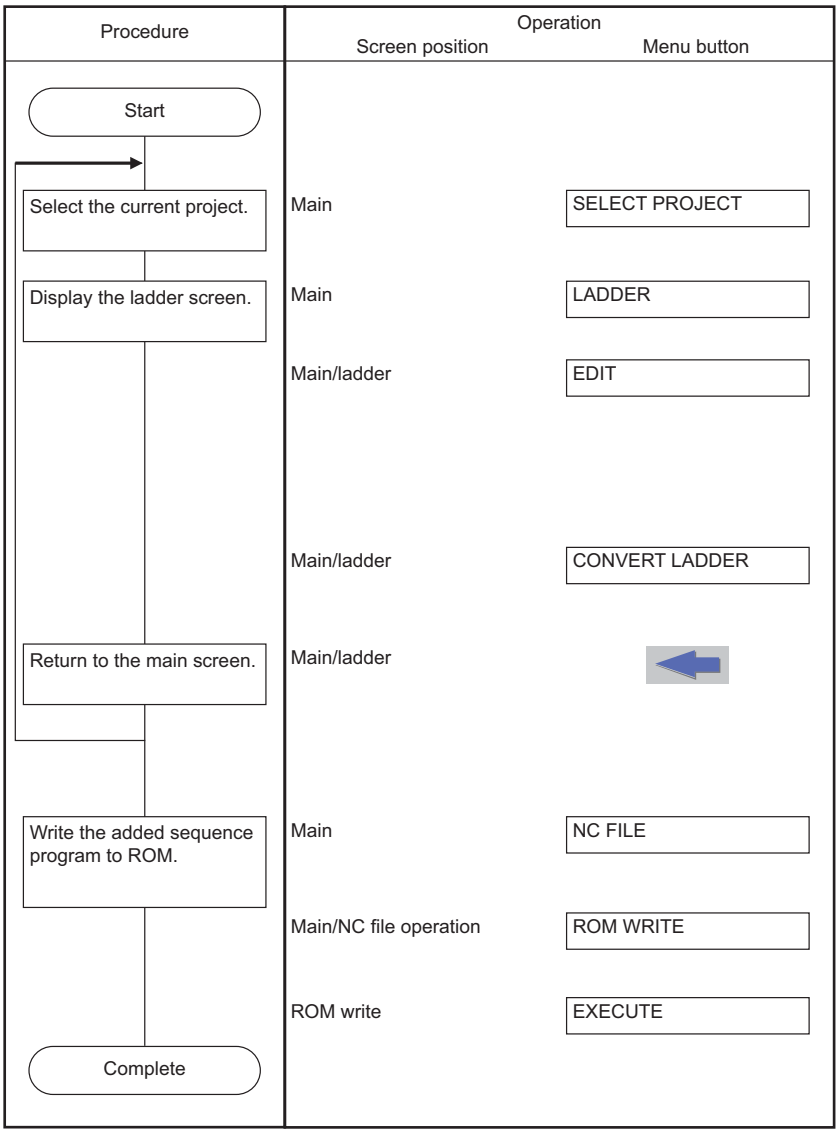
6.9.2.2 Editing the Sequence Program

The following diagrams illustrate the procedure to edit sequence programs.

To use only one project



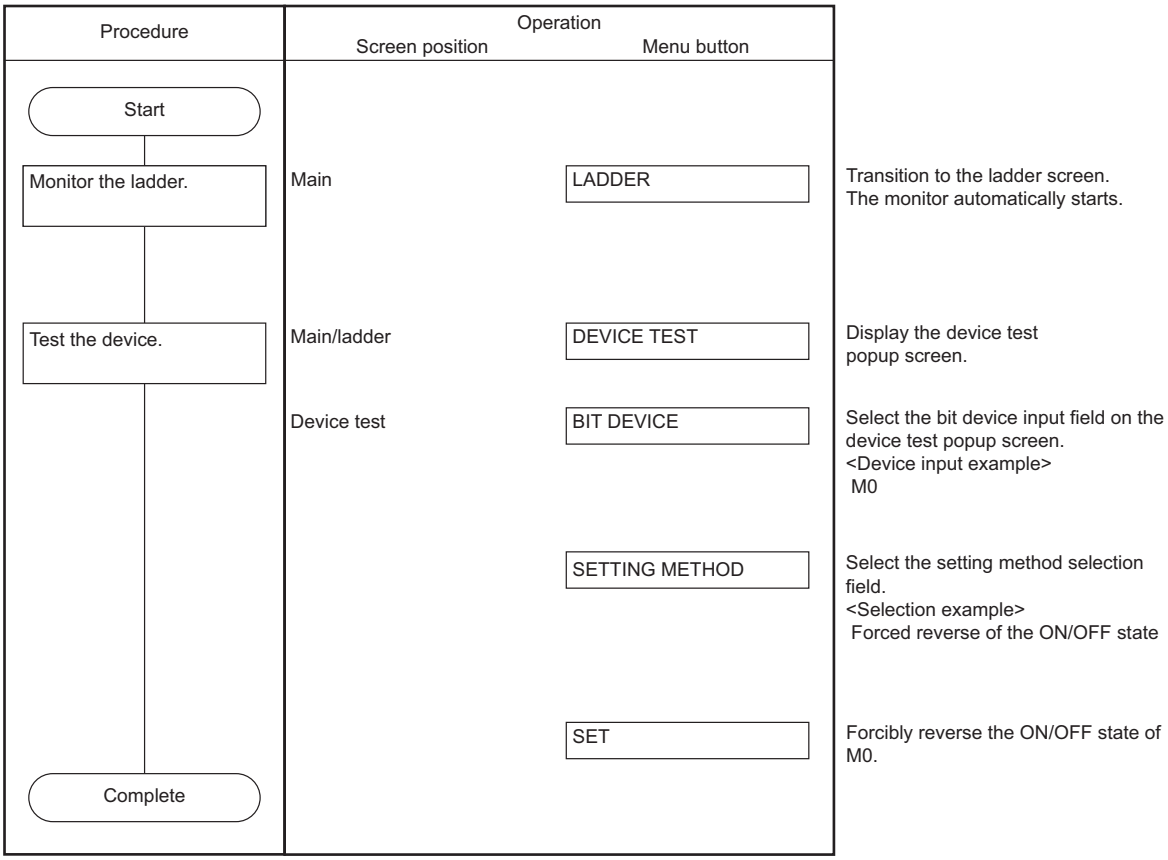
To use multiple projects



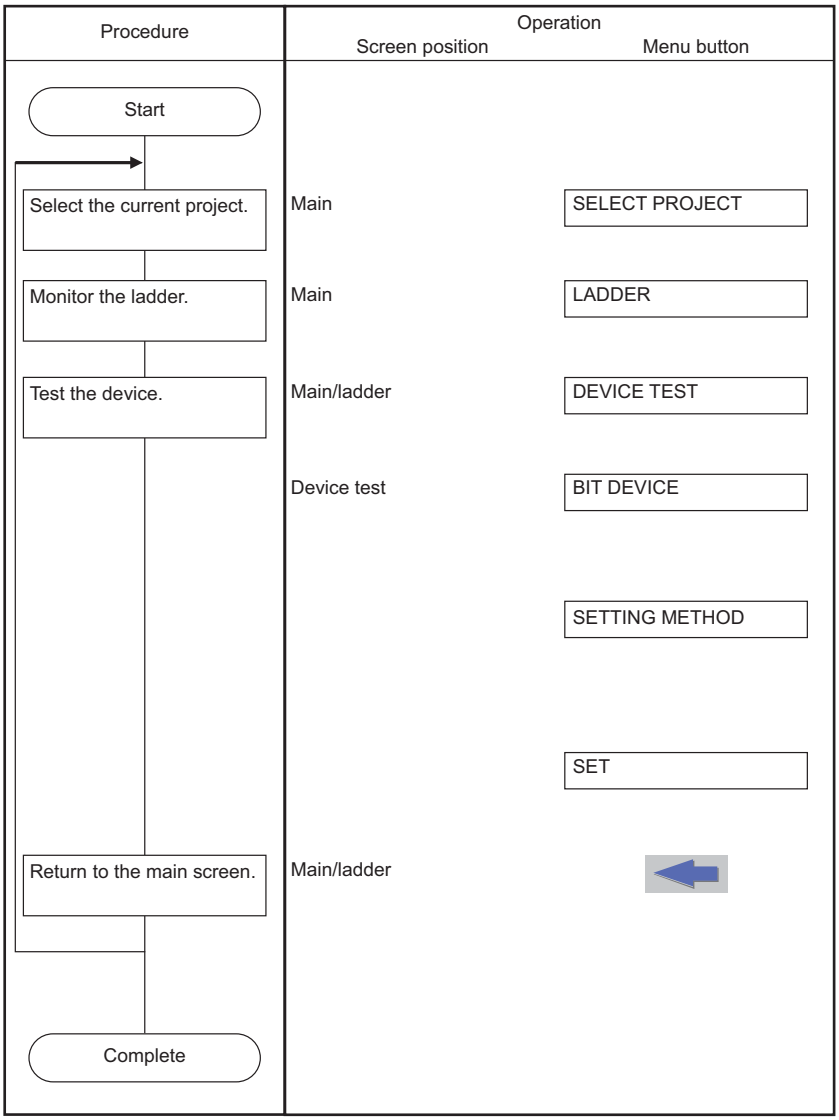
6.9.2.3 Monitoring Sequence Programs

The following diagrams illustrate the procedure to monitor sequence programs.

To use only one project



To use multiple projects



6.9.3 Basic Operation 3 (Editing Programs Stored in the NC)

If the sequence programs are stored in the NC, follow the sequence of operations as described in the following table to edit the sequence programs.

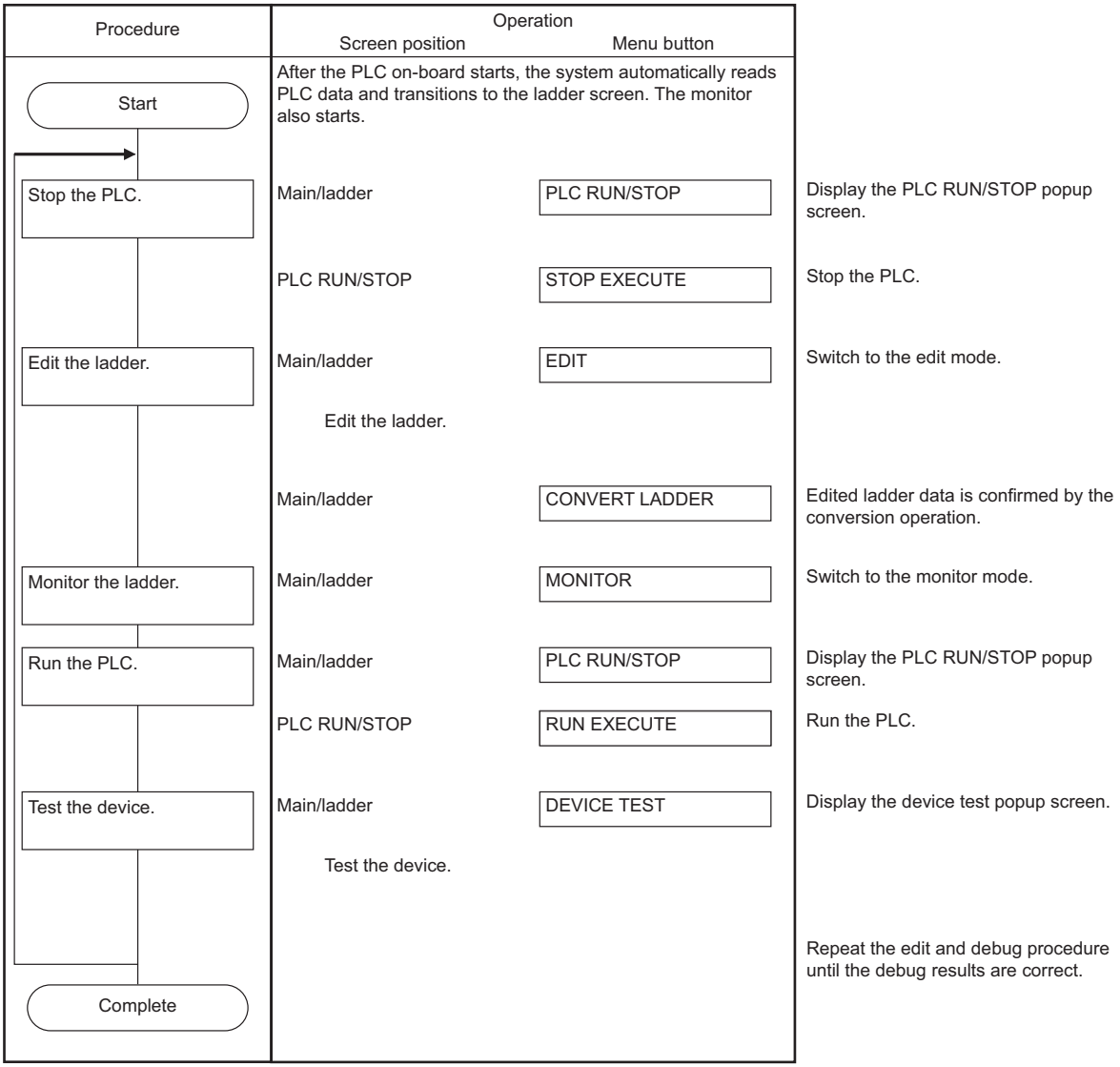
Procedure	Operation
1	Edit and debug the sequence program
2	Save the sequence program to the internal ROM

*The procedure described is an example when using only one sequence program.

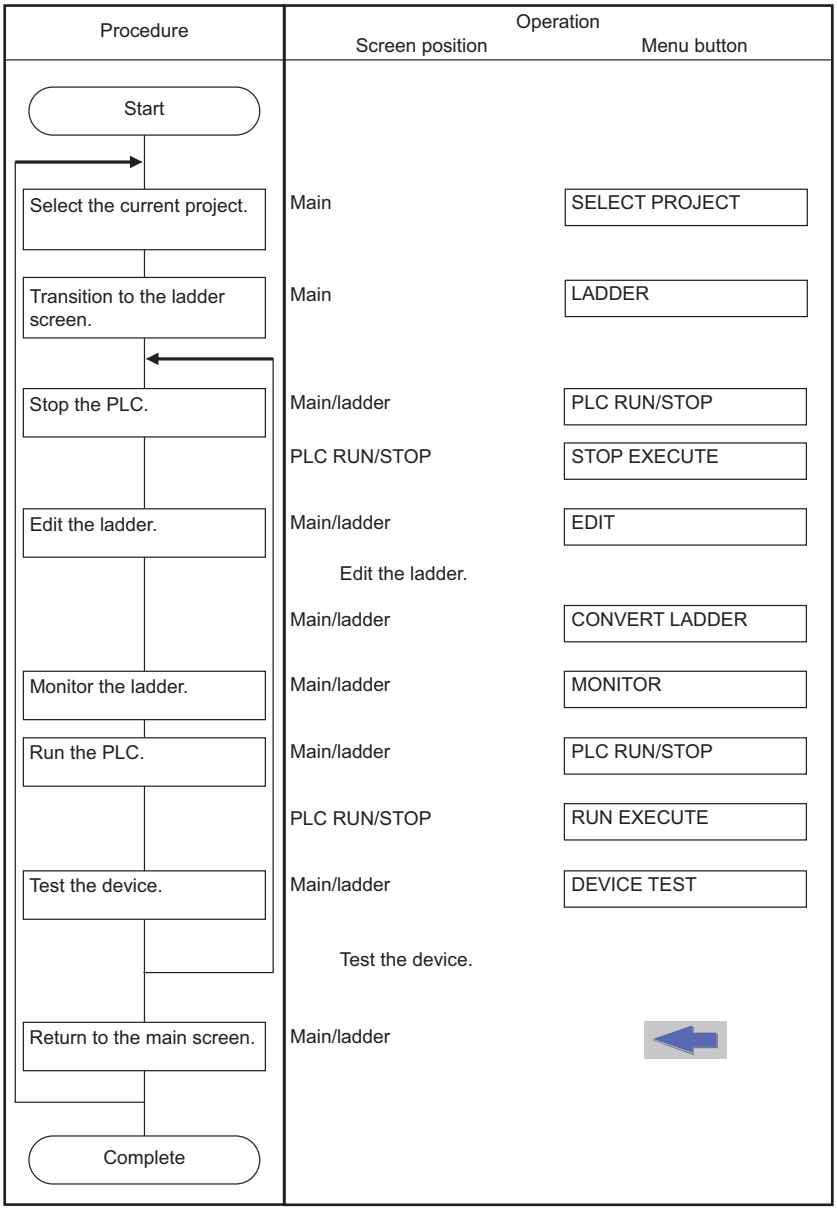
6.9.3.1 Editing and Debugging the Sequence Program

The following diagrams illustrate the procedure to edit and debug sequence programs stored in the NC.

To use only one project

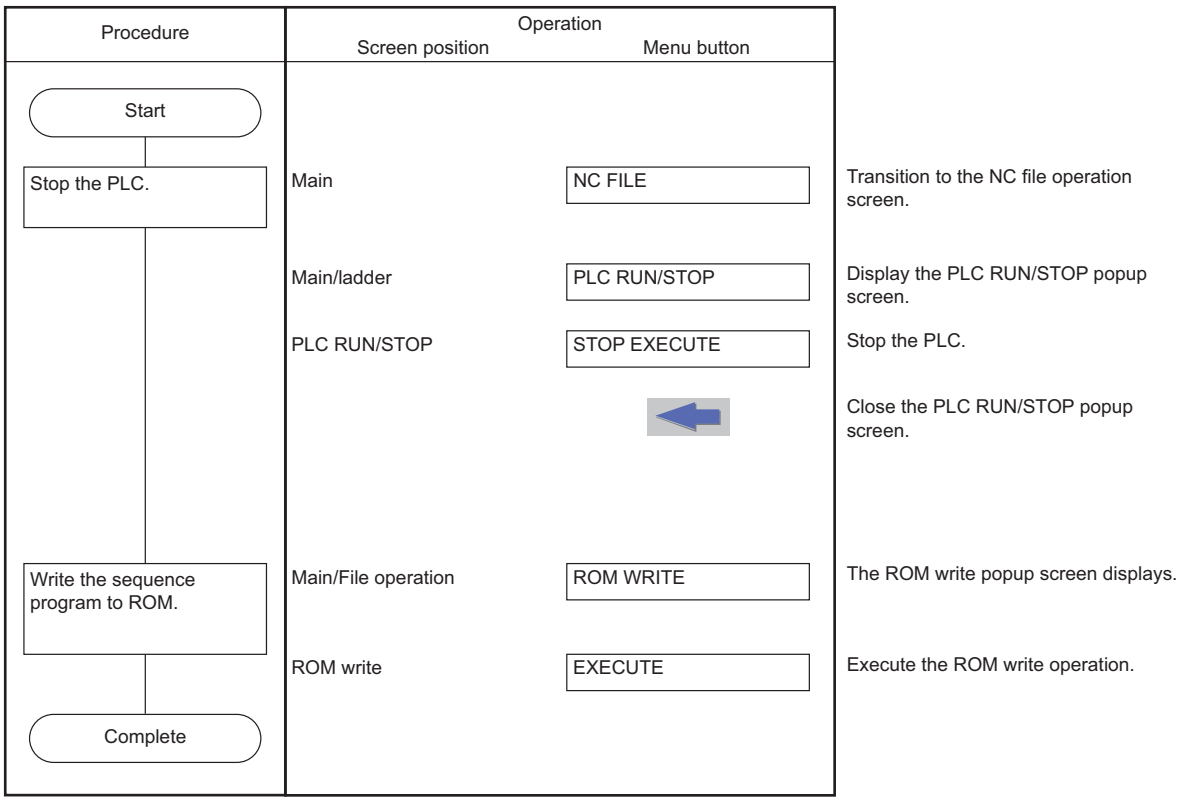


To use multiple projects



6.9.3.2 Saving the Sequence Program to the Internal ROM

The following diagram illustrates the procedure to save sequence programs ,which have been edited and debugged, to the internal ROM. The same procedure is executed whether using only one project or using multiple projects.



6.9.4 Basic Operation 4 (Creating Multiple Sequence Programs)

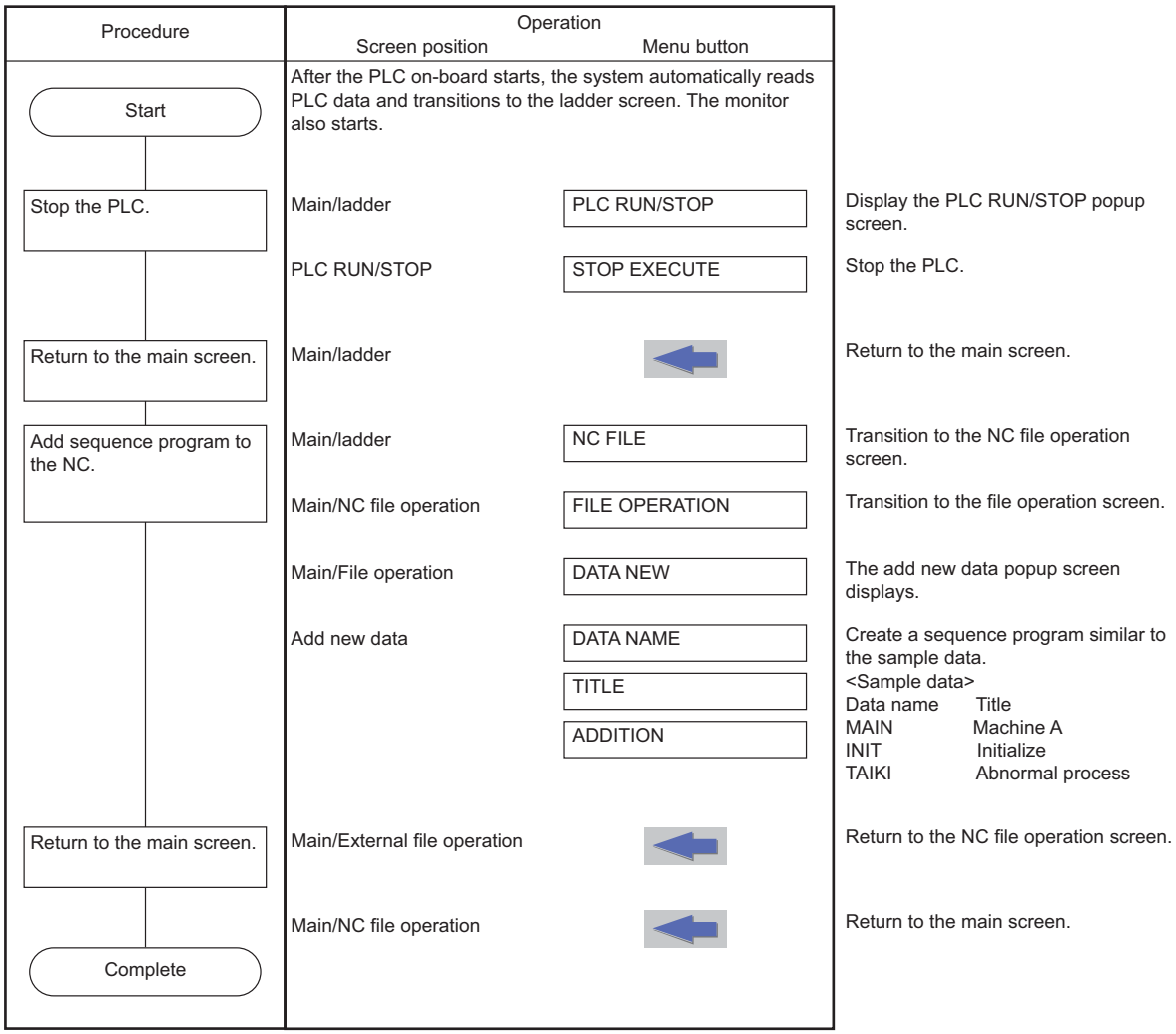
Follow the sequence of operations as described in the following table to create multiple programs.

Procedure	Operation
1	Add a sequence program
2	Configure the execution order of sequence programs
3	Edit and debug the sequence program
4	Save the sequence program to the internal ROM

6.9.4.1 Adding Sequence Programs

The following diagrams illustrate the procedure to add sequence programs.

To use only one project



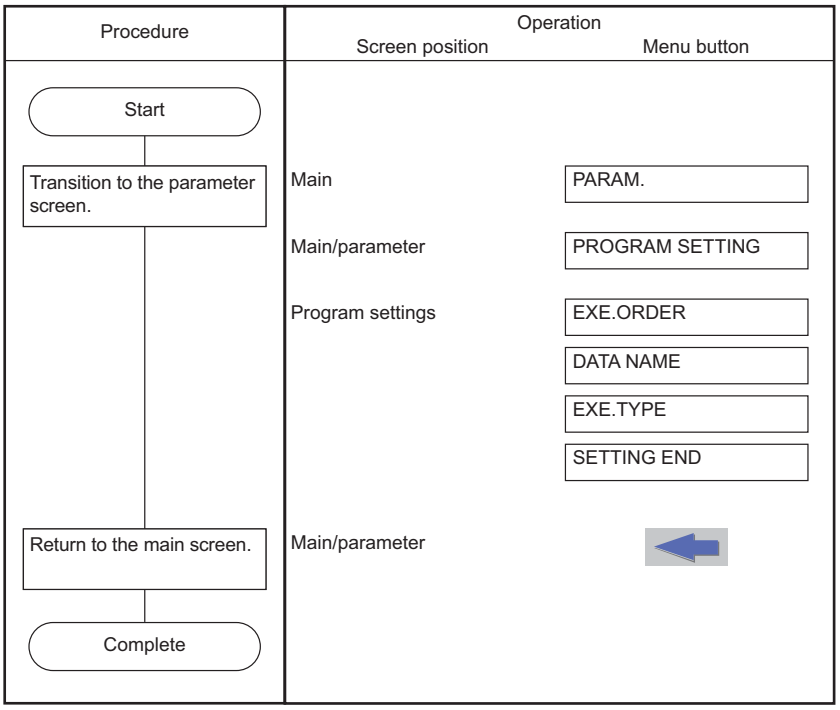
To use multiple projects

Procedure	Operation: Screen position	Operation: Menu button	
Start			
Select the current project.	Main	SELECT PROJECT	Select the current operation project.
Stop the PLC.	Main	NC FILE	Transition to the NC file operation screen.
	Main/NC file operation	PLC RUN/STOP	Display the PLC RUN/STOP popup screen.
	PLC RUN/STOP	STOP EXECUTE	Stop the PLC.
			Return to the NC file operation screen.
Add sequence program to the NC.	Main/NC file operation	FILE OPERATION	Transition to the file operation screen.
	Main/file operation	DATA NEW	The add new data popup screen displays.
	Add new data	DATA NAME TITLE ADDITION	Create a sequence program similar to the sample data. <Sample data> Data name Title MAIN Machine A INIT Initialize TAIKI Abnormal process
Return to the main screen.	Main/file operation		Return to the NC file operation screen.
	Main/NC file operation		Return to the main screen.
Complete			Repeat this procedure until the sequence program has been added to all projects.

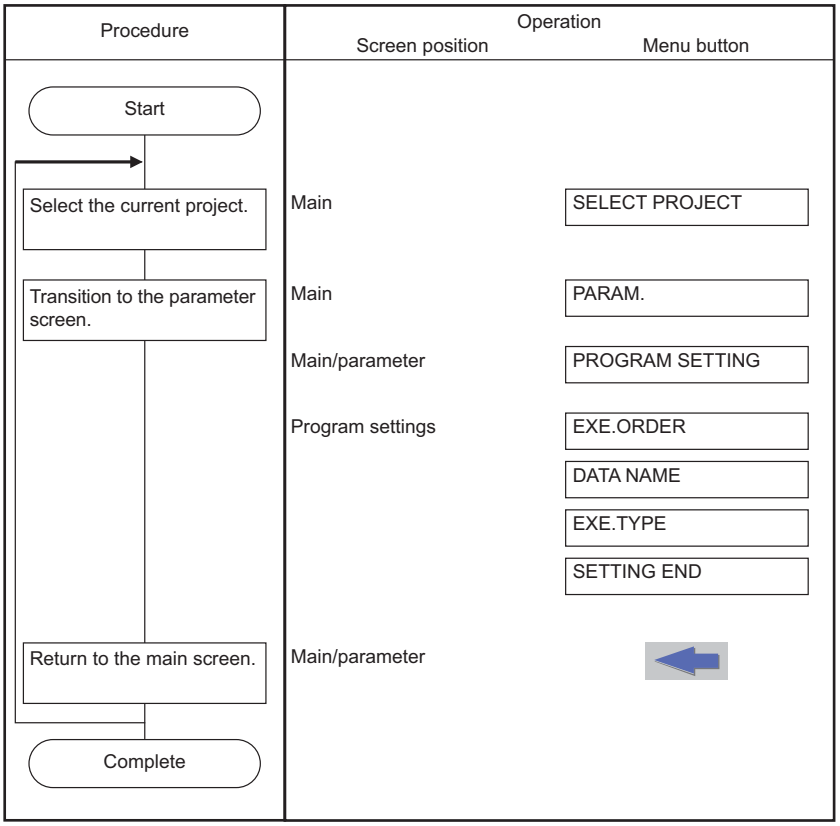
6.9.4.2 Configuring the Execution Order of Sequence Programs

The following diagrams illustrate the procedure to configure the execution order of sequence programs.

To use only one project



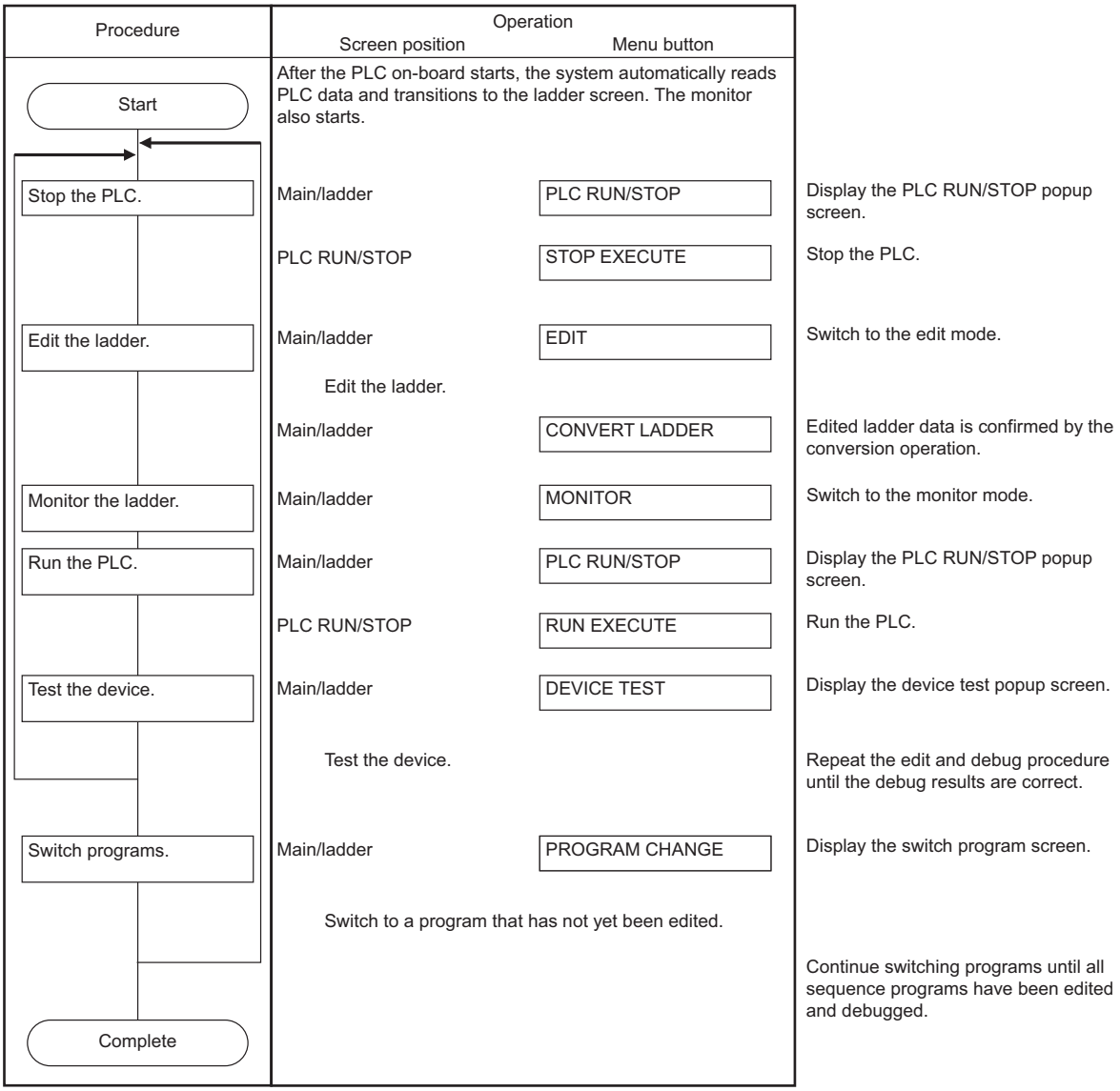
To use multiple projects



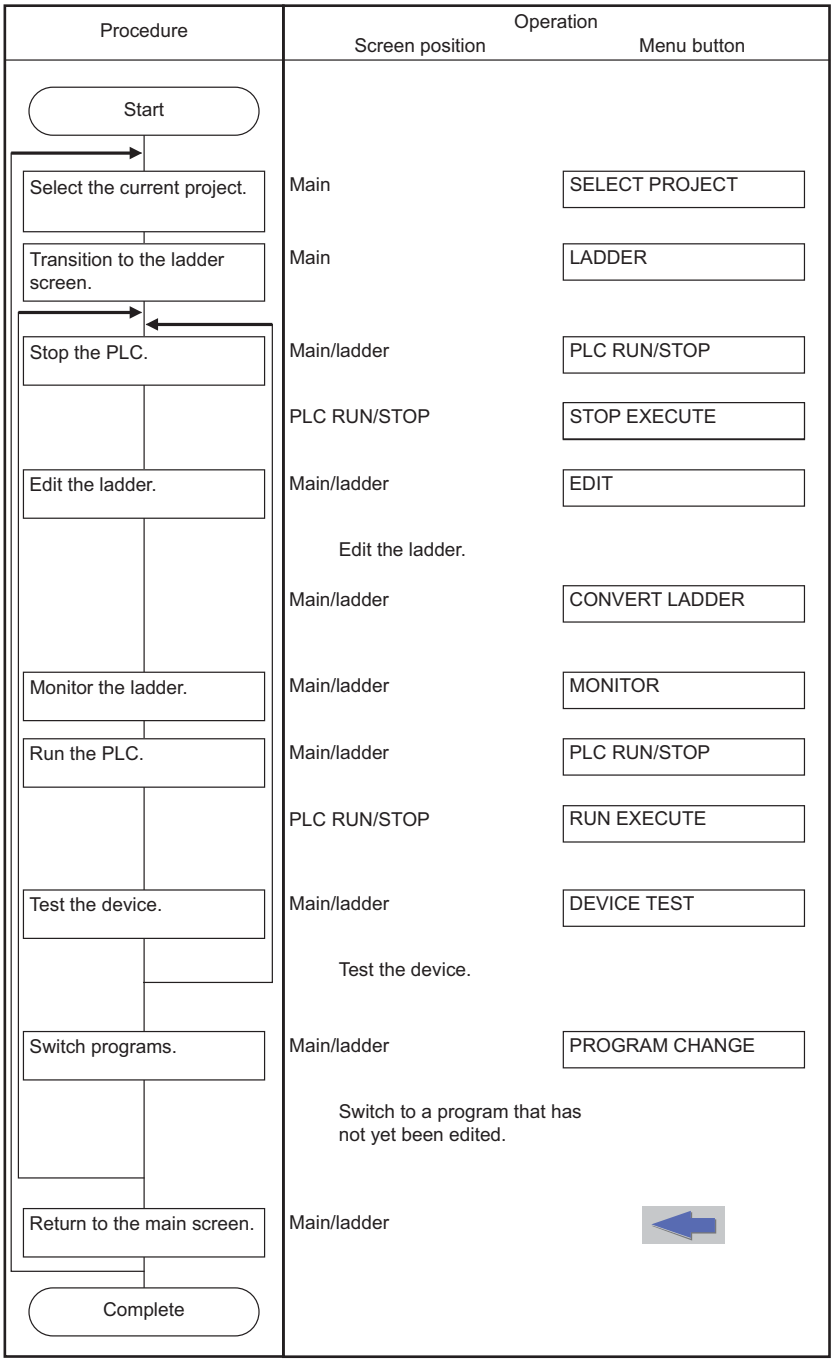
6.9.4.3 Editing and Debugging the Sequence Program

The following diagrams illustrate the procedure to edit and debug sequence programs stored in the NC.

To use only one project

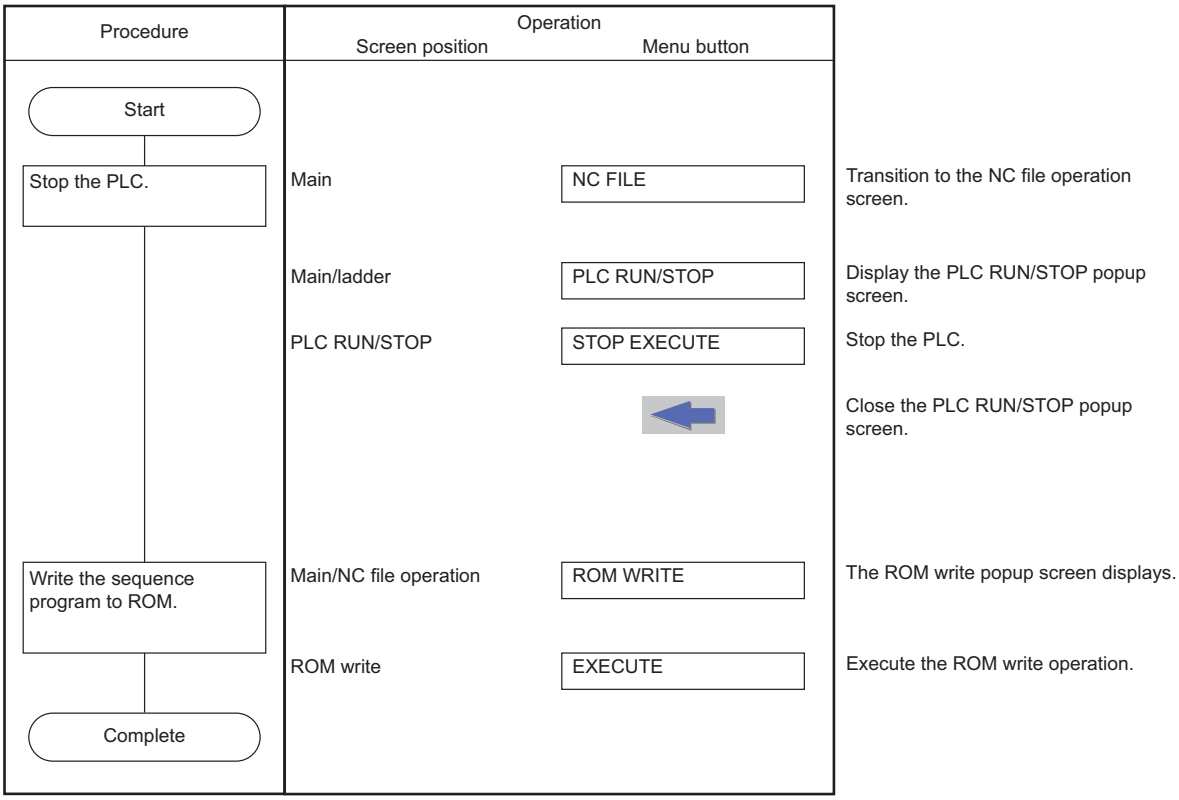


To use multiple projects



6.9.4.4 Saving the Sequence Program to the Internal ROM

The following diagram illustrates the procedure to save sequence programs ,which have been edited and debugged, to the internal ROM. The same procedure is executed whether using only one project or using multiple projects.



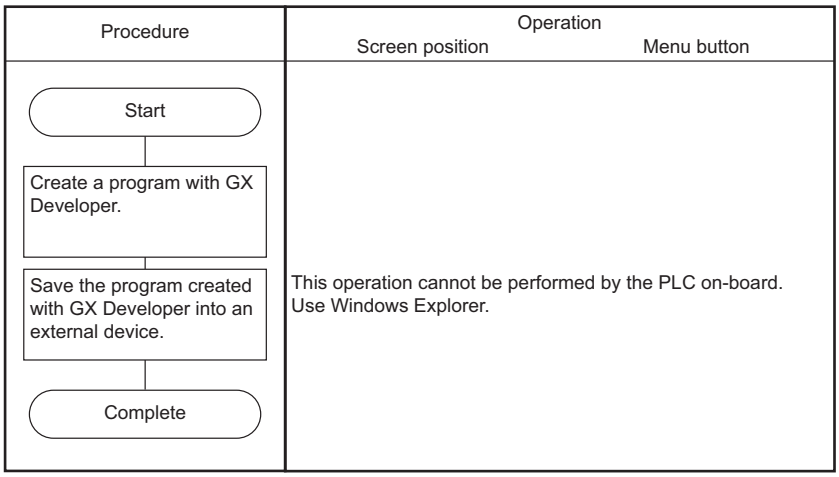
6.9.5 Basic Operation 5 (Loading Programs Created with GX Developer)

Follow the sequence of operations as described in the following table to load and adjust ladders created with GX Developer.

Procedure	Operation
1	Save PLC data to an external device
2	Save PLC data in external devices to the NC

6.9.5.1 Saving PLC data to an External Device

The following diagram illustrates the procedure to save PLC data to an external device. The same procedure is executed whether using only one project or using multiple projects.



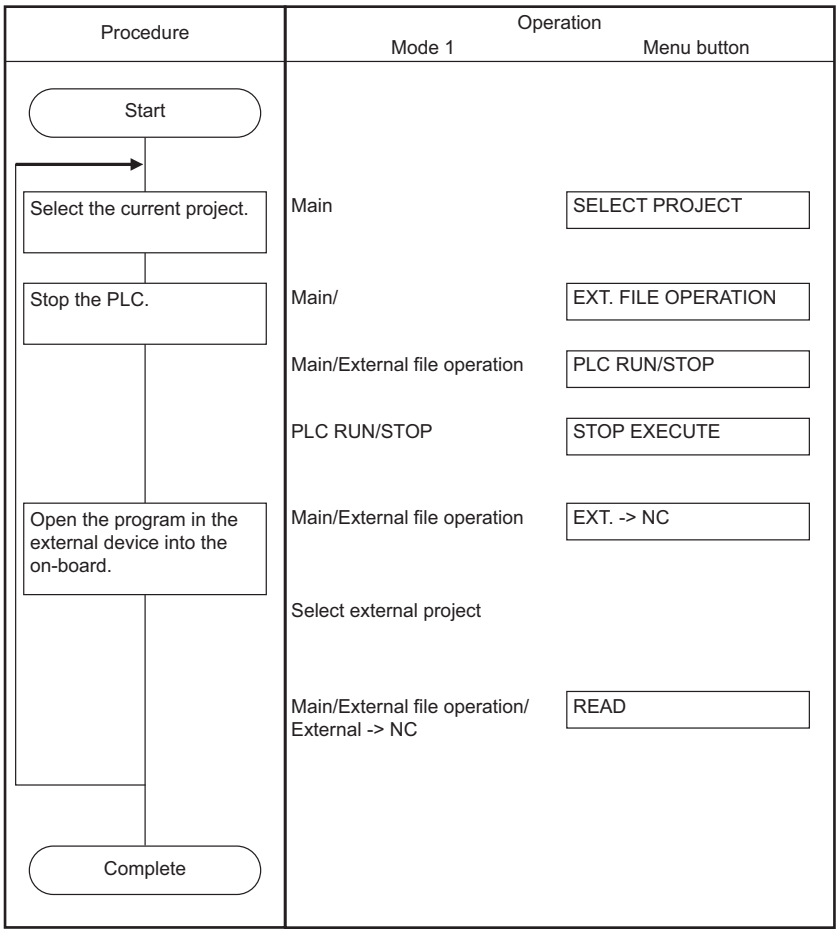
6.9.5.2 Saving PLC data in External Devices to the NC

The following diagram illustrates the procedure to save PLC data in external devices to the NC.

To use only one project

Procedure	Operation Mode 1	Menu button	
Start	After the PLC on-board starts, the system automatically reads PLC data and transitions to the ladder screen. The monitor also starts.		
Return to the main screen.	Ladder		
Stop the PLC.	Main/	EXT. FILE OPERATION	
	Main/External file operation	PLC RUN/STOP	Display the PLC RUN/STOP popup screen.
	PLC RUN/STOP	STOP EXECUTE	Stop the PLC.
Open the program in the external device into the on-board.	Main/External file operation	EXT. -> NC	The select external project popup screen is displayed.
	Select external project		Select the project data saved in the external device.
	Main/External file operation/ External -> NC	READ	Store the project data stored in the external device into the temporary memory area in the NC.
Complete			

To use multiple projects



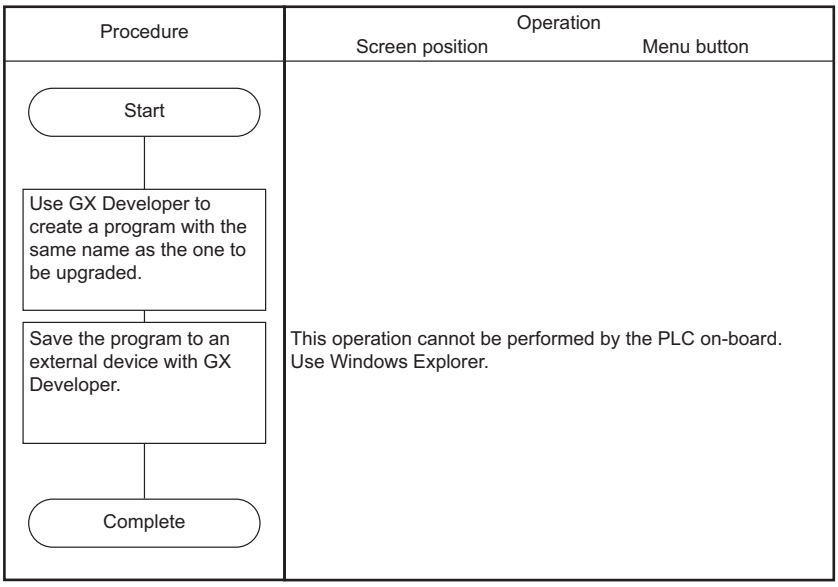
6.9.6 Basic Operation 6 (Updating the Program Version)

Follow the sequence of operations as described in the following table to update the version of PLC data in the NC with PLC data in an external device.

Procedure	Operation
1	Save the updated version data to an external device
2	Update the PLC data version in NC

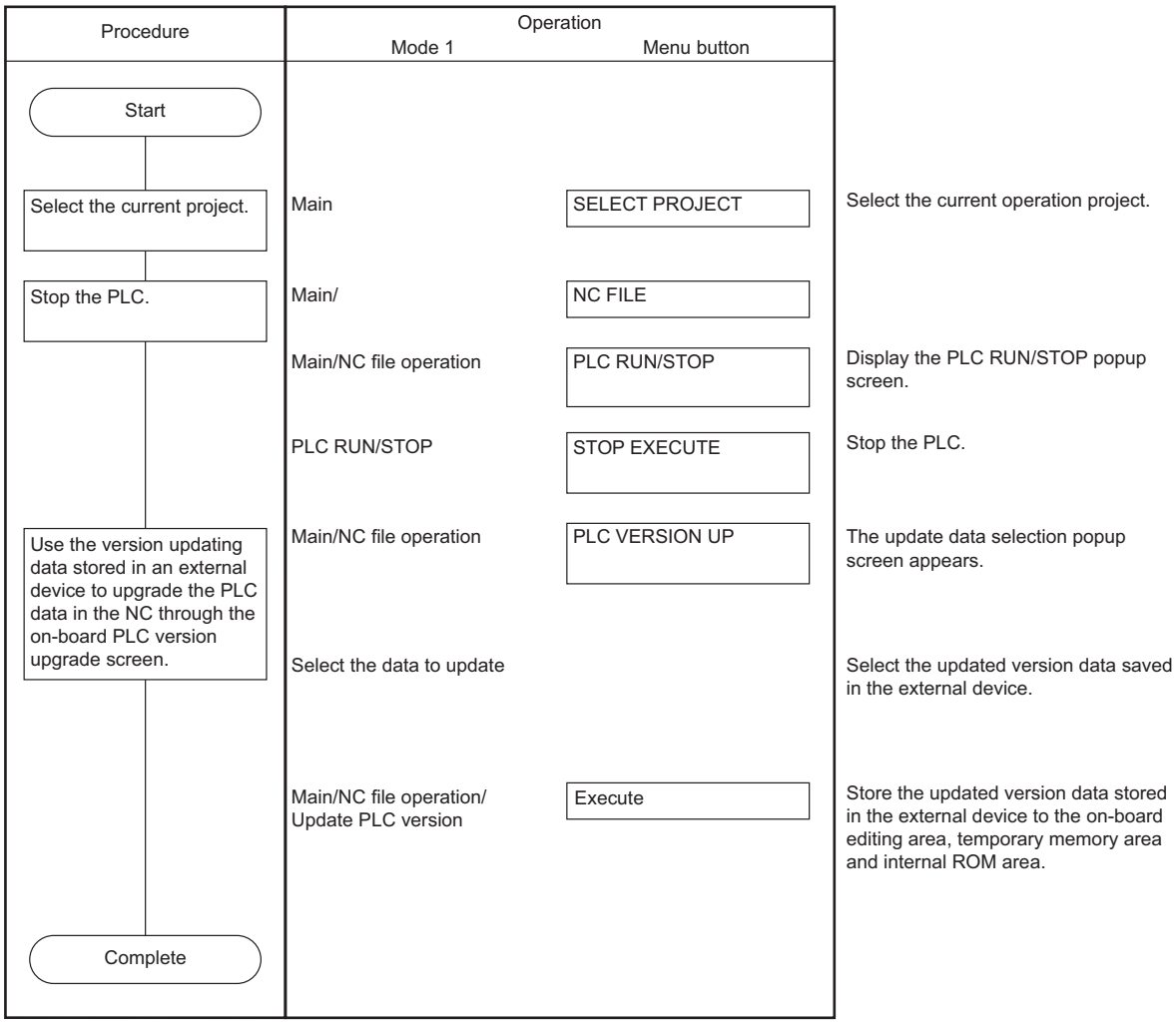
6.9.6.1 Saving the Updated Version Data to an External Device

The following diagram illustrates the procedure to save the updated version data to an external device. The updated version data must be stored in "ladXX" (XX is a project No.), a directory directly under the external device. For the project format, the project name needs to be set as "plcproj". Refer to "Select Version Up Data Popup Screen: Storing Method of the Updating Version Data" for details.



6.9.6.2 Updating the PLC Data Version in NC

Given below is the procedure to use the version updating data stored in an external device to upgrade the PLC data in the NC. The PLC data which can be upgraded are as follows: sequence program, PLC message, device comment and parameter. For details of operation on the PLC version upgrade screen, refer to "PLC Version Up Screen: Update the PLC Version".



6.10 Main Screen

The multiple projects you may want to use can be selected at the main (highest tier) PLC On-board screen. This screen also displays the status of the currently connected NC.
When the smart safety observation function is enabled, the user safety sequence "SafePLC1" or "SafePLC2" can be selected as the operation target. Hereafter, the project or user safety sequence targeted for the operation is referred to as the operation target project.

6.10.1 Switching Menu Keys

The menu keys on the main screen change depending on whether sequence programs are stored or not stored in the NC.

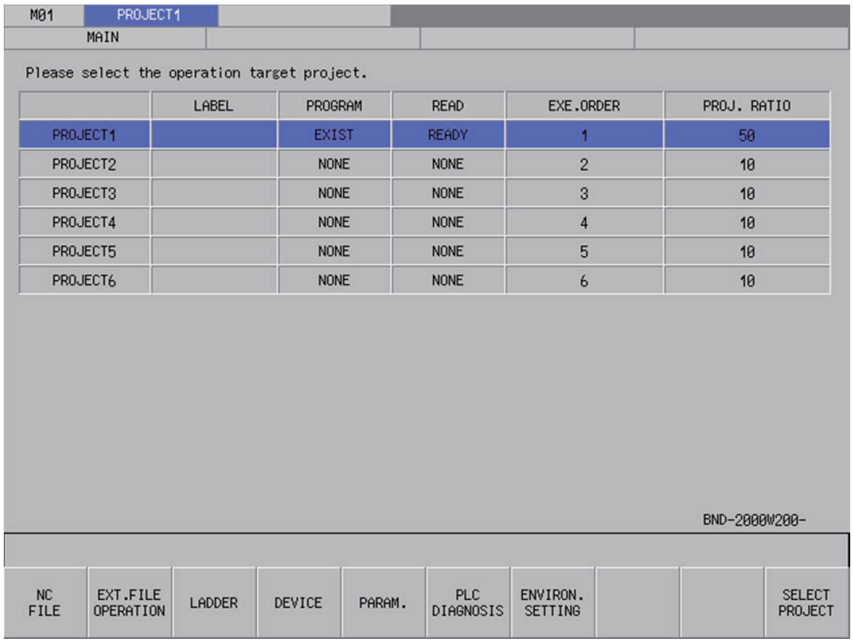
Sequence programs	Menu keys
Stored	Menu keys for all usable functions are displayed.
Not stored	Menu keys related to storing and creating sequence programs and menu keys for configuring the NC environment are displayed.

6.10.1.1 Cases in which sequence programs are stored

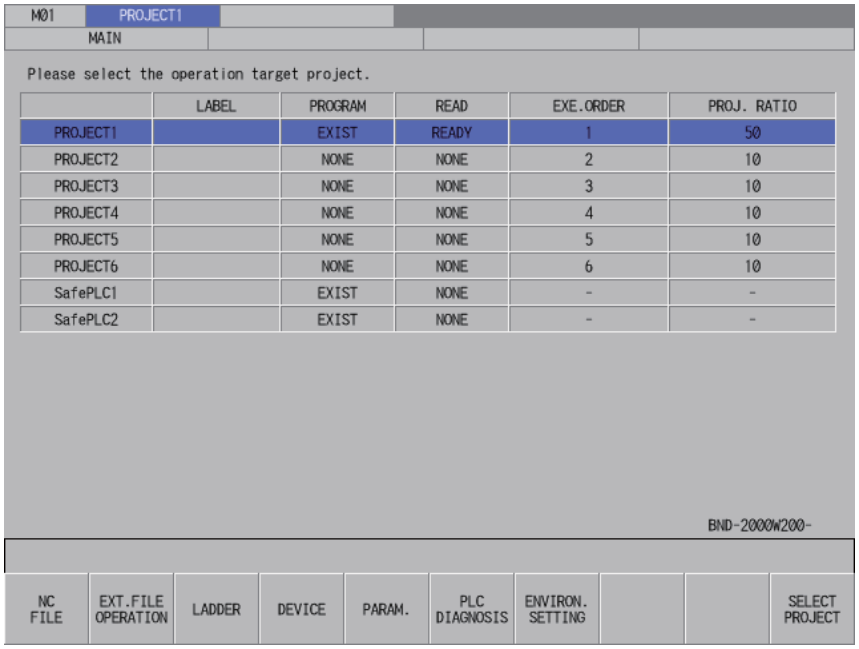
(1) To use multiple projects

When using multiple projects, information for up to the maximum number of projects stored in the NC is displayed. The desired project can also be selected.

(a) When the smart safety observation function is disabled



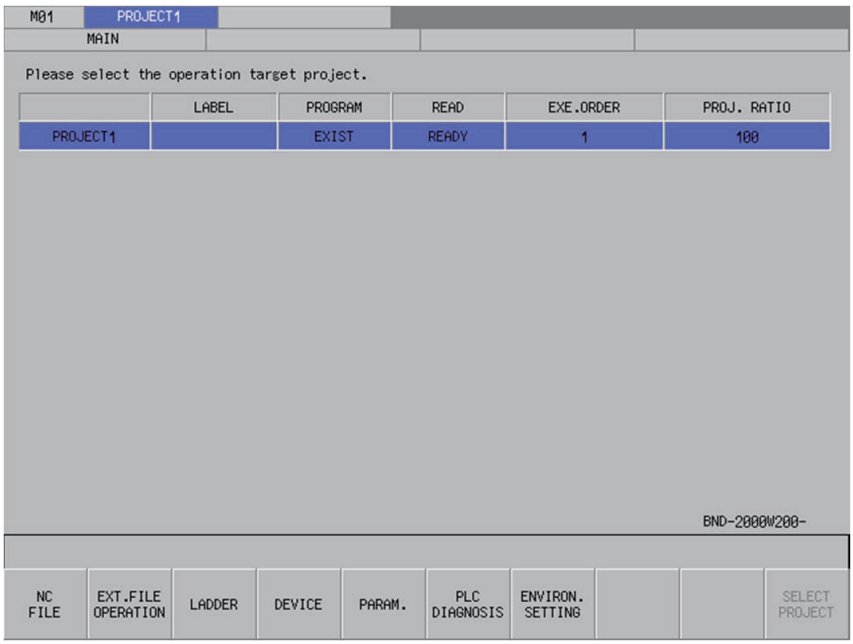
(b) When the smart safety observation function is enabled



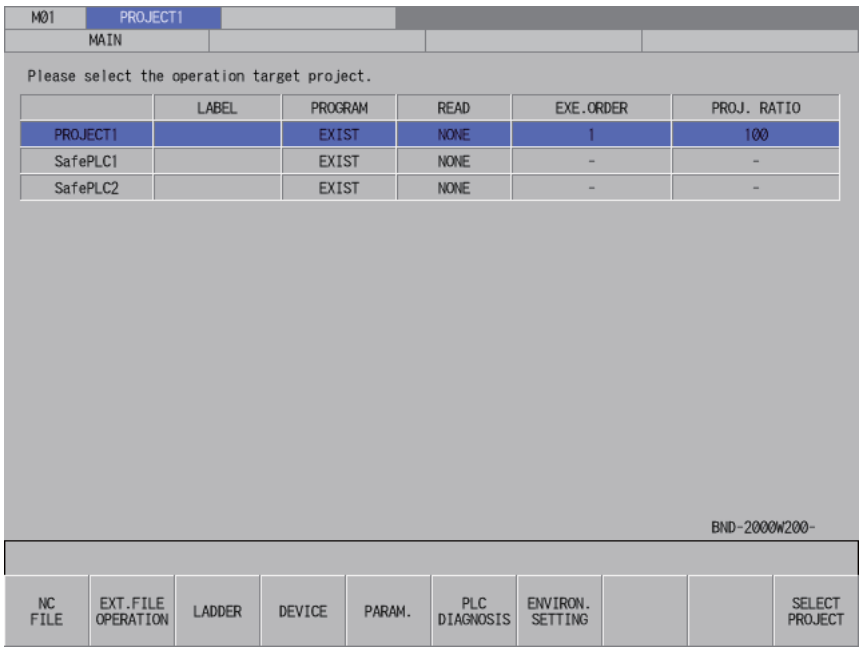
(2) To use only one project

When using only one project, there is no need to select the desired project. For this reason, after the PLC On-board starts and the main screen displays, the system automatically reads PLC data, transitions to the ladder screen and starts the monitor.

(a) When the smart safety observation function is disabled



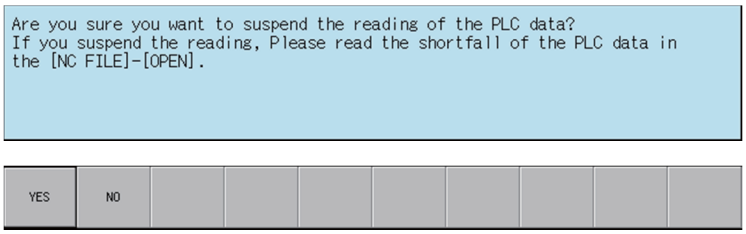
(b) When the smart safety observation function is enabled



*A progress bar is displayed indicating the status of reading PLC data.

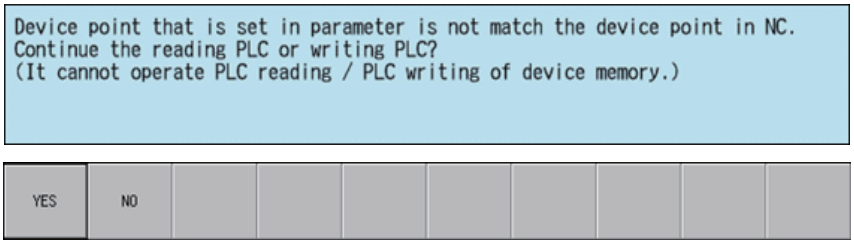
The menu keys change as follows.

The massage to confirm the suspension appears when the suspend menu is pressed.



* If you suspend the reading, specify and read the PLC data which has not been read with the [NC FILE] - [OPEN] function as the massage.
Refer to "Opened Screen".

(Note) When a message below appears while reading PC data, the number of device points that is set in the PC parameter and the number of device points that is set in the multi-project parameter are not matched.
There is a possibility that the device number/type which are used by the ladder circuit may change when reading PC data is continued. Therefore, do not use the ladder circuit being read.
After having formatted the storage area once, you need to review the number of device points in PC parameter and multi-project parameter, and rewrite the ladder again.

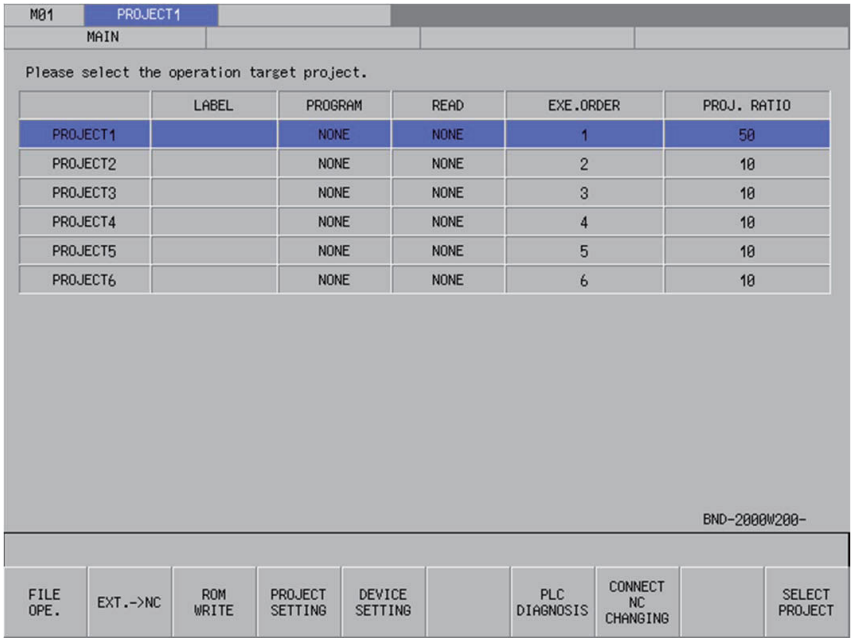


6.10.1.2 Cases in which sequence programs are not stored

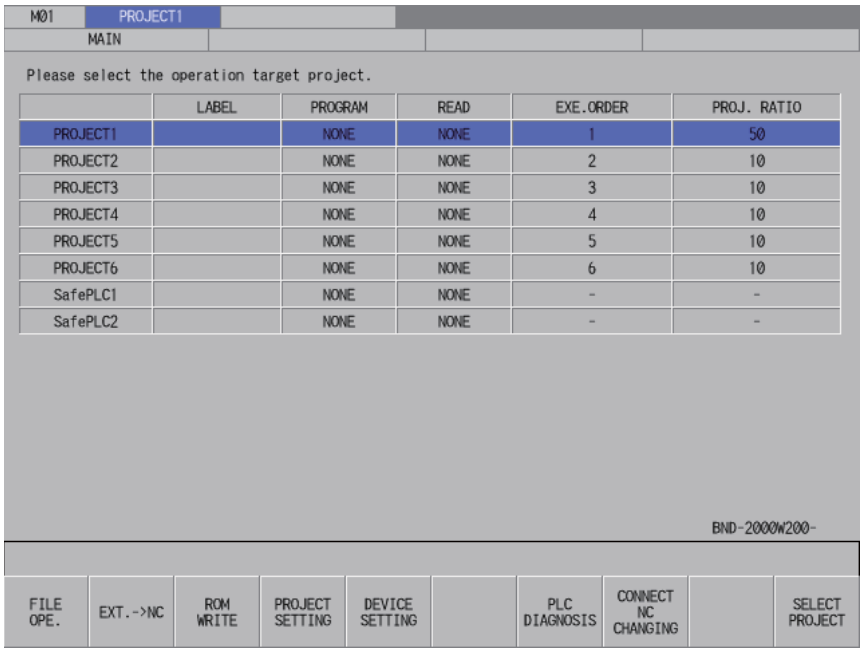
(1) To use multiple projects

When using multiple projects, information for up to the maximum number of projects stored in the NC is displayed. The desired project can also be selected.

(a) When the smart safety observation function is disabled



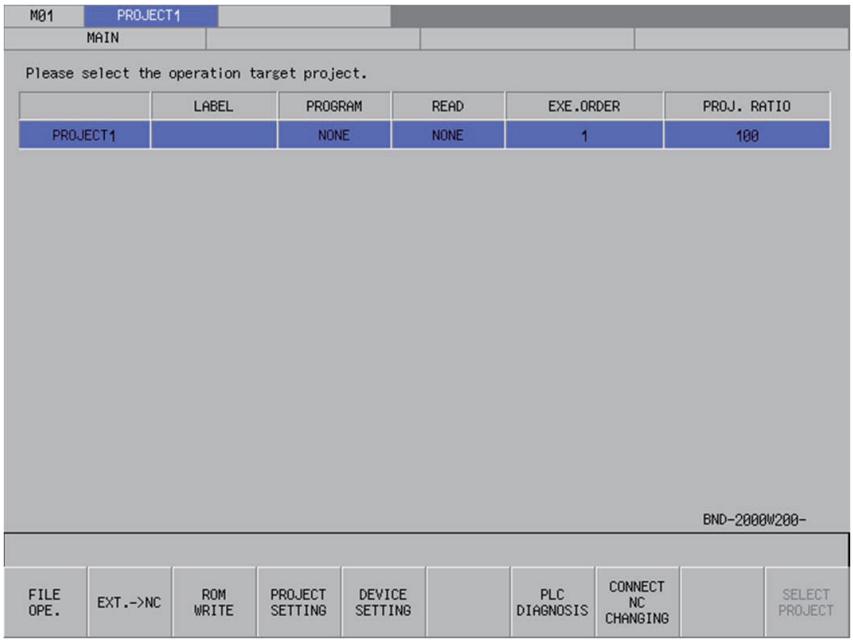
(b) When the smart safety observation function is enabled



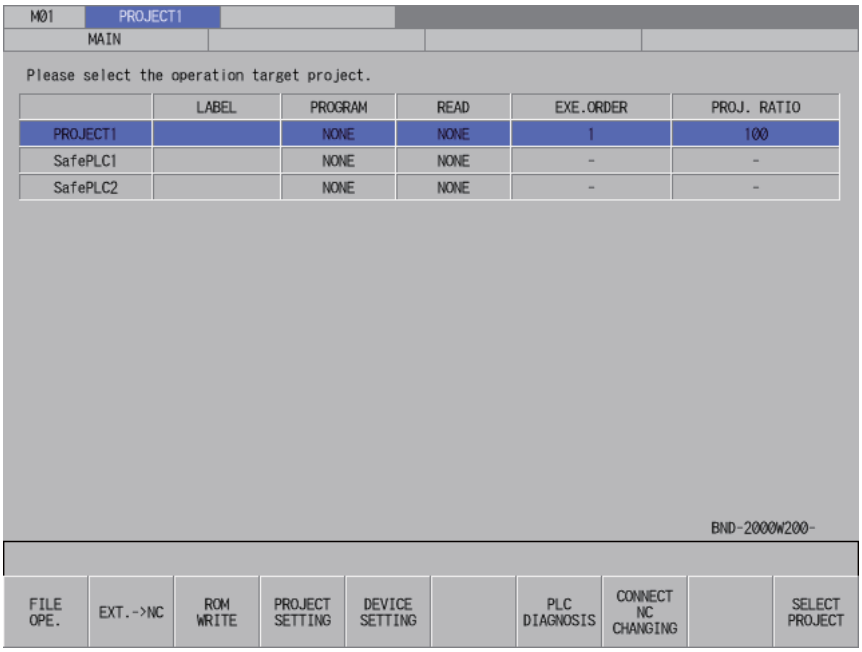
(2) To use only one project

When using only one project, there is no need to select the desired project. As no sequence programs are stored, you cannot transition to the ladder screen. PLC data is also not automatically read.

(a) When the smart safety observation function is disabled



(b) When the smart safety observation function is enabled



6.10.2 Screen Display Items

The following table describes the screen display items on the main screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the number of the current project.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Soft keyboard	This is displayed only when parameters are enabled.

The information in the following table is displayed in the main screen.

Item	Description
Project No.	Displays project numbers up to the maximum number of projects
Labels	This displays labels assigned to projects. However, for the user safety sequence, this section is always blank.
Programs	This displays whether or not programs are stored in the projects.
Read	This displays whether or not PLC data has been read.
Execution sequence	This displays the execution sequence set for each project. This is left blank if the execution sequence has not been set.
Project ratio	This displays the project ratio set for each project.

6.10.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the main screen are enabled.

6.10.3.1 Cases in which sequence programs are stored

The following table describes the conditions upon which menu keys are enabled/disabled when sequence programs are stored.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Ladder	Disabled when the function is restricted.
Parameter	Disabled when the function is restricted.
Environment Setting	Disabled when the function is restricted.
Select project	Always enabled when using multiple projects and smart safety observation function is enabled. Disabled when using only one project.

6.10.3.2 Cases in which sequence programs are not stored

The following table describes the conditions upon which menu keys are enabled/disabled when sequence programs are not stored.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
File Operation	Disabled when the function is restricted.
External -> NC	Disabled when the function is restricted.
ROM Write	Disabled when the function is restricted.
Project Setting	Disabled when the function is restricted.
Device Setting	Disabled when the function is restricted.
Select project	Always enabled when using multiple projects and smart safety observation function is enabled. Disabled when using only one project.

6.10.4 Selecting the Current Project

When using multiple projects, the current project needs to be selected. The area with the blue background color in the list displayed in the main screen represents the current project. Multiple projects cannot be selected as the current project for operation.

When using only one project, project 01 automatically becomes the current project and thus there is no need to select the current project.

If the current project selected is changed, the menu keys change in correspondence with how sequence programs are stored.

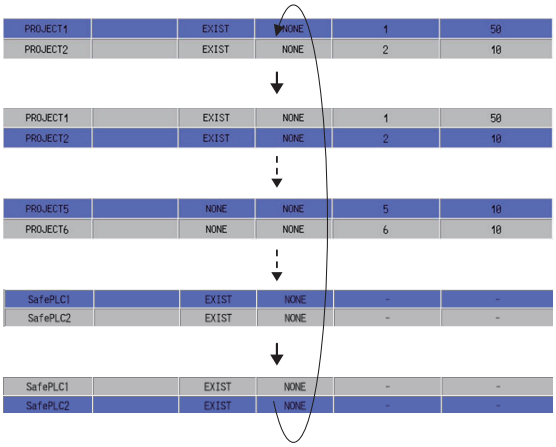
When the smart safety observation function is enabled, as the user safety sequence "SafePLC1" or "SafePLC2" is displayed, select "SafePLC1" or "SafePLC2" to use the user safety sequence.

Use one of the following two methods to change the currently selected project.

1. Method using the project selection menu key

   Pressing the project selection menu key moves down the selected position in the list of project information.

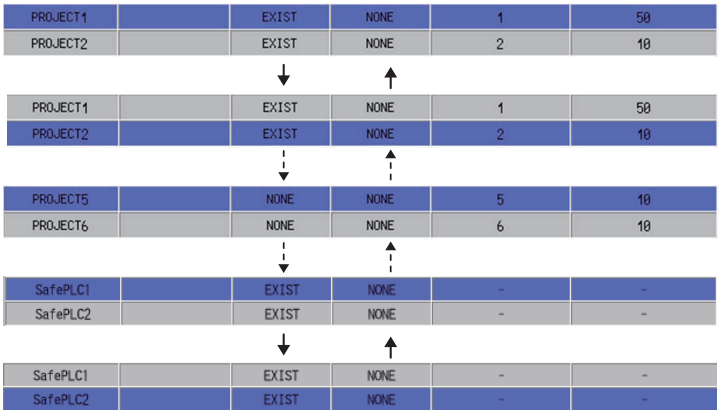
   Pressing the menu key when the project at the bottom of the list is selected selects the project at the top of the list.



2. Method using the up and down arrow keys

   Pressing the down arrow key moves down the selected position in the list of project information.

   Pressing the up arrow key moves up the selected position in the list of project information.



6.10.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

6.10.5.1 Cases in which sequence programs are stored

Item name	Operation
NC file operation	This transitions to the NC file operation main screen.
External file operation	This transitions to the external file operation main screen.
Ladder	This automatically reads the PLC data stored in the current project and transitions to the ladder screen. This also automatically starts the ladder monitor.
Device	This transitions to the device main screen.
Parameter	This transitions to the parameter main screen.
PLC diagnosis	This transitions to the PLC diagnosis screen.
Environment settings	This transitions to the environment settings main screen.

6.10.5.2 Cases in which sequence programs are not stored

Item name	Operation
File operation	This transitions to the file operation screen.
External -> NC	This transitions to the "EXT.->NC" screen.
ROM write	This transitions to the ROM write screen.
Project settings	This transitions to the project settings screen.
Device settings	This transitions to the device settings screen.
PLC diagnosis	This transitions to the PLC diagnosis screen.
Connect NC Changing	This transitions to the connect NC changing screen.

6.10.6 Returning to the Main Screen from Other Screens

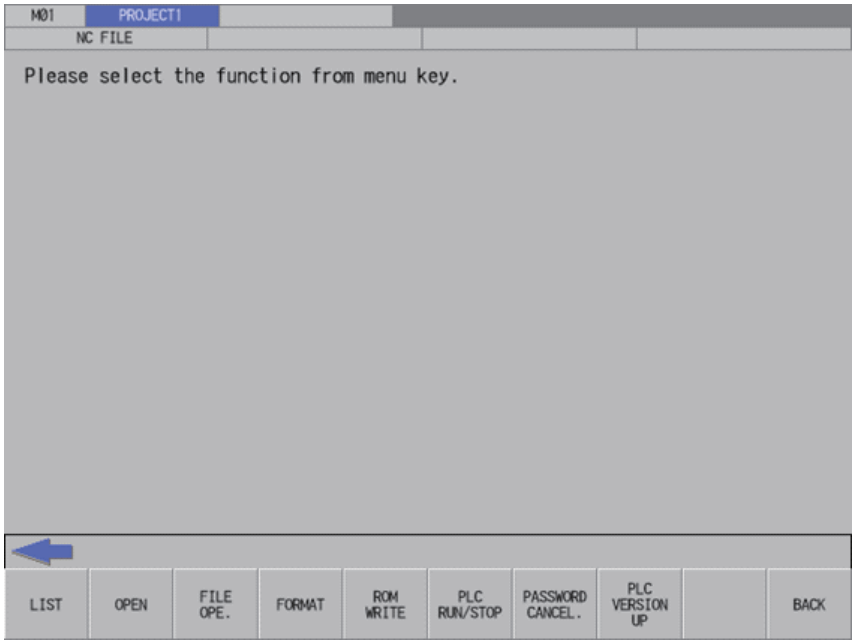
When transitioning to the main screen and there are no sequence programs stored in the current project, the menu keys corresponding to the state when there are no sequence programs stored are displayed.

6.11 NC File Operation Menu

6.11.1 NC File Operation Main Screen

6.11.1.1 Outline

This screen contains menus of operations for PLC data stored in the NC.



6.11.1.2 Screen Display Items

The following table describes the screen display items for the NC file operation screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.11.1.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the NC file operation screen are enabled/disabled. The menu keys which are not described in the following table are always enabled..

Menu name	Condition upon which it is enabled/disabled
ROM Write	Disabled when the function is restricted.
File Operation	Disabled when the function is restricted.
Format	Disabled when the function is restricted.
PLC RUN/STOP	Disabled when the function is restricted.
Password Cancellation	Disabled when the function is restricted.
PLC Version Up	Disabled when the function is restricted.

6.11.1.4 Operation of Button Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

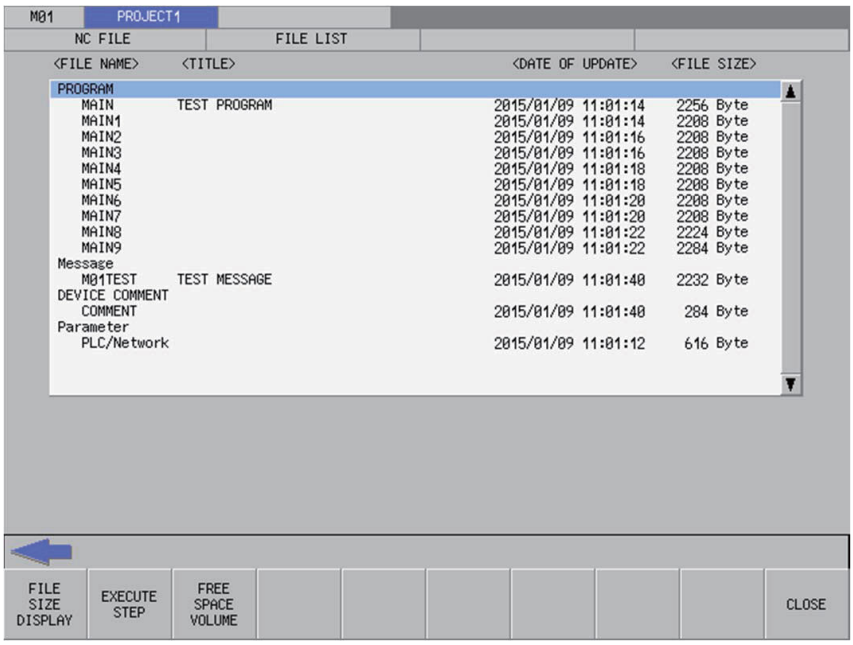
Item name	Operation
Left arrow key/return menu key	These transition to the main menu.
Various menu keys	This displays the specified screen.

6.11.2 File List Screen

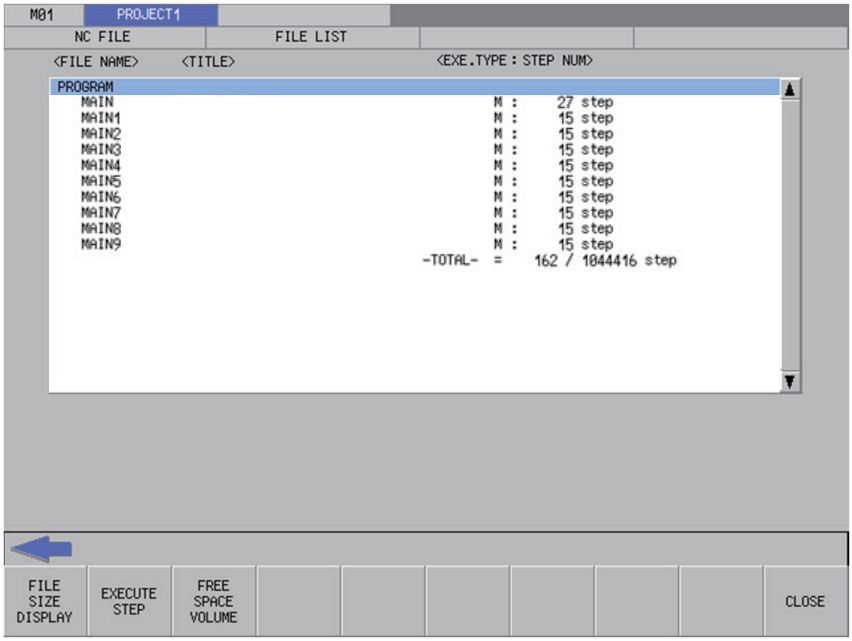
6.11.2.1 Outline

This displays the file size and execution step for the PLC data stored in the current project. The amount of free space for each project in the NC is also displayed.

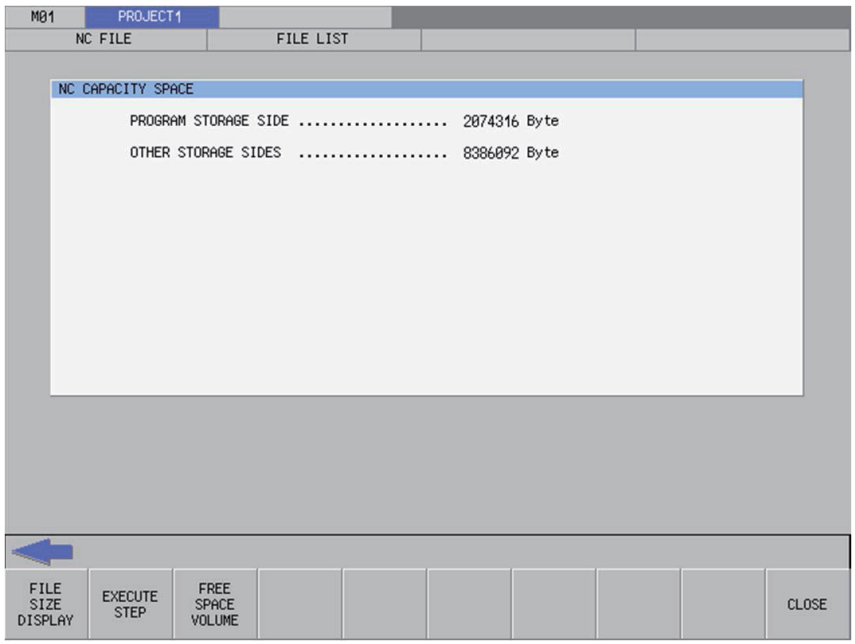
(1) File size display screen



(2) Execution step display screen



(3) Amount of free space display screen



6.11.2.2 Screen Display Items

The following table describes the screen display items for the file list screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	[File Size Display] This displays the file size of the PLC data stored in the current project. This displays nothing if there is nothing stored. [Execution Step Display] This displays the execution step of the sequence program stored in the current project. This displays nothing if there is nothing stored. [Amount of Free Space Display] This displays the amount of free space allocated to the current project.

6.11.2.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the file list screen are always enabled.

6.11.2.4 Status during Screen Displays

The following table describes the status when displaying the file list screen.

Item name	Operation
List	This is the default focus position when the screen is displayed. This displays the file size of the PLC data stored in the current project.

6.11.2.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the File List Screen".
File size display	This displays the size of files stored in the connected project.
Execution step	This displays the execution step of programs stored in the current project.
Amount of free space display	This displays the amount of free space available in the region used to store programs and the region used to store other data.
Close	Refer to "Closing the File List Screen".

6.11.2.6 Closing the File List Screen

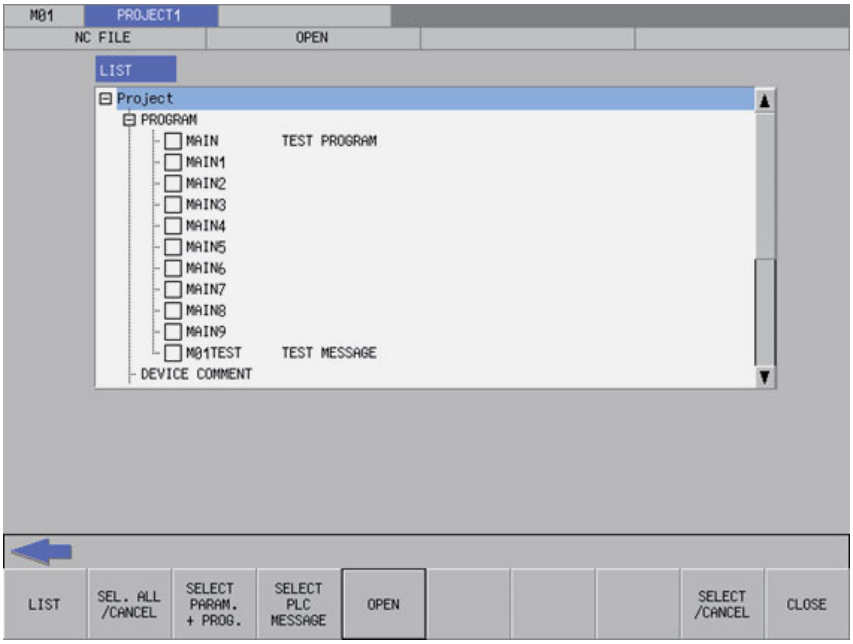
Use any of the following methods to close the file list screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.3 Opened Screen

6.11.3.1 Outline

This displays a list of PLC data stored in the current project and reads the selected data.



6.11.3.2 Screen Display Items

The following table describes the screen display items for the opened screens.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the PLC data stored in the current project. This displays nothing of there is nothing stored.

6.11.3.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the opened screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Select/cancel all data	Enabled when selectable PLC data has been added to the list
Parameter + Program	Enabled when selectable PLC data has been added to the list
PLC messages	Enabled when selectable PLC data has been added to the list
Open	Enabled when selectable PLC data has been added to the list
Select/cancel data	Enabled when selectable PLC data has been added to the list

6.11.3.4 Status during Screen Displays

The following table describes the status when the opened screen is displayed.

Item name	Operation
List	This is the default focus position when the screen is displayed. This displays the PLC data stored in the current project. All enabled PLC data has their check boxes selected.

6.11.3.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

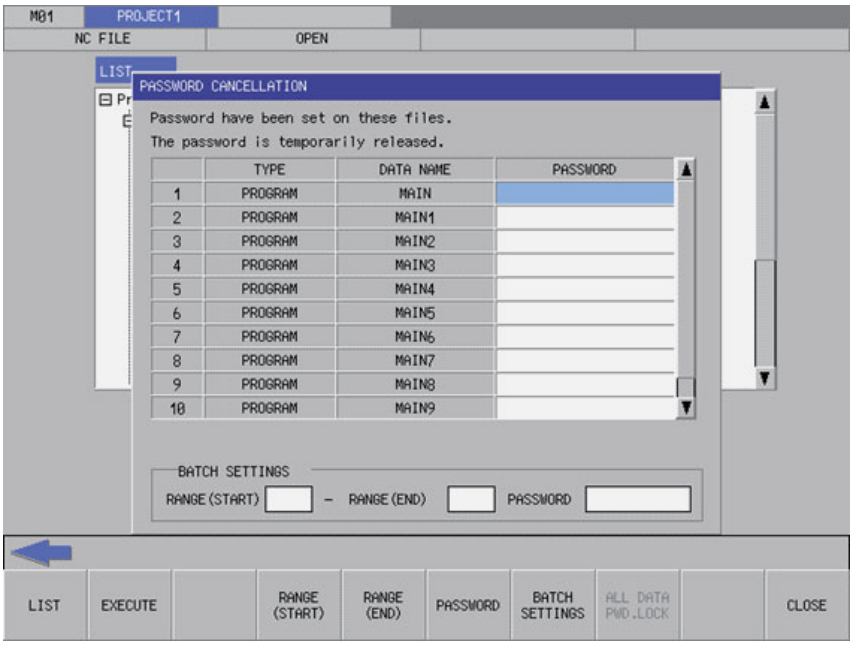
Item name	Operation
Left arrow key	Refer to "Closing the Opened Screen".
List	The focus is applied to the list.
Select/cancel all data	This switches between the enabled and disabled state of the check boxes for all data in the list.
Parameter + Program	This turns the check boxes for parameters and programs in the list to the enabled state. This does not include PLC messages however.
PLC messages	This turns the check boxes for the PLC messages in the list to the enabled state.
Open	Refer to "Opening PLC Data".
Select/cancel data	This switches between the enabled and disabled state of the check boxes for data selected in the list. This operation can also be performed with the [SP (space)] key.
Close	Refer to "Closing the Opened Screen".

6.11.3.6 Opening PLC Data

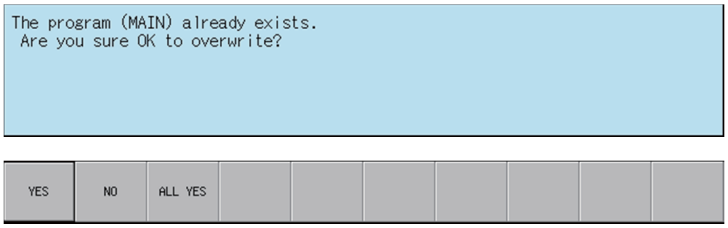
Normal operation

1. Press the [LIST] menu key to move the focus to the list. Select the desired PLC data from the list. Deselect the check boxes for data you do not want read.
2. After selecting data, press the [OPEN] menu key. After pressing the key, the PLC data selected from the list is read.

* If a password to protect reads/writes has been registered to the selected files, the cancel password screen is displayed. Enter the password to temporarily cancel the password.
If the password is canceled, processing will continue.
Refer to "Canceling File Passwords" for information on entering and canceling passwords.



* If PLC data with the same name has already been read, the confirm overwrite popup screen is displayed.



* A progress bar is displayed indicating the status of reading PLC data.

3. After the selected PLC data has been read, the complete message is displayed.

Abnormal operation

This information describes the details of error messages displayed on the opened screen and the corrective action thereof.

Error message	Error description	Corrective action
Read data has not been selected.	This is displayed when the [OPEN] menu key is pressed before any PLC data has been selected from the displayed list.	Select PLC data from the displayed list before pressing the [OPEN] menu key.

6.11.3.7 Closing the Opened Screen

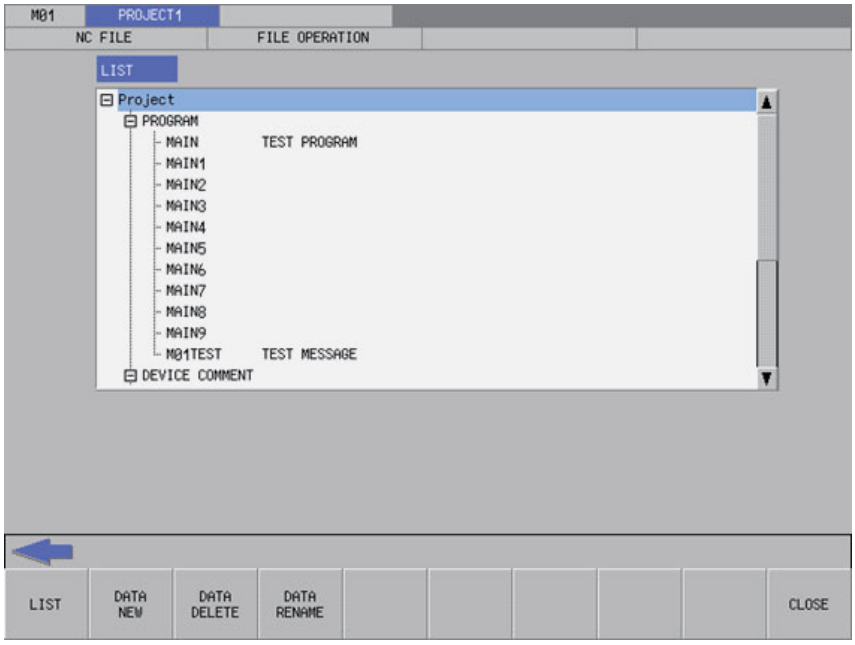
Use any of the following methods to close the opened screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.4 File Operation Screen

6.11.4.1 Outline

This displays a list of PLC data stored in the current project as well as creates and deletes new PLC data and changes the name of this data.



6.11.4.2 Screen Display Items

The following table describes the screen display items for the file operation screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the PLC data stored in the current project. This displays nothing if there is nothing stored.

6.11.4.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the file operation screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Data Delete	Enabled when PLC data is displayed in the list.
Data Rename	Enabled when PLC data is displayed in the list.

6.11.4.4 Status during Screen Displays

The following table describes the status when displaying the file operation screen.

Item name	Operation
List	This is the default focus position when the screen is displayed. This displays the PLC data stored in the current project.

6.11.4.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the File Operation Screen" *Returns to the screen from where the file operation screen was displayed.
List	The focus is applied to the list.
Add New Data	The add new data popup screen is displayed. (Refer to "Add New Data Popup Screen".)
Delete Data	This displays the delete data popup screen. (Refer to "Delete Data Popup Screen".)
Rename Data	This displays the rename data popup screen. (Refer to "Rename Data Popup Screen".)
Close	Refer to "Closing the File Operation Screen".

6.11.4.6 Closing the File Operation Screen

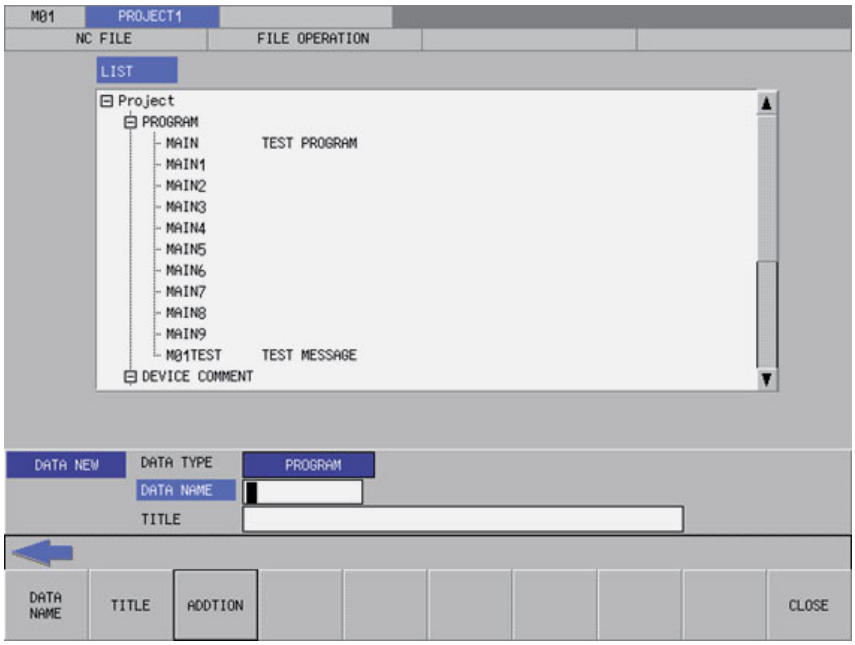
Use any of the following methods to close the file operation screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.5 Add New Data Popup Screen

6.11.5.1 Outline

This enables new PLC data to be created for the current project.



6.11.5.2 Screen Display Items

The following table describes the screen display items for the add new data popup screen.

Item name	Display state
Data type	This displays only programs.
Data name	This is left blank. These are restricted to a maximum of 8 single-byte alphanumeric numeric characters.
Title	This is left blank. These are restricted to a maximum of 32 single-byte alphanumeric numeric characters. *

*Refer to "PLC Data: PLC Data Used by the PLC On-board" for information on restrictions to PLC data names and titles.

6.11.5.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the add new data popup screen are always enabled.

6.11.5.4 Status during Screen Displays

The following table describes the status when displaying the add new data popup screen.

Item name	Operation
Data name	This is the default focus position when the screen is displayed.

6.11.5.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

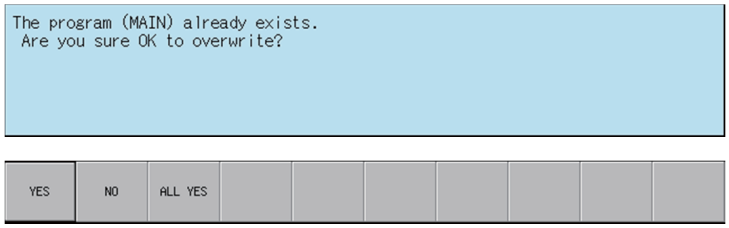
Item name	Operation
Left arrow key	Refer to "Closing the Add New Data Popup Screen".
Data name	This selects the data name input field.
Title	This selects the title input field.
Add	Refer to "Adding PLC Data".
Close	Refer to "Closing the Add New Data Popup Screen".

6.11.5.6 Adding PLC Data

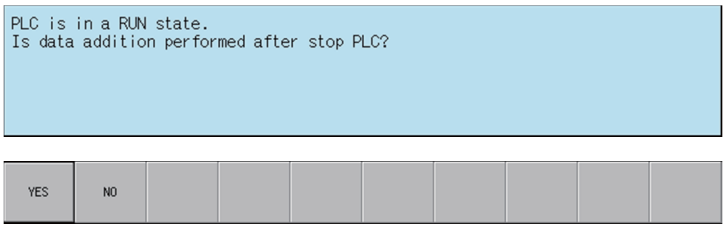
Normal operation

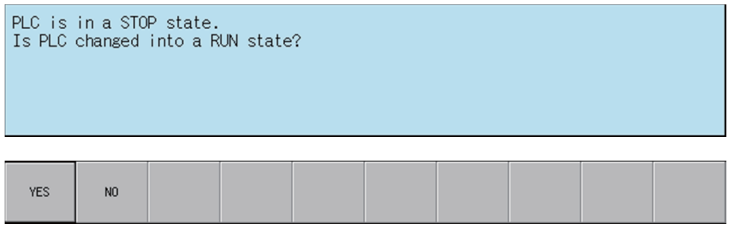
1. Press the [DATA NAME] menu key and enter the desired PLC data name into the data name input field.
2. Press the [TITLE] menu key and enter a title that identifies the PLC data you are adding into the title input field. (Entering titles is optional.)
3. Press the [ADD] menu key. Pressing this key closes the add new data popup screen and adds the PLC data with the entered name and title. The name of the added PLC data displays in the list on the file operation screen.

* If PLC data with the same name already exists, the confirm overwrite popup screen is displayed.



* If PLC data is added while the PLC is running, a message confirming whether or not to pause the PLC is displayed. Select [YES] to stop the PLC and continue adding the PLC data. If [NO] is selected, the PLC does not stop which results in an error and the display of an error message. (Refer to "Abnormal operation")
* If the PLC stops, a message displays to confirm whether or not to restart the PLC immediately after data has been added. Select [YES] to continue running the PLC. Select [NO] to keep the PLC stopped.





Abnormal operation

This information describes the details of error messages displayed on the add new data popup screen and the corrective action thereof.

Error message	Error description	Corrective action
A data name has not been entered. Enter a data name.	This is displayed when the [ADD] menu key is pressed while the data name input field is still blank.	Enter a valid data name before pressing the [ADD] menu key.
This project/data name is a reserved device name. Please choose another name.	This is displayed after the [ADD] menu key is pressed when a reserved device name*1 has been entered as the data name.	Enter a valid data name before pressing the [ADD] menu key.
Prohibited characters were used in the file name. / Do not use the following characters in file names: ,:,,;,;,*,?,\,",<,>,[,],+,.,|.	This is displayed when the [ADD] menu key is pressed and the data name contains prohibited characters*1.	Enter a valid data name before pressing the [ADD] menu key.
File name includes the multi-byte character code. Please confirm file name.	This is displayed when the [ADD] menu key is pressed and the data name contains double-byte characters.	Enter a valid data name before pressing the [ADD] menu key.
Illegal characters have been used for a data name. Use legal characters.	This is displayed when the [ADD] menu key is pressed and the final character of the data name is a period.	Enter a valid data name before pressing the [ADD] menu key.
New data cannot be added because the PLC is running. Execute again after the PLC stops.	This is displayed when trying to add new data without stopping the PLC.	Add new data when the PLC is not running.

*1: Refer to "PLC Data: PLC Data Used by the PLC On-board".

6.11.5.7 Closing the Add New Data Popup Screen

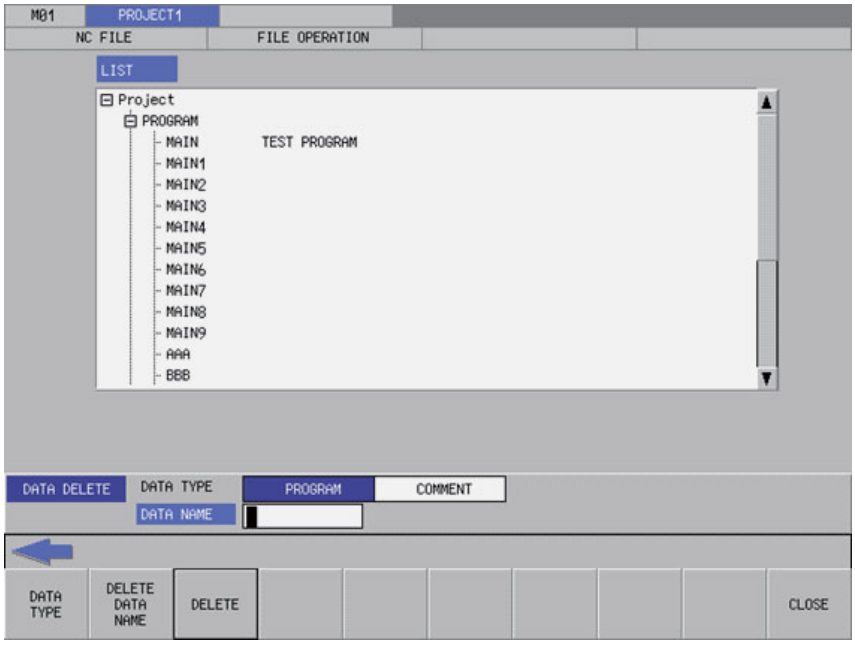
Use any of the following methods to close the add new data popup screen.

Methods to close the screen
This adds new PLC data.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.6 Delete Data Popup Screen

6.11.6.1 Outline

This enables PLC data stored in the current project to be deleted.



6.11.6.2 Screen Display Items

The following table describes the screen display items for the delete data popup screen.

Item name	Display state
Data type	This displays programs and comments. Programs are the default selection.* 1
Data name	This is left blank.* 1 These are restricted to a maximum of 8 single-byte alphanumeric numeric characters.* 2

*1: Selecting data of different types (program and comments) from the list on the file operation screen and displaying this data on the delete data screen causes the data type and data name of the selected data to be selected and displayed.

*2: Refer to "PLC Data: PLC Data Used by the PLC On-board" for information on restrictions to PLC data names and titles.

6.11.6.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the delete data popup screen are always enabled.

6.11.6.4 Status during Screen Displays

The following table describes the status when displaying the delete data popup screen.

Item name	Operation
Data type	This is the default focus position when the screen is displayed. This selects either programs or the data type of selected data.
Data name	This selects either blank displays or the data names of selected data.

6.11.6.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Delete Data Popup Screen".
Data type	This selects either the data type selection field or changes the data type selection.
Data name	This selects the data name input field.
Delete	Refer to "Deleting PLC Data".
Close	Refer to "Closing the Delete Data Popup Screen".

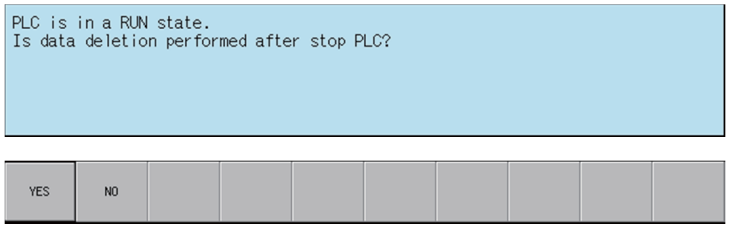
6.11.6.6 Deleting PLC Data

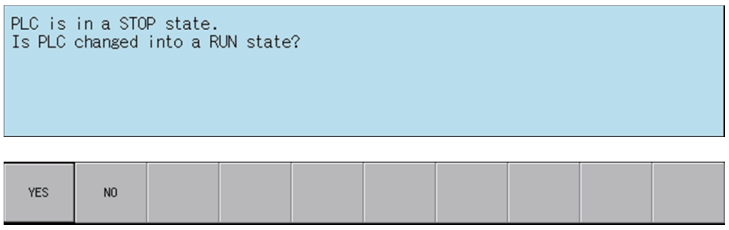
Normal operation

1. Press the [DATA TYPE] menu key and select the data type you want to delete from the data type selection field.
2. Press the [DATA NAME] menu key and enter the desired PLC data name into the data name input field.
3. Press the [DELETE] menu key. Press the delete menu key to display the confirm delete message. If [YES] is selected, the confirm delete message and the delete data popup screen closes and the data is deleted. The name of the deleted PLC data is removed from the list on the file operation screen. If [NO] is selected, the confirm delete message closes and then the system returns to the delete data popup screen.

* If a password to protect against reads or reads/writes has been registered to the selected files, the cancel password screen is displayed.
Enter the password to cancel the password.
If the password is canceled, processing will continue.
Refer to "Canceling File Passwords" for information on clearing passwords.

* If PLC data is deleted while the PLC is running, a message confirming whether or not to pause the PLC is displayed. Select [YES] to stop the PLC and continue deleting the PLC data. If [NO] is selected, the PLC does not stop which results in an error and the display of an error message. (Refer to "Abnormal operation")
* If the PLC stops, a message displays to confirm whether or not to restart the PLC immediately after data has been deleted. Select [YES] to continue running the PLC. Select [NO] to keep the PLC stopped.





Abnormal operation

This information describes the details of error messages displayed on the delete data popup screen and the corrective action thereof.

Error message	Error description	Corrective action
A data name has not been entered. Enter a data name.	This is displayed when the [DELETE] menu key is pressed while the data name input field is still blank.	Enter a valid data name before pressing the [DELETE] menu key.
A file was specified which does not exist in the NC.	This is displayed when the [DELETE] menu key is pressed after specifying a data type or data name in the data name input field that is not stored in the NC.	Press the [DELETE] menu key after specifying a data type or data name in the data name that is stored in the NC.
Data cannot be deleted because the PLC is running. Execute again after the PLC stops.	This is displayed when trying to delete data without stopping the PLC.	Delete data when the PLC is not running.

6.11.6.7 Closing the Delete Data Popup Screen

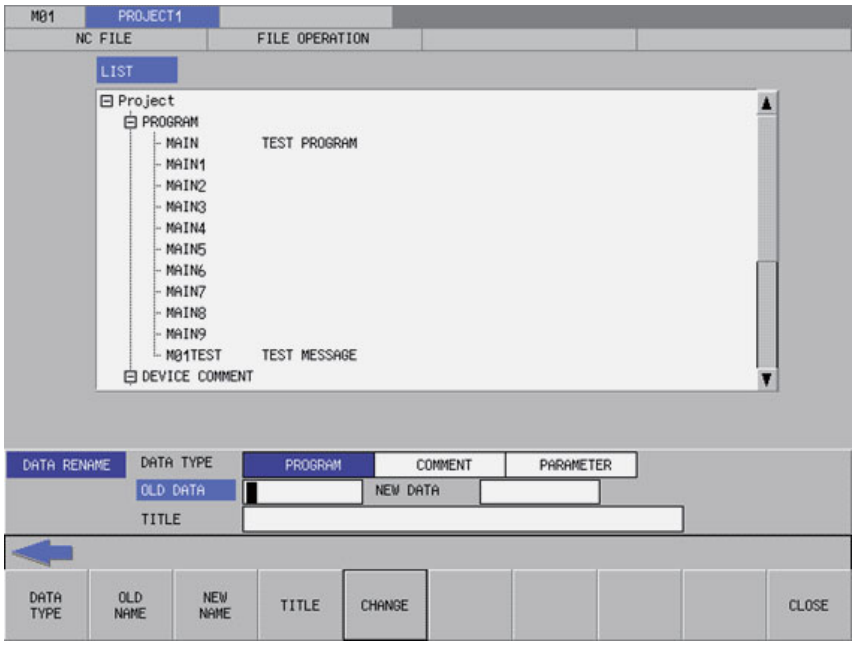
Use any of the following methods to close the delete data popup screen.

Methods to close the screen
Delete PLC data.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.7 Rename Data Popup Screen

6.11.7.1 Outline

This enables the name of PLC data stored in the current project to be changed.



6.11.7.2 Screen Display Items

The following table describes the screen display items for the rename data popup screen.

Item name	Display state
Data type	This displays programs, comments, and parameters. Programs are the default selection.* 1
Old data name	This is left blank.* 1 These are restricted to a maximum of 8 single-byte alphanumeric numeric characters.* 2
New data name	This is left blank. These are restricted to a maximum of 8 single-byte alphanumeric numeric characters. 2
Title	This is left blank. These are restricted to a maximum of 32 single-byte alphanumeric numeric characters. * 2

*1 Selecting data of different types (program, comments, and parameters) from the list on the file operation screen and displaying this data on the rename data screen causes the data type and data name of the selected data to be selected and displayed. If parameter data is selected, however, characters cannot be entered into blank fields for old data names and new data names.

*2 Refer to "PLC Data: PLC Data Used by the PLC On-board" for information on restrictions to PLC data names and titles.

6.11.7.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the rename data popup screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Old data name	Enabled when data type is other than parameter.
New data name	Enabled when data type is other than parameter.

6.11.7.4 Status during Screen Displays

The following table describes the status when displaying the rename data popup screen.

Item name	Operation
Data type	This is the default focus position when the screen is displayed. This selects either programs or the data type of selected data.
Old data name	This selects either blank displays or the data names of selected data. If the data type is parameter, data input is disabled for blank fields.
New data name	This is left blank. If the data type is parameter, data input is disabled for blank fields.
Title	This selects either blank fields or the titles of selected data.

6.11.7.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Rename Data Popup Screen".
Data type	This selects either the data type selection field or changes the data type selection.
Old data name	This selects the old data name input field.
New data name	This selects the new data name input field.
Title	This selects the title input field.
Change	Refer to "Changing PLC Data Names".
Close	Refer to "Closing the Rename Data Popup Screen".

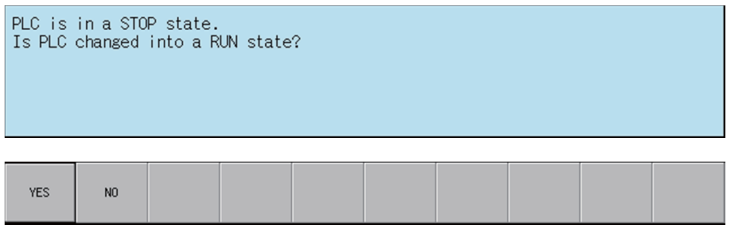
6.11.7.6 Renaming the PLC Data

Normal operation

1. Press the [DATA TYPE] menu key and select the data type you want to change from the data type selection field.
2. Press the [DATA NAME] menu key and enter the current PLC data name into the old data name input field.
3. Press the [DATA NAME] menu key and enter the new PLC data name into the new data name input field.
4. Press the [CHANGE] menu key. Pressing the [CHANGE] menu key closes the rename data popup screen and changes the data name. The old PLC data name is removed from the list on the file operation screen and the new PLC data name is displayed.

* If a password to protect against reads or reads/writes has been registered to the selected data, the cancel password screen is displayed.
Enter the password to cancel the password.
If the password is canceled, processing will continue.
Refer to "Canceling File Passwords" for information on clearing passwords.

* If PLC data names are changed while the PLC is running, a message confirming whether or not to pause the PLC is displayed. Select [YES] to stop the PLC and continue changing the PLC data name. If [NO] is selected, the PLC does not stop which results in an error and the display of an error message. (Refer to "Abnormal operation")
* If the PLC stops, a message displays to confirm whether or not to restart the PLC immediately after the data name has been changed. Select [YES] to continue running the PLC. Select [NO] to keep the PLC stopped.



Abnormal operation

This information describes the details of error messages displayed on the rename data popup screen and the corrective action thereof.

Error message	Error description	Corrective action
An old data name has not been inputted. Please input an old data name.	This is displayed when the [CHANGE] menu key is pressed while the old data name input field is still blank.	Enter a valid old data name before pressing the [CHANGE] menu key.
Please input a new data name. Enter the new data name.	This is displayed when the [CHANGE] menu key is pressed while the new data name input field is still blank.	Enter a valid new data name before pressing the [CHANGE] menu key.
This project/data name is a reserved device name. Please choose another name.	This is displayed after the [CHANGE] menu key is pressed when a reserved device name*1 has been entered as the old data name or the new data name.	Enter a valid old data name or new data name before pressing the [CHANGE] menu key.
Prohibited characters were used in the file name. Do not use the following characters in file names: /, :, ,, ;, *, ?, \, ", <, >, [,], +, ., |.	This is displayed after the [CHANGE] menu key is pressed and the old data name or the new data name contains prohibited characters*1.	Enter a valid old data name or new data name before pressing the [CHANGE] menu key.
File name includes the multi-byte character code. Please confirm file name.	This is displayed after the [CHANGE] menu key is pressed and the old data name or the new data name contains double-byte characters.	Enter a valid old data name or new data name before pressing the [CHANGE] menu key.
A file was specified which does not exist in the NC.	This is displayed when the [CHANGE] menu key is pressed after specifying a data type or data name that is not stored in the NC.	Press the [CHANGE] menu key after specifying a data type or data name in the data name that is stored in the NC.
The same data name has already been set. Change to a different data name.	This is displayed when the [CHANGE] menu key is pressed after specifying a new data name that already exists.	Specify a new data name that does not exist in the NC before pressing the [CHANGE] menu key.
Data names for device comments cannot be changed.	This is displayed when the [CHANGE] menu key is specified after a comment is specified for the old data name.	Specify something other than a comment for the old data name and press the [CHANGE] menu key.
It cannot change into the same name as a common device comment. Please choose another name.	This is displayed when the [CHANGE] menu key is specified after a comment is specified for the new data name.	Specify something other than a comment for the new data name and press the [CHANGE] menu key.
Data name cannot be changed because the PLC is running. Execute again after the PLC stops.	This is displayed when trying to change data names without stopping the PLC.	Change data names when the PLC is not running.

*1: Refer to "PLC Data: PLC Data Used by the PLC On-board".

6.11.7.7 Closing the Rename Data Name Popup Screen

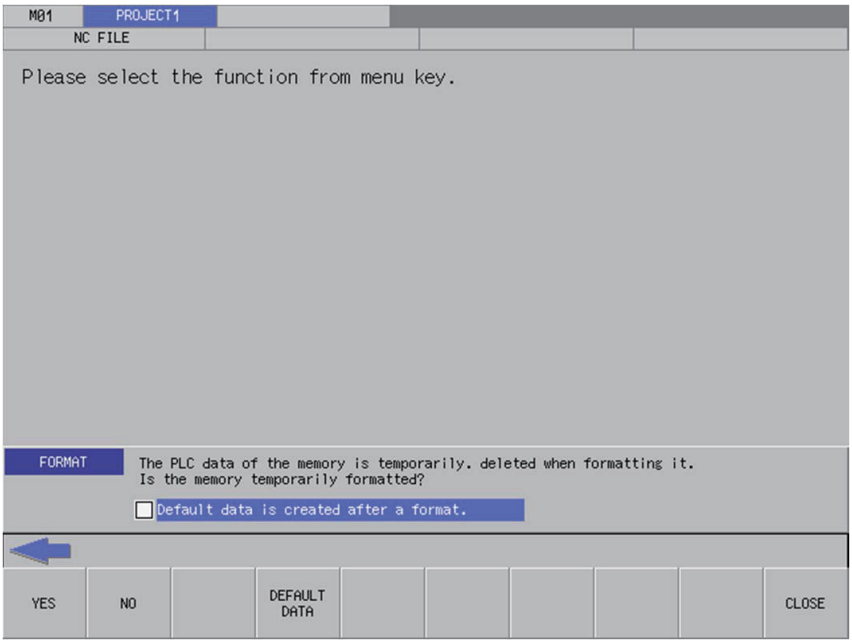
Use any of the following methods to close the rename data popup screen.

Methods to close the screen
Change the data name.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.8 Format Popup Screen

6.11.8.1 Outline

This is used to format the temporary storage area in the NC.



6.11.8.2 Screen Display Items

The following table describes the screen display items for the format popup screen.

Item name	Display state
Create default data after formatting	This is displayed with the check box not selected.

6.11.8.3 Default Data

If the [Create default data after formatting] check box in the format popup screen is selected, the following PLC data is created after formatting the temporary storage area in the NC.

Data classification	Data name	Description
Program	MAIN	Blank program with only an END instruction
Parameter	PARAM	Parameters inherited from device settings for the formatted project.

6.11.8.4 Enabled/Disabled State of Menu Keys

The menu keys displayed on the format popup screen are always enabled.

6.11.8.5 Status during Screen Displays

The following table describes the status when displaying the format popup screen.

Item name	Operation
Create default data after formatting	This is displayed with the check box not selected.

6.11.8.6 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Format Popup Screen"
Yes	Refer to "Formatting the Temporary Memory Area in the NC"
No	Closes the format popup screen and transitions to the file operation screen.
Default data	Selects the selection field to create the default data or changes the selection to create the default data.
Close	Refer to "Closing the Format Popup Screen"

6.11.8.7 Formatting the Temporary Memory Area in the NC

Normal operation

1. Press the [DEFAULT DATA] menu key to select whether or not to create the default data after formatting.
2. Press the [YES] menu key to format the temporary memory area. If the create default data setting is configured, the default data is created after formatting. After the process is complete, the format popup screen closes.

Abnormal operation

This information describes the details of error messages displayed on the format popup screen and the corrective action thereof.

Error message	Error description	Corrective action
Write executions cannot be performed because the PLC is running. Execute again after the PLC stops.	This is displayed when trying to format memory without stopping the PLC.	Format memory when the PLC is not running.

6.11.8.8 Closing the Format Popup Screen

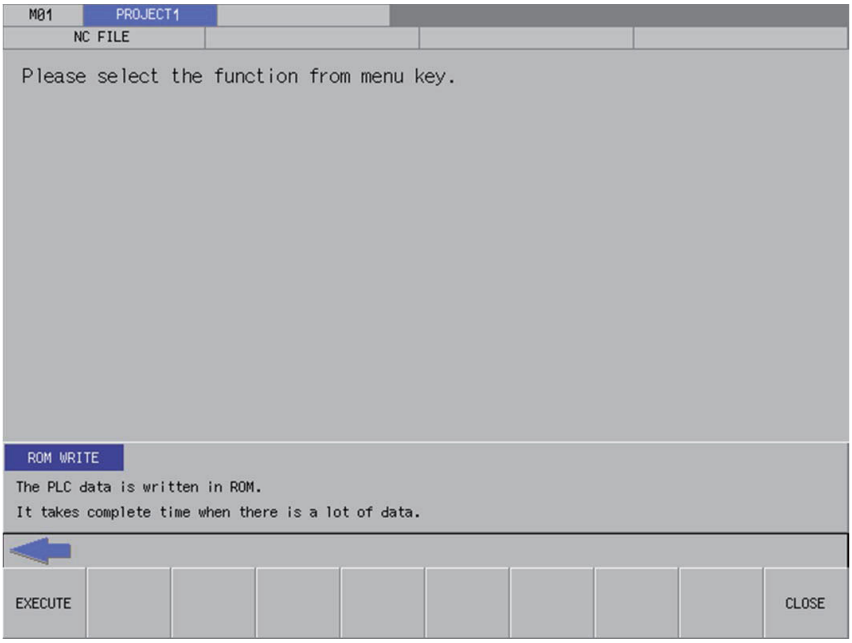
Use any of the following methods to close the format popup screen.

Methods to close the screen
Format the memory.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.9 ROM Write Popup Screen

6.11.9.1 Outline

This is used to store PLC data stored in the temporary memory area inside the NC into an SD card.



6.11.9.2 Screen Display Conditions

If automatic ROM write is set, the ROM write menu is not displayed in the NC file operation menu.

6.11.9.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the ROM write popup screen are always enabled.

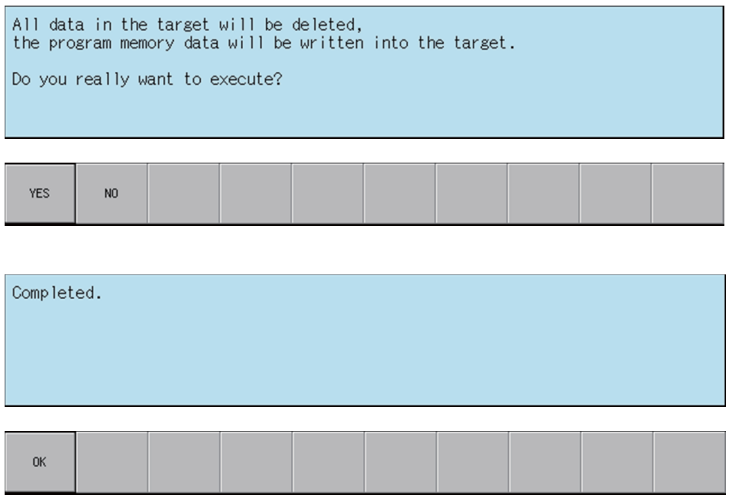
6.11.9.4 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the ROM Write Screen"
Execute	Refer to "Writing PLC Data in the Temporary Memory Area into ROM"
Close	Refer to "Closing the ROM Write Screen"

6.11.9.5 Writing PLC Data in the Temporary Memory Area into ROM

1. Press the [RUN] menu key to display the execute ROM write confirmation message. If [YES] is selected, the execute ROM write confirmation message and the ROM write popup screen closes, and the data is written to ROM. After the process is complete, the completion message is displayed.



6.11.9.6 Closing the ROM Write Screen

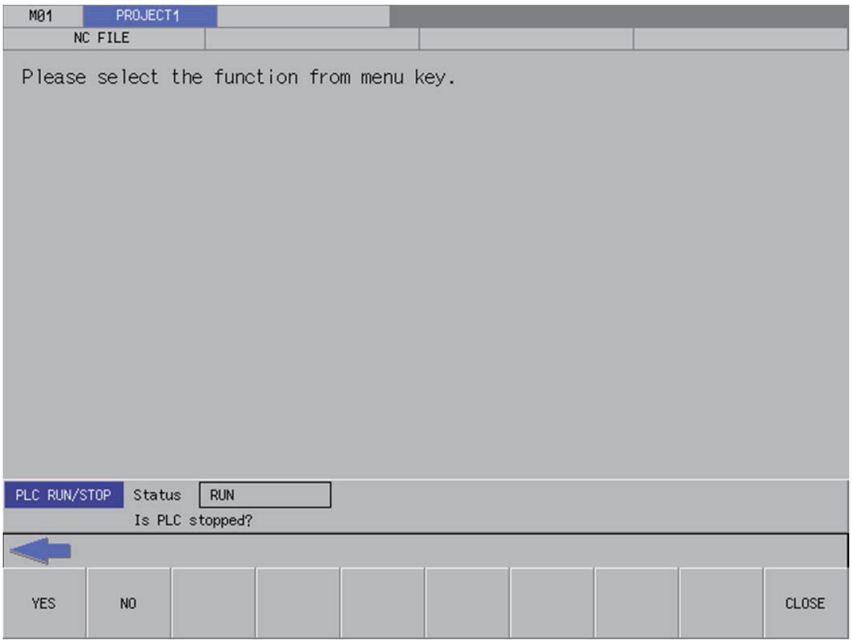
Use any of the following methods to close the ROM write screen.

Methods to close the screen
Execute the ROM write operation.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.10 PLC RUN/STOP Popup Screen

6.11.10.1 Outline

This displays the current PLC state (running or stopped) and enables run and stop control of the PLC. The current status display on the screen changes depending on whether the PLC is currently running or is stopped.
The PLC RUN/STOP popup screen can be called from several different screens.



6.11.10.2 Screen Display Menu

The PLC RUN/STOP popup screen can be displayed from the following menus.
- [NC FILE OPERATION] - [PLC RUN/STOP]
- [EXT. FILE OPERATION] - [PLC RUN/STOP]
- [LADDER MONITOR] - [PLC RUN/STOP]
- [LADDER MONITOR] - [LADDER RATIO] - [ENTRY DEVICE MONITOR] - [PLC RUN/STOP]
- [LADDER MONITOR] - [LADDER RATIO] - [ENTRY LADDER MONITOR] - [PLC RUN/STOP]
- [DEVICE] - [DEVICE BATCH MONITOR] - [PLC RUN/STOP]
- [DEVICE] - [ENTRY DEVICE MONITOR] - [PLC RUN/STOP]
- [SAMPLING TRACE] - [TRACE EXECUTION] - [PLC RUN/STOP]

6.11.10.3 Screen Display Items

The following table describes the screen display items for the PLC RUN/STOP popup screen.

Item name	Display state
Current state	This displays the PLC state for the current project.

6.11.10.4 Enabled/Disabled State of Menu Keys

The menu keys displayed on the PLC RUN/STOP popup screen are always enabled.

6.11.10.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the PLC RUN/STOP Popup Screen".
Yes	Refer to "Changing the PLC State for the Specified Project".
No	Refer to "Closing the PLC RUN/STOP Popup Screen".
Close	Refer to "Closing the PLC RUN/STOP Popup Screen".

6.11.10.6 Changing the PLC State for the Specified Project

To run

1. Press the [YES] menu key to run the PLC for the specified project. PLC may not run depending on the ladder status, parameter settings, or other factors.

To stop

1. Press the [YES] menu key to stop the PLC for the specified project.

6.11.10.7 Closing the PLC RUN/STOP Popup Screen

Use any of the following methods to close the PLC RUN/STOP popup screen.

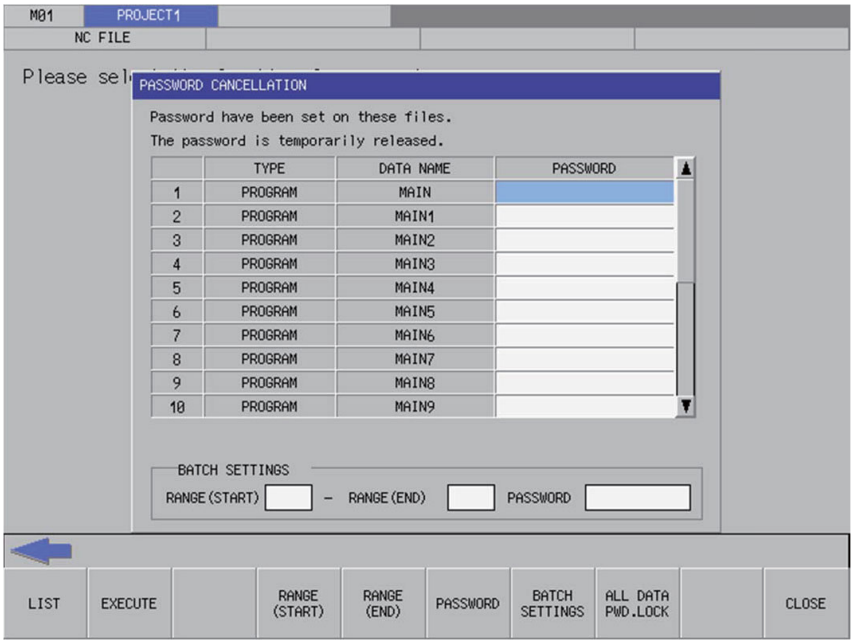
Methods to close the screen
Press the [YES] menu key.
Press the [NO] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.11 Cancel Password Popup Screen

6.11.11.1 Outline

Passwords registered to PLC data files stored in the NC can be temporarily canceled.

Cancel password popup screen



6.11.11.2 Screen Display Items

The following table describes the screen display items for the cancel password popup screen.

Item name		Display state
Type		This displays the type of file for which the password is cleared.
Data name		This displays the name of the file for which the password is cleared.
Password		Entered passwords are displayed on-screen using asterisks.
Batch settings	Range start	Enter the start number for batch settings. Input range: 001 to 999 (highest number)
	Range end	Enter the end number for batch settings. Input range: 001 to 999 (highest number)
	Password	Enter the password for batch settings. Input range: 4 single-byte alphanumeric characters

6.11.11.3 Enabled/Disabled State of Menu Keys

The following information describes the conditions upon which menu keys displayed on the cancel password popup screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
PWD lock for all data	Enabled when the following menu keys are selected ・[NC FILE OPERATION] - [PASSWORD CANCELLATION] ・[EXT. FILE OPERATION] - [PASSWORD CANCELLATION]

6.11.11.4 Status during Screen Displays

The following table describes the status when displaying the cancel password popup screen.

Item name		Operation
Type		If the file selected to have the password cleared exists, the file type is displayed. If it does not exist, the display is blank.
Data name		If the file selected to have the password cleared exists, the file name is displayed. If it does not exist, the display is blank.
Password		This is the default focus position when the screen is displayed. This is left blank.
Batch settings	Range start	This displays the lowest number.
	Range end	This displays the highest number.
	Password	This is left blank.

6.11.11.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Cancel Password Popup Screen"
List	This sets the focus to the password.
Execute	Refer to "Canceling Passwords".
Range start	Batch settings: Sets the focus to the start of the range.
Range end	Batch settings: Sets the focus to the end of the range.
Password	Batch settings: Sets the focus is applied to the password.
Batch settings	This sets the password for the files set from the start of the range to the end of the range with the password set in [BATCH SETTINGS] - [PASSWORD]. Refer to "Batch input".
PWD lock for all data	This sets all files set with passwords to the password not entered state (password locked state). Refer to "Locking the Password for All Data".
Close	Refer to "Closing the Cancel Password Popup Screen"

6.11.11.6 Entering Passwords

Separate entry

Use the following procedure to enter the file password.

1. Press the [LIST] menu key to select the list.
2. Use the up/down arrow keys, Page Up key, and Page Down key to move to the password display column for the desired file.
3. Press the [INPUT] key to display the password input field at the bottom of the list and move the focus.

4. Enter the password and then press the [INPUT] key. Press the INPUT key to close the password input field. The password entered at the cursor position in the list is displayed using asterisks.
   * Passwords are displayed using asterisks as they are input.
5. Pressing the [CLOSE] menu key cancels the password being entered, closes the password input field, and returns to the cursor position to the list.

Batch input

Passwords can be cleared in batches if multiple files have the same password.
Use the following procedure to enter batch settings.

1. Press the [RANGE (START)] menu key to select the start of the range.
2. Enter the start number for batch settings.
3. Press the [RANGE (END)] menu key to select the end of the range.
4. Enter the end number for batch settings.
5. Press the [PASSWORD] menu key to select the password.
6. Enter the password for batch settings.
   * Passwords are displayed using asterisks as they are input.
7. Press the [BATCH SETTINGS] menu key. Pressing the batch settings key displays the password entered for the specified range using asterisks.
   * Batch settings are enabled only when files are consecutively displayed in the list.

Abnormal operation

This information describes the details of error messages displayed when entering passwords and the corrective action thereof.

(1) Separate entry

Error message	Error description	Corrective action
A password has not been entered.	This is displayed when trying to confirm a password before entering the password.	Enter the password before confirming it.
The password is incorrect.	This is displayed when trying to confirm a password entered using less than 4 characters.	Correctly enter the 4-character password before confirming it.

(2) Batch input

Error message	Error description	Corrective action
The range start is not input.	This is displayed when the [BATCH SETTINGS] menu key is pressed before entering the start of the range.	Enter the start of the range before pressing the [BATCH SETTINGS] menu key.
The range end is not input.	This is displayed when the [BATCH SETTINGS] menu key is pressed before entering the end of the range.	Enter the end of the range before pressing the [BATCH SETTINGS] menu key.
A password has not been entered.	This is displayed when the [BATCH SETTINGS] menu key is pressed before entering the password.	Enter the password before pressing the [BATCH SETTINGS] menu key.
The range start is not input.	The specified range is incorrect. This is displayed when the [Batch Settings] menu key is pressed while the start of the range is not within the range of numbers in the list.	Edit the start of the range and then press the [Batch Settings] menu key again.
The password range is illegal.	The specified range is incorrect. This is displayed when the [Batch Settings] menu key is pressed while the start of the range is higher than the end.	Edit the start of the range so that it is higher than the end and then press the [Batch Settings] menu key again.
The range end is illegal.	The specified range is incorrect. This is displayed when the [BATCH SETTINGS] menu key is pressed while the end of the range is not within the range of numbers in the list.	Edit the end of the range and then press the [BATCH SETTINGS] menu key again.
The password is incorrect.	This is displayed when the [BATCH SETTINGS] menu key is pressed while the password entered is less than 4 characters.	Edit the password with all 4 characters before pressing the [BATCH SETTINGS] menu key.

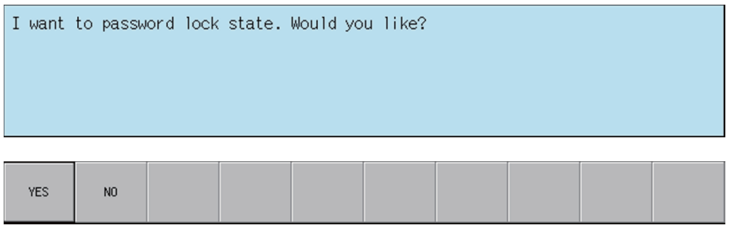
6.11.11.7 Deleting Passwords

Deleting entered passwords

1. Use the up/down arrow keys, Page Up key, and Page Down key to move to the password display column for the desired file.
2. Press the [DELETE] key. Pressing the [DELETE] key deletes the password at the cursor position.

Locking the password for all data

1. Press the [ALL DATA PWD. LOCK] menu key. Pressing the [ALL DATA PWD. LOCK] menu key displays the following message screen.



2. Pressing the [YES] menu key closes the message screen and resets all files to the password not set state (password locked state). The cancel password popup screen closes and the PLC data stored in the NC is retrieved again.
   Pressing the [NO] menu key closes the message screen and returns to the cancel password popup screen.

6.11.11.8 Canceling Passwords

Normal operation

1. Press the [EXECUTE] menu key. Pressing this key removes successfully cleared files from the list. Files that were not successfully cleared remain displayed.
   * Files for which a password was not entered are also removed from the list as clearing the password for these files is no longer needed.

Abnormal operation

This information describes the details of error messages displayed on the cancel password popup screen and the corrective action thereof.

Error message	Error description	Corrective action
The entered password is not correct. Enter the correct password.	This is displayed when the [EXECUTE] menu key is pressed after entering an incorrect password.	The file for which an incorrect password was entered is displayed again. Enter the correct password and then press the [EXECUTE] menu key again.

6.11.11.9 Closing the Cancel Password Popup Screen

Use any of the following methods to close the cancel password popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

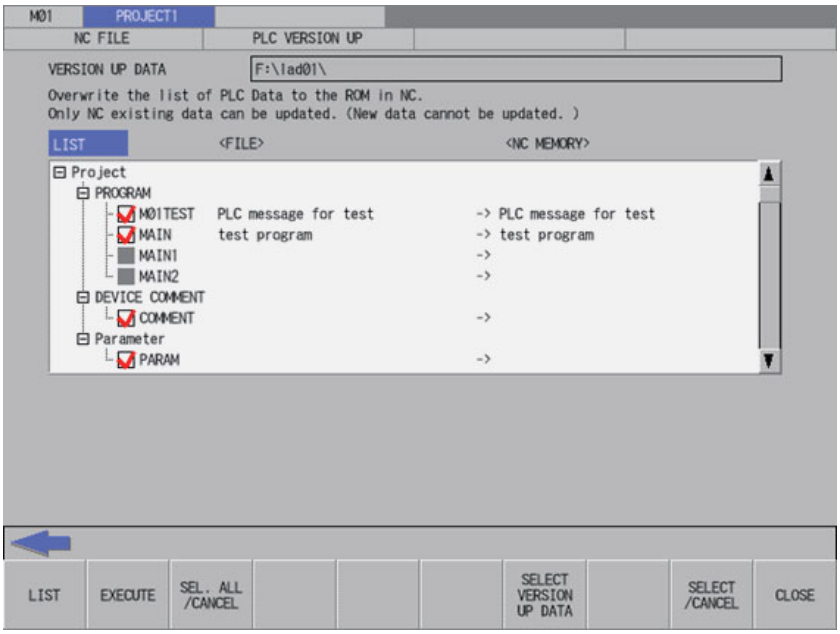
6.11.12 PLC Version Up Screen

6.11.12.1 Outline

The screen enables you to update the sequence programs, PLC messages, device comments and parameters in the NC temporary memory area with the files with the same name stored in an external device. It also performs ROM write in a batch.

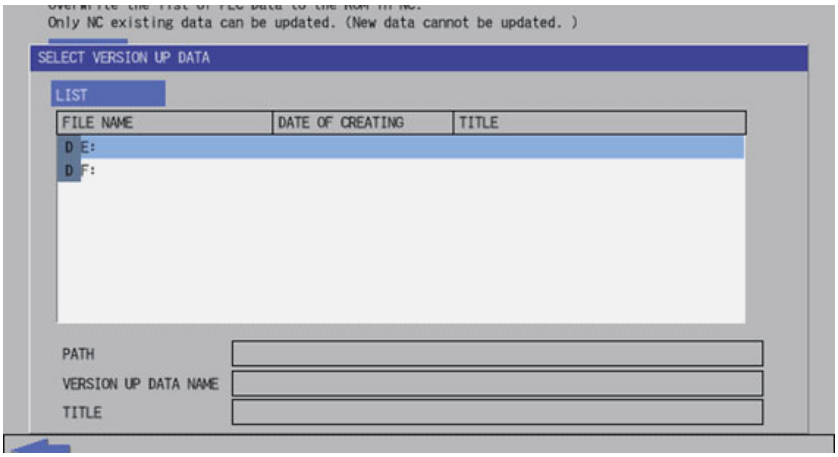
Store the target updated data for NC to the external device in advance. Since the storage destination of the updated data is fixed, only one NC is available. Refer to "Select Version Up Data Popup Screen: Storing Method of the Updating Version Data" for the storage method.

If the PLC data is present in either the external device or the NC, the checkbox is grayed out in the tree diagram, thus the data cannot be updated.



(Note) Back up data before updating a PLC.
If an error occurs during the update, data in the CNC may be deleted.

Pressing the [PLC VERSION UP] menu from the NC file screen displays the select version up data popup screen as illustrated in the following diagram.



*1 The screen covers the data in the NC. Thus the PLC data cannot be added to the NC.

*2 The updating destinations are on-board editing area, temporary memory area and built-in ROM area as illustrated in "PLC Data: PLC Data Storage Areas".

*3 The PLC data displayed in the LIST are those stored in the temporary memory area. Thus if there is difference between the built-in ROM area and the temporary memory area as follows, the data is overwritten by that in the temporary memory area, and the difference on the built-in ROM area side is discarded.

- when the PLC alarm message "WRITE LADDER TO ROM" is displayed
- when you have not restarted the NC after restoring the backup data made with the PLC-related data all backup function.

Refer to "Procedures for Backing up Data Such as Sequence Programs" in "Peripheral Development Environment" for details of the PLC-related data all backup function.

*4 When using multiple projects, switch the current project in advance because the update is executed to the current project.

Refer to "Main Screen: Selecting the Current Project" for the switching method.

6.11.12.2 Screen Display Items

The following table describes the screen display items on the PLC version up screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This displays alarm messages when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Version up data	This displays the path of the updating version data selected on the select version up data popup screen.
List	This lists the sequence programs, PLC messages, device comments and parameters in the tree view, which are the results of comparison between the PLC data stored in the NC and those stored in the updating version data you selected on the "select version up data" popup screen.

6.11.12.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the PLC version up screen are always enabled.

6.11.12.4 Status during Screen Displays

The following table describes the status when displaying the PLC version up screen.

Item name	Operation
List	This is the default focus position when the screen is displayed. This lists the sequence programs, PLC messages, device comments and parameters in the tree view, which are the results of comparison between the PLC data stored in the NC and those stored in the updating version data. If there is nothing stored or no updating version data has been selected, this lists the PLC data of the NC in the tree view, with the setting operation of the sequence programs, PLC messages, device comments and parameters disabled.

6.11.12.5 Operation of Key Presses

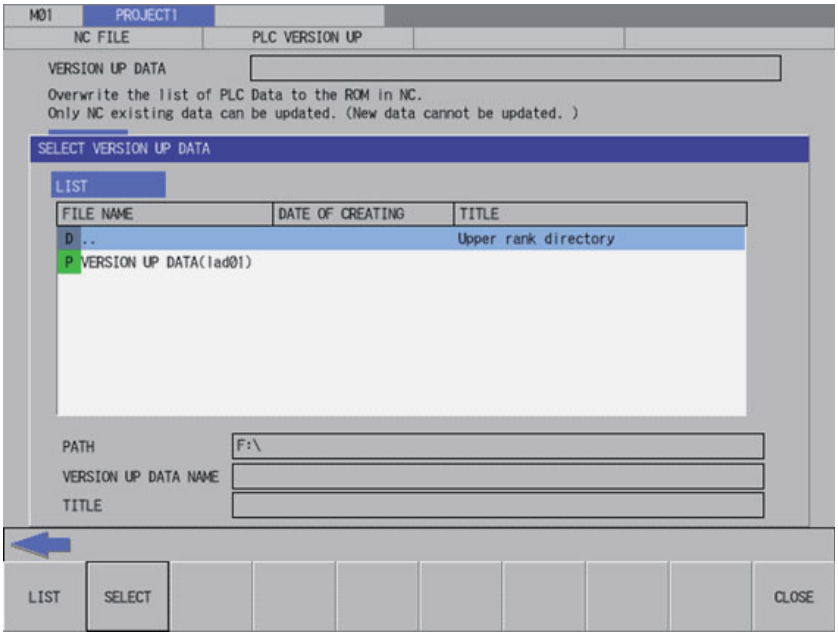
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	This closes the PLC version up screen.
List	The focus is applied to the list.
Execute	Refer to "Update the PLC Version".
Select/cancel all data	This selects/deselects the checkboxes for all data in the list.
Select version up data	This displays the select version up data popup screen. Refer to "Select Version Up Data Popup Screen" for details.
Select/cancel data	This selects/deselects the checkboxes for data selected in the list. This operation can also be performed with the [SP (space)] key.
Close	This closes the PLC version up screen.

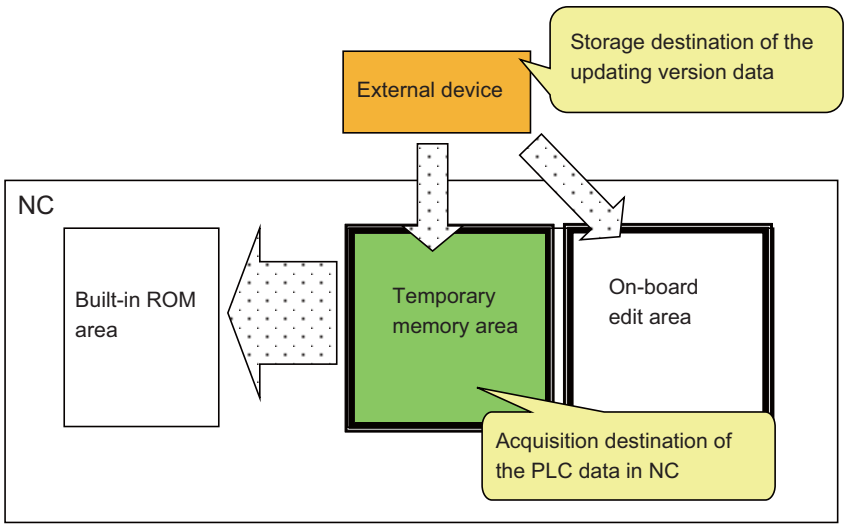
6.11.12.6 Update the PLC Version

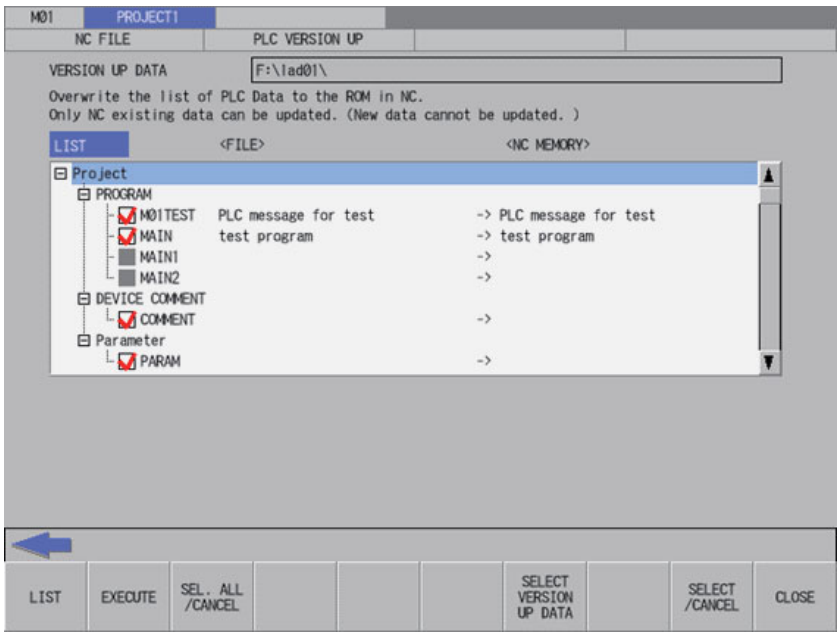
Normal operation

(1) Select the updating version data from the select version up data popup screen.

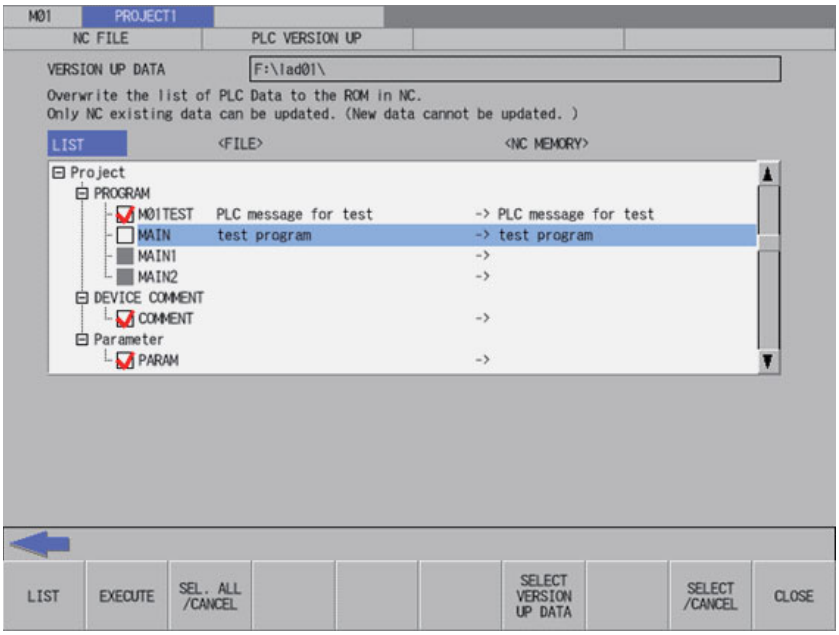


(2) When selecting the updating version data, the data is compared to the temporary memory area of NC. If the both areas have the PLC data with the same name, the checkbox of the data is activated. If the PLC data exists in either of the areas, the checkbox of the data is deactivated.



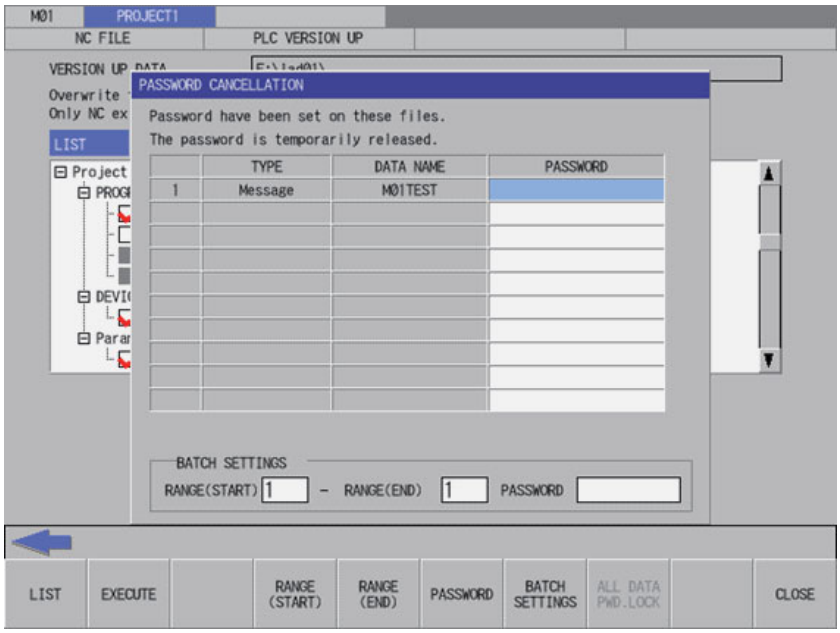


(3) If you exclude any PLC data from PLC version update, remove the check from the checkbox in the PLC version up screen list.



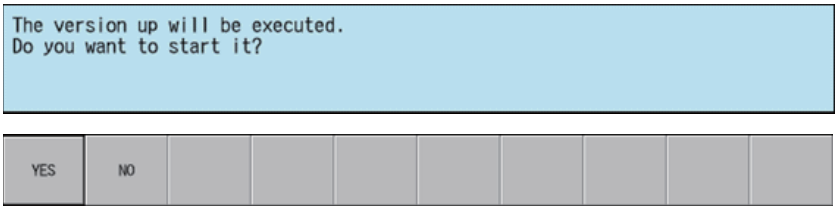
(4) After selecting data, press the [EXECUTE] menu key. The PLC data selected in the list is read from the external device and then the PLC data with the same name in the NC is overwritten.

If a password to protect against read or read and write has been registered to the selected files, the password cancel screen pops up.
Enter the password to temporarily cancel the password. If the password is temporarily cancelled, processing will continue.
Refer to "Canceling File Passwords" for information on entering and clearing passwords.



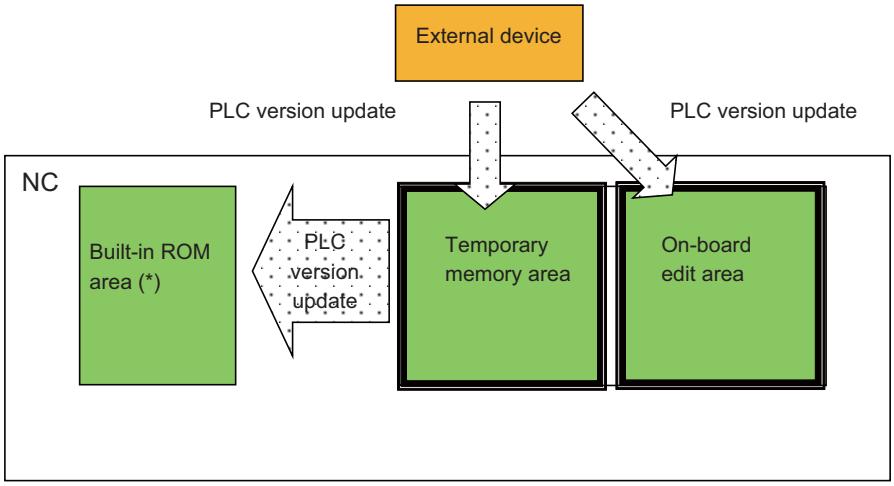
*After the password is cleared, the operation to the PLC on-board is in the password cancel state. If necessary, enable the password lock state again by any of the following methods:
- Restart the NC
- Execute the password lock for all data (Refer to "Locking the password for all data" in "Cancel Password Popup Screen: Deleting Passwords" for the methods.)

(5) When the confirm start PLC version update popup screen is displayed, select "YES".



The progress bar appears, indicating the status of updating the PLC version.

* Do not remove the external device while the progress bar is displayed. Failure to observe this may cause damage to the data in the NC or the external device, as the PLC version is not updated correctly.



*The built-in ROM area is overwritten with the temporary memory area for which PLC version update has been performed. Thus, if there is a difference between the two areas, the difference on the built-in ROM side is discarded. Refer to the precautions of "Outline" for details.

(6) After the PLC version update has been completed, the complete message is displayed. Press the OK button to automatically close the PLC version up screen and return to the NC file operation screen.

If you update PLC version while the PLC is running, a message displays to confirm whether or not to pause the PLC. Select [YES] to stop the PLC and continue updating the PLC version. If [NO] is selected, an error occurs since the PLC is not stopped and the error message is displayed. (Refer to "Abnormal operation".)
If the PLC is stopped, a message displays to confirm whether or not to restart the PLC immediately before data has been added. Select [YES] to continue running the PLC, or select [NO] to keep the PLC stopped.

Abnormal operation

This information describes the details of error messages displayed on the PLC version up screen and the corrective action thereof.

Error message	Error description	Corrective action
A Version up Data is not selected.	This is displayed when you press the [EXECUTE] menu key without selecting any PLC data from the list.	Select PLC data from the list before pressing the [EXECUTE] menu key.
The version up cannot be executed because the PLC is running. Execute again after stopping the PLC.	This is displayed when you attempt to update the PLC data stored in the NC without stopping the PLC.	Update the PLC data stored in the NC after stopping the PLC.
The temporary data cannot be created in the specified drive.The possible reasons are following. The drive capacity is not enough. The drive is write protected. The directory for the temporary data "WorkTemp" already exists.	When you use "Method for Directly Storing the PLC Data File in "ladXX" Directory" described in "Select Version Up Data Popup Screen: Storing Method of the Updating Version Data" to store the updating version data, the temporary data directory "WorkTemp" is created in the storage destination. This message is displayed in the following cases. - The free capacity is insufficient. - The external device is write protected. - A directory or file named "WorkTemp" exists.	Perform the following for the external device that contains the updating version data, before updating the PLC data version. - Increase the free capacity (For required free capacity, refer to "Method for Directly Storing the PLC Data File in "ladXX" Directory" in "Select Version Up Data Popup Screen: Storing Method of the Updating Version Data".) - Release the write protection - Delete or rename the "WorkTemp" directory or file
A faulty command exist in the program. Execute a program check and correct the program.	This is displayed when you attempt to update the program containing any device No. which is out of the device range of the NC.	Check the device range and correct the program to be updated, so that all the devices in the program are within the range.
Device point that is set in parameter is not match the device point in NC. Continue the reading PLC or writing PLC?	This is displayed when the parameter file to be updated has different number of device points from that of the NC. When selecting [YES], reading of the parameter file is skipped and the update process is continued. When selecting [NO], the update process is cancelled.	When updating the version of parameter file, check the number of NC device points shown in "Parameter Menu: Device Settings Screen", and match the number.
Insufficient file capacity. Execute again after deleting unnecessary files.	This is displayed when the file capacity is insufficient and the version update failed.	Reduce the size of the data to be updated to a size that can be stored in the CNC. Then, restore from the backup data, and update the version again.

6.11.12.7 Closing the PLC Version Up Screen

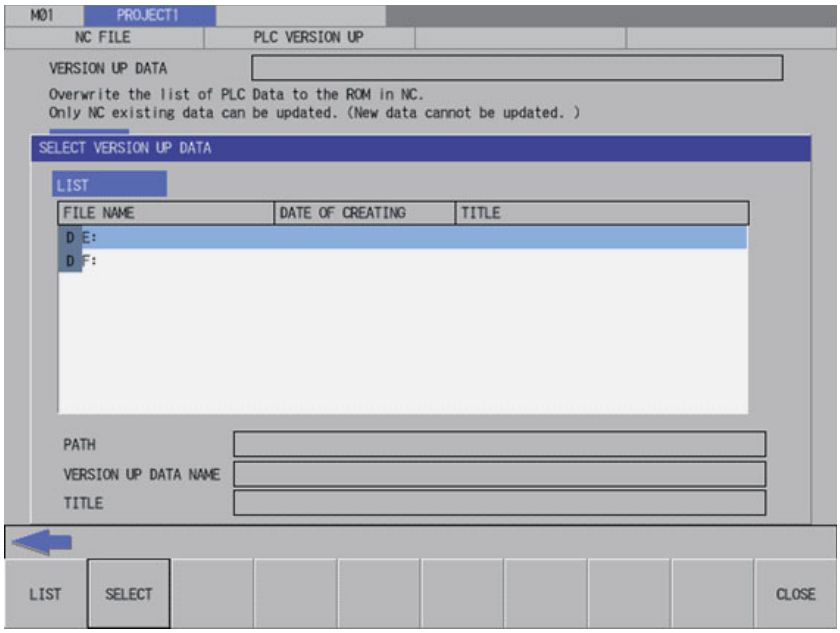
Use any of the following methods to close the PLC version up screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.11.13 Select Version Up Data Popup Screen

6.11.13.1 Outline

This screen enables you to select the updating version data stored directly under the external device.



6.11.13.2 Screen Display Items

The following table describes the screen display items for the select version up data popup screen.

Item name	Display state
List	The File name column displays the external device list or the updating version data. The Date of creating column is always blank. The Title column displays the title set in the project when the selected data is in the project format.
Path	This displays the path where the updating version data is stored.
Version up data name	This displays the name of the updating version data that is selected in the list.
Title	This displays the title set in the project when the selected updating version data is in the project format.

6.11.13.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the select version up data popup screen are always enabled.

6.11.13.4 Status during Screen Displays

The following table describes the status when displaying the select version up data popup screen.

Item name	Operation
List	Refer to "Displaying Updating Version Data".
Path	This is blank or displays the path that is displayed in the List.
Version up data name	This is blank or displays the name of the updating version data that is selected in the list.
Title	This is blank or displays the title set in the project when the selected updating version data is in the project format.

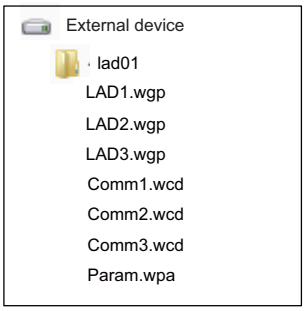
6.11.13.5 Storing Method of the Updating Version Data

The updating version data is stored in the directory named "ladXX" that is located directly under the external device. (XX is a two-digit number representing the project No., from "01" to "06".)
The "ladXX" directory is located directly under the external device and is case-insensitive.
For a single project, store the data in "lad01" which is project No.1.
There are two storage methods, and the method to be stored in project format will have a priority.

Method for directly storing the PLC data file in "ladXX" directory

This is the method for directly storing the individually prepared PLC data in "ladXX" directory.

Storage example (Project No.1)

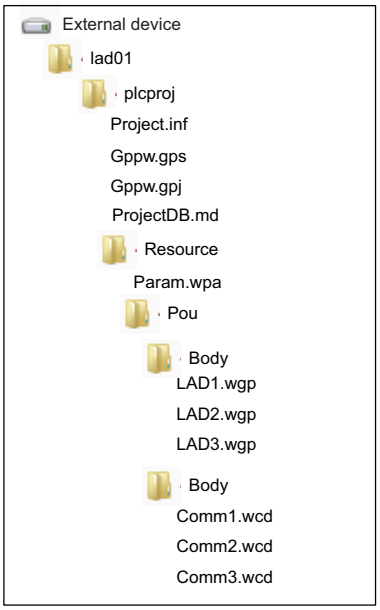


* In this method, the temporary work directory "WorkTemp" is created when updating the PLC version directly under the "ladXX" directory and is deleted after the update.
The external device requires the following free capacity because the fixed file and the PLC data selected on the PLC version up screen are stored in "WorkTemp".
Free capacity to be required = Fixed file size (128 kilobytes) + PLC data file size

Method for storing project-format data in "ladXX" directory

This is the method for directly storing the project format directory for GX Developer to the "ladXX" directory. The project format directory name is fixed to "plcproj" and is case-insensitive.

Storage example (Project No.1)



When reading version update data in the format of a project stored in an SD card, the data is not displayed in the PLC select version up data screen if the lock switch of the SD card is ON. To read the data, turn OFF the lock switch of the SD card.

6.11.13.6 Displaying Updating Version Data

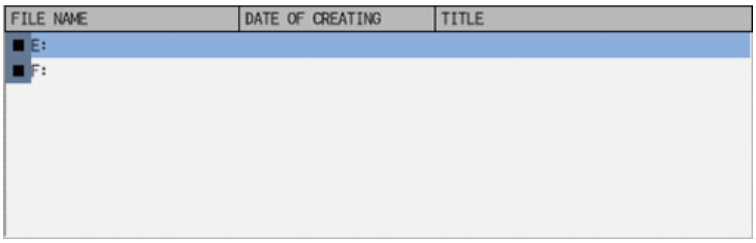
When the updating version data is stored directly under the external device, it is displayed as the fixed name "VERSION UP DATA (ladXX)" in the list of the select version up data popup screen. (XX is a two-digit number representing the project No., from "01" to "06".)

* The updating version data is stored in the "ladXX" directory that is located directly under the external device. However, in the list of the select version up data popup screen, it is displayed as the item name "VERSION UP DATA (ladXX)".

Difference of the display according to the displaying timing

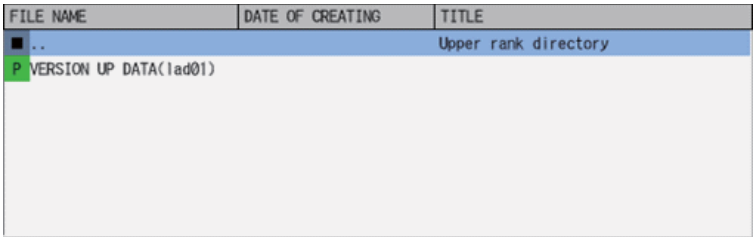
This displays the external device list when the select version up data popup screen is displayed for the first time.
This displays the updating version data previously selected when the select version up data popup screen is displayed after the data is already selected.

< List for the initial display of the screen >

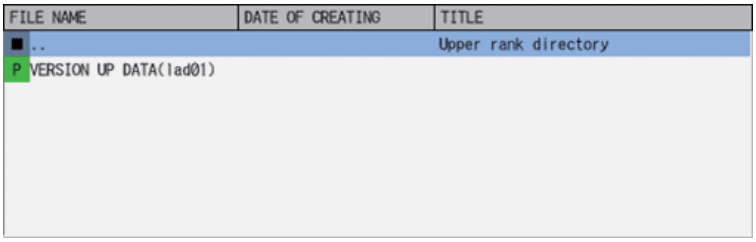


< List when an updating version data was selected >

(Example)If you select and execute the updating version data stored in the external device F, the data of the external device F is displayed next time.



< List to be displayed next time >



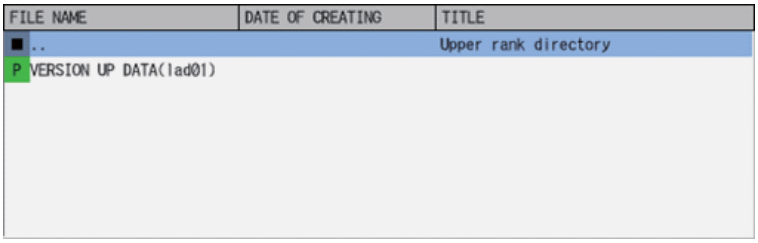
6.11.13.7 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

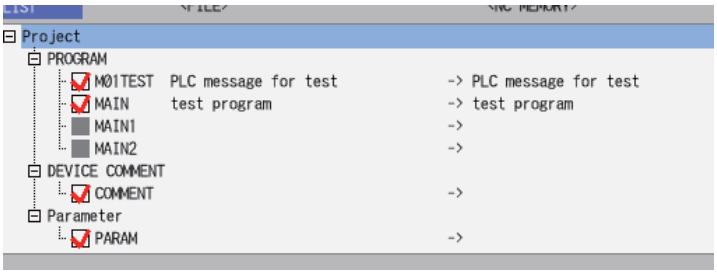
Item name	Operation
Left arrow key	This closes the select version up data popup screen.
Select	Refer to "Selecting Updating Version Data".
Close	This closes the select version up data popup screen.

6.11.13.8 Selecting Updating Version Data

1. Press the [LIST] menu key to move the focus to the list. Use the up and down arrow keys to select the external device where the updating version data is stored and press the [INPUT] key or the [SELECT] menu key.



2. When you press the [INPUT] key or the [SELECT] menu key after selecting "VERSION UP DATA" with the up and down arrow keys, the select version up data popup screen closes and the PLC version up screen appears again. PLC version up screen lists the sequence programs, PLC messages, device comments and parameters in the tree view, which are the results of the comparison between each PLC data stored in the selected updating version data and those stored in the NC.



6.11.13.9 Closing the Select Version Up Data Popup Screen

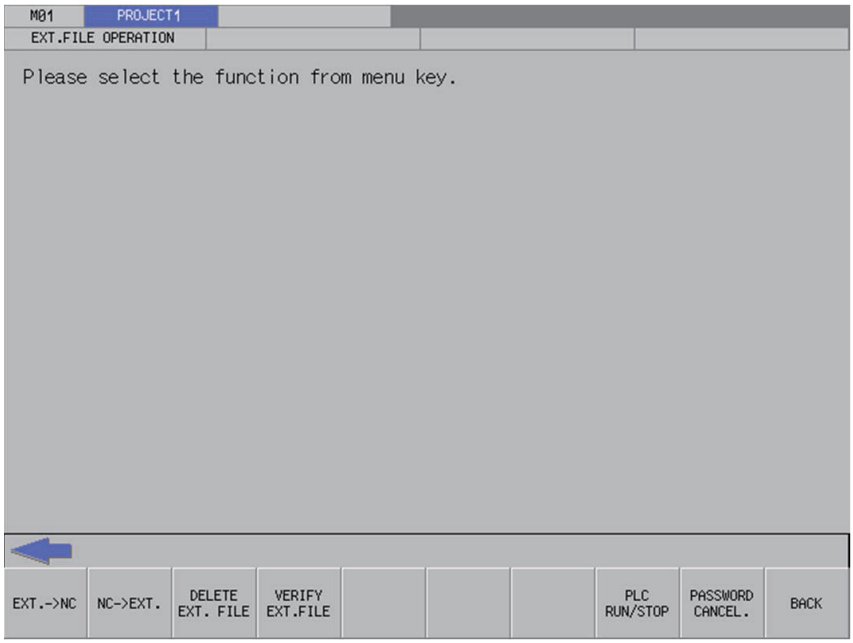
Use any of the following methods to close the select version up data popup screen.

Methods to close the screen
Select the updating version data and then press the [SELECT] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12 External File Operation Menu

6.12.1 External File Operation Main Screen

This is used to perform operations on PLC data stored in external devices.



6.12.1.1 Screen Display Items

The following table describes the screen display items for the external file operation screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.12.1.2 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the external file operation screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
External -> NC	Disabled when the function is restricted.
PLC RUN/STOP	Disabled when the function is restricted.
Cancel password	Disabled when the function is restricted.

Operation of Key Presses

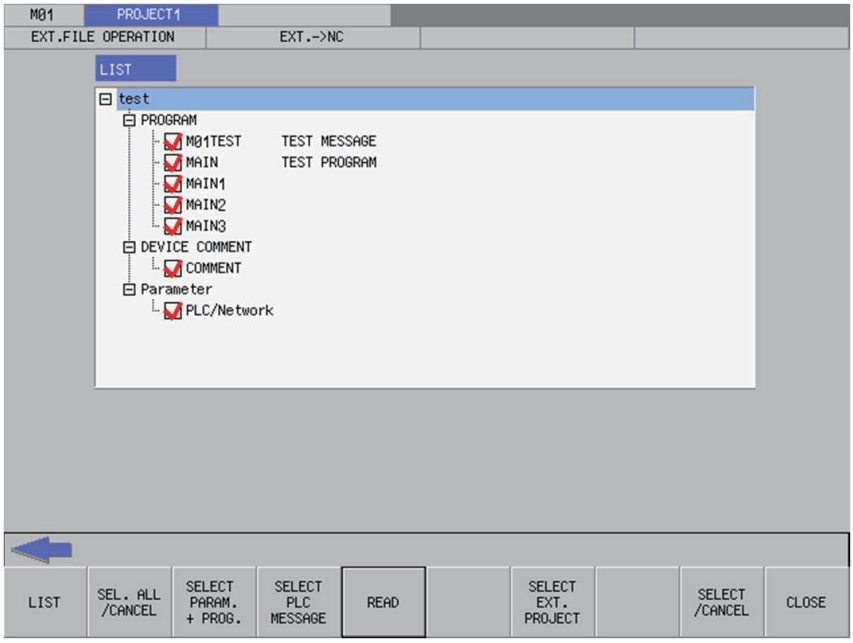
The following table describes the operation of the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/return menu key	These transition to the main menu.
Various menu keys	This displays the specified screen.

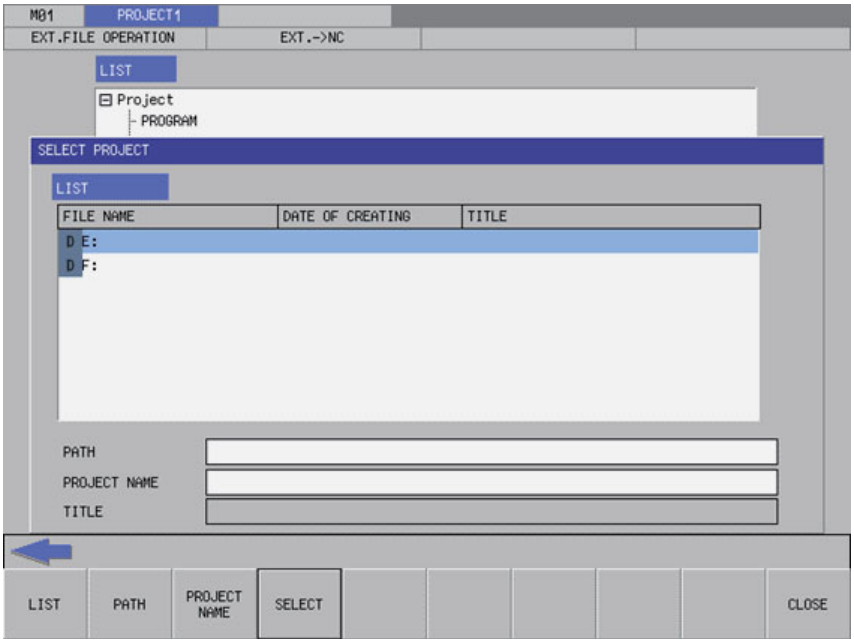
6.12.2 EXT.->NC Screen

6.12.2.1 Outline

This reads the project data stored in external device and writes to the temporary memory area of the current project in the NC.



Pressing the [EXT. -> NC] menu from the external file operation screen displays the select external project popup screen as illustrated in the following diagram. If this screen displays while an external project is not selected, PLC data cannot be displayed in the list.



6.12.2.2 Screen Display Items

The following table describes the screen display items for the "EXT.->NC" screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays PLC data stored in the selected on the select external project screen. This displays nothing if there is nothing stored or no PLC data has been selected.

6.12.2.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the "EXT.->NC" screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Select/Cancel all data	Enabled when selectable PLC data has been added to the list
Parameter + Program	Enabled when selectable PLC data has been added to the list
PLC messages	Enabled when selectable PLC data has been added to the list
Execute	Enabled when selectable PLC data has been added to the list
Select/Cancel data	Enabled when selectable PLC data has been added to the list

6.12.2.4 Status during Screen Displays

The following table describes the status when displaying the "EXT.->NC" screen.

Item name	Operation
List	This is the default focus position when the screen is displayed. This displays PLC data stored in the selected on the select external project screen. This displays nothing if there is nothing stored or no PLC data has been selected.

6.12.2.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

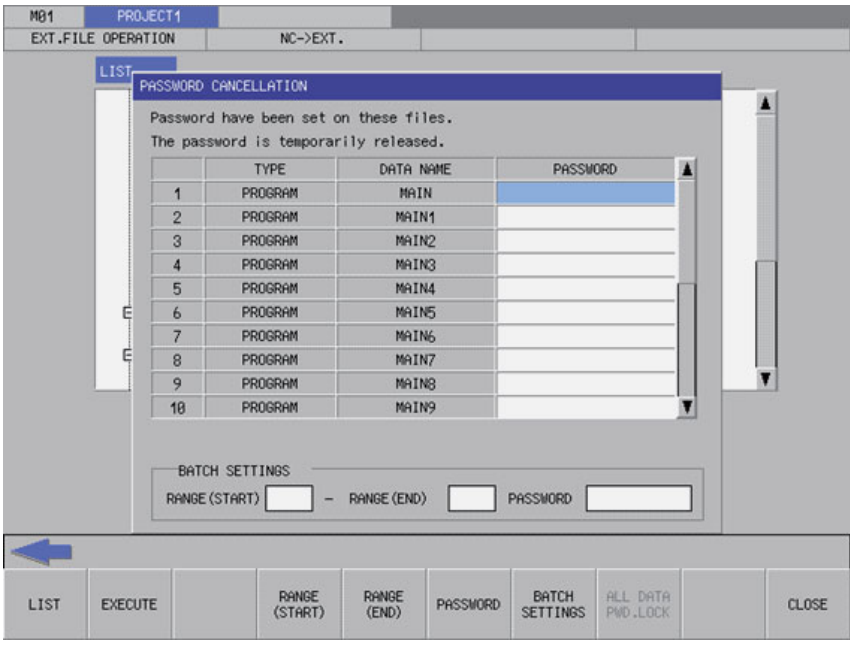
Item name	Operation
Left arrow key	Refer to "Closing the External -> NC Screen".
List	The focus is applied to the list.
Select/Cancel all data	This selects/deselects the check boxes for all data in the list.
Parameter + Program	This selects/deselects the check boxes for parameters and programs in the list. This does not include PLC messages however.
PLC messages	This selects/deselects the check boxes for the PLC messages in the list.
Execute	Refer to "Reading External Project Data and Storing in the NC".
Select external project	This displays the select external project popup screen. Refer to "Select External Project Popup Screen".
Select/Cancel data	This selects/deselects the check boxes for data selected in the list. *This operation can also be performed with the [SP (space)] key.
Close	Refer to "Closing the External -> NC Screen".

6.12.2.6 Reading External Project Data and Storing in the NC

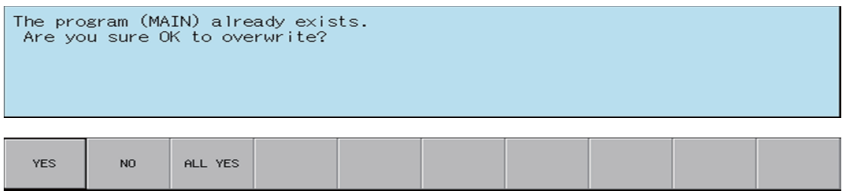
Normal operation

1. Press the [LIST] menu key to move the focus to the list. Select the desired PLC data from the list. Deselect the check boxes for data you do not want to store.
2. After selecting data, press the [EXECUTE] menu key. After pressing this menu key, the PLC data selected in the list is read from the project stored in an external device and then stored in the specified project in the NC.

* If a password to protect against reads or reads/writes has been registered to the selected files, the cancel password screen is displayed.
Enter the password to temporarily cancel the password.
If the password is temporarily canceled, processing will continue.
Refer to "Canceling File Passwords" for information on entering and clearing passwords.

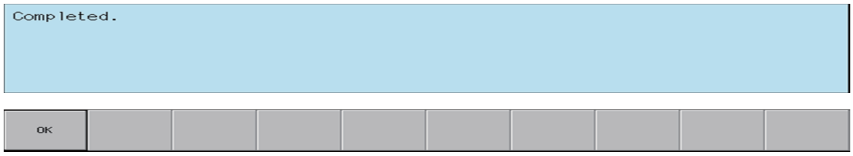


* If PLC data with the same name has already been read, the confirm overwrite popup screen is displayed.

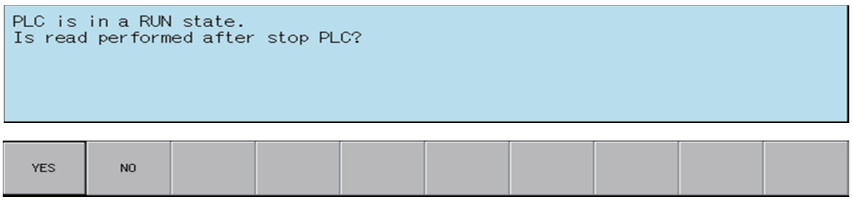


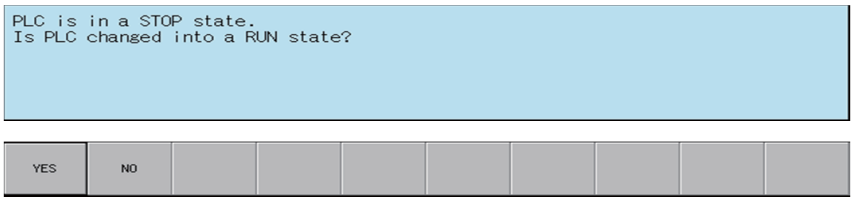
* A progress bar is displayed indicating the status of reading and writing PLC data.

3. After the selected PLC data has been read and written, the complete message is displayed.



* If PLC data is written while the PLC is running, a message confirming whether or not to pause the PLC is displayed. Select [YES] to stop the PLC and continue writing the PLC data. If [NO] is selected, the PLC does not stop which results in an error and the display of an error message. (Refer to "Abnormal operation")
* If the PLC stops, a message displays to confirm whether or not to restart the PLC immediately after data has been written. Select [YES] to continue running the PLC. Select [NO] to keep the PLC stopped.





Abnormal operation

This information describes the details of error messages displayed on the "EXT.->NC" screen and the corrective action thereof.

Error message	Error description	Corrective action
Read data has not been selected.	This is displayed when the [EXECUTE] menu key is pressed before any PLC data has been selected from the displayed list.	Select PLC data from the displayed list before pressing the [EXECUTE] menu key.
Write executions cannot be performed because the PLC is running. Execute again after the PLC stops.	This displays when attempting to store PLC data stored in an external device into the NC without stopping the PLC.	Store PLC data stored in an external device into the NC after stopping the PLC.
Device point that is set in parameter is not match the device point in NC. Continue the reading PLC or writing PLC?	This message appears when you attempt to read a parameter file that has a different number of device points from that of the NC. When you select [Yes], reading of the parameter file is skipped and the reading process is continued. When you select [No], the reading process is cancelled.	Before reading a parameter file, check the number of NC device points in "Parameter Menu: Device Settings Screen" and correct if unmatched.

6.12.2.7 Closing the "EXT.->NC" Screen

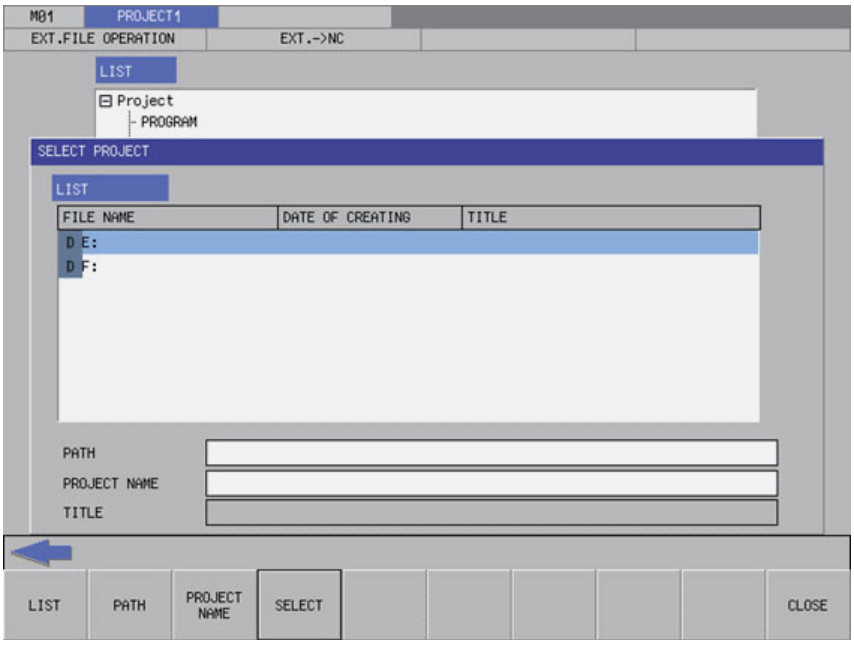
Use any of the following methods to close the "EXT.->NC" screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.3 Select External Project Popup Screen

6.12.3.1 Outline

This displays a list of project data stored in external devices and selects the project data to be read.



6.12.3.2 Screen Display Items

The following table describes the screen display items for the select external project popup screen.

Item name	Display state
List	This displays the directory and PLC data stored at the specified path.
Path	This displays the path where the project data is stored. (the path can be entered)
Project name	This displays the name of the project data selected in the list. (the project name can be entered)
Title	This displays the title set in the project data selected in the list.

6.12.3.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the select external project popup screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Select	Enabled when the path and project name are not blank

6.12.3.4 Status during Screen Displays

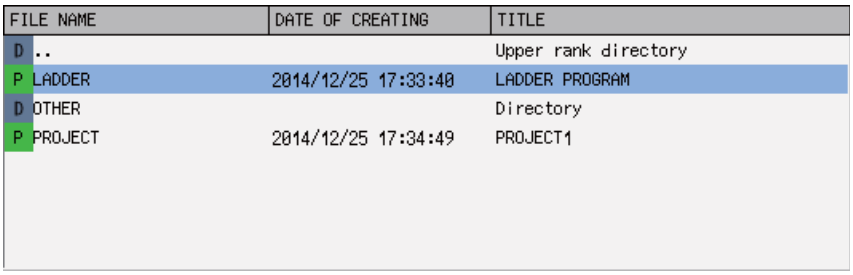
The following table describes the status when displaying the select external project popup screen.

Item name	Operation
List	Refer to "Displaying PLC Data"
Path	This is blank or displays the path that is displayed in the list.
Project name	This is blank or displays the project data that is selected in the list.
Title	This is blank or displays the title specified in the project data that is selected in the list.

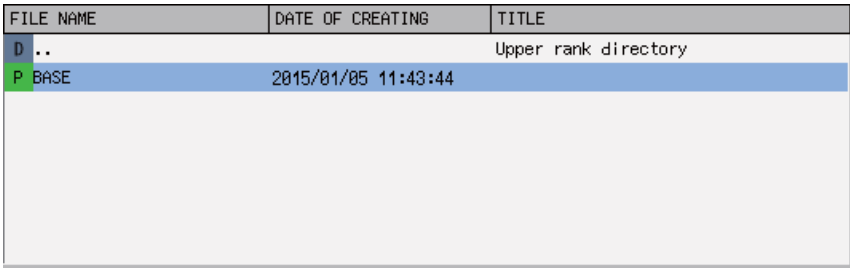
6.12.3.5 Displaying PLC Data

This displays the directory and project data stored directly under the root path of the default external device when the select external project popup screen is displayed for the first time.
This displays the details of the path where the previously selected project is stored when the select external project popup screen is displayed after a project is already selected. This displays path details directly under the root of the default external device when there is no specified path.

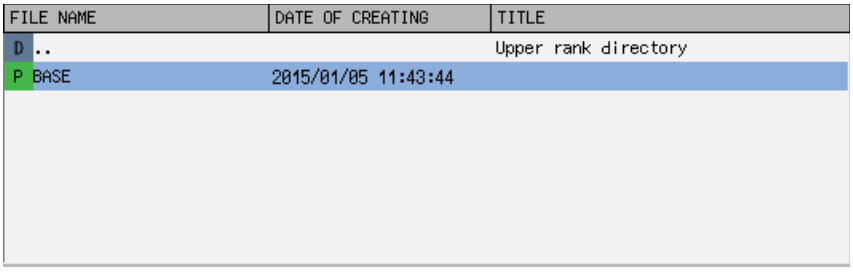
<List display for the initial display of the screen>



<List display when a project is selected>



<List for the next display>



6.12.3.6 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Select External Project Popup Screen".
List	This selects the list.
Path	This selects the password input field.
Project name	This selects the project name input field.
Select	Refer to "Selecting External Projects".
Close	Refer to "Closing the Select External Project Popup Screen".

6.12.3.7 Select External Projects

Normal operation

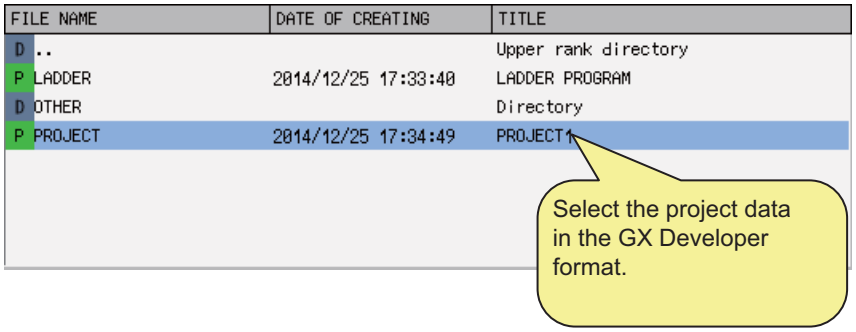
(1) To directly input the path and project name

1. Press the [PATH] menu key to move the focus to the path input field. Input the path where the project data is stored.
   *This operation is not necessary if the read source does not need to be changed.
2. Press the [PROJECT NAME] menu key to move the focus to the project name input field. Enter the name for the project data.
3. Pressing the [SELECT] menu key closes the select external project popup screen and returns to the "EXT.->NC" screen. The PLC data stored in the selected project is displayed in the list on the "EXT.->NC" screen.

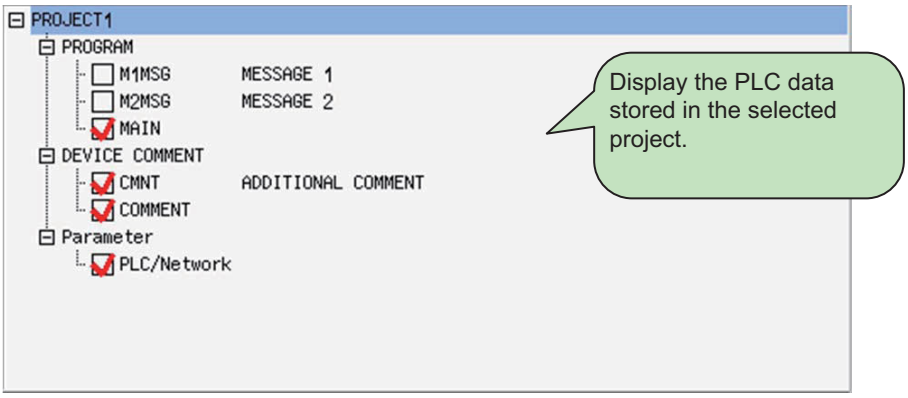
(2) To select a project from the list

1. Press the [LIST] menu key to move the focus to the list. Use the up and down arrow keys to select existing project data.
2. Pressing the [INPUT] menu key or pressing the [SELECT] menu key closes the select external project popup screen and returns to the "EXT.->NC" screen. The PLC data stored in the selected project is displayed in the list on the "EXT.->NC" screen.

<List for the select external project screen>



<List for the "EXT.->NC" screen>



(3) When the project is read-only

When an external project is selected and the following applies, a read-only confirmation message is displayed.
- When a file in the folder of the project is read-only
- When the device in which the project is stored is read-only

The selected project is read-only. Is a read-only setup canceled?

When the file is read-only, clicking [YES] cancels read-only setup and closes the select external project popup screen. When the screen returns to the previous screen, the specified project is selected.

When the device is read-only, clicking [YES] does not cancel the read-only setup, and the project is not selected after retuning to the previous screen.
Remove the external device and cancel the read-only setup. (For example, unlock the lock switch on an SD card, etc.)

Clicking [NO] displays the following confirmation message and returns to the select external project popup screen.

A read-only project cannot be chosen.

Abnormal operation

This information describes the details of error messages displayed on the select project popup screen and the corrective action thereof.

Error message	Error description	Corrective action
The specified project does not exist. Specify an existing project path/project name.	This is displayed when the [SELECT] menu key is pressed after entering a path or project name that does not exist.	Enter the correct path and project name and then press the [SELECT] menu key again.

6.12.3.8 Closing the Select External Project Popup Screen

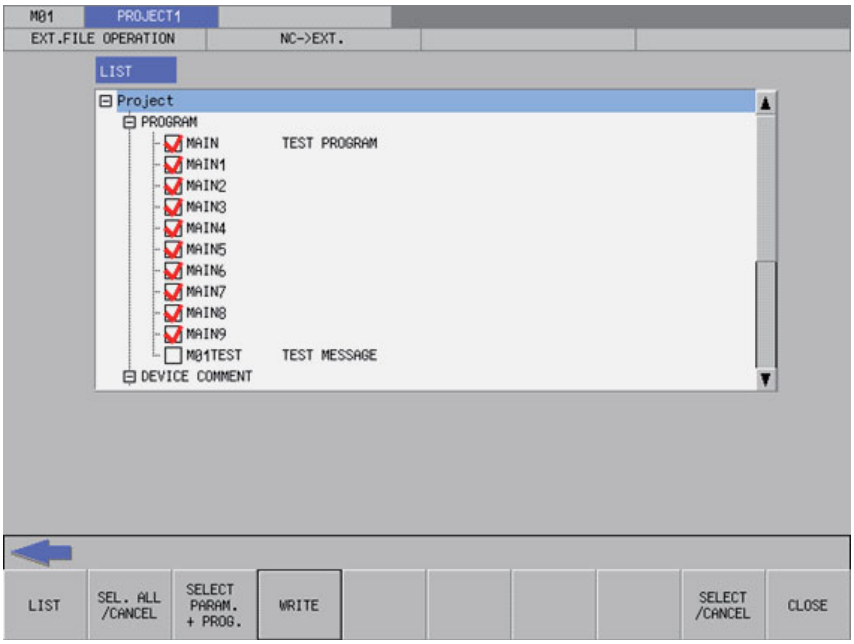
Use any of the following methods to close the select external project popup screen.

Methods to close the screen
Select the project and then press the [SELECT] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.4 NC->EXT. Screen

6.12.4.1 Outline

This reads the project data stored in the current project and stored it into external media in GX Developer format.



6.12.4.2 Screen Display Items

The following table describes the screen display items for the "NC->EXT." screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the PLC data stored in the current project. This displays nothing if there is nothing stored.

6.12.4.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the "NC->EXT." screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Select/Cancel all data	Enabled when selectable PLC data has been added to the list
Parameter + Program	Enabled when selectable PLC data has been added to the list
Write	Enabled when selectable PLC data has been added to the list
Select/Cancel data	Enabled when selectable PLC data has been added to the list

6.12.4.4 Status during Screen Displays

The following table describes the status when displaying the "NC->EXT." screen.

Item name	Operation
List	This is the default focus position when the screen is displayed. This displays the PLC data stored in the current project.

6.12.4.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

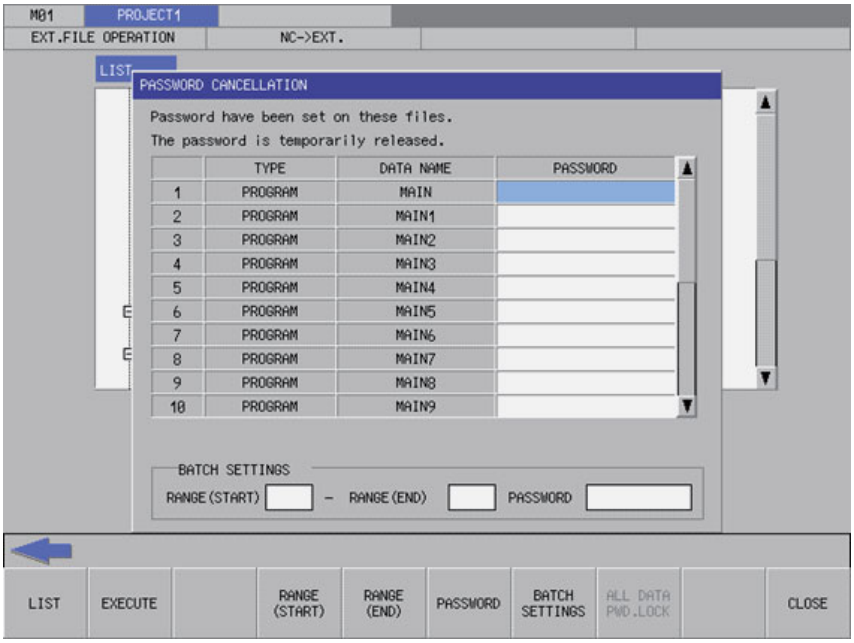
Item name	Operation
Left arrow key	Refer to "Closing the NC -> External Screen".
List	The focus is applied to the list.
Select/Cancel all data	This selects/deselects the check boxes for all data in the list.
Parameter + Program	This selects/deselects the check boxes for parameters and programs in the list. This does not include PLC messages however.
Write	Refer to "Storing PLC Data Stored in the Current Project into an External Device".
Select/Cancel data	This selects/deselects the check boxes for data selected in the list. *This operation can also be performed with the [SP (space)] key.
Close	Refer to "Closing the NC -> External Screen".

6.12.4.6 Storing PLC Data Stored in the Current Project into an External Device

Normal operation

1. Press the [LIST] menu key to move the focus to the list. Select the desired PLC data from the list. Deselect the check boxes for data you do not want to store.
2. After selecting data, press the [WRITE] menu key. After pressing this menu key, the save external project popup screen displays.
3. At the save external project popup screen, specify the project you want to save and then press the [SELECT] menu key. The PLC data selected in the list on the "NC->EXT." screen is saved to the project specified on the [SAVE EXTERNAL PROJECT] popup screen in GX Developer format.
   After the save process completes, the save external project popup screen closes.
   * Refer to "Save External Project Popup Screen" for more information on the process performed with the save external project popup screen.

* If a password to protect reads/writes has been registered to the selected files, the cancel password screen is displayed.
  Enter the password to temporarily cancel the password.
  If the password is temporarily canceled, processing will continue.
  Refer to "Canceling File Passwords" for information on entering and clearing passwords.



Abnormal operation

This information describes the details of error messages displayed on the "NC->EXT." screen and the corrective action thereof.

Error message	Error description	Corrective action
Write data has not been selected.	This is displayed when the [EXECUTE] menu key is pressed before any PLC data has been selected from the displayed list.	Select PLC data from the displayed list before pressing the [EXECUTE] menu key.
It is not possible to add more programs than this to the current project. Delete any unnecessary programs and try again.	This is displayed when the total number of the selected programs and PLC messages exceeds the upper limit 124 of GX Developer project formats.	Select the programs and PLC messages so that the total number of them is 124 or less before pressing the [EXECUTE] menu key.

6.12.4.7 Closing the NC->EXT. Screen

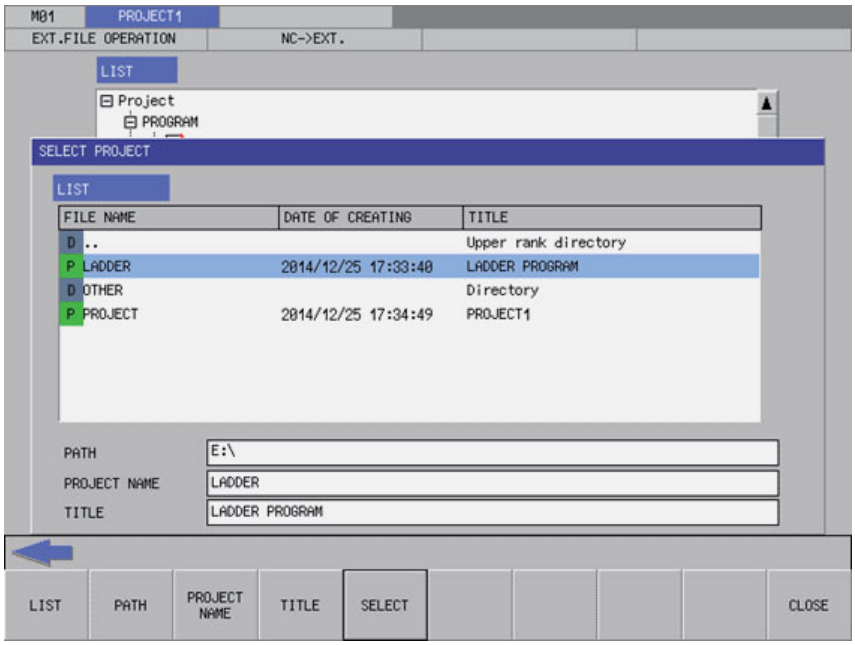
Use any of the following methods to close the "NC->EXT." screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.5 Save External Project Popup Screen

6.12.5.1 Outline

This displays a list of project data stored in external devices, selects the project data to be saved, and also creates new data.



6.12.5.2 Screen Display Items

The following table describes the screen display items for the save external project popup screen.

Item name	Display state
List	This displays the directory and PLC data stored at the specified path.
Path	This displays the path where the project data is stored. (the path can be entered)
Project name	This displays the name of the project data selected in the list. (the project name can be entered)
Title	This displays the title set in the project data selected in the list. (the title can also be entered)

6.12.5.3 Enabled/Disabled State of Menu Keys

The menu key displayed on the save external project popup screen are always enabled.

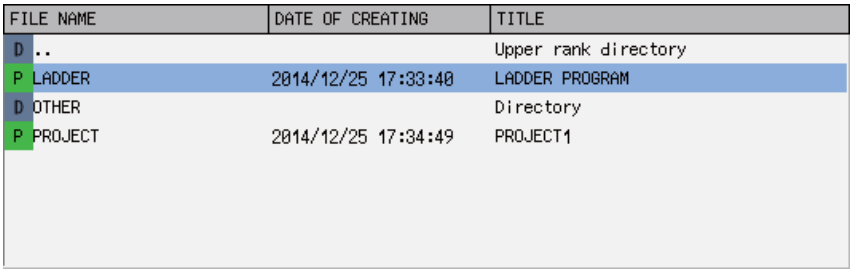
6.12.5.4 Status during Screen Displays

The following table describes the status when displaying the save external project popup screen.

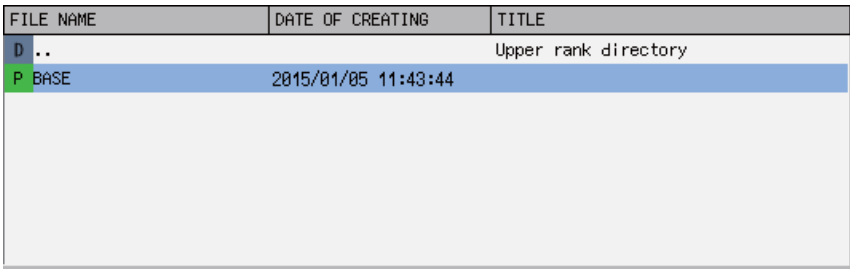
Item name	Operation
List	Refer to "Displaying PLC Data"
Path	This is blank or displays the path that is displayed in the list.
Project name	This is blank or displays the project data that is selected in the list.
Title	This is blank or displays the title specified in the project data that is selected in the list.

6.12.5.5 Displaying PLC Data

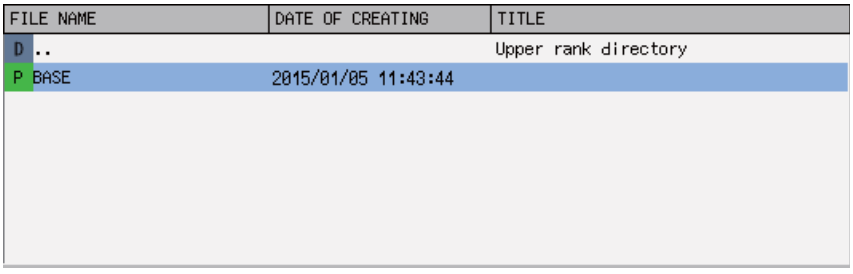
This displays the directory and project data stored directly under the root path of the default external device when the save external project popup screen is displayed for the first time.
This displays the details of the path where the previously saved project is stored when the save external project popup screen is displayed after a project is already saved. This displays path details directly under the root of the default external device when there is no specified path.
<List display for the initial display of the screen>



<List display when a project is selected>



<List for the next display>



6.12.5.6 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Save External Project Popup Screen".
List	This selects the list.
Path	This selects the password input field.
Project name	This selects the project name input field.
Title	This selects the title input field.
Select	Refer to "Saving to External Projects".
Close	Refer to "Closing the Save External Project Popup Screen".

6.12.5.7 Saving to External Projects

Normal operation

(1) To save to new projects

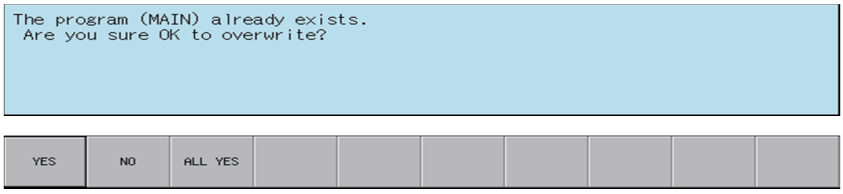
1. Press the [PATH] menu key to move the focus to the path input field. Enter the save destination for the project data.
   *This operation is not necessary if the save destination does not need to be changed.
2. Press the [PROJECT NAME] menu key to move the focus to the project name input field. Enter the name for the project data.
3. Press the [TITLE] menu key to move the focus to the title input field. Enter the title for the project data.
   *Titles are optional.
4. Pressing the [SELECT] menu key creates the project data according to the specified name and tile at the specified path and then stores the PLC data selected at the "NC->EXT." screen.

   * A progress bar is displayed indicating the status of writing PLC data.

5. After the selected PLC data has been written, the complete message is displayed.
   Pressing the [OK] menu key closes the complete message and also ends the save external project screen.

(2) To save to existing projects

1. Press the [LIST] menu key to move the focus to the list. Use the up and down arrow keys to select existing project data.
2. Pressing the [INPUT] key or the [SELECT] menu key saves the PLC data selected at the "NC->EXT." screen to the selected project data.
   * If PLC data with the same name already exists, the confirm overwrite popup screen is displayed.



   * A progress bar is displayed indicating the status of writing PLC data.

3. After the selected PLC data has been written, the complete message is displayed.
   Pressing the [OK] menu key closes the complete message and also ends the save external project screen.

Abnormal operation

This information describes the details of error messages displayed on the save external project popup screen and the corrective action thereof.

Error message	Error description	Corrective action
This project/data name is a reserved device name. Please choose another name.	This is displayed after the [SELECT] menu key is pressed when a reserved device name*1 has been entered as the data name.	Enter a suitable data name before pressing the [SELECT] menu key.
Prohibited characters were used in the file name. Do not use the following characters in file names: /, :, ,, ;, *, ?, \, ", <, >, [,], +, ., |.	This is displayed when the [SELECT] menu key is pressed and the data name contains prohibited characters*1.	Enter a suitable data name before pressing the [SELECT] menu key.
File name includes the multi-byte character code. Please confirm file name.	This is displayed when the [SELECT] menu key is pressed and the data name contains double-byte characters.	Enter a suitable data name before pressing the [SELECT] menu key.
The selected project is read-only.	This message is displayed in the following cases. - When an existing project is selected and the project is set to read-only. - The external device in which the project is stored is set to read-only.	- Cancel read-only for the project file. - Cancel read-only for the external device in which the project is stored. (The lock switch of the SD card, etc.)

*1: Refer to "PLC Data: PLC Data Used by the PLC On-board".

6.12.5.8 Closing the Save External Project Popup Screen

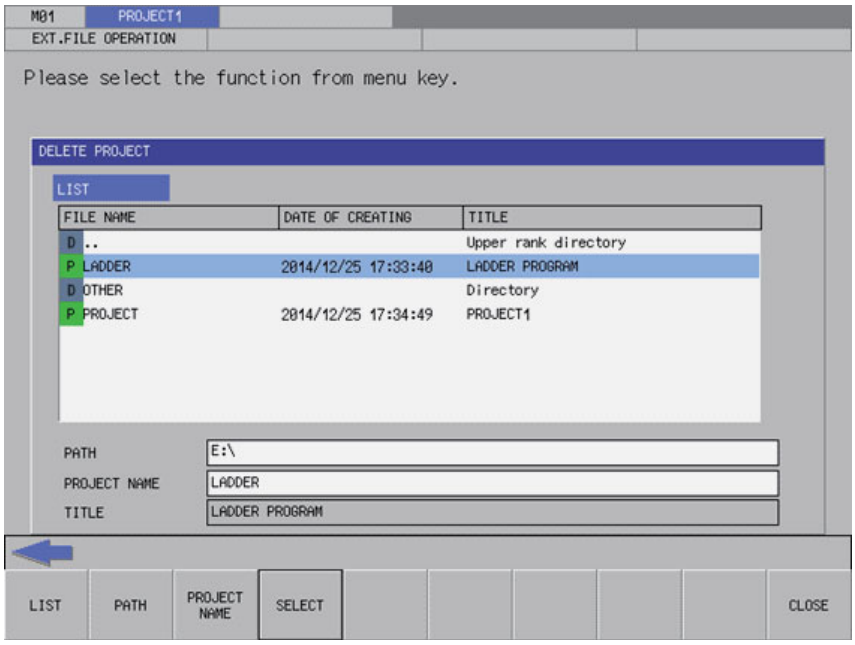
Use any of the following methods to close the save external project popup screen.

Methods to close the screen
Save the project data to the external device.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.6 Delete External File Popup Screen

6.12.6.1 Outline

This displays a list of project data stored in external devices and deletes the specified project data.



6.12.6.2 Screen Display Items

The following table describes the screen display items for the delete external file popup screen.

Item name	Display state
List	This displays the directory and PLC data stored at the specified path.
Path	This displays the path where the project data is stored. (the path can be entered)
Project name	This displays the name of the project data selected in the list. (the project name can be entered)
Title	This displays the title set in the project data selected in the list.

6.12.6.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the delete external project popup screen are always enabled.

6.12.6.4 Status during Screen Displays

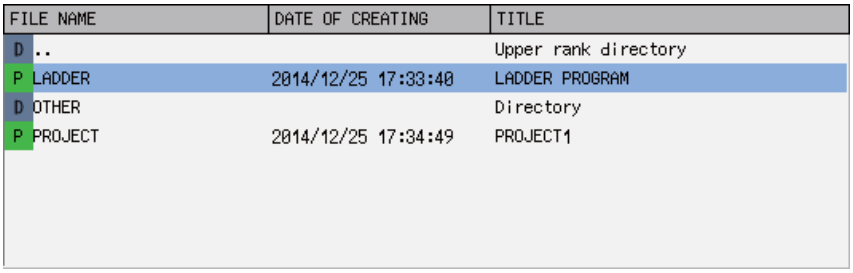
The following table describes the status when displaying the delete external file popup screen.

Item name	Operation
List	Refer to "Displaying PLC Data"
Path	This is blank or displays the path that is displayed in the list.
Project name	This is blank or displays the project data that is selected in the list.
Title	This is blank or displays the title specified in the project data that is selected in the list.

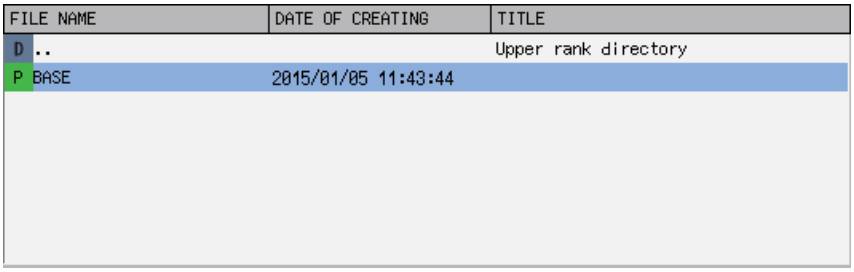
6.12.6.5 Displaying PLC Data

This displays the directory and project data stored directly under the root path of the default external device when the delete external file popup screen is displayed for the first time.
This displays the details of the path where the previously selected project is stored when the delete external file popup screen is displayed after a project is already selected. This displays path details directly under the root of the default external device when there is no specified path.

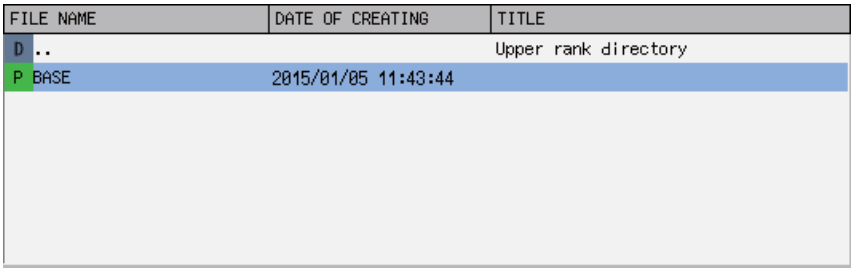
<List display for the initial display of the screen>



<List display when a project is selected>



<List for the next display>



6.12.6.6 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

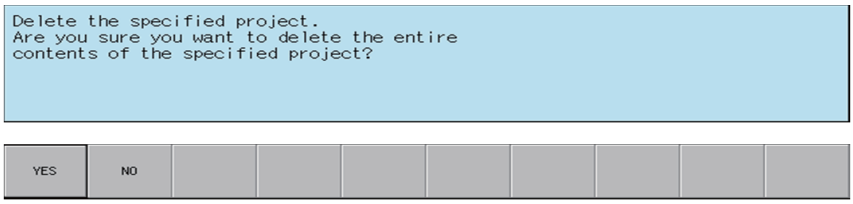
Item name	Operation
Left arrow key	Refer to "Closing the Delete External File Popup Screen".
List	This selects the list.
Path	This selects the password input field.
Project name	This selects the project name input field.
Select	Refer to "Deleting External Projects".
Close	Refer to "Closing the Delete External File Popup Screen".

6.12.6.7 Deleting External Projects

Normal operation

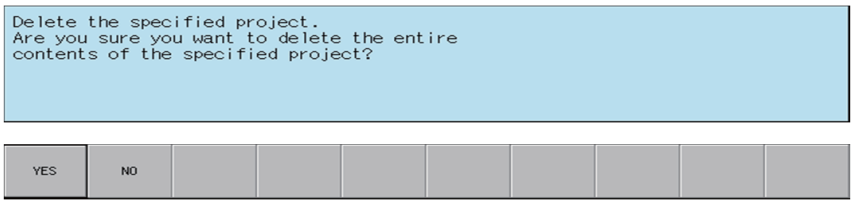
(1) To directly input the path and name of the project to delete

1. Press the [PATH] menu key to move the focus to the path input field. Input the path where the project data is stored.
   *This operation is not necessary if the read source does not need to be changed.
2. Press the [PROJECT NAME] menu key to move the focus to the project name input field. Enter the name for the project data.
3. Press the [SELECT] menu key to display the confirm delete message. If [YES] is selected, the confirm delete message and the delete external file popup screen closes and the data is deleted. If [NO] is selected, the confirm delete message closes and then the system returns to the delete external file popup screen.



(2) To select a project to delete from the list

1. Press the [LIST] menu key to move the focus to the list. Use the up and down arrow keys to select existing project data.
2. Press the [INPUT] menu key or the [SELECT] menu key to display the confirm delete message. If [YES] is selected, the confirm delete message and the delete external file popup screen closes and the data is deleted. If [NO] is selected, the confirm delete message closes and then the system returns to the delete external file popup screen.



Abnormal operation

This information describes the details of error messages displayed on the delete external project popup screen and the corrective action thereof.

Error message	Error description	Corrective action
The specified project does not exist. Specify an existing project path/project name.	This is displayed when the [SELECT] menu key is pressed after entering a path or project name that does not exist.	Enter the correct path and project name and then press the [SELECT] menu key again.
The selected project is read-only.	This message is displayed when an existing project is selected and set to read-only or when the external device in which the project is stored is set to read-only.	- Cancel read-only for the project file. - Cancel read-only for the external device in which the project is stored. (The lock switch of an SD card, etc.)

6.12.6.8 Closing the Delete External File Popup Screen

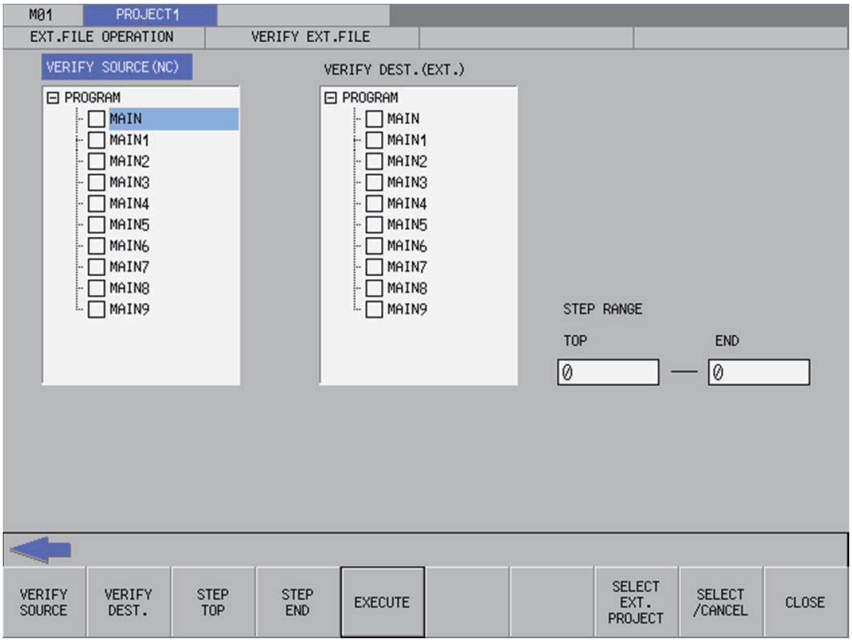
Use any of the following methods to close the delete external file popup screen.

Methods to close the screen
Delete the external files.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.7 Verify External File Screen

6.12.7.1 Outline

This compares the PLC data (sequence programs and parameters) stored in external devices with PLC data (sequence programs and parameters) stored in projects.



6.12.7.2 Screen Display Items

The following table describes the screen display items for the verify external file screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Verify source (NC)	This displays the PLC data stored in the current project. This displays nothing if there is nothing stored.
Verify destination (external)	This displays PLC data stored in the selected on the select external project screen. This displays nothing if there is nothing stored or no PLC data has been selected.
Top of step range	This displays the top step number in the step range. A zero is displayed if there is nothing stored.
End of step range	This displays the end step number in the step range. A zero is displayed if there is nothing stored.

6.12.7.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the verify external file screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Select/Cancel data	Enabled when selectable PLC data has been added to the list

6.12.7.4 Status during Screen Displays

The following table describes the status when displaying the verify external file screen.

Item name	Operation
Verify source (NC)	This displays the PLC data stored in the current project. This displays nothing if there is nothing stored.
Verify destination (external)	This displays PLC data stored in the selected on the select external project screen. This displays nothing if there is nothing stored or no PLC data has been selected.
Top of step range	This displays the top step number in the step range. A zero is displayed if there is nothing stored.
End of step range	This displays the end step number in the step range. A zero is displayed if there is nothing stored.

6.12.7.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Verify External File Screen".
Verify source	This sets the focus to verify source (NC) data.
Verify destination	This sets the focus to verify destination (external) data.
Top step	This sets the focus to the top of the step range.
End step	This sets the focus to the end of the step range.
Execute	Refer to "Verifying PLC Data".
Select external project	This displays the select external project popup screen. Refer to "Select External Project Popup Screen".
Select/Cancel data	This selects/deselects the check boxes for data selected in the list that is highlighted, which is either the verify source (NC) data or the verify destination (external) data. *This operation can also be performed with the [SP (space)] key.
Close	Refer to "Closing the Verify External File Screen".

6.12.7.6 Verifying PLC Data

Normal operation

1. Press the [VERIFY SOURCE] menu key to move the focus to the verify source (NC) data. Use the up and down arrow keys to select PLC data to verify. Use the [SELECT/DELETE DATA] menu key or the SP key to select the check boxes for the desired PLC data.
2. Press the [SELECT EXTERNAL PROJECT] menu key to display the select external project popup screen. Select the project data to verify in the select external project popup screen.
   *Refer to "Select External Project Popup Screen" for more information on operations within the select external project popup screen.
3. Press the [VERIFY SOURCE] menu key to move the focus to the verify destination (external) data. Use the up and down arrow keys to select the category of PLC data as selected for the verify source data. Use the [SELECT/DELETE DATA] menu key or the SP key to select the check boxes for the desired PLC data.
4. After selecting data, press the [EXECUTE] menu key. Pressing this menu key compares the verify source PLC data with the verify destination PLC data and then displays the verify results popup screen.
   *Refer to "Verify Results Popup Screen" for more information on the operations within the verify results popup screen.

* If a password to protect reads/writes has been registered to the selected files, the cancel password screen is displayed.
Enter the password to cancel the password.
If the password is canceled, processing will continue.
Refer to "Canceling File Passwords" for information on clearing passwords.

Abnormal operation

This information describes the details of error messages displayed on the verify external file screen and the corrective action thereof.

Error message	Error description	Corrective action
Verify source PLC data is not selected. Select verify source PLC data and execute again.	This is displayed when the [EXECUTE] menu key is pressed before any PLC data has been selected from the displayed verify source data list.	Select PLC data from the displayed verify source data list before pressing the [EXECUTE] menu key.
Verify destination PLC data is not selected. Select verify source PLC data and execute again.	This is displayed when the [EXECUTE] menu key is pressed before any PLC data has been selected from the displayed verify destination data list.	Select PLC data from the displayed verify destination data list before pressing the [EXECUTE] menu key.
Different types of data are selected. Check the files and execute again.	This is displayed when the [EXECUTE] menu key is pressed when the types of PLC data selected for the verify source data list and the verify destination data list are different.	Select the same types of data from the verify source data list and the verify destination data list and then press the [EXECUTE] menu key again.

6.12.7.7 Closing the Verify External File Screen

Use any of the following methods to close the verify external file screen.

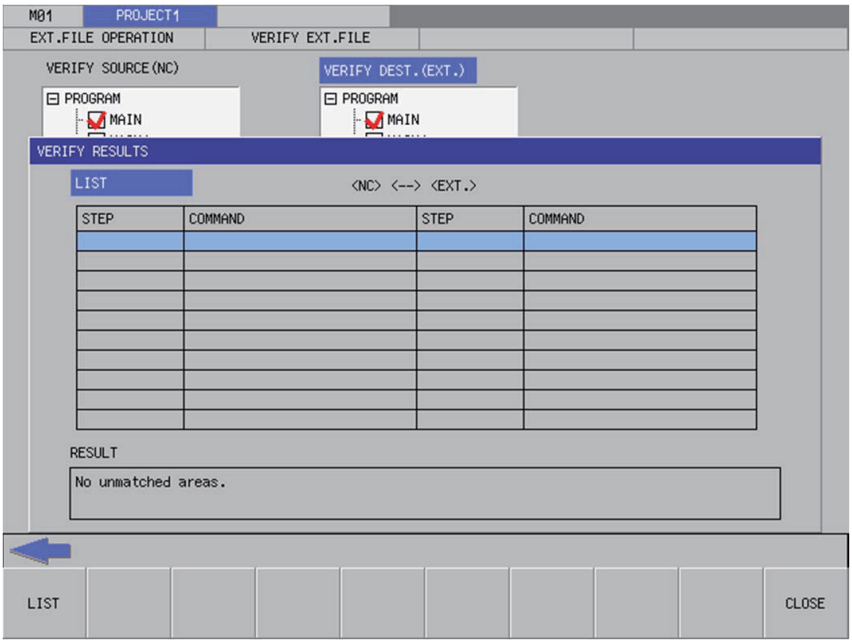
Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.8 Verify Results Popup Screen

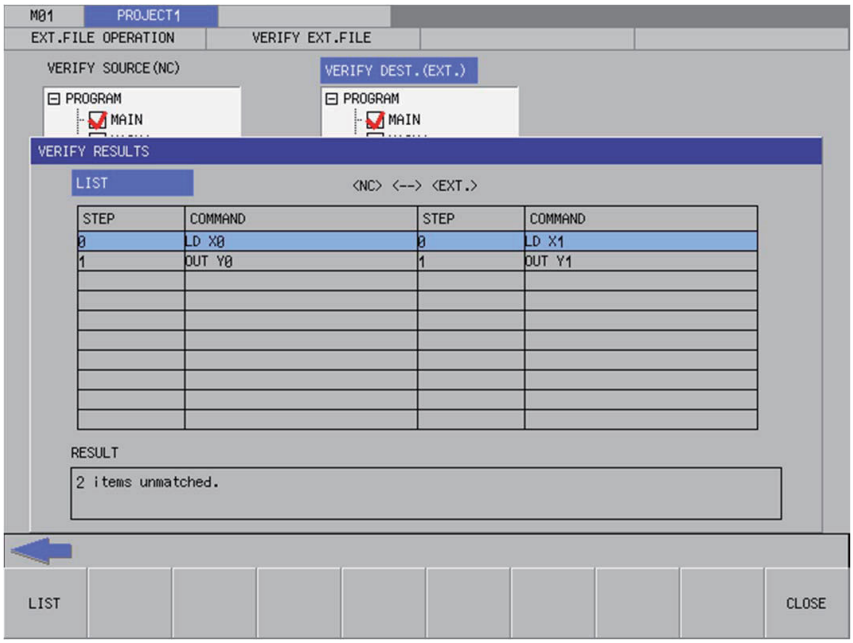
6.12.8.1 Outline

This displays the results of comparing the PLC data (sequence programs and parameters) stored in external devices with PLC data (sequence programs and parameters) stored in projects.

<Verify sequence program results popup screen>



<Verify parameter results popup screen>



6.12.8.2 Screen Display Items

The following table describes the screen display items for the verify results popup screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the information that does not match. This is a blank display if there all data matches.
Result	This displays the verification result.

6.12.8.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the verify results popup screen are always enabled.

6.12.8.4 Status during Screen Displays

The following table describes the status when displaying the verify results popup screen.

Item name	Operation
List	This displays the information that does not match. This is a blank display if there all data matches.

6.12.8.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Verify Results Popup Screen".
List	This is the default focus position when the screen is displayed. This displays the information that does not match.
Close	Refer to "Closing the Verify Results Popup Screen".

6.12.8.6 Closing the Verify Results Popup Screen

Use any of the following methods to close the verify results popup screen.

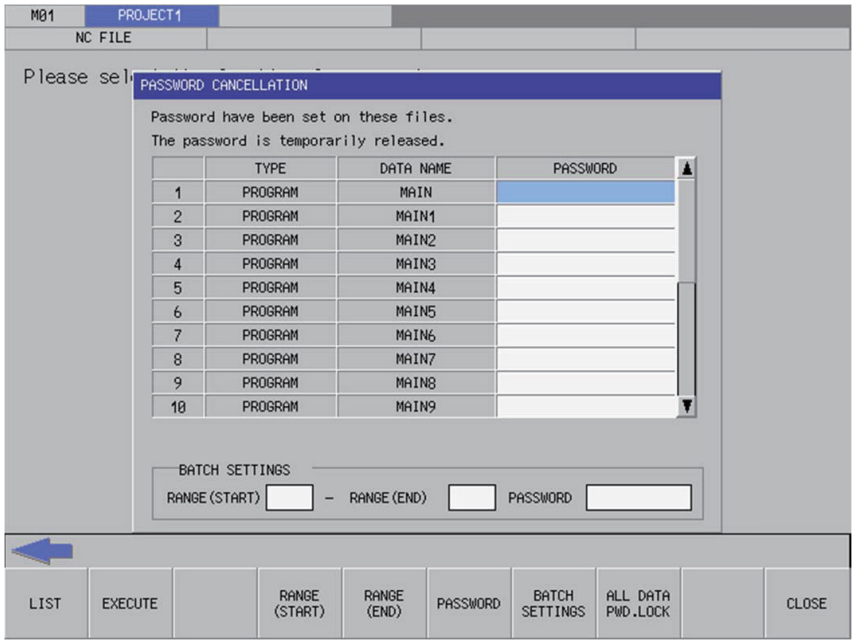
Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.12.9 Cancel Password Popup Screen

6.12.9.1 Outline

Passwords registered to PLC data files stored in the NC can be temporarily canceled.

Cancel password popup



Refer to "NC File Operation Menu: Cancel Password Popup Screen" for more information.

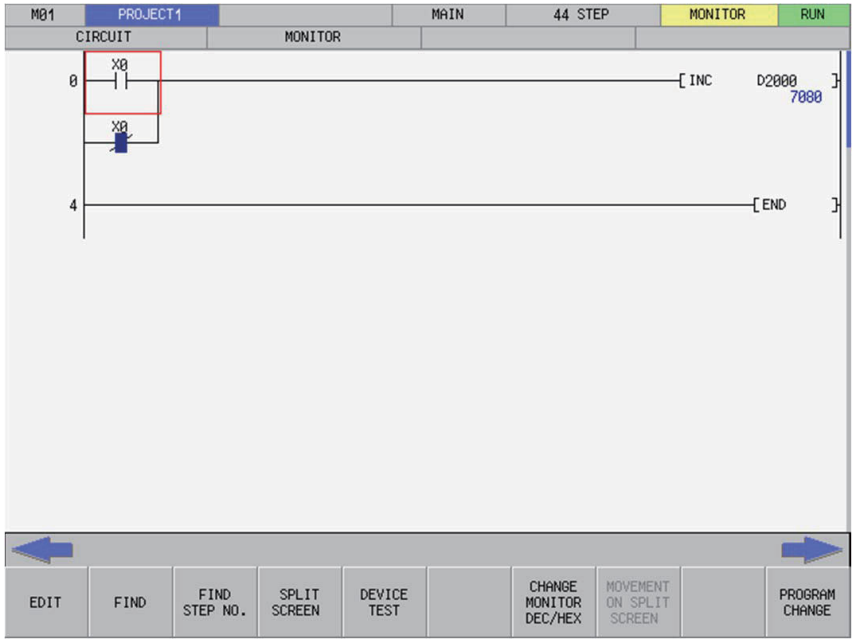
6.13 Ladder Menu

6.13.1 Ladder Monitor

6.13.1.1 Outline

The continuity state of contacts and coils can be monitored while displaying the PLC ladders.

(1) Ladder display and first page of the ladder monitor menu



(2) Second page of the ladder monitor menu

6.13.1.2 Screen Display Items

The following table describes the screen display items for the ladder monitor screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Program name	This displays the name of the currently displayed program.
Step number	This displays the step number of the currently displayed program.
Monitor/Edit display	This displays the [MONITOR].
PLC status and overwrite/insert display	This displays the PLC state (RUN/STOP).
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Right arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.13.1.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the ladder monitor screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

(1) First page of the ladder monitor menu

Menu name	Condition upon which it is enabled/disabled
Edit	Enabled when not displaying PLC messages. Disabled when the function is restricted.
Transition to split screen	Enabled when using split screen mode
Switch Program	Enabled when using multiple programs

(2) Second page of the ladder edit menu

Menu name	Condition upon which it is enabled/disabled
PLC RUN/STOP	Disabled when the function is restricted.
Zoom display	Enabled when the screen resolution is 640x480

6.13.1.4 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	This transitions to the main screen.
Right arrow key	First page of the menu: Transitions to the second page of the menu. Second page of the menu: Transitions to the first page of the menu.
Edit	This transitions to the edit menu. This also stops the ladder monitor and changes to the edit ladder mode.
Find	This displays the find popup screen.
Find Step No.	This opens the Find Step No. popup screen.
Split screen	This transitions to the split screen menu.
Device test	This displays the device test popup screen.
Current value monitor changeover (10/16)	This changes the currently monitored value display between decimal and hexadecimal.
Transition to split screen	This moves the focus to the split screen when the split screen is displayed.
Switch Program	This displays the switch program screen.
Contact coil usage list	This opens the contact coil usage list popup screen.
List of used devices	This opens the list of used devices popup screen.
Comment ON/OFF	This turns the device comment display on and off.
Zoom display	This switches the screen magnification of the ladder screen in this order: Reduced -> Standard -> Enlarged -> Reduced.
PLC RUN/STOP	Display the PLC RUN/STOP popup screen.

6.13.1.5 Ladder Display

Monitor display

During monitoring, the contact and coil ON/OFF state and the device's current value are displayed. These will change according to the PLC operation sate.

The following diagram illustrates ladder ON/OFF state.

OFF:  *1

ON:  *1

*1: , and can be used only for comparative instruction, which is equivalent to the contact and SET, RST, PLS, PLF, SFT and MC, which is equivalent to coils.

Restrictions

The following restrictions apply to the ladder display on the ladder display screen.

- One ladder block must be created with 24 or less lines. An error will occur if there are more than 24 lines in one ladder block.
- The maximum number of contacts in one ladder line can be changed with the ladder display setting popup screen.
- The following table describes the number of characters displayed in comments.

Type	Number of characters displayed on ladder screen
Device comments	This is changed by the settings configured on the comment display setting screen.
Statements	All set characters are displayed.
Notes	
Aliases	

6.13.1.6 Moving the Cursor

To move the cursor displayed on the ladder screen, use the keys as described in "Operation Key List: Basic Operation Keys."

The following table describes the cursor movement that occurs when each key is pressed.

Key	Operation
Up and down arrow keys	This moves the cursor on the ladder screen vertically for one increment.
Left and right arrow keys	This moves the cursor on the ladder screen horizontally in one increment.
→ | key	This moves the cursor on the ladder screen forward (to the right) in increments of ladders. The cursor does not move in a horizontal line.
| ← key	This moves the cursor on the ladder screen backward (to the left) in increments of ladders. The cursor does not move in a horizontal line.
Page Up key	This moves the cursor on the ladder screen up one page.
Page Down key	This moves the cursor on the ladder screen down one page.

6.13.1.7 Starting and Stopping the Monitor

The following table describes the timings at which the monitor is started and stopped.

Start monitor	Stop monitor
Timing at which the PLC On-board starts and the ladder screen displays	Timing at which the system transitions to the edit menu
Timing at which the system transitions to the monitor menu	Timing at which the system transitions to the main menu
Timing at which the system transitions to the ladder screen	Timing at which the system transitions to a screen other than the ladder screen
	Timing at which the system transitions to the Mitsubishi standard display

6.13.2 Editing Ladders

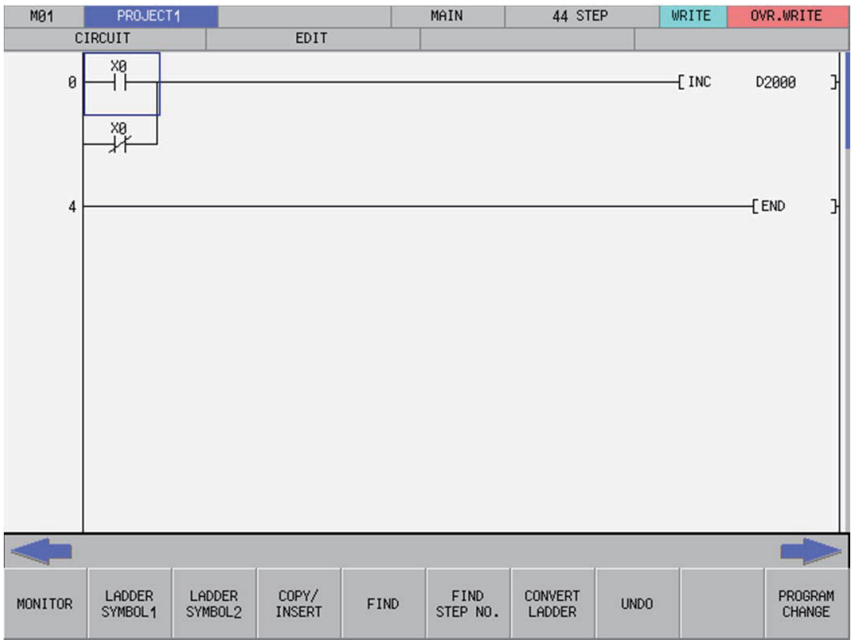
6.13.2.1 Outline

This enables sequence programs, statements, and notes to be edited (overwrite, insert, and delete).

The following table describes which information displayable on the ladder screen can be edited.

	Editable
Sequence programs (ladder circuits)	Yes
PLC messages	No
Device comments	No
Statements	Yes
Notes	Yes
Aliases	No

(1) Ladder display and first page of the ladder edit menu



(2) Second page of the ladder edit menu

6.13.2.2 Screen Display Items

The following table describes the screen display items for the ladder edit screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Program name	This displays the name of the currently displayed program.
Step number	This displays the step number of the currently displayed program.
Monitor/Edit display	This displays [EDIT].
PLC status and overwrite/insert display	This displays either [OVR. WRITE] or [INSERT] in correspondence with the edit mode.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Right arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.13.2.3 Enabled/Disabled State of Menu Keys

The following tables describe the conditions upon which menu keys displayed on the ladder edit screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

(1) First page of the ladder edit menu

Menu name	Condition upon which it is enabled/disabled
Convert Ladder	Enabled when there are unconverted ladders. Disabled when the function is restricted.
Undo	Enabled when there are unconverted ladders
Switch Program	Enabled when using multiple programs

(2) Second page of the ladder edit menu

Menu name	Condition upon which it is enabled/disabled
Cancel edit ladder	Enabled when there are unconverted ladders
Zoom display	Enabled when the screen resolution is 640x480

6.13.2.4 Operation of Key Presses

The following table describes the operation of each menu key, and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	This transitions to the main screen.
Right arrow key	First page of the menu: Transitions to the second page of the menu. Second page of the menu: Transitions to the first page of the menu.
Monitor	This transitions to the monitor menu. This also starts the ladder monitor.
Ladder Symbol 1	This transitions to the ladder symbol 1 menu.
Ladder Symbol 2	This transitions to the ladder symbol 2 menu.
Find	This displays the find popup screen.
Step No. search	This opens the Find Step No. popup screen.
Convert Ladder	This converts ladders not yet converted and edits details.
Undo	This returns to the unconverted ladder to the last previous state.
Switch Program	This displays the select program screen.
Contact coil usage list	This opens the contact coil usage list popup screen.
List of used devices	This opens the list of used devices popup screen.
Check program	This opens the check program popup screen.
Comment ON/OFF	This turns the device comment display on and off.
Cancel edit ladder	This cancels the unconverted ladder and returns it to the state before any edits were made.
Zoom display	This switches the screen magnification of the ladder screen in this order: Reduced -> Standard -> Enlarged -> Reduced.
Overwrite/Insert	This switches the edit mode between overwrite and insert mode.

6.13.2.5 Moving the Cursor

Refer to "Ladder Monitor: Moving the Cursor".

6.13.2.6 Editing Ladders

Editing with instructions

Ladders can be edited using the following procedure.

(1) Move to the edit position

Use the basic operation keys to move the cursor to the edit position. (Refer to "Ladder Monitor: Moving the Cursor".)

(2) Display the enter symbol popup screen

Use the following procedure to display the enter symbol popup screen used to edit ladders.

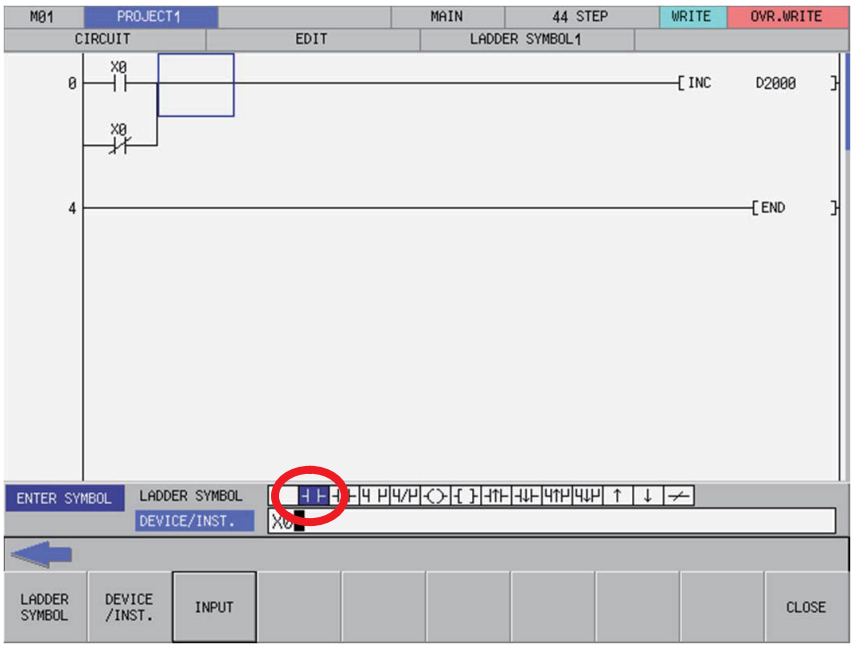
(2-1) To use the ladder symbol menu

Pressing the [LADDER SYMBOL 1] or the [LADDER SYMBOL 2] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[LADDER SYMBOL 1] menu

[LADDER SYMBOL 2] menu

Pressing any of the menu keys in the area inside the red lines changes the display in accordance with the ladder symbol selected from the enter symbol popup screen.



(2-1) To use the INPUT key

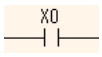
Move the cursor to the ladder you want to edit on the ladder screen and press the [INPUT] key. The ladder symbol used for the ladder at the cursor position on the enter symbol popup screen is selected and the display changes in accordance with the instruction and device entered in the device/instruction field for the ladder at the cursor position.

(3) Ladder input patterns

(3-1) To use ladder symbols

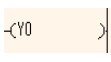
The following information describes the basic input patterns when entering ladders to be edited on the enter symbol popup screen.

• Inputting contact instructions

(Example)  symbol:

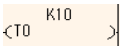
Ladder symbol	Instruction
-||-	Device name (e.g. X0)

• Inputting coil instructions

(Example)  symbol:

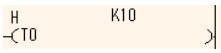
Ladder symbol	Instruction
-< >-|	Device name (e.g. Y0)

• Inputting timer and counter coil instructions

(Example) 

symbol: *[SP] space code

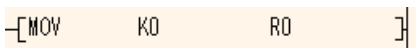
Ladder symbol	Instruction
-< >-|	Device [SP] device (e.g. To K10)

(Example) 

symbol: *[SP] space code

Ladder symbol	Instruction
-< >-|	Device [SP] device [SP] (e.g. H t0 K10)

• Inputting function instructions

(Example) 

symbol: *[SP] space code

Ladder symbol	Instruction
-[ ]-	Instruction [SP] device [SP] device (e.g. MOV K0 R0)

• Inputting labels

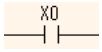
Example: Label of P4002

Ladder symbol	Instruction
(blank)	Device (e.g. P4002)

(3-2) Enter symbols in list format

A list of instruction text strings can be directly entered and edited. (For most cases, enter the symbols using ladder symbols.)

The following information describes the input method using a contact instruction as an example.

(Example) 

symbol: *[SP] space code

Ladder symbol	Instruction
blank	Instruction [SP] Device name (e.g. LD X0)

(4) Checking entered ladders

After entering the ladder symbols in accordance with the preceding input patterns, press the [INPUT] menu key. After pressing the input menu key, the enter symbol popup screen closes and the ladder edit screen is updated with the details of entry. The background color of entered ladder symbols updated on the ladder edit screen is changed to gray for each ladder block.

(5) Deleting circuits

Move the cursor to the ladder position to be edited and press the [DELETE] key to delete the ladder at that cursor position.

Inputting lines (vertical and horizontal)

(1) Move to the edit position

Use the basic operation keys to move the cursor to the edit position. (Refer to "Ladder Monitor: Moving the Cursor".)

(2) Input lines

Pressing the [LADDER SYMBOL 1] or the menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[LADDER SYMBOL 1] menu

Pressing any of the menu keys in the area inside the red lines inputs a vertical or horizontal line as illustrated in the following diagrams.

• Vertical lines: A vertical line is input at the bottom-left of the cursor.

• Horizontal lines: A horizontal line is input at the cursor position.

(3) Deleting lines

(3-1) Deleting vertical lines

Move the cursor to the position such that the vertical line to be deleted is at the bottom-left of the cursor and then press the [DELETE] menu key in the [LADDER SYMBOL 2] menu keys.

Pressing the [DELETE] menu key deletes the vertical line at the position to the bottom-left of the cursor.

(3-2) Deleting horizontal lines

Move the cursor to the horizontal line position to be deleted and press the [DELETE] key to delete the horizontal line at the cursor position.

Inserting lines

New lines can be inserted at the cursor position using the following procedure.

(1) Move to the position where the line is to be inserted

Move the cursor to the position where the line is to be inserted using the basic operation keys. (Refer to "Ladder Monitor: Moving the Cursor".)

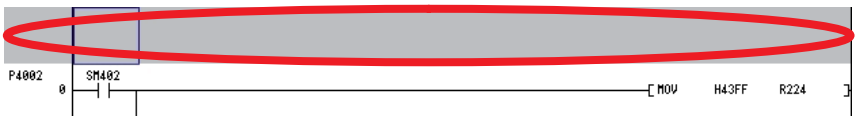
(2) Display the copy/insert menu.

Pressing the [COPY/INSERT] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[COPY/INSERT] menu

(3) Insert line menu key

Pressing the [INSERT LINE] menu key in the [COPY/INSERT] menu keys on the first page of the ladder edit menu inserts one blank line at the cursor position as illustrated in the following diagram.



Deleting lines

Lines can be deleted at the cursor position using the following procedure.

(1) Move to the position where the line is to be deleted

Move the cursor to the position where the line is to be deleted using the basic operation keys. (Refer to "Ladder Monitor: Moving the Cursor".)

(2) Display the copy/insert menu.

Pressing the [COPY/INSERT] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

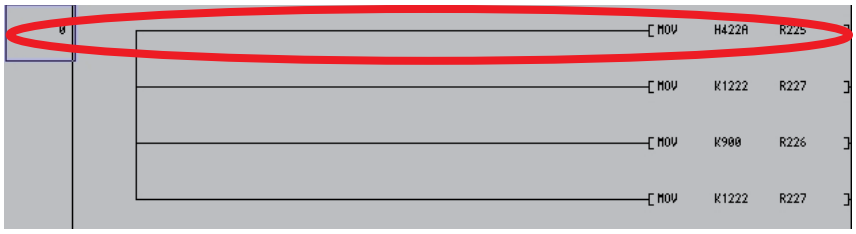
[COPY/INSERT] menu

(3) Delete line menu key

Pressing [DELETE LINE] in the [COPY/INSERT] menu key deletes the line at the cursor position as illustrated in the following diagram.

"Before deleting the line"

"After deleting the line"



Marking ranges

Ranges can be designated in units of ladder blocks or circuits.

(1) Designating the range in ladder blocks

Ranges can be selected in units of ladder blocks using the following procedure.

(a) Move to the position to select the range

Use the basic operation keys to move the cursor to the left end (position displaying the label number and step number) of the ladder block of the desired range.

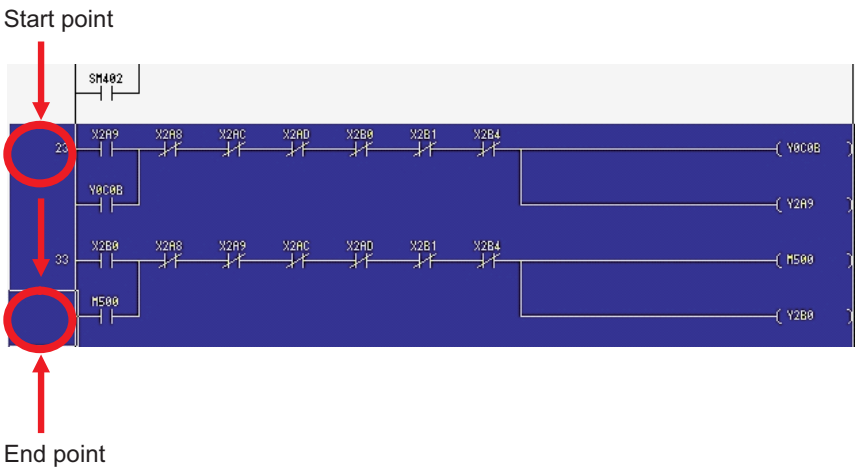
(b) Display the copy/insert menu.

Pressing the [COPY/INSERT] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[COPY/INSERT] menu

(c) Select the range

Press the [SELECT RANGE] menu key in the [COPY/INSERT] menu keys and move the cursor vertically until you reach the last ladder block in the desired range. The background color of the selected range will change to blue.



(d) Restrictions

The following restrictions apply to ranges selected in ladder blocks.

• Deletes and copy & paste operations cannot be performed in batches on circuits in ranges designated in ladder blocks.

(2) Designating ranges in circuits

(a) Move to the position to select the range

Move the cursor to the position of the ladder of the desired range using the basic operation keys.

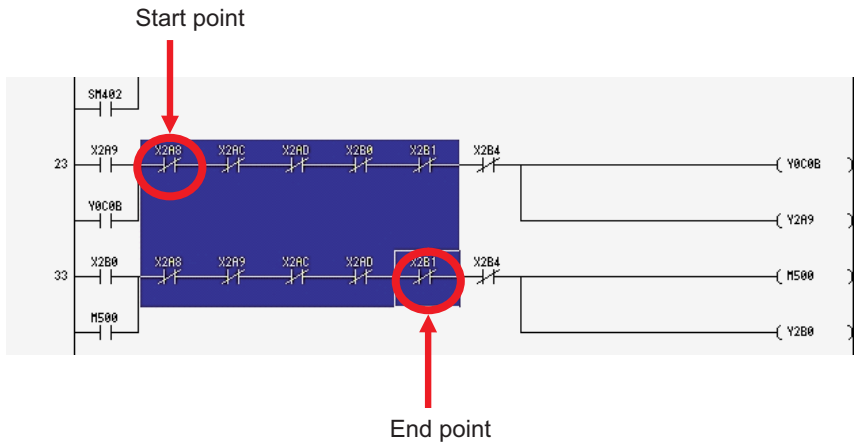
(b) Display the copy/insert menu.

Pressing the [COPY/INSERT] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[COPY/INSERT] menu

(c) Select the range

Press the [SELECT RANGE] menu key in the [COPY/INSERT] menu keys and move the cursor horizontally and vertically until you reach the last ladder in the desired range. The background color of the selected range will change to blue.



(3) Canceling marked ranges

Press the [SELECT RANGE] menu key in the [COPY/INSERT] menu keys again over the selected range (areas with a blue background color) to cancel the range selection and return the background color to the original color.

Batch deletes

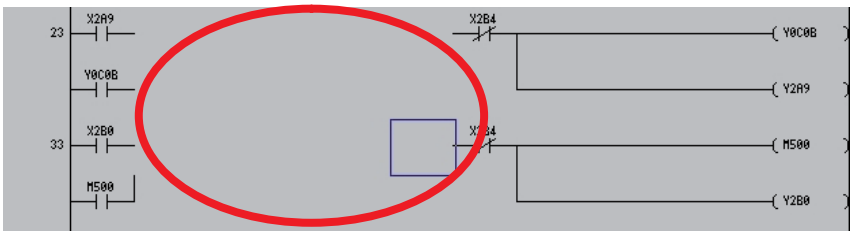
Ladder circuits can be deleted in batches using the following procedure.

(1) Designate the range of circuits to be deleted

Designate the range of circuits to be deleted using the procedure described in "Designating ranges in circuits."

(2) Delete circuits

While a range of circuits has been designated, press the [DELETE] key to delete all circuits in the range.



(3) Restrictions

The following restrictions apply to batch deletions of circuits.

• Deletes cannot be performed in batches on circuits in ranges designated in ladder blocks.

Copy & paste

Circuits can be copied and pasted at another position or in another program using the following procedure.

(1) Designate the range of circuits to be copied

Designate the range of circuits to be copied using the procedure described in "Designating ranges in circuits."

(2) Display the copy/insert menu.

Pressing the [COPY/INSERT] menu key on the first page of the ladder edit menu changes the menu keys as illustrated in the following diagram.

[COPY/INSERT] menu

(3) Copy circuits

Press the [COPY] menu key in the [COPY/INSERT] menu keys. Pressing the [COPY] menu key cancels the selected range (blue background color).

* If necessary memory could not be secured for the copied ladder, an error is displayed and the selected area to be copied is cleared.

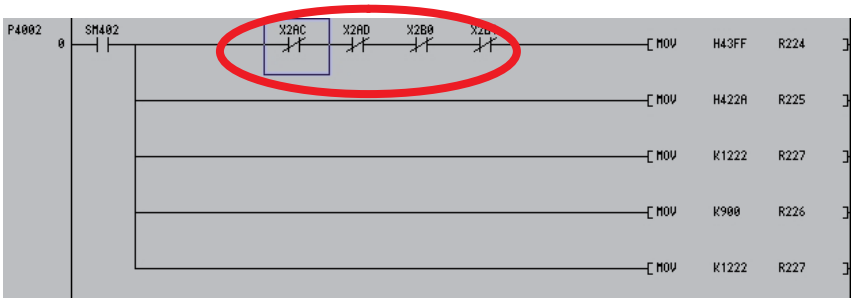
(4) Move to the position where circuits are to be pasted

Move the cursor to the position where the copied ladder is to be pasted using the basic operation keys.

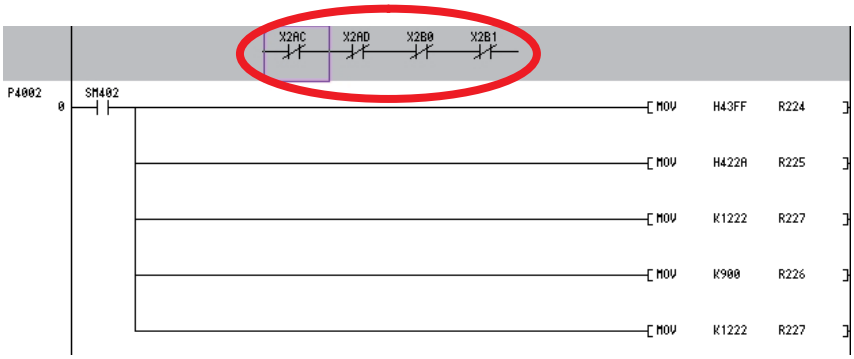
(5) Paste the circuits

Press the [PASTE] menu key in the [COPY/INSERT] menu keys. Pressing the [PASTE] menu key pastes the copied ladder into the ladder screen in accordance with the overwrite/insert mode.

• Pasting in overwrite mode



• Pasting in insert mode



Restrictions when editing ladders

The following information details restrictions when editing ladders.

• Up to 24 lines can be edited in one ladder block.

• Up to 24 lines in one block and up to 48 lines in total can be edited.

• The maximum number of contacts in one ladder line can be changed with the ladder display setting popup screen.

• The master control (MC) symbol cannot be edited. The MC symbol is displayed during ladder monitoring.
(The MC symbol does not appear during ladder editing.)

• If a series ladder exceeding the maximum number of contacts is created in one line, the line will automatically return and move to the next line. The return symbol is created with K0 to K99. The OUT (->) and IN (>-) return symbol No. always have to be the same.

• Another ladder cannot be inserted between the OUT (->) line and IN (>-) line of the return line.

• When writing the ladder, the return symbol is assigned with a serial number even if it is not in the same ladder block.
Note that in the ladder block read out with the read function, the return number is assigned in order from No. 0.

• If the contact and coil to be overwritten extends over several contacts, the ladder cannot be edited with the write (overwrite) mode.

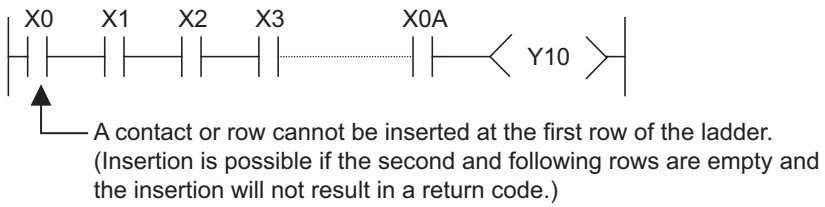
(Example)

An instruction that uses multiple contacts such as "-[= D0 D1]-" at this position cannot be overwritten in overwrite mode. (This is because the next instruction will also be overwritten.)

If the contact and coil to be overwritten extends over several contacts, the ladder cannot be edited with the write (overwrite) mode.

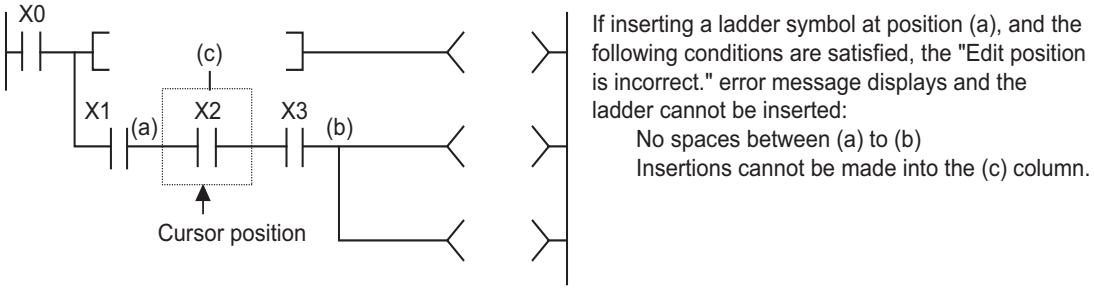
• If a return results from the insertion of a contact in the first row of the ladder, the contact cannot be inserted.

(Example)



• Insertion of the ladder symbol is processed by right alignment and row insertion, so there may be causes when the symbol cannot be inserted because of the ladder shape.

(Example)



(Note) The position (b) is the closest position to the cursor position among the branch symbols and the coil-equivalent instructions.

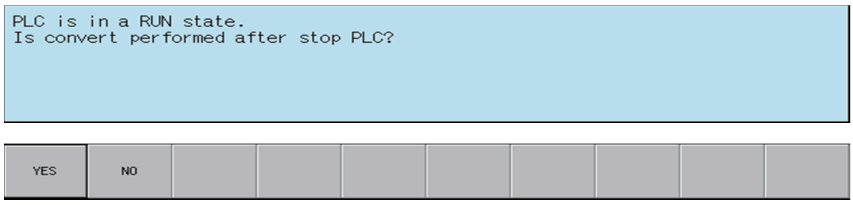
• If one ladder block has two or more lines, and the instruction does not fit on one line, enter a new line before entering the instruction.
• Create the number of steps for one ladder block within approximately 4k steps. The NOP instruction in the ladder block is also included in the number of steps. The NOP instruction between ladder blocks is irrelevant.
• If there is an unconverted ladder, the screen movement range may be limited.

6.13.2.7 Converting Programs

Details of edits cannot be checked when using the preceding edit procedures to edit ladders and transitioning to the ladder screen will cause these edits to be lost. For this reason, you perform conversions to check the details of edits.
The currently displayed program will be the program that is converted. The converted details are updated in the program stored in the temporary storage area and so these edits will be lost when the power to the NC is turned off if you do not execute a ROM write operation.
The maximum number of steps that can be converted at one time is 512.
The behavior is different according to the setting of ladder program write during RUN (#6455 bit6/bit7).
This chapter describes the behavior when ladder program writing during RUN is disabled.
For the behavior when it is enabled, refer to "Ladder Program Writing during RUN by Conversion".

When the PLC is running

If a conversion is executed while the PLC is running, a message confirming whether or not to stop the PLC is displayed.

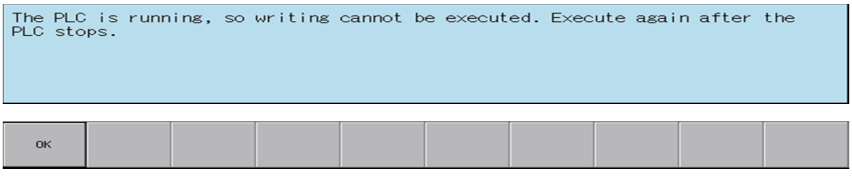


The following information describes the resulting operation depending on whether the [YES] or the [NO] menu key is pressed.

(1) [YES] menu key is pressed
The PLC stops and the conversion process executes. Once the conversion is complete, the background color of the edited portion of the ladder screen (gray) changes to white.
Once the conversion process is complete, a message confirming whether or not to continue running the PLC is displayed.

If the [YES] menu key is pressed, the PLC continues running. If the [NO] menu key is pressed, the PLC state is not changed.

(2) [NO] menu key is pressed
The following error message is displayed and the conversion process is canceled.



When the PLC is stopped

If the PLC is stopped, the conversion process starts without displaying any confirmation messages. Once the conversion is complete, the background color of the edited portion of the ladder screen (gray) changes to white.

Edit files with write-protect passwords configured

If a password to protect against writes or reads/writes has been configured for the edit files, the cancel password screen is displayed.
Enter the password to cancel the password.
Refer to "Canceling File Passwords" for information on clearing passwords.

6.13.2.8 Undoing the Last Edit Operation

When editing ladders, you can undo the last edit operation and return the ladder this previous state. This undo operation is only valid for the last single operation.

Use either of the following methods to execute the undo operation.
• Press the [UNDO] menu key
• Press and hold the Ctrl key and then press the Z key.

The following table describes which edit operations can and cannot be undone.

Operations that can be undone	Operations that cannot be undone
Editing contacts/coils/lines/etc. (adds/changes/deletes)	When a ladder is changed, the state prior to the change cannot be restored.
Editing statements/notes	When an unconverted ladder is discarded, the state prior to discarding cannot be restored.
Line insertions/line deletions	Editing circuits in the split display
Pasting in units of ladder blocks	When pasting ladder blocks, the state prior to pasting cannot be restored.

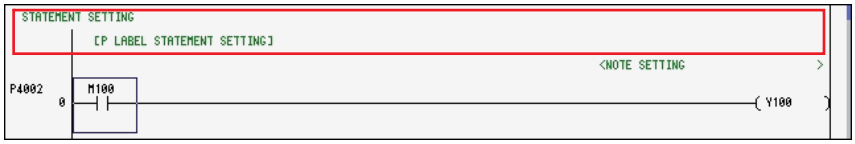
6.13.2.9 Editing Statements

Outline

Statements can be added to the program displayed on the ladder screen.
A statement is text string data added to each ladder block to make it easy to understand the flow of the entire program.
Statements can be edited in accordance with the following restrictions.

	Input character range	Storage destination data type
Statements	64 single-byte alphanumeric characters	Sequence programs

Example display of a statement



Integrated statements and peripheral statements

Statements include integrated types and peripheral types. Integrated types and peripheral types are designated by the first character in the string.

The first character is an asterisk.	Peripheral statements
The first character is not an asterisk.	Integrated statement

Note the following precautions regarding integrated statements.

Precautions
Saving user PLCs containing an integrated statement is saved in the NC requires a large amount of memory in the user PLC.

Edit method

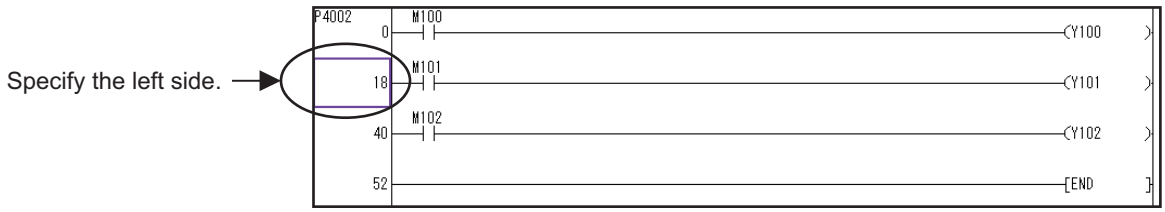
(1) Entering statements between lines

Statements can be entered between ladders using the following procedure.

(a) Move to the edit position

Move the cursor to the position to the left end of the line where the statement is to be entered using the basic operation keys.

(Refer to "Ladder Monitor: Moving the Cursor".)



(b) Switch to the edit mode

Press the [OVR. WRITE/INSERT] menu key to switch to the insert mode.

(c) Display the enter symbol popup screen

Press the [INPUT] key to display the enter symbol popup screen.

(d) Enter the statement

Enter the statement into the enter symbol popup screen as in the following example. Add a semicolon at the beginning when entering.

(Example) Entering a statement

After the entry is complete, press the [INPUT] menu key. Press the [INPUT] menu key to input the statement between the lines at the cursor.

(e) Check the details of edits

After entering the statement, press the [CONVERT LADDER] menu key to confirm the edit. (Refer to "Converting Programs")

(2) Entering statements into P labels

Statements can be entered into P labels using the following procedure.

(a) Move to the edit position

Move the cursor to the position of the P label where the statement is to be entered using the basic operation keys.

(Refer to "Ladder Monitor: Moving the Cursor".)

(b) Display the enter symbol popup screen

Press the [INPUT] key to display the enter symbol popup screen.

(c) Enter the statement

Enter the statement into the enter symbol popup screen as in the following example. Add a semicolon after the label when entering.

(Example) Entering a P label statement

After the entry is complete, press the [INPUT] menu key. Press the [INPUT] menu key to input the statement in the P label.

(d) Check the details of edits

After entering the statement, press the [CONVERT LADDER] menu key to confirm the edit. (Refer to "Converting Programs")

6.13.2.10 Editing Notes

Outline

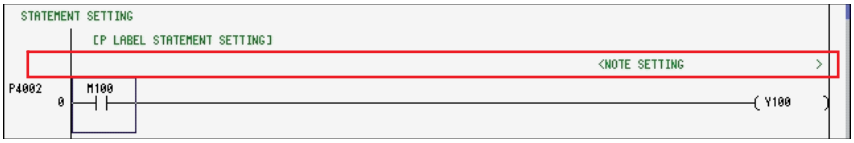
Notes can be added to the program displayed on the ladder screen.

A note, just like a statement, is text string data added to each coil and function instruction to make it easy to understand the flow of the entire program.

Notes can be edited in accordance with the following restrictions.

	Input character range	Storage destination data type
Notes	64 single-byte alphanumeric characters	Sequence programs

Example display of a note



Integrated notes and peripheral notes

Notes include integrated types and peripheral types. Integrated types and peripheral types are designated by the first character in the string.

The first character is an asterisk.	Peripheral note
The first character is not an asterisk.	Integrated note

Note the following precautions regarding integrated notes.

Precautions
Saving user PLCs containing an integrated note is saved in the NC requires a large amount of memory in the user PLC.

Edit method

Notes can be entered using the following procedure.

(1) Move to the edit position
Move the cursor to the position to the function instruction in the line where the note is to be entered using the basic operation keys.
(Refer to "Ladder Monitor: Moving the Cursor".)

(2) Display the enter symbol popup screen
Press the [INPUT] key to display the enter symbol popup screen.

(3) Enter the note
Enter the note into the enter symbol popup screen as in the following example. Add a semicolon after the instruction when entering.
(Example) Entering a note

After the entry is complete, press the [INPUT] menu key. Press the [INPUT] menu key to input the note.

(4) Check the details of edits
After the inputting the note, press the [CONVERT LADDER] menu key to confirm the edit.
(Refer to "Converting Programs")

6.13.2.11 Ladder Program Writing during RUN by Conversion

Outline

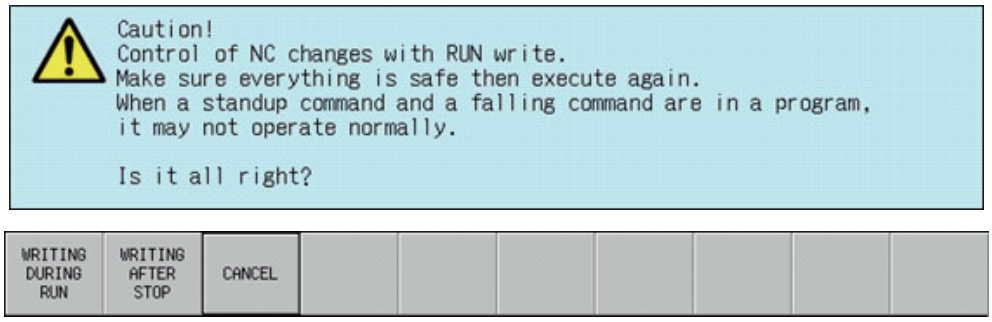
Ladder program writing during RUN (or RUN write) enables to edit and change sequence programs without stopping PLC operation. When RUN write is enabled in bit selection parameter, RUN write will be available with normal operation.

Refer to section "6.5.6 Executing Ladder Program Writing during RUN" for details of RUN write.

> **⚠ CAUTION**
>
> **Only the person who knows well about sequence programs can execute ladder program writing during RUN.**
> **When the RUN write is enabled, the modification will be immediately effective after the data editing and conversion.**
> **The machine might operate in unexpected way when the ladder program is incomplete.**
> **Consider well the influence of the modification in advance. Also, always make sure that the system's safe operation with the sequence programs.**

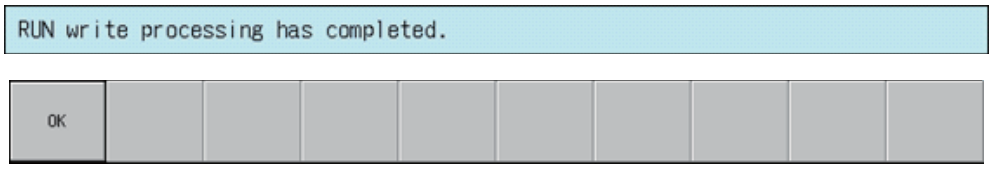
RUN write execution

When you execute a conversion during PLC RUN, the following message will appear to confirm whether to continue the RUN write execution.

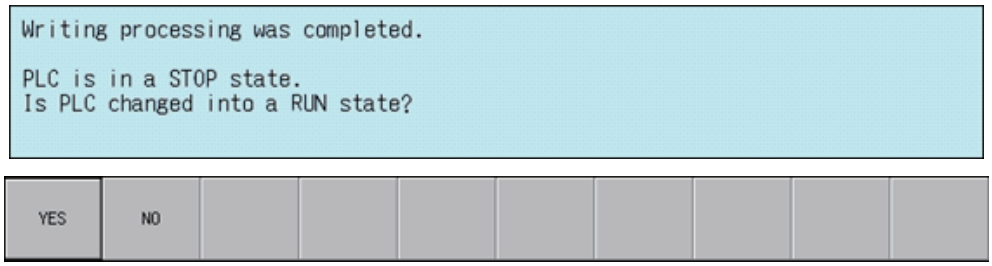


The following information describes the resulting operation by pressing each menu key.

(1) [WRITING DURING RUN] key is pressed.
RUN write is executed. Processing time of RUN write depends on the total number of steps used in the ladder programs programs and the points where the steps are written in (from one second or less to several seconds).
The following message will appear when RUN write is completed.



(2) [WRITING AFTER STOP] key is pressed.
The PLC stops and the conversion process executes. Once the conversion is complete, the background color of the edited portion of the ladder screen (gray) changes to white.
After the conversion has been completed, a message confirming whether to have PLC returned to the RUN state is displayed.



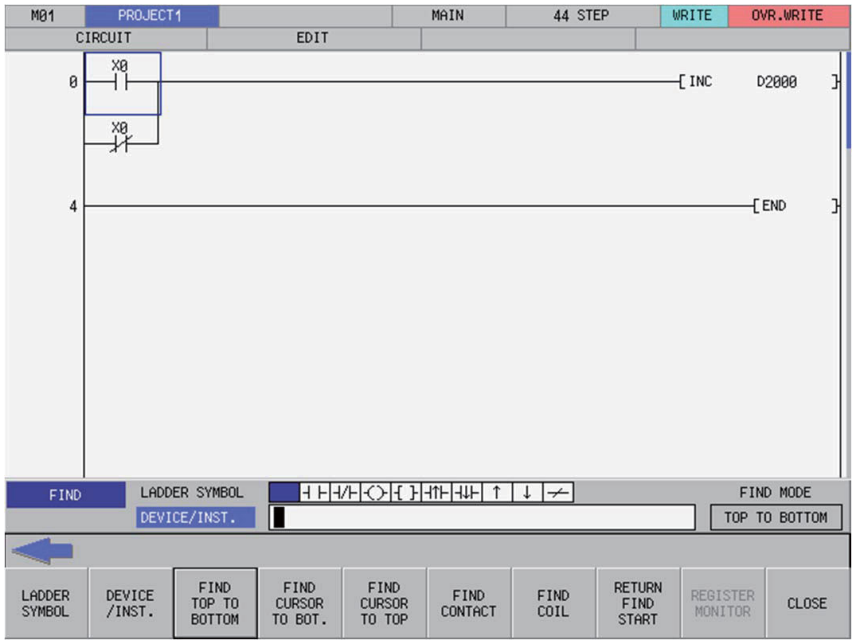
If the [YES] menu key is pressed, the PLC continues running. If the [NO] menu key is pressed, the PLC state is not changed.

(3) [CANCEL] key is pressed
PLC will be back to the state before conversion.

6.13.3 Find Popup Screen

6.13.3.1 Outline

Contacts, coils, and instructions can be searched while editing and monitoring circuits.



6.13.3.2 Screen Display Items

The following table describes the screen display items for the find popup screen.

Item name	Display state
Ladder symbol	This displays the ladder symbol used in the search.
Device/Instruction	This displays the device or instruction to be searched.
Current search mode	This displays the current search mode.

6.13.3.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the find popup screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Register monitor	Enabled when the ladder screen is selected and being in monitoring.

6.13.3.4 Status during Screen Displays

The following table describes the status when displaying the find popup screen.

Item name	Operation
Ladder symbol	This selects the ladder symbol at the cursor position.
Device/Instruction	This displays the device name at the cursor position. This also sets the alias for the device at the cursor position and displays the alias if attempting to display the alias. This is left blank if there is no device at the cursor position. This is the default focus position when the screen is displayed.
Current search mode	This displays from the top to the bottom.

6.13.3.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

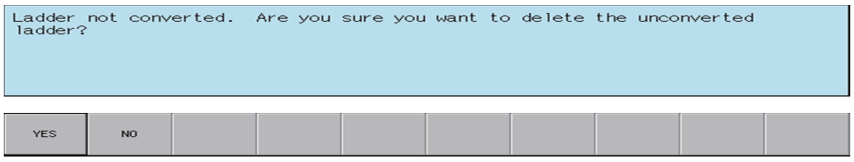
Item name	Operation
Left arrow key	Refer to "Closing the Find Popup Screen".
Ladder symbol	This selects the ladder symbol selection or changes the ladder symbol selection.
Device/Instruction	This selects the device/instruction input field.
Find top to bottom	Refer to "Find Operation".
Find cursor to bottom	
Find cursor to top	
Find contact	
Find coil	
Return to the start position	Refer to "Returning to the Start Position".
Register monitor	Refer to "Register Monitor Operation".
Close	Refer to "Closing the Find Popup Screen".

6.13.3.6 Displaying the Find Popup Screen

The display method for the find popup screen differs depending on the state of the ladder screen.
The following table describes the display method for the find popup screen.

State of the ladder screen		Display method for the find popup screen
Ladder screen is selected		
	Monitoring	Press the [FIND] menu key.
		Press the [INPUT] key.
		Press any character key.
	Edit	Press the [FIND] menu key.
Entry ladder monitor is selected		
	Monitoring	Press the [FIND] menu key.
		Press the [INPUT] key.
		Press any character key.

* The following message is displayed when attempting to display the find screen when a ladder is being edited (area with a gray background color).



Pressing the [NO] menu key returns to the ladder screen without displaying the find screen.
Pressing the [YES] menu key cancels the edits made to the ladder, returns the ladder to its previous state before editing, and then displays the find popup screen.

6.13.3.7 Find Operation

Normal find

1. Press the [LADDER SYMBOL] menu key to select the ladder symbol for the ladder to be searched.
   * Ladder symbols can be searched even if not selected.
2. Press the [DEVICE/INST.] menu key and then enter either the device or instruction to be searched into the device/instruction input field.
   * Instructions cannot be searched if they do not match the ladder symbol.
3. To execute the corresponding find operation, press either the [INPUT] key or one of the following menu keys: [FIND TOP TO BOTTOM], [FIND CURSOR TO BOT.], [FIND CURSOR TO TOP], [FIND CONTACT], and [FIND COIL]. If the search finds a match, the cursor moves to the position where the match was found.

The following table describes the direction and types of searches.

Menu item	Search direction and type
Find top to bottom	This searches the designated device or instruction from the top of the currently displayed program. The find top to bottom search is performed when displaying the find popup screen and pressing the [INPUT] key.
Find cursor to bottom	This searches the designated device or instruction downward from the cursor position.
Find cursor to top	This searches the designated device or instruction upward from the cursor position.
Find contact	This searches the designated device contact instruction from the top of the currently displayed program. The status of [LADDER SYMBOL] is ignored at this time. (Example: When a contact is searched in the "-()- M0" state, the M0 contact is searched instead of resulting in an error.)
Find coil	This searches the designated device coil instruction from the top of the program. The status of [LADDER SYMBOL] is ignored at this time.

(1) Continuous search

Perform the following operations to search continuously.

• Once the search is started after pressing the [INPUT] keys or one of the search menu keys, the executed search menu key changes to [FIND NEXT].

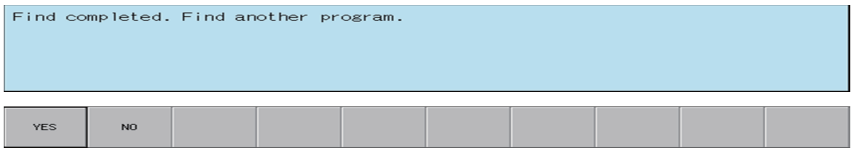
• Press the [FIND NEXT] menu key or the [INPUT] key to continue the search.

(2) Consecutive searching of multiple programs

When multiple programs are opened, the program is searched until the end of the program. Then the following message is displayed and the search can continue on to the next program.

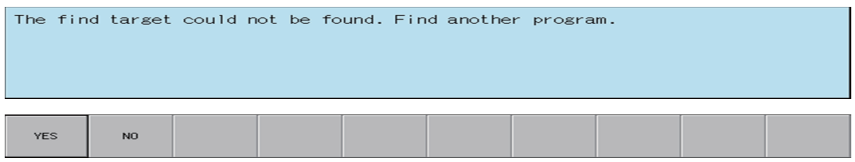
• When a search match is found in the first program:

* (The message is not displayed after the second program.)



• When a search match is not found in the first program:

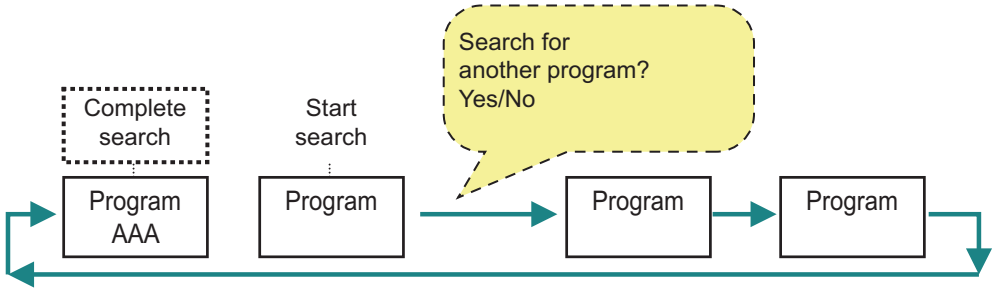
* (The message is not displayed after the second program.)



The search ends if the [NO] menu key is pressed.
The search continues to the next program if the [YES] menu key is pressed. The following message is displayed when all programs have been searched.

Pressing the [OK] menu key closes the message and returns to the find popup screen.

(Example)



(3) Consecutive searching of multiple projects

Ladder searches cannot be performed across multiple projects. Change to a different project and execute the search again.

Search using the alias

Searches can be performed using aliases in the same way as for devices by specifying the alias configured for the device into the [DEVICE/INST.] input field. Only aliases configured with single-byte alphanumeric characters can be searched by the PLC On-board.
Use either of the following formats to specify the alias.

- Single quotation mark" + "Desired alias"
- "Period" + "Desired alias"

Changes to the direction and type of search and continuous searches are performed in the same way as for normal searches.

6.13.3.8 Returning to the Start Position

Pressing the [RETURN TO START POSITION] menu key enables you to return to the step position when the search was started in the program that was displayed when the search was started. The [FIND START] position is updated if a new search is started.

6.13.3.9 Register Monitor Operation

Pressing the [REGISTER MONITOR] menu key enables you to register ladders including the cursor position device and cursor position into the split screen entry ladder monitor screen or the entry device monitor screen.
Use the following procedures to register to these registration monitors.

Registering to the entry ladder monitor

Ladders including the cursor position can be registered to the entry ladder monitor for the following cases.
• Pressing the [REGISTER MONITOR] menu key when not using the split screen mode.
• Pressing the [REGISTER MONITOR] menu key when displaying the entry ladder monitor.

Registering to the entry device monitor

Devices at the cursor position can be registered to the entry ladder monitor for the following cases.
• Pressing the [REGISTER MONITOR] menu key when displaying the entry device monitor.

6.13.3.10 Find Popup Screen Errors

This information describes the details of error messages displayed on the find popup screen and the corrective action thereof.

Error message	Error description	Corrective action
Device setting is wrong. The following causes may be responsible: ・The device No. is over the usable range. ・An unusable device has been designated.	This is displayed when the search-related menu keys are pressed when the range of the specified device is unusable or an unusable device is specified.	Enter a suitable device into the device/instruction input field and then press a search-related menu key again.
Device setting is wrong. The following causes may be responsible: ・An unusable device has been designated. ・Index modification, module specification setting is wrong. ・Special function module device, link direct device setting is wrong.	This is displayed when the search-related menu keys are pressed when the range of the specified device is unusable or a mistake was made in the specification of the index modification, module specification, etc.	Enter a suitable device into the device/instruction input field and then press a search-related menu key again.
The relationship between the ladder code and instruction is incorrect. Change one of them.	This is displayed when search-related menu keys are pressed when the ladder symbol and instruction do not match. (e.g.) Ladder symbol: -[ ]- Device/instruction: LD	Correct the relationship between the ladder symbol and instruction and then press a search-related menu key again. (e.g.) Ladder symbol: -[ ]- Device/instruction: MOV
The instruction or device is incorrect.	This is displayed when the search-related menu keys are pressed when a non-existent device or non-existent instruction is entered into the device/instruction input field without selecting a ladder symbol.	Enter an existing device or instruction into the device/instruction input field and then press a search-related menu key again.
A device that corresponds to the alias has not been assigned. Check the device comment window.	This is displayed when the search-related menu keys are pressed after entering an alias not allocated to a device.	Enter an alias allocated to a device and then press a search-related menu key again.

6.13.3.11 Closing the Find Popup Screen

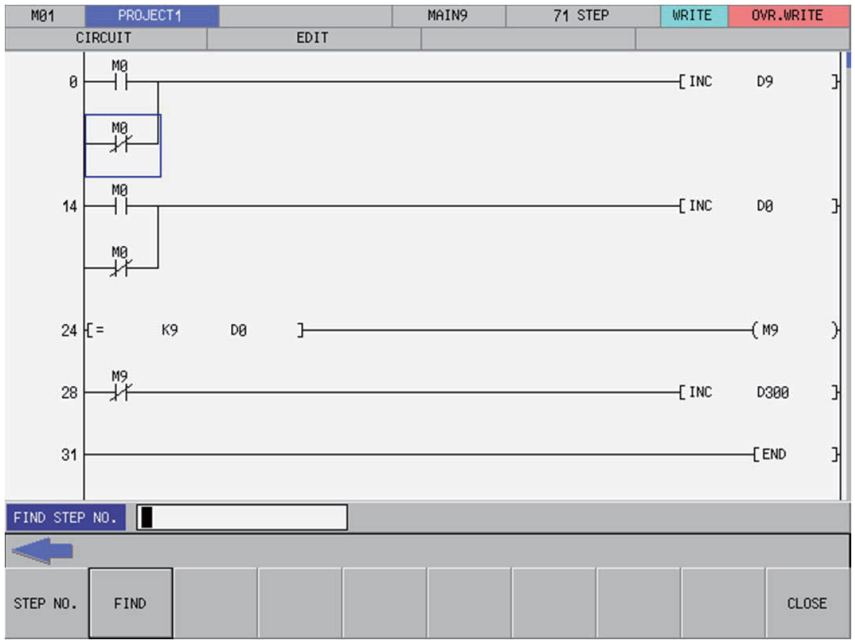
Use any of the following methods to close the find popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.4 Find Step No. Popup Screen

6.13.4.1 Outline

This enables transitions to the specified step position when editing and monitoring ladders.



6.13.4.2 Screen Display Items

The following table describes the screen display items for the find step No. popup screen.

Item name	Display state
Find step No.	This displays the step No. position to which you want to transition.

6.13.4.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the find step No. popup screen are always enabled.

6.13.4.4 Status during Screen Displays

The following table describes the status when displaying the find step No. popup screen.

Item name	Operation
Find step No.	This is left blank. This is the default focus position when the screen is displayed.

6.13.4.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Find Step No. Popup Screen".
Find step No.	This selects the find step No. input field.
Find	Refer to "Finding Step Numbers".
Close	Refer to "Closing the Find Step No. Popup Screen".

6.13.4.6 Displaying the Find Step No. Popup Screen

The find step No. popup screen can be displayed using several different methods.
The following table describes the display method for the find step No. popup screen.

Display method for the Find step No. popup screen
Press the [FIND STEP NO.] menu key.
Press any number key.

6.13.4.7 Finding Step Numbers

Normal operation

1. Press the [FIND STEP NO.] menu key and enter the desired step number into find step No. input field.
2. Press the [FIND] menu key. Pressing the menu key closes the find step No. popup screen and transitions the cursor to the entered position.
   *If the entered step number is larger than the number of steps in the ladder, the cursor is transitioned to the ladder end position.

Abnormal operation

This information describes the details of error messages displayed on the find step No. popup screen and the corrective action thereof.

Error message	Error description	Corrective action
The specified step is out of the range. Set a valid step No.	This is displayed when an incorrect step number is specified such as setting a negative number in the find step No. input field.	Enter a positive integer into the find step No. input field and press the [FIND] menu key again.

6.13.4.8 Closing the Find Step No. Popup Screen

Use any of the following methods to close the find step No. popup screen.

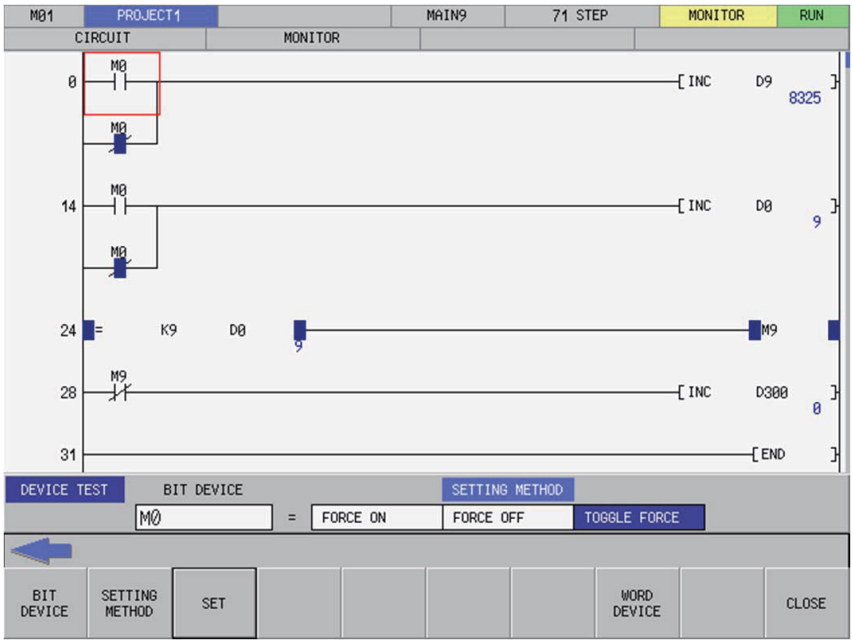
Methods to close the screen
Execute the find step No. operation.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.5 Device Test Popup Screen

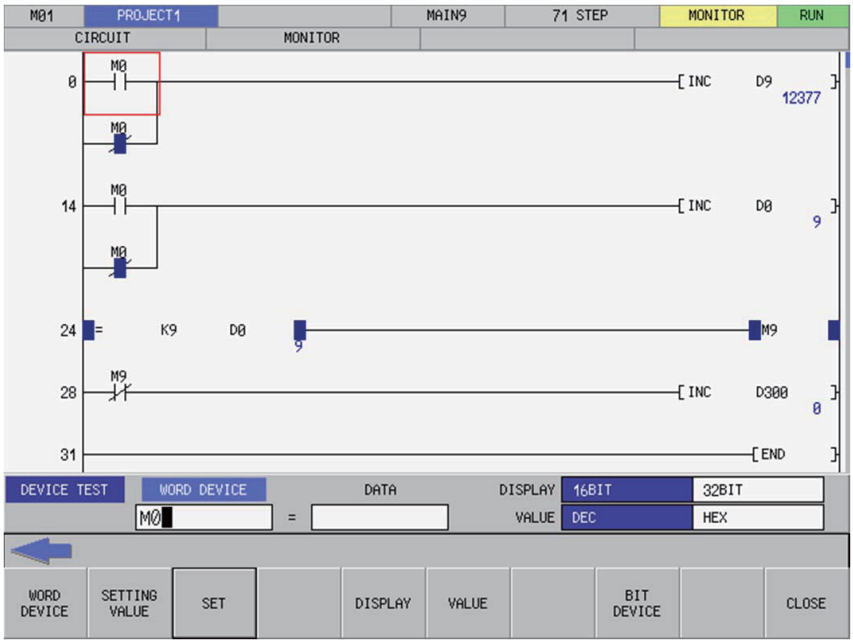
6.13.5.1 Outline

The bit devices can be turned ON and OFF forcibly and the word device current value can be changed.

<Bit device setting screen (ladder screen)>



<Word device setting screen (ladder screen)>



6.13.5.2 Screen Display Items

The following table describes the screen display items for the device test popup screen.

Item name		Display state
Bit device setting screen		
	Bit device	This displays the bit device at the cursor position. This is left blank if there is no bit device.
	Device ON/OFF settings	This displays the forced ON, forced OFF, and toggle between forced ON/OFF.
Word device setting screen		
	Word device	This displays the word device at the cursor position. This is left blank if there is no word device.
	Setting value	This displays the value set for the word device. This is left blank when displaying screens.
	Display	This displays 16-bit integers and 32-bit integers.
	Format	This displays values in either decimal or hexadecimal format.

6.13.5.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the device test popup screen are always enabled.

6.13.5.4 Status during Screen Displays

The following table describes the status when displaying the device test popup screen.

Item name		Operation
Bit device setting screen		
	Bit device	This is the default focus position when the screen is displayed. This displays the bit device at the cursor position. This is left blank if there is no bit device.
	Setting method	This selects the toggle between forced ON/OFF.
Word device setting screen		
	Word device	This displays the word device at the cursor position. This is left blank if there is no word device.
	Setting value	This is left blank.
	Display	This selects 16-bit integers.
	Format	This selects decimal numbers.

6.13.5.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Menu name		Operation
Left arrow key		Refer to "Closing the Device Test Popup Screen".
Bit device setting screen		
	Bit device	This selects the bit device input field.
	Setting method	This sets the focus to the device ON/OFF setting. This changes the setting method selection when the focus is already set.
	Settings	Refer to "Testing Bit Devices".
	Switch word device	This switches to the word device setting screen.
	Close	Refer to "Closing the Device Test Popup Screen".
Word device setting screen		
	Word device	This selects the word device input field.
	Setting value	This selects the setting value input field.
	Settings	Refer to "Testing Word Devices".
	Display	This sets the focus to the display. This changes the display selection when the focus is already set.
	Format	This sets the focus to the format. This changes the format selection when the focus is already set.
	Switch bit device	This switches to the bit device setting screen.
	Close	Refer to "Closing the Device Test Popup Screen".

6.13.5.6 Testing Bit Devices

Normal operation

1. Press the [BIT DEVICE] menu key and enter the desired bit device.
2. Press or press and hold the [SETTING METHOD] menu key in accordance with the following conditions.
   • To use a forced ON: Select [FORCE ON].
   • To use a forced OFF: Select [FORCE OFF].
   • To toggle between forced ON/OFF: Select [TOGGLE FORCE].
3. Press the [SET] menu key.

Abnormal operation

This information describes the details of error messages displayed when testing bit devices and the corrective action thereof.

Error message	Error description	Corrective action
The device name has not been entered. Enter the device name.	This is displayed when the [SET] menu key is pressed without entering the device name.	Enter the bit device before pressing the [SET] menu key.
The device is incorrect. Specify a bit device.	This is displayed when the [SET] menu key is pressed when something other than a bit device was entered.	Enter the bit device before pressing the [SET] menu key.
The device No. is outside the range. Check using the parameter device.	This is displayed when the [SET] menu key is pressed when a device outside of the range is specified in the bit device name input field.	Enter a bit device number within range before pressing the [SET] menu key.

6.13.5.7 Testing Word Devices

Normal operation

1. Press the [DISPLAY] menu key and select whether the devices are displayed in 16-bit integers or 32-bit integers.
2. Press the [FORMAT] menu key and select whether the device setting values are entered as decimal or hexadecimal numbers.
3. Press the [WORD DEVICE] menu key and enter the desired word device.
4. Press the [SETTING VALUE] menu key and enter the desired value in the format selected in the format selection field.
5. Press the [SET] menu key.

Abnormal operation

Error message	Error description	Corrective action
The device name has not been entered. Enter the device name.	This is displayed when the [SET] menu key is pressed without entering the device name.	Enter the word device before pressing the [SET] menu key.
The device is incorrect. Specify a word device.	This is displayed when the [SET] menu key is pressed when something other than a word device was entered.	Enter the word device before pressing the [SET] menu key.
A value has not been entered.	This is displayed when the [SET] menu key is pressed without entering a setting value.	Enter a setting value before pressing the [SET] menu key.
The device No. is outside the range. Check using the parameter device.	This is displayed when the [SET] menu key is pressed when a device outside of the range is specified in the word device name input field.	Enter a word device number within range before pressing the [SET] menu key.

6.13.5.8 Closing the Device Test Popup Screen

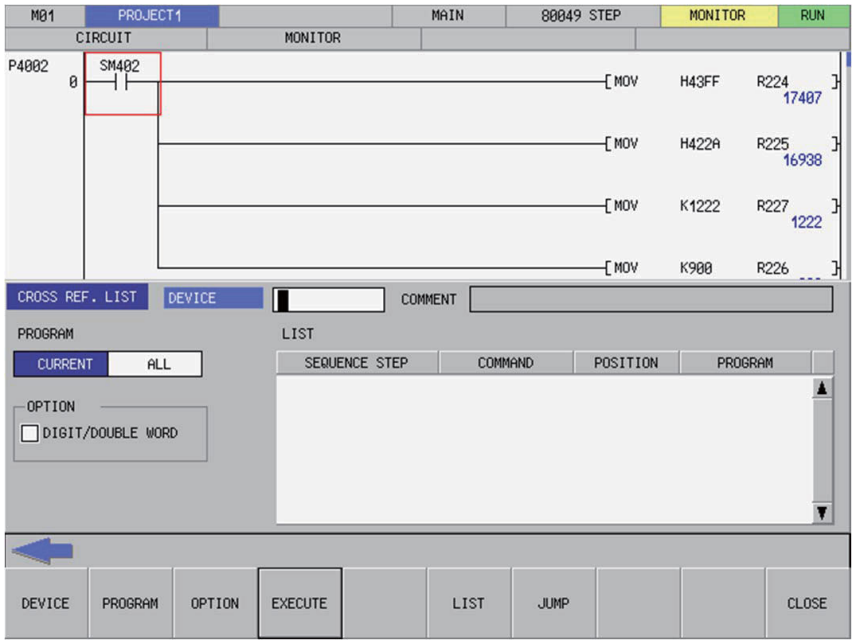
Use any of the following methods to close the device test popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.6 Contact Coil Usage List Popup Screen

6.13.6.1 Outline

The steps, instructions and position in which the designated device is used can be listed.
The program searched is the one stored in the current project.



6.13.6.2 Screen Display Items

The following table describes the screen display items for the contact coil usage list popup screen.

Item name	Display state
Device	This displays the device to be searched.
Comment	This displays comments set for the device to be searched.
Program	This displays the currently displayed or all programs.
Options	This displays specified search options for digits/double words.
List	This displays the search results.

6.13.6.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the contact coil usage list popup screen are always enabled.

6.13.6.4 Status during Screen Displays

The following table describes the status when displaying the contact coil usage list popup screen.

Item name	Operation
Device	This displays the device at the cursor position in the ladder screen. This also sets the alias for the device at the cursor position and displays the alias if attempting to display the alias. This is left blank if there is no device at the cursor position. This is the default focus position when the screen is displayed.
Comment	This is left blank.
Program	This selects the current display.
Options	The check box is deselected.
List	This is left blank.

6.13.6.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Contact Coil Usage List Popup Screen".
Device	This selects the device input field.
Program	This selects the search program selection field or changes the selection of the program to be searched.
Options	This selects the search options selection field or changes the selection of the search options.
Execute	Refer to "Investigating Usage States of Specified Devices".
List	This selects the list.
Jump	This moves the cursor on the ladder screen to the step position selected in the list.
Close	Refer to "Closing the Contact Coil Usage List Popup Screen".

6.13.6.6 Investigating Usage States of Specified Devices

Normal operation

(1) When devices are used

1. Press the [DEVICE] menu key and enter the device for which you want to investigate the usage state.
2. Press the [PROGRAM] menu key and select whether the program to be searched is the currently displayed program or the entire program stored in the current project.
3. Press the [OPTION] menu key and select whether or not to use the search option.
4. Press the [EXECUTE] menu key to investigate the usage state. The investigation results are displayed in the list. Comments specified for the searched device are displayed in the comment field.
5. Press the [LIST] menu key to select the list. Use the up/down arrow keys, Page Up key, and Page Down key to select the area of the ladder you want to check.
6. Press the [JUMP] menu key. Move the cursor on the ladder screen to the program or step position present in the ladder selected in the list.

When aliases are used

Usage states can be investigated using aliases in the same way as for devices by specifying the alias configured for the device into the [DEVICE/INST.] input field. Only aliases configured with single-byte alphanumeric characters can be investigated by the PLC On-board.

Use either of the following formats to specify the alias.

- "Single quotation mark" + "Desired alias"
- "Period" + "Desired alias"

Processes other than device specifications are performed in the same way as normal.

Abnormal operation

This information describes the details of error messages displayed on the contact coil usage list popup screen and the corrective action thereof.

Error message	Error description	Corrective action
Device setting is wrong. The following causes may be responsible: ・An unusable device has been designated. ・Index modification, module specification setting is wrong. ・Special function module device, link direct device setting is wrong.	This is displayed when the [EXECUTE] menu key is pressed when the range of the specified device is unusable or a mistake was made in the specification of the index modification, module specification, etc.	Enter a suitable device into the device/ instruction input field and then press the [EXECUTE] menu key again.
Device setting is wrong. The following causes may be responsible: ・The device No. is over the usable range. ・An unusable device has been designated.	This is displayed when the [EXECUTE] menu key is pressed when the range of the specified device is unusable or an unusable device is specified.	Enter a suitable device into the device/ instruction input field and then press the [EXECUTE] menu key again.
A device that corresponds to the alias has not been assigned. Check the device comment window.	This is displayed when the [EXECUTE] menu key is pressed after entering an alias not allocated to a device.	Enter an alias allocated to a device and then press the [EXECUTE] menu key again.

6.13.6.7 Closing the Contact Coil Usage List Popup Screen

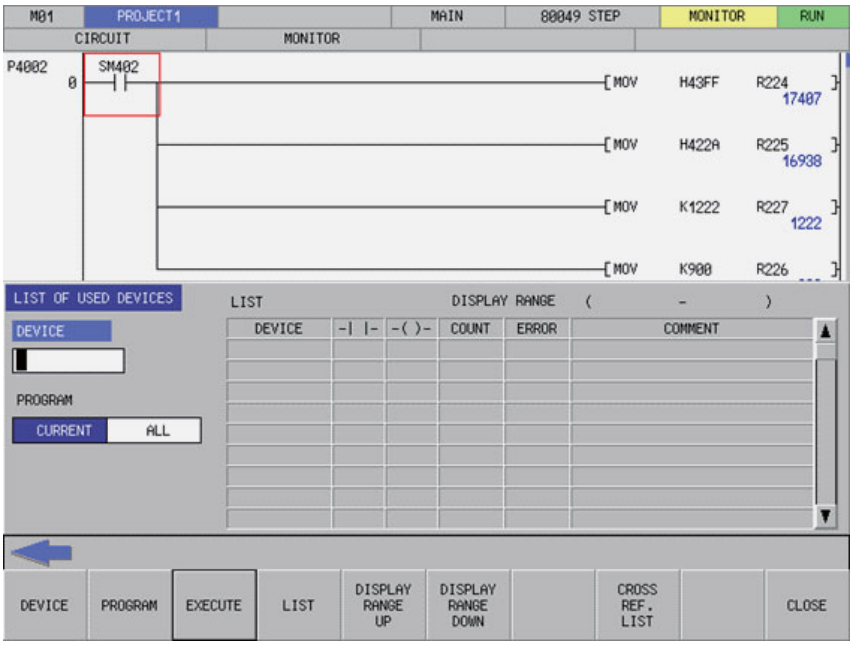
Use any of the following methods to close the contact coil usage list popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.7 List of Used Devices Popup Screen

6.13.7.1 Outline

The usage state of devices in the program can be displayed for each designated device. The ladder symbols, usage quantity and presence of errors can be displayed by designating the device.
The program searched is the one stored in the current project.



6.13.7.2 Screen Display Items

The following table describes the screen display items for the list of used devices popup screen.

Item name	Display state
Device	This displays the device to be searched.
Program	This displays the currently displayed or all programs.
List	This displays the search results.
Display range	This displays the range of devices displayed in the current list.

6.13.7.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the list of used devices popup screen are always enabled.

6.13.7.4 Status during Screen Displays

The following table describes the status when displaying the list of used devices popup screen.

Item name	Display state
Device	This displays the device at the cursor position in the ladder screen. This also sets the alias for the device at the cursor position and displays the alias if attempting to display the alias. This is left blank if there is no device at the cursor position. This is the default focus position when the screen is displayed.
Program	This selects the current display.
List	This is left blank.
Display range	The range is not displayed.

6.13.7.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the List of Used Devices Popup Screen".
Device	This selects the device input field.
Program	This selects the search program selection field or changes the selection of the program to be searched.
Execute	Refer to "Investigating Usage States of Devices".
List	This selects the list.
Display range upward	This moves the range of devices displayed in the list upward by one page (128 points).
Display range downward	This moves the range of devices displayed in the list downward by one page 128 points).
Contact coil usage list	This displays the contact coil usage list popup screen.
Close	Refer to "Closing the List of Used Devices Popup Screen".

6.13.7.6 Investigating Usage States of Devices

Normal operation

(1) When devices are used

1. Press the [DEVICE] menu key and enter the device for which you want to investigate the usage state.
2. Press the [PROGRAM] menu key and select whether the program to be searched is the currently displayed program or the entire program stored in the current project.
3. Press the [EXECUTE] menu key to investigate the usage state. The investigation results are displayed in the list.
4. Press the [DISPLAY RANGE UPWARD] and [DISPLAY RANGE DOWNWARD] menu keys to transition to the range that includes the devices for which you want to check the results.
5. Press the [LIST] menu key to select the list. Use the up/down arrow keys, Page Up key, and Page Down key to select the area of the status you want to check.
6. Press the [CONTACT COIL USAGE LIST] menu key. An investigation is automatically performed to determine the manner in which the device at the cursor position in the list is used and then the contact coil usage list popup screen displays.
   (Refer to "Contact Coil Usage List Popup Screen".)

When aliases are used

Usage states can be investigated using aliases in the same way as for devices by specifying the alias configured for the device into the [DEVICE/INST.] input field. Only aliases configured with single-byte alphanumeric characters can be investigated by the PLC On-board.

Use either of the following formats to specify the alias.

• "Single quotation mark" + "Desired alias"

• "Period" + "Desired alias"

Processes other than device specifications are performed in the same way as normal.

Abnormal operation

This information describes the details of error messages displayed on the list of used devices popup screen and the corrective action thereof.

Error message	Error description	Corrective action
Device setting is wrong. The following causes may be responsible: ・An unusable device has been designated. ・Index modification, module specification setting is wrong. ・Special function module device, link direct device setting is wrong.	This is displayed when the [EXECUTE] menu key is pressed when the range of the specified device is unusable or a mistake was made in the specification of the index modification, module specification, etc.	Enter a suitable device into the device/ instruction input field and then press the [EXECUTE] menu key again.
Device setting is wrong. The following causes may be responsible: ・The device No. is over the usable range. ・An unusable device has been designated.	This is displayed when the [EXECUTE] menu key is pressed when the range of the specified device is unusable or an unusable device is specified.	Enter a suitable device into the device/ instruction input field and then press the [EXECUTE] menu key again.
A device that corresponds to the alias has not been assigned. Check the device comment window.	This is displayed when the [EXECUTE] menu key is pressed after entering an alias not allocated to a device.	Enter an alias allocated to a device and then press the [EXECUTE] menu key again.

6.13.7.7 Closing the List of Used Devices Popup Screen

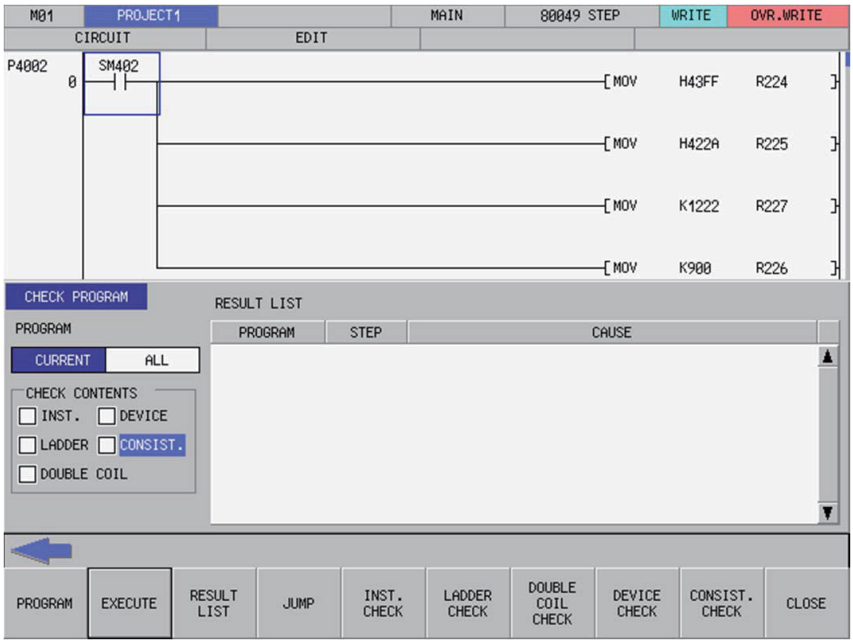
Use any of the following methods to close the list of used devices popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.8 Check Program Popup Screen

6.13.8.1 Outline

This enables checking of logical errors and input mistakes in the program.
The program searched is the one stored in the current project.



6.13.8.2 Screen Display Items

The following table describes the screen display items for the check program popup screen.

Item name		Display state
Program		This displays the currently displayed or all programs.
Check details		
	Instruction	This displays whether or not the instruction check is executed.
	Ladder	This displays whether or not the ladder check is executed.
	Double coil	This displays whether or not the double coil check is executed.
	Device	This displays whether or not the device check is executed.
	Consistency	This displays whether or not the consistency check is executed.
Result list		This displays the results of the check program operation.

6.13.8.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the check program popup screen are always enabled.

6.13.8.4 Status during Screen Displays

The following table describes the screen display items for the check program popup screen.

Item name		Display state
Program		This selects the current display.
Check details		
	Instruction	This displays the execution of the instruction check (when applicable).
	Ladder	This displays the execution of the ladder check (when applicable).
	Double coil	This displays the execution of the double coil check (when applicable).
	Device	This displays the execution of the device check (when applicable).
	Consistency	This displays the execution of the consistency check (when applicable).
Result list		This is left blank.

6.13.8.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Check Program Popup Screen".
Program	This selects the check program selection field or changes the selection of the program to be checked.
Execute	Refer to "Checking Programs".
Result list	This selects the result list.
Jump	This moves the cursor on the ladder screen to the step position selected in the list.
Instruction check	This selects the check instruction selection field or changes the selection to execute/not execute the instruction check.
Ladder check	This selects the check ladder selection field or changes the selection to execute/not execute the ladder check.
Double coil check	This selects the check double coil selection field or changes the selection to execute/not execute the double coil check.
Device check	This selects the check device selection field or changes the selection to execute/not execute the device check.
Consistency check	This selects the check consistency selection field or changes the selection to execute/not execute the consistency check.
Close	Refer to "Closing the Check Program Popup Screen".

6.13.8.6 Checking Programs

1. Press the [CHECK PROGRAM] menu key and select whether the program to be checked is the currently displayed program or the entire program stored in the current project.
2. Press the [INST. CHECK] menu key to select whether or not to perform the instruction check.
3. Press the [LADDER CHECK] menu key to select whether or not to perform the ladder check.
4. Press the [DOUBLE COIL CHECK] menu key to select whether or not to perform the double coil check.
5. Press the [DEVICE CHECK] menu key to select whether or not to perform the device check.
6. Press the [CONSIST. CHECK] menu key to select whether or not to perform the consistency check.
7. Press the [EXECUTE] menu key to start the checks.
   * A progress bar is displayed indicating the status during the program checks.

8. Press the [RESULT LIST] menu key to select the result list. Use the up/down arrow keys, Page Up key, and Page Down key to select the area where errors occurred in the ladder you want to check.
9. Press the [JUMP] menu key. Move the cursor on the ladder screen to the program or step position present in the ladder selected in the result list.

6.13.8.7 Closing the Check Program Popup Screen

Use any of the following methods to close the check program popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.13.9 Split Screen

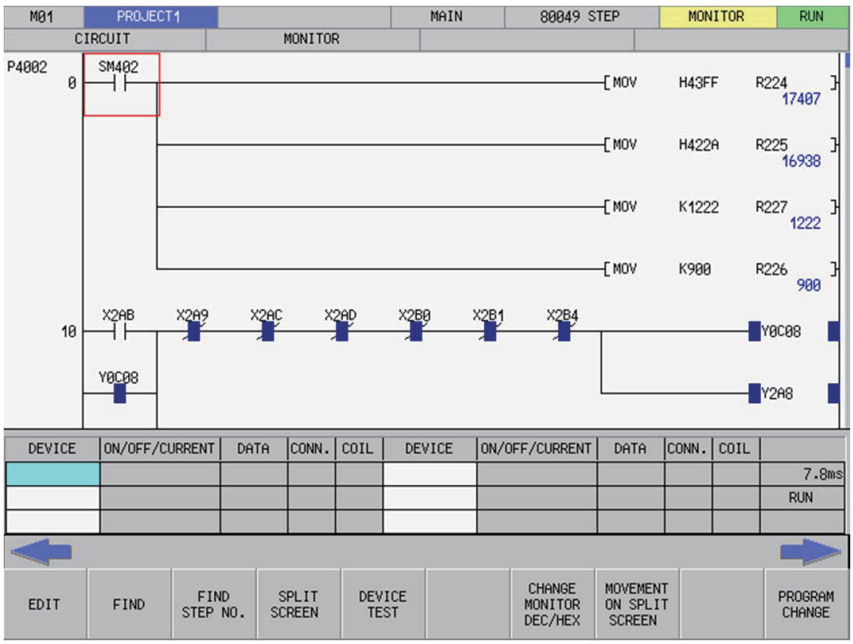
This splits the ladder screen and displays both the entry device monitor and the entry ladder monitor screens.
The entry device monitor and the entry ladder monitor screens cannot be displayed simultaneously.

6.13.9.1 Entry Device Monitor

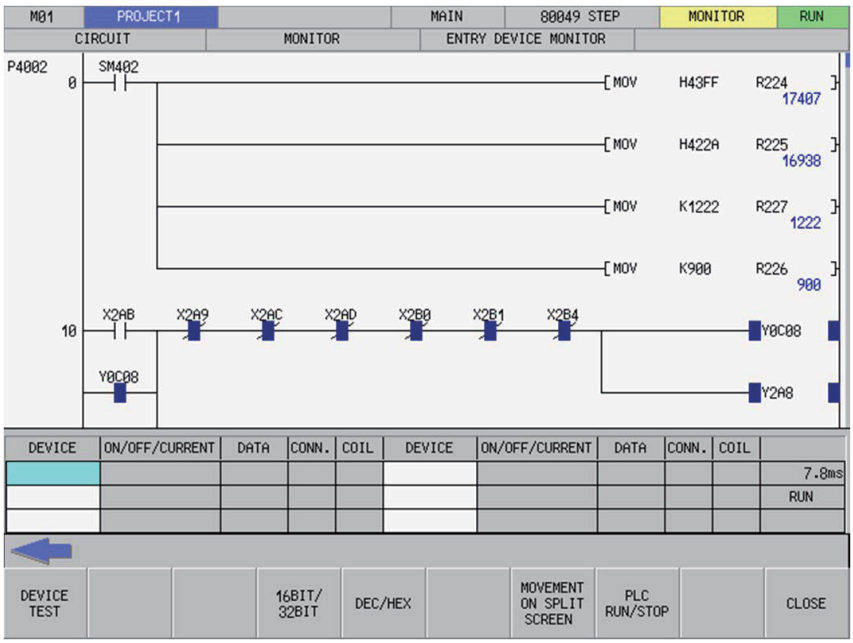
Outline

This splits the ladder screen (monitor) and enables the entry ladder monitor together with the ladder monitor display.
The display of menu keys changes depending on whether the ladder screen or the entry device monitor is selected.

<Selecting the ladder screen>



<Selecting the entry device monitor>



Transitioning between the ladder screen and the split screen

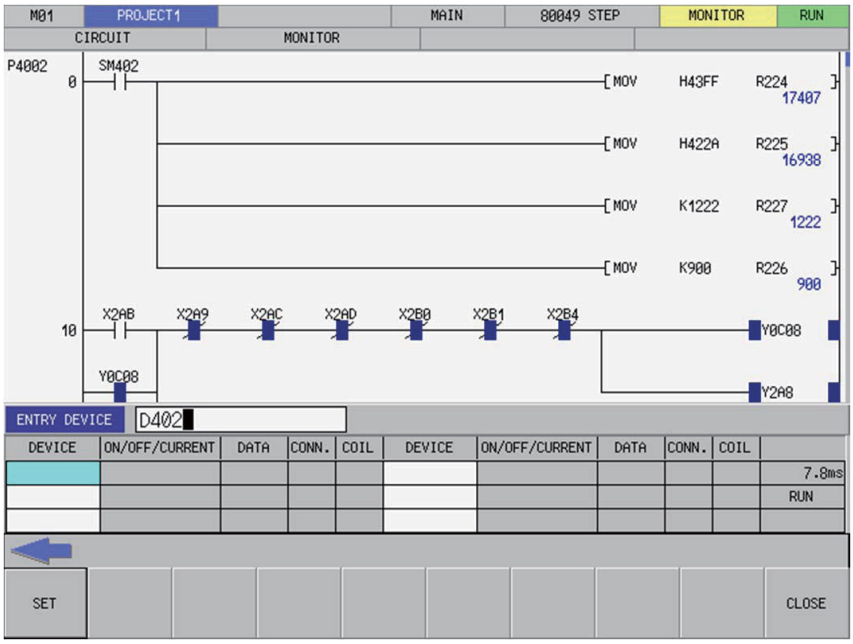
Use the [SPLIT SCREEN] transition menu key to transition between the ladder screen and the split screen (entry device monitor). Pressing the [MOVEMENT ON SPLIT SCREEN] menu key transitions the selection to the split screen when the ladder screen is selected and transitions the selection to the ladder screen when the split screen is selected.

Registering devices to the entry device monitor

Pressing the [REGISTER MONITOR] menu key registers the device or ladder at the cursor position to the registration monitor in accordance with the following rules.

Status	Operation when the register monitor menu key is pressed
Not using split screen mode	Registers the ladder at the cursor position to the entry ladder monitor.
Displaying the entry ladder monitor	
Displaying the entry device monitor	Registers the device at the cursor position to the entry device monitor.
Selecting the entry device monitor	

The entry device popup screen displays after pressing the [INPUT] key while the entry device monitor screen is selected.



Register devices using the following operations.

1. Use the keys as described in "Operation Key List: Basic Operation Keys" to select the devices you want to register in the device field of the entry device monitor. The background color of the selected areas becomes blue.
2. Press the [DEVICE] menu key to select the device input field and enter the device you want to monitor.
3. Press the [REGISTER] menu key to select the device at the position selected in the entry device monitor. Close the entry device popup screen.

Changing the display of monitor values

Select the entry device monitor and then use the [16-BIT/32-BIT SWITCH] menu key or the [DEC./HEX.] menu key to change the display of setting values.

Closing the Entry Device Monitor

Use any of the following methods to close the entry device monitor popup screen.

Methods to close the screen
Select the entry device monitor and press the [CLOSE] menu key.
Select the entry device monitor and press the left arrow key.
Select the entry device monitor and press the [ESC] key on the soft keyboard.
Select the entry device monitor and press the [ENTRY DEVICE MONITOR] menu key.

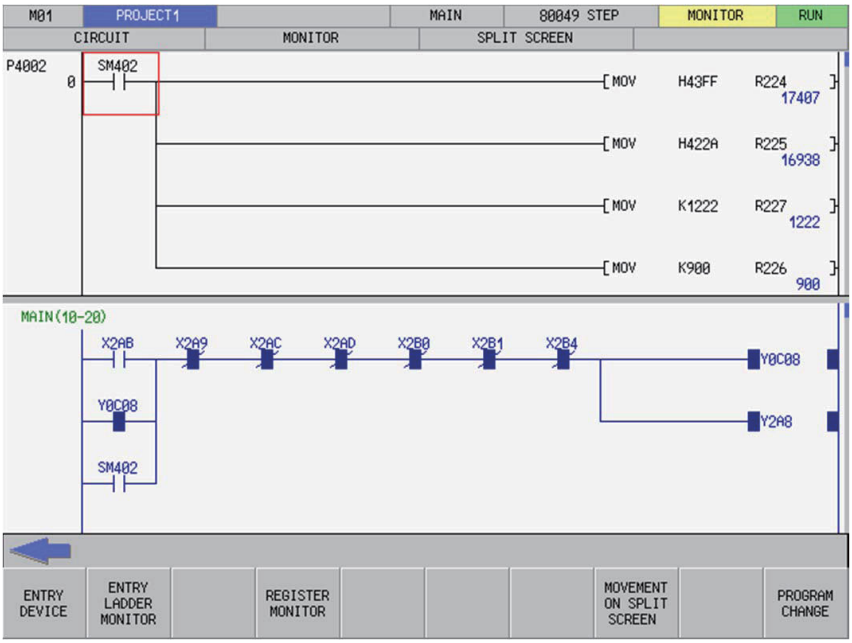
6.13.9.2 Entry Ladder Monitor

Outline

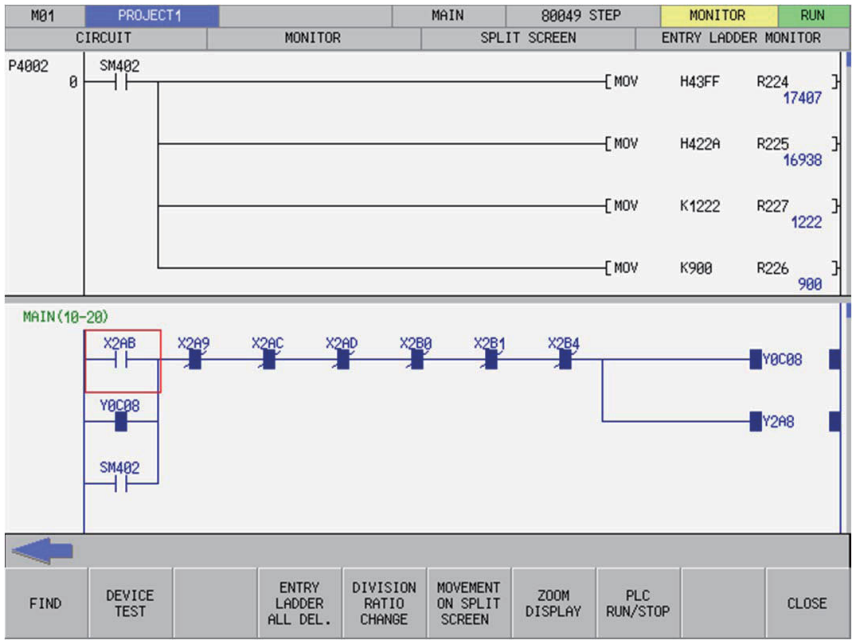
This splits the ladder screen (monitor) and enables the registered ladders to be monitored together with the ladder monitor display.

The display of menu keys changes depending on whether the ladder screen or the entry ladder monitor is selected.

<Selecting the ladder screen>



<Selecting the entry ladder monitor>



Transitioning between the ladder screen and the split screen

Use the [SPLIT SCREEN] movement menu key to transition between the ladder screen and the split screen (entry ladder monitor). Pressing the [SPLIT SCREEN TRANSITION] menu key transitions the selection to the split screen when the ladder screen is selected and transitions the selection to the ladder screen when the split screen is selected.

Registering ladders to the entry ladder monitor

Pressing the [REGISTER MONITOR] menu key registers the device or ladder at the cursor position to the registration monitor in accordance with the following rules.

Status	Operation when the register monitor menu key is pressed
Not using split screen mode	Registers the ladder at the cursor position to the entry ladder monitor.
Displaying the entry ladder monitor	
Displaying the entry device monitor	Registers the device at the cursor position to the entry device monitor.
Selecting the entry device monitor	

Deleting registered ladders

(1) Deleting individual ladder blocks

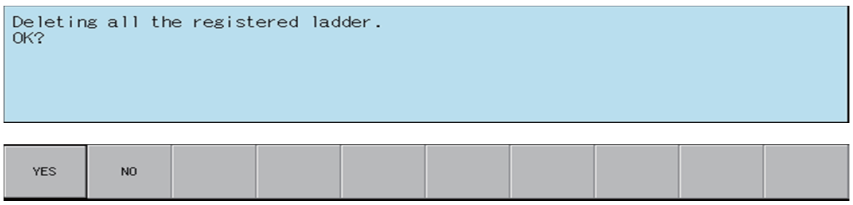
Perform the following operations in order to delete ladder circuits registered in the entry ladder monitor one block at a time.

1. Use the [SPLIT SCREEN TRANSITION] menu key to select the entry ladder monitor.
2. Use the keys as described in "Operation Key List: Basic Operation Keys" to transition to the left end of the ladder block you want to delete. The background color of the ladder block changes to blue after transitioning to the left end of the ladder block.
3. Press the [DELETE] key.

(2) Deleting all registered circuits

Perform the following operations in order to delete all ladder circuits registered in the entry ladder monitor.

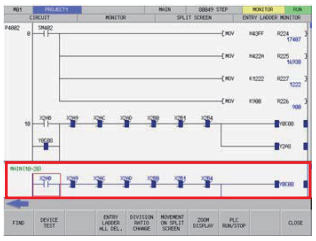
1. Use the [SPLIT SCREEN TRANSITION] menu key to select the entry ladder monitor.
2. Press the [DELETE ALL REG. CIRCUITS] menu key. Pressing the [DELETE ALL REG. CIRCUITS] menu key displays the following message.



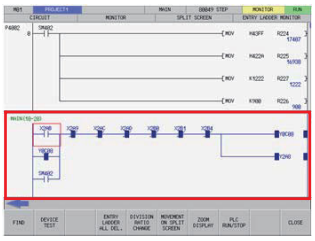
3. Pressing the [YES] menu key closes the message screen and all ladder circuits registered in the entry ladder monitor are deleted.
   Pressing the [NO] menu key closes the message. The ladder circuits registered in the entry ladder monitor are not deleted.

Changing the split screen ratio for the entry ladder monitor

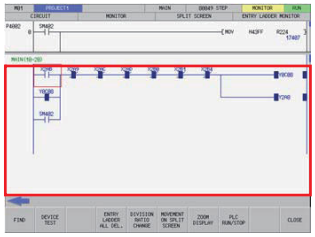
The split ratio between the display of the "ENTRY LADDER MONITOR" and "CIRCUIT" screens can be changed. When the [DEVISION RATIO CHANGE] menu key is pressed, the split ratio changes between "25%" -> "50%" -> "75%" -> "100%" -> "25%". The default split ratio is 50%.



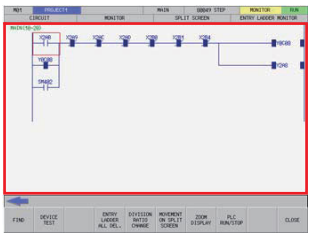
25%



50%



75%



100%

. . .

Closing the Entry Ladder Monitor

Use any of the following methods to close the entry ladder monitor popup screen.

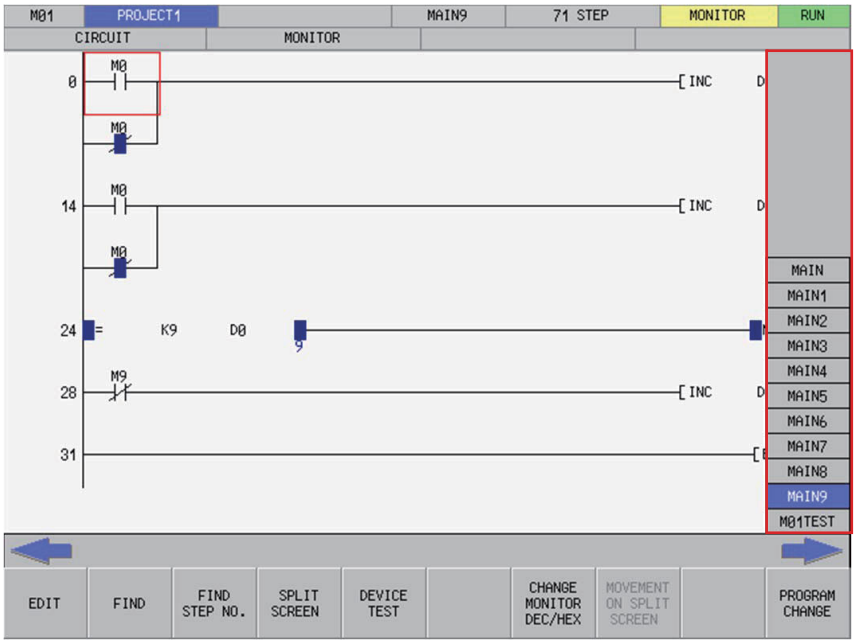
Methods to close the screen
Select the entry ladder monitor and press the [CLOSE] menu key.
Select the entry ladder monitor and press the left arrow key.
Select the entry ladder monitor and press the [ESC] key on the soft keyboard.
Select the entry ladder monitor and press the [ENTRY LADDER MONITOR] menu key.

6.13.10 Switching Programs

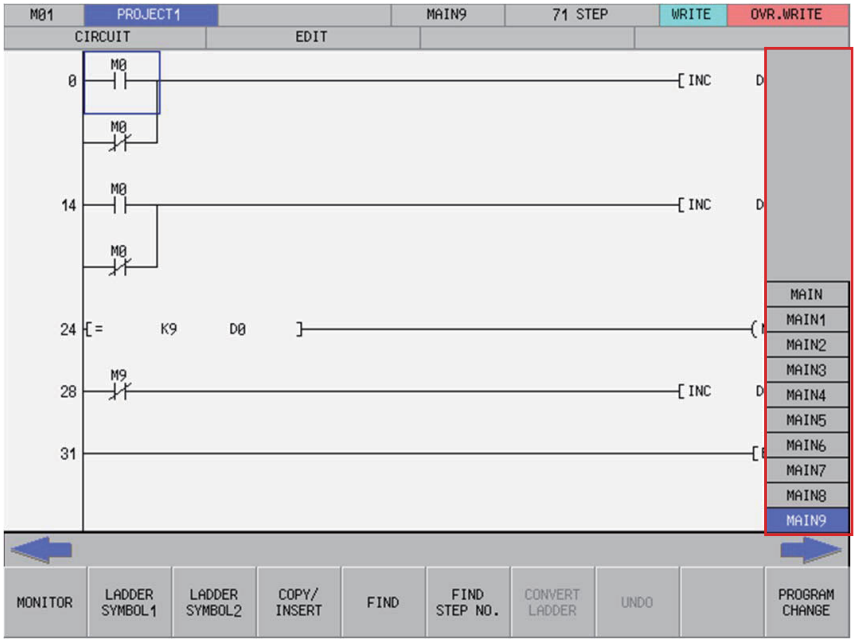
6.13.10.1 Outline

The programs displayed on the ladder screen can be changed.
The programs that can be selected differ depending on whether selecting to switch programs while monitoring ladders or while editing ladders.

<Monitoring ladders>

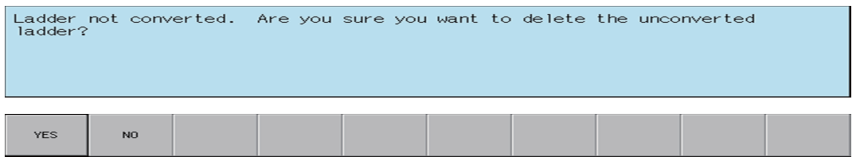


<Editing ladders>



6.13.10.2 Selecting and Switching Programs

Refer to "(1) Switching between programs or other types of data" under "Setting selection items in lists" in "Operation Key List :Screen Items (Control)" to select and switch programs.
Switching programs while monitoring ladders enables you to switch between programs and PLC messages.
Switching programs while editing ladders enables you to switch programs only.
Note that the following message screen displays when attempting to switch programs when there are unconverted ladders.



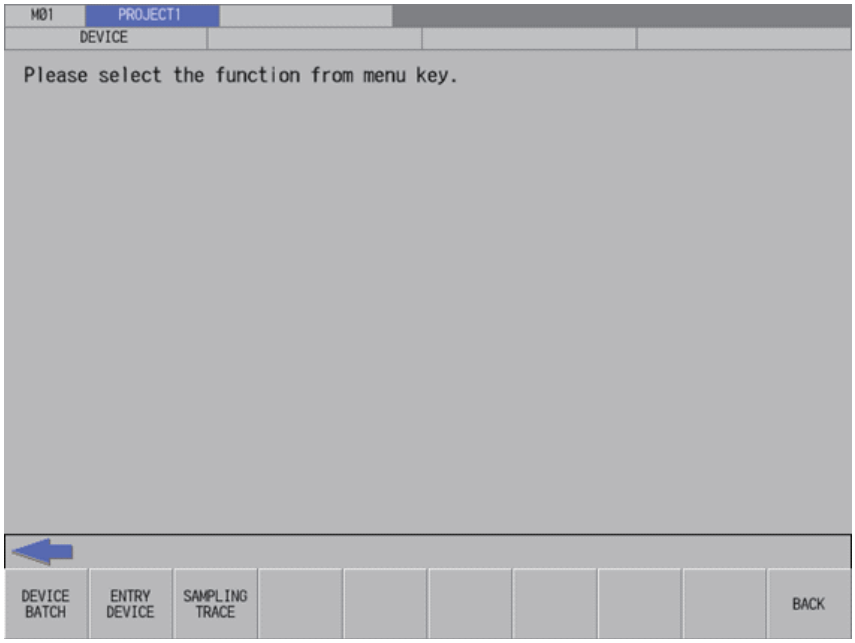
Pressing the [YES] menu key cancels the unconverted ladder and switches to the program selected on the switch program screen.
Pressing the [NO] menu key returns to the ladder screen without switching to the program selected on the switch program screen.

6.14 Environment Setting Menu

6.14.1 Environment Settings Main Screen

6.14.1.1 Outline

This section describes the various settings for using the PLC On-board.



6.14.1.2 Screen Display Items

The following table describes the screen display items for the environment settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.14.1.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the environment settings screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Comment Display setting	This is enables when reading the sequence program in the current project.
Ladder Display	This is enables when reading the sequence program in the current project.

6.14.1.4 Operation of Key Presses

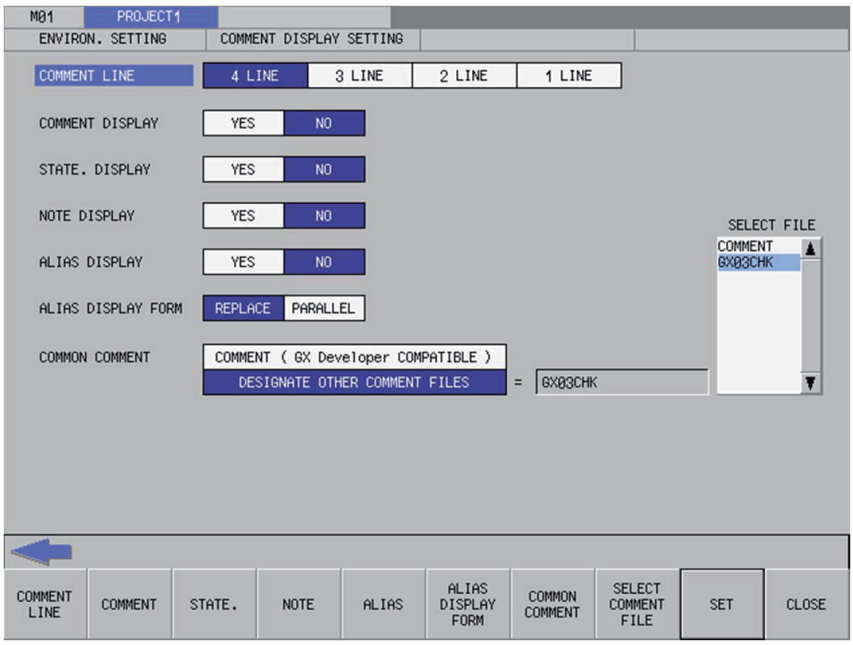
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/return menu key	These transition to the main menu.
Various menu keys	This displays the specified screen.

6.14.2 Comment Display Settings Screen

6.14.2.1 Outline

This configures settings for device comments stored in projects.



6.14.2.2 Screen Display Items

The following table describes the screen display items for the comment display settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Comment line	This displays the [4 LINE], [3 LINE], [2 LINE], and [1 LINE] options.
Comment display	This displays the [YES] and [NO] options.
Statement display	
Note display	
Alias display	
Alias display form	This displays the [REPLACE] and [PARALLEL] options.
Common comment file	This displays the [COMMENT (GX Developer compatible)] and [Specify other comment file] options.
Select comment file	This displays the name of the device comment file stored in the current project.

6.14.2.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the comment display settings screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Common comment file	This is enabled when device comments are stored in the current project.
Select comment file	This is enabled when device comments are stored in the current project and the selection of the common comment file is [Specify other comment file].

6.14.2.4 Status during Screen Displays

The following table describes the status when displaying the comment display settings screen for the first time.
(The details of the configuration made on the comment display settings screen are stored. The screen is displayed with the updated settings configured previously the next time it is displayed. However, the comment file name displayed in the select comment file field is updated every time the screen is displayed.)

Item name	Operation
Comment line	This selects the [4 LINE] option.
Comment display	This selects the [NO] option.
Statement display	This selects the [NO] option.
Note display	This selects the [NO] option.
Alias display	This selects the [NO] option.
Alias display form	This selects the [REPLACE] option.
Common comment file	This selects the [COMMENT (GX Developer compatible)] option.
Select comment file	This displays the name of the device comment file stored in the current project.

6.14.2.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

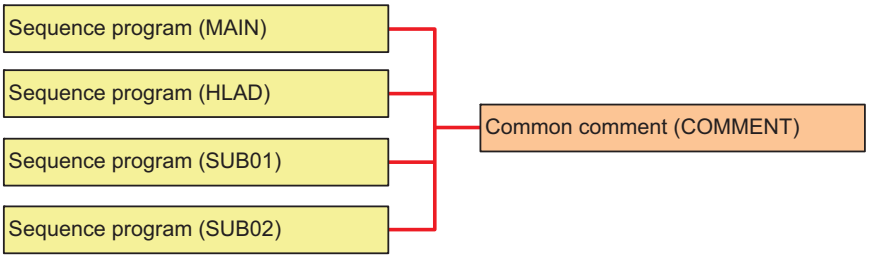
Item name	Operation
Left arrow key	Refer to "Closing the Comment Display Settings Screen".
Comment line	This sets the focus to the comment line. This changes the comment line selection when the focus is already set.
Comment display	This sets the focus to the comment display. This changes the comment display selection when the focus is already set.
Statement display	This sets the focus to the statement display. This changes the statement display selection when the focus is already set.
Note display	This sets the focus to the note display. This changes the note display selection when the focus is already set.
Alias display	This sets the focus to the alias display. This changes the alias display selection when the focus is already set.
Alias display form	This sets the focus to the alias display form. This changes the alias display form selection when the focus is already set.
Common comment file	This sets the focus to the common comment file. This changes the common comment file selection when the focus is already set.
Select comment file	This sets the focus to the select comment file.
Settings	Refer to "Setting the Comment Display State".
Close	Refer to "Closing the Comment Display Settings Screen".

6.14.2.6 Common Comment File

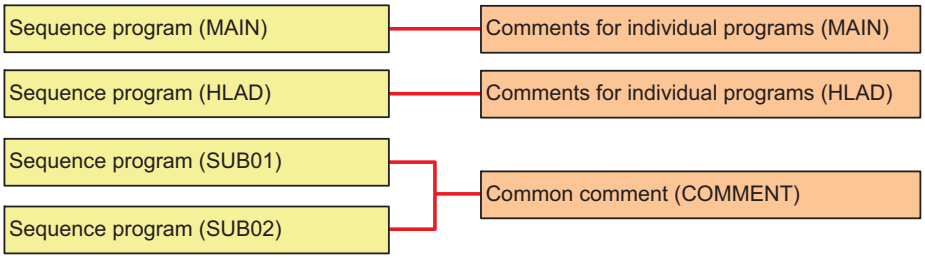
COMMENT (GX Developer compatible)

When [COMMENT (GX Developer compatible)] is selected as the common comment file, a correspondence is created between the sequence program and device comments as illustrated in the following diagram.

1. Contains common comments.
   Common comments are referenced in all sequence programs.

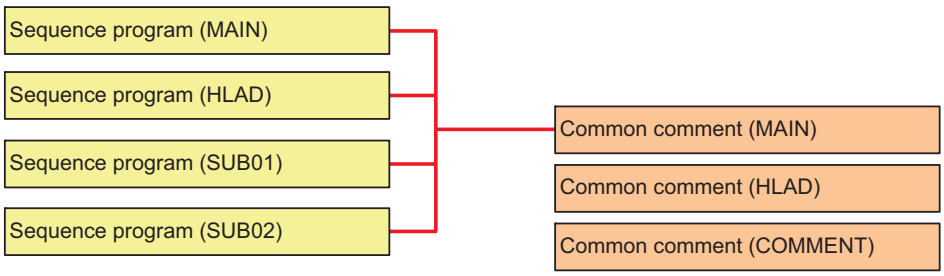


2. Contains both common comments and program-specific comments.
   Program-specific comments are only referenced in sequence programs with the same name. Common comments are referenced in the other sequence programs.



Specifying other comment files

When [Specify other comment file] is selected as the common comment file, you can specify one comment file referenced by all sequence programs.



6.14.2.7 Setting the Comment Display State

1. Press the [COMMENT LINE] menu key and select the number of comment lines to display on the ladder screen.
2. Press the [COMMENT DISPLAY] menu key and select whether or not to display comments on the ladder screen.
3. Press the [STATE. DISPLAY] menu key and select whether or not to display statements on the ladder screen.
4. Press the [NOTE DISPLAY] menu key and select whether or not to display notes on the ladder screen.
5. Press the [ALIAS DISPLAY] menu key and select whether or not to display aliases on the ladder screen.
6. Press the [ALIAS DISPLAY FORM] menu key and select whether to replace the format of the alias display with the device name or to display both the alias and device name vertically in parallel.
7. Press the [COMMON COMMENT] menu key and select whether to use COMMENT (GX Developer compatible) common comments or to specify some other comment file.
8. Perform this step only when [Specify other comment file] was selected at step 8.
   8-1. Press the [SELECT COMMENT FILE] menu key and select the select comment file field.
   8-2. Press the up and down arrow keys and select the comment file to use as the common comment file.
   8-3. Press the [INPUT] key and issue the common comment file selection.
9. Press the [SET] menu key and issue the comment display configuration.
   Pressing the [SET] menu key also closes the comment display settings screen and returns to the environment settings screen.

(Note) The comment display settings are retained even after the power OFF. When restarting after the power OFF, the displayed comment on the ladder screen is based on the retained contents.

6.14.2.8 Closing the Comment Display Settings Screen

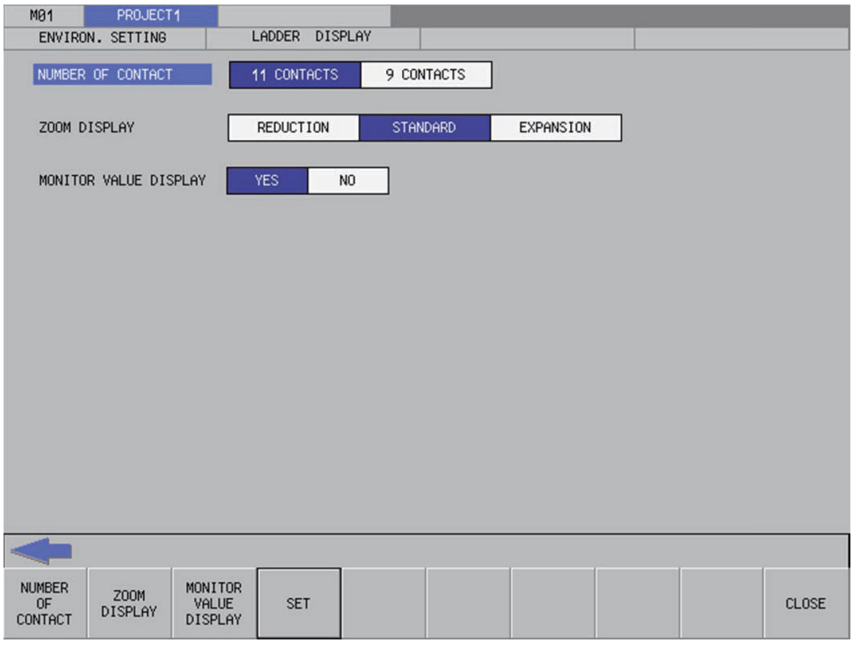
Use any of the following methods to close the comment display settings screen.

Methods to close the screen
Press the [SET] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.14.3 Ladder Display Settings Screen

6.14.3.1 Outline

This configures settings for the ladder screen. These settings are common between different projects.



6.14.3.2 Screen Display Items

The following table describes the screen display items for the ladder display settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Maximum number of contacts	This displays [11 CONTACTS] and [9 CONTACTS] options.
Zoom display	This displays the [REDUCE], [STANDARD], and [ENLARGE] options.
Monitor Value Display	This displays the [YES] and [NO] options.

6.14.3.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the ladder display settings screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Zoom display	Enabled when the screen resolution is 640 x 480

6.14.3.4 Status during Screen Displays

The following table describes the status when displaying the ladder display settings screen for the first time.
(The details of the configuration made on the comment display settings screen are stored. The screen is displayed with the updated settings configured previously the next time it is displayed.)

Item name	Operation
Maximum number of contacts	This selects the [11 CONTACTS] option.
Zoom display	This selects the [STANDARD] option.
Monitor Value Display	This selects the [YES] option.

6.14.3.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Ladder Display Settings Screen".
Maximum number of contacts	This sets the focus to the number of contacts. This changes the number of contacts selection when the focus is already set.
Zoom display	This sets the focus to the zoom display. This changes the zoom display selection when the focus is already set.
Monitor Value Display	This sets the focus to the monitor value display. This changes the monitor value display form selection when the focus is already set.
Settings	Refer to "Setting the Ladder Display State".
Close	Refer to "Closing the Ladder Display Settings Screen".

6.14.3.6 Setting the Ladder Display State

1. Press the [NUMBER OF CONTACT] menu key and select either [11 CONTACTS] or [9 CONTACTS] for the number of contacts to be displayed on the ladder screen.
2. Press the [ZOOM DISPLAY] menu key and select [REDUCE], [STANDARD], or [ENLARGE] for the magnification of the ladder screen.
3. Press the [MONITOR VALUE DISPLAY] menu key and select wither or not to display the current value on the ladder monitor.
4. Press the [SET] menu key and issue the ladder display configuration.
   Pressing the [SET] menu key also closes the ladder display settings screen and returns to the environment settings screen.

The following table describes the relationship between the screen resolution and the zoom level of the ladder screen.

Screen resolution	Maximum number of contacts	Reduced display	Standard display	Expanded display
VGA (640 x 480)	11 contacts	Entire ladder can be displayed	Horizontal scroll appears	Horizontal scroll appears
	9 contacts	Entire ladder can be displayed	Entire ladder can be displayed	Horizontal scroll appears
XGA (1024 x 768)	11 contacts		Entire ladder can be displayed	
	9 contacts		Entire ladder can be displayed	
SXGA (1280 x 1024)	11 contacts			Entire ladder can be displayed
	9 contacts			Entire ladder can be displayed

6.14.3.7 Closing the Ladder Display Settings Screen

Use any of the following methods to close the ladder display settings screen.

Methods to close the screen
Press the [SET] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

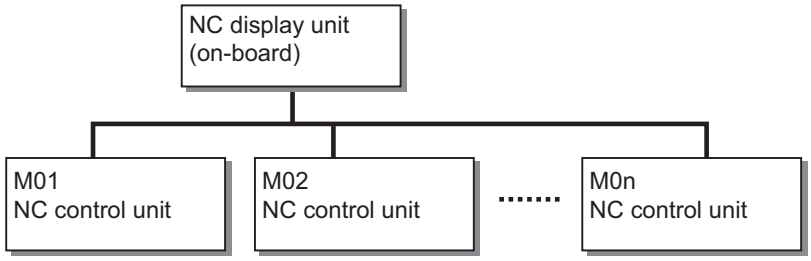
6.14.4 Change NC Connection

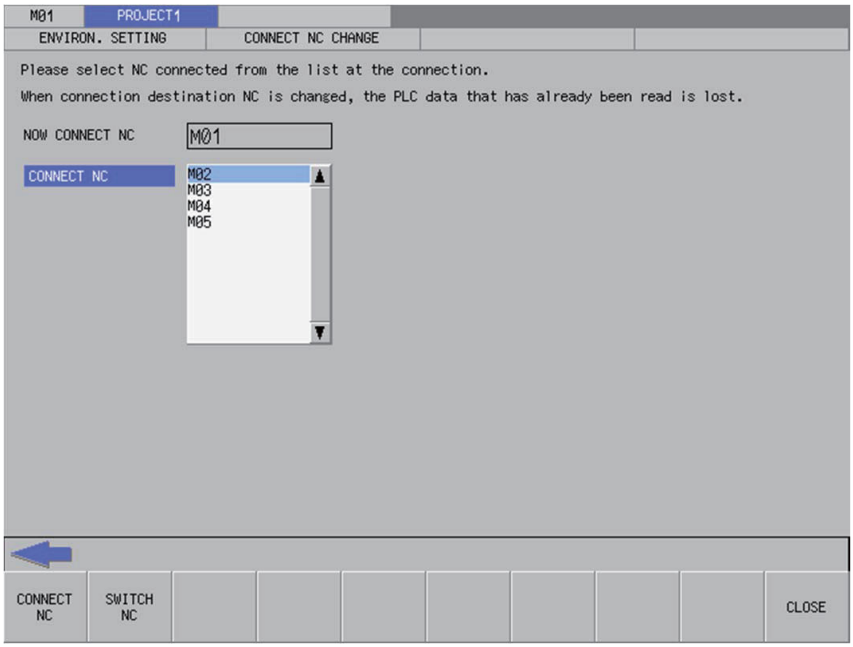
6.14.4.1 Outline

When the NC display unit and the NC control unit are connected in a ratio of one display unit to multiple NC control units, the NC unit connected with the PLC On-board can be selected. (At the initial start-up of the PLC On-board, the system connects to the same NC unit as the HMI screen side.)

(Note 1) When switching to another connected NC (control unit), the following information will be discarded.

• All PLC data in the on-board editing area will be discarded. (Program data with unconverted ladders will also be discarded.)





6.14.4.2 Screen Display Items

The following table describes the screen display items for the change NC connection screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow button	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Currently connected NC	This displays the name of the currently connected NC.
Available NCs	This displays the names of NCs available for connection.

6.14.4.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the change connected NC screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Switch NC	Enabled when NCs other than the currently connected NC are not displayed for the available NCs.

6.14.4.4 Status during Screen Displays

The following table describes the status when displaying the change NC connection screen.

Item name	Operation
Currently connected NC	This displays the name of the currently connected NC.
Available NCs	This displays the names of NCs available for connection.

6.14.4.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Change NC Connection Screen".
Available NCs	This selects the available NCs.
Switch NC	Refer to "Changing the NC Connection".
Close	Refer to "Closing the Change NC Connection Screen".

6.14.4.6 Changing the NC Connection

1. Press the [AVAILABLE NCS] menu key to select the available NCs screen.
2. Use the up/down arrow keys, Page Up key, and Page Down key to select the name of the NC connection.
3. Pressing the [SWITCH NC] menu key closes the change NC connection screen and changes the NC connection. The system transitions to the main screen when changing NC connections so as to read PLC data stored in the newly connected NC.

6.14.4.7 Closing the Change NC Connection Screen

Use any of the following methods to close the change NC connection screen.

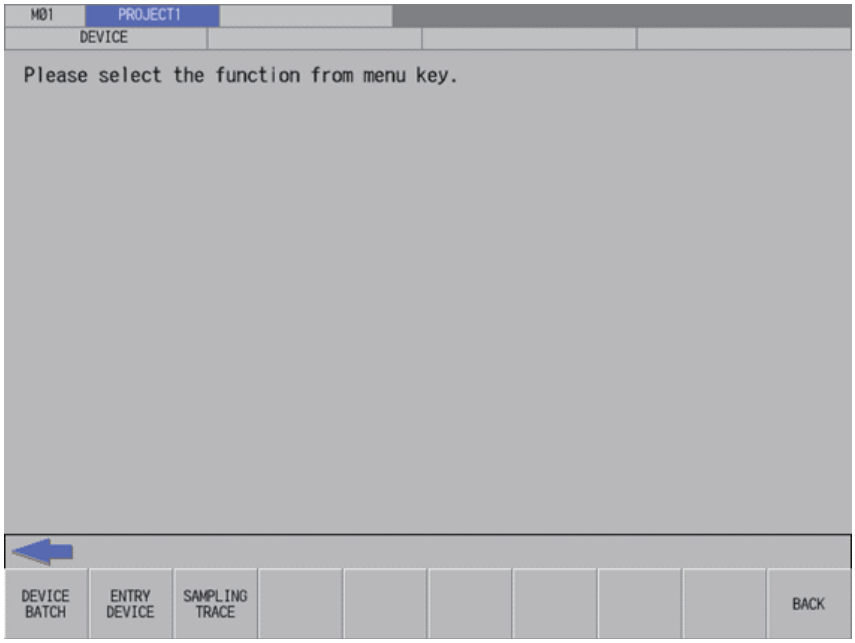
Methods to close the screen
Press the [SWITCH NC] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15 Device Menu

6.15.1 Device Main Screen

6.15.1.1 Outline

This screen contains menus used to monitor devices.



6.15.1.2 Screen Display Items

The following table describes the screen display items on the device main screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.15.1.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the device main screen are enabled/disabled.
The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Sampling trace	Disabled when the function is restricted.

6.15.1.4 Operation of Key Presses

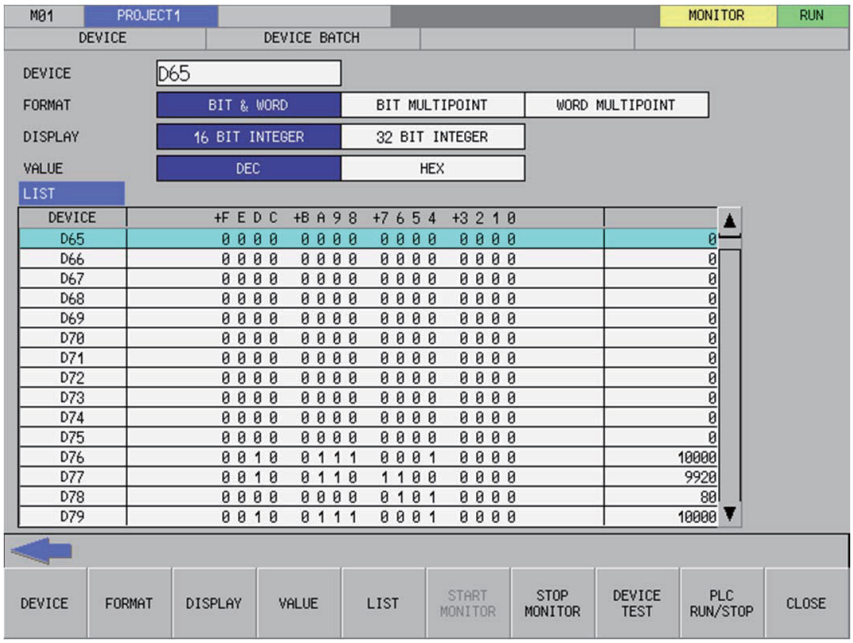
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/return menu key	These transition to the main menu.
Various menu keys	This displays the specified screen.

6.15.2 Device Batch Monitor Screen

6.15.2.1 Outline

This enables multiple consecutive devices to be monitored simultaneously in list format after designating one type of device.



6.15.2.2 Screen Display Items

The following table describes the screen display items on the device batch monitor screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Monitor/edit display	Starting the monitor displays [MONITOR]. Stopping the monitor cancels the display.
PLC status and overwrite/insert display	This displays the PLC status (RUN/STOP) for the monitored project.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Device	This displays the device to be monitored.
Format	This displays the [BIT & WORD], [BIT MULTIPOINT], and [WORD MULTIPOINT] options.
Display	This displays the [16 BIT INTEGER] and [32 BIT INTEGER] options.
Format	This displays the [DEC] and [HEX] options.
List	This displays the monitoring results.

6.15.2.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the device batch monitor screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Start monitor	Disabled after the monitor is started
Stop monitor	Disables after the monitor is stopped

6.15.2.4 Status during Screen Displays

The following table describes the status when displaying the device batch monitor screen.

Item name	Operation
Device	This is left blank.
Format	This selects the [BIT & WORD] option.
Display	This selects the [16 BIT INTEGER] option.
Format	This selects the [DEC] option.
List	This is left blank.

6.15.2.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Device Batch Monitor Screen".
Device	This selects the device input field.
Format	This sets the focus to the format. This changes the format selection when the focus is already set.
Display	This sets the focus to the display selection field. This changes the selection in the display selection field when the focus is already set.
Format	This sets the focus to the value selection field. This changes the selection in the value selection field when the focus is already set.
List	The focus is applied to the list.
Start monitor	Refer to "Starting and Stopping the Monitor for the Selected Device".
Stop monitor	Refer to "Starting and Stopping the Monitor for the Selected Device".
Device test	This displays the device test popup screen. Refer to "Ladder Menu: Device Test Popup Screen".
PLC RUN/STOP	This displays the PLC RUN/STOP screen. Refer to "NC File Operation Menu: PLC RUN/STOP Popup Screen".
Close	Refer to "Closing the Device Batch Monitor Screen".

6.15.2.6 Starting and Stopping the Monitor for the Selected Device

Starting the monitor

1. Press the [DEVICE] menu key and enter the device you want to monitor into the device selection field.
2. Press the [FORMAT] menu key and select the format from the format selection field.
3. Press the [DISPLAY] menu key and select the display format for the current value from the display selection field.
4. Press the [VALUE] menu key and select the type of value to display for the current value from the value section field.
5. Press the [START MONITOR] menu key to start the monitor. Starting the monitor moves the focus to the list. [MONITOR] is also displayed in the top-right of the screen.

6. Use the up/down arrow keys, Page Up key, and Page Down key to move within the list and check the monitoring status of the devices downstream and upstream from the specified device.

Stopping the monitor

1. Pressing the [STOP MONITOR] menu key while monitoring devices stops the monitor. The [MONITOR] display in the top-right of the screen is also canceled.

6.15.2.7 Closing the Device Batch Monitor Screen

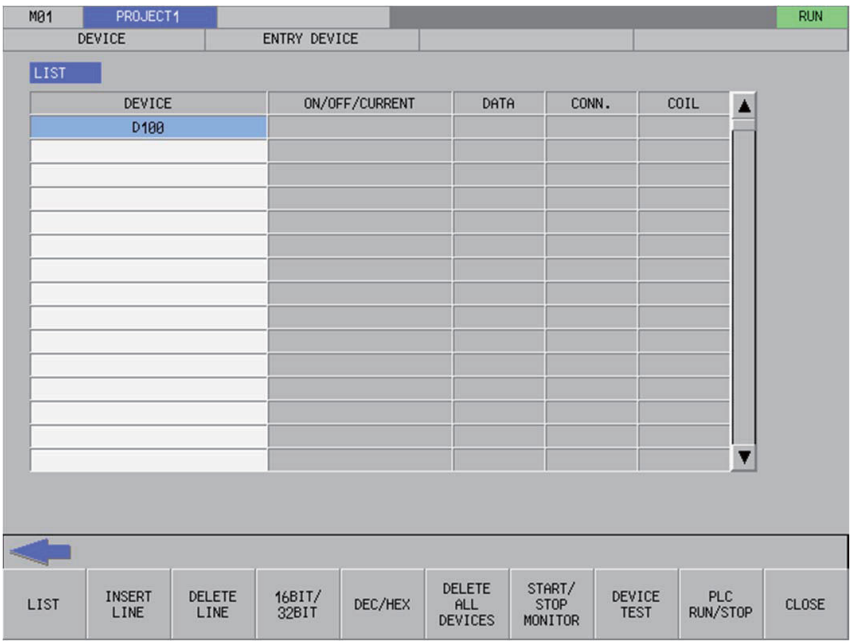
Use any of the following methods to close the device batch monitor screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.3 Entry Device Monitor Screen

6.15.3.1 Outline

This monitors devices at separated positions in ladders or different types of devices simultaneously on one screen.



6.15.3.2 Screen Display Items

The following table describes the screen display items for the file list screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Monitor/edit display	Starting the monitor displays [MONITOR]. Stopping the monitor cancels the display.
PLC status (RUN/STOP) display	This displays the PLC status (RUN/STOP) for the monitored project.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the monitored device, current project, and monitoring results.

6.15.3.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the entry device monitor screen are always enabled.

6.15.3.4 Status during Screen Displays

The following table describes the status when displaying the entry device monitor screen.

Item name	Operation
List	This is left blank.

6.15.3.5 Operation of Key Presses

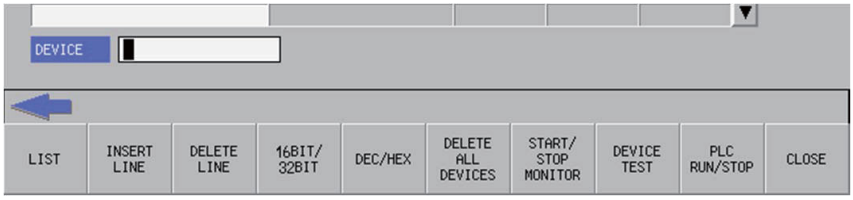
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Entry Device Monitor Screen".
List	The focus is applied to the list.
Insert line	This inserts a blank line at the cursor position in the list.
Delete line	This deletes one blank line at the cursor position in the list.
16 bit/32 bit switch	This switches the display of the current value in the list between a 16-bit display and a 32-bit display.
Decimal/Hexadecimal switch	This switches the display of the current value in the list between a decimal display and a hexadecimal display.
Delete all devices	This deletes all the devices registered in the list. Refer to "Deleting All Devices".
Start/stop monitor	Refer to "Starting and Stopping the Monitor for the Selected Device".
Device test	This displays the device test popup screen. Refer to "Ladder Menu: Device Test Popup Screen".
PLC RUN/STOP	This displays the PLC RUN/STOP screen. Refer to "NC File Operation Menu: PLC RUN/STOP Popup Screen".
Close	Refer to "Closing the Entry Device Monitor Screen".

6.15.3.6 Entering Devices for Monitoring

Use the following procedure to enter devices for monitoring.

1. Press the [LIST] menu key to select the list.
2. Use the up/down arrow keys, Page Up key, and Page Down key to move to the desired position in the device display column in the list.
3. Press the [INPUT] key to display the device entry field at the bottom of the list and move the focus.



4. Enter the device you want to monitor and then press the [INPUT] key. Press the [INPUT] key to close the device entry field. The entered device displays at the cursor position in the list.

6.15.3.7 Deleting Devices

Single deletions (1)

1. Use the up/down arrow keys, Page Up key, and Page Down key to move to the position where the device you want to delete is displayed in the device display column in the list.
2. Press the [DELETE] key. Pressing the [DELETE] key deletes the device at the cursor position. The project No. display in the same line is also removed.

Single deletions (2)

1. Use the up/down arrow keys, Page Up key, and Page Down key to move to the position where the device you want to delete is displayed in the device display column in the list.
2. Press the [DELETE LINE] menu key. Pressing the [DELETE LINE] menu key deletes the line at the cursor position in the list and moves the remaining lines below the cursor position up one line.

Delete all devices

1. Press the [DELETE ALL DEVICES] menu key. Pressing the [DELETE ALL DEVICES] menu key displays the following message screen.

2. Pressing the [YES] menu key closes the message screen and all devices registered in the list are deleted. The project No. display in the same line as the device is also deleted.
   Pressing the [NO] menu key closes the message screen and returns to the entry device monitor screen.

6.15.3.8 Starting and Stopping the Monitor for the Selected Device

1. Refer to "Entering Devices for Monitoring" and enter the device you want to monitor into the list.
2. Press the [SWITCH 16-BIT/32-BIT] menu key and select whether the current value is displayed in 16-bit integers or 32-bit integers.
3. Press the [SWITCH DEC/HEX] menu key and select whether the current value is displayed in decimal or hexadecimal numbers.
4. Press the [START/STOP MONITOR] menu key to start the monitor. Starting the monitor moves the focus to the list. [MONITOR] is also displayed in the top-right of the screen.

5. Use the up/down arrow keys, Page Up key, and Page Down key to move within the list and check the monitoring status of other specified devices.

Stopping the monitor

1. Pressing the [START/STOP MONITOR] menu key while monitoring devices stops the monitor. The [MONITOR] display in the top-right of the screen is also canceled.

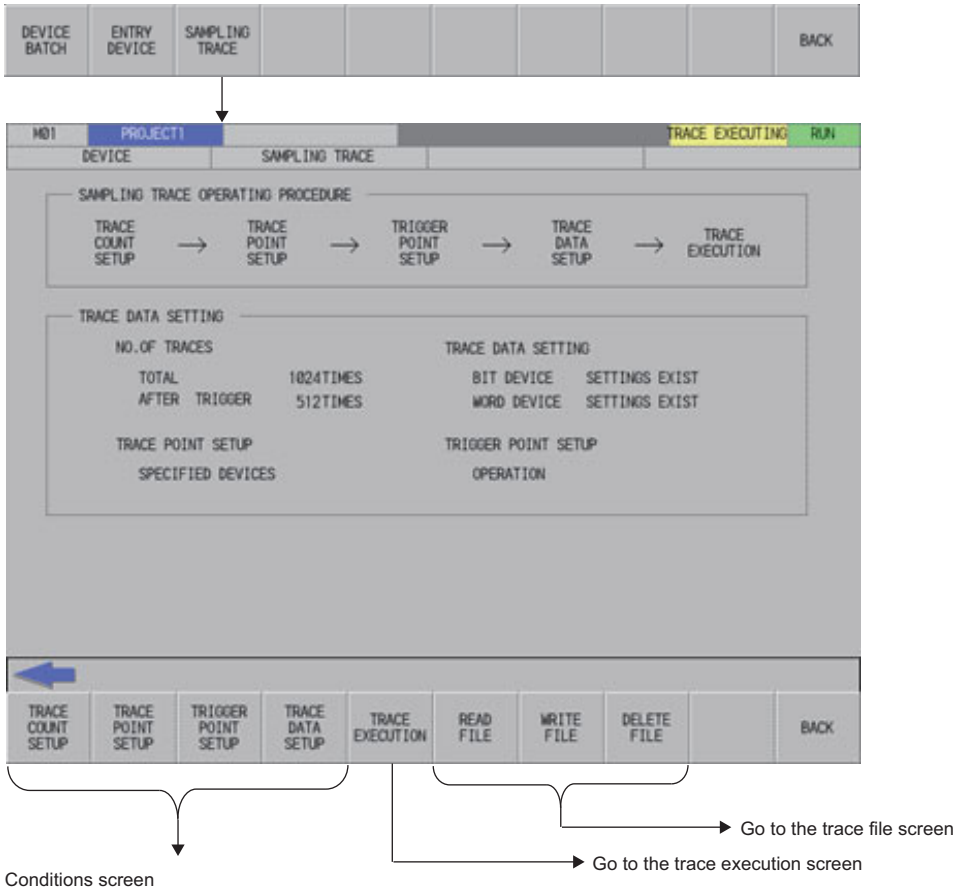
6.15.3.9 Closing the Entry Device Monitor Screen

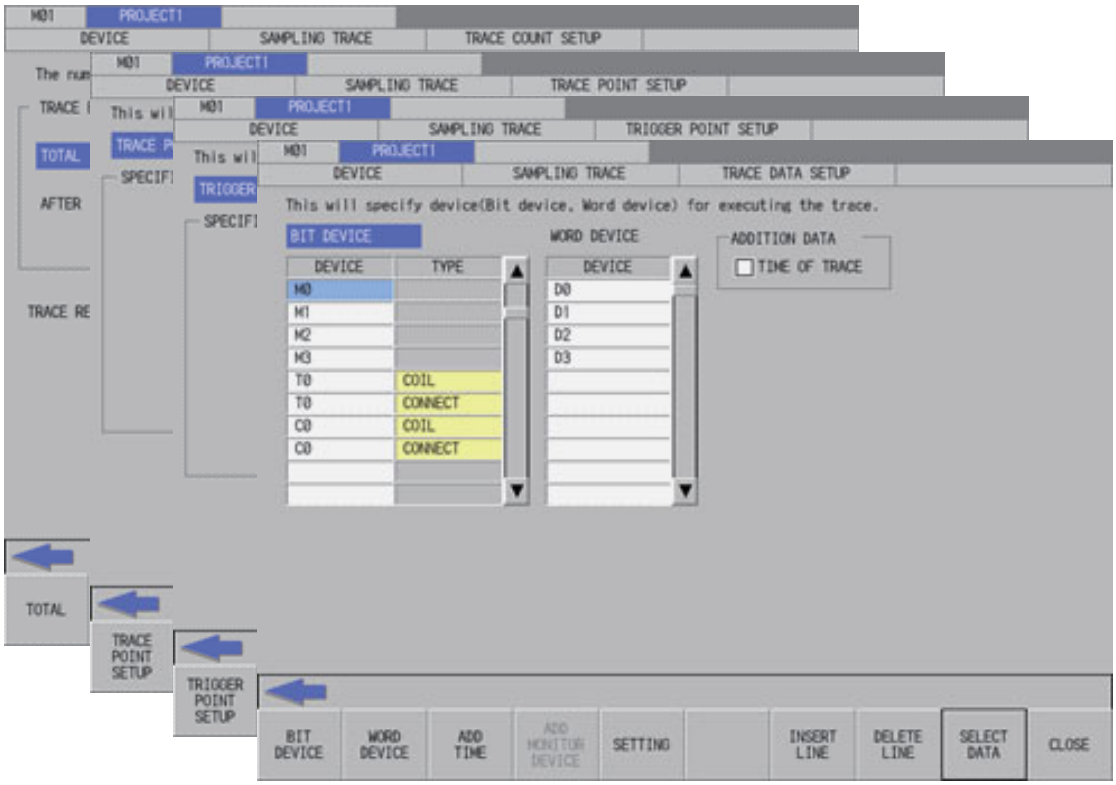
Use any of the following methods to close the entry device monitor popup screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

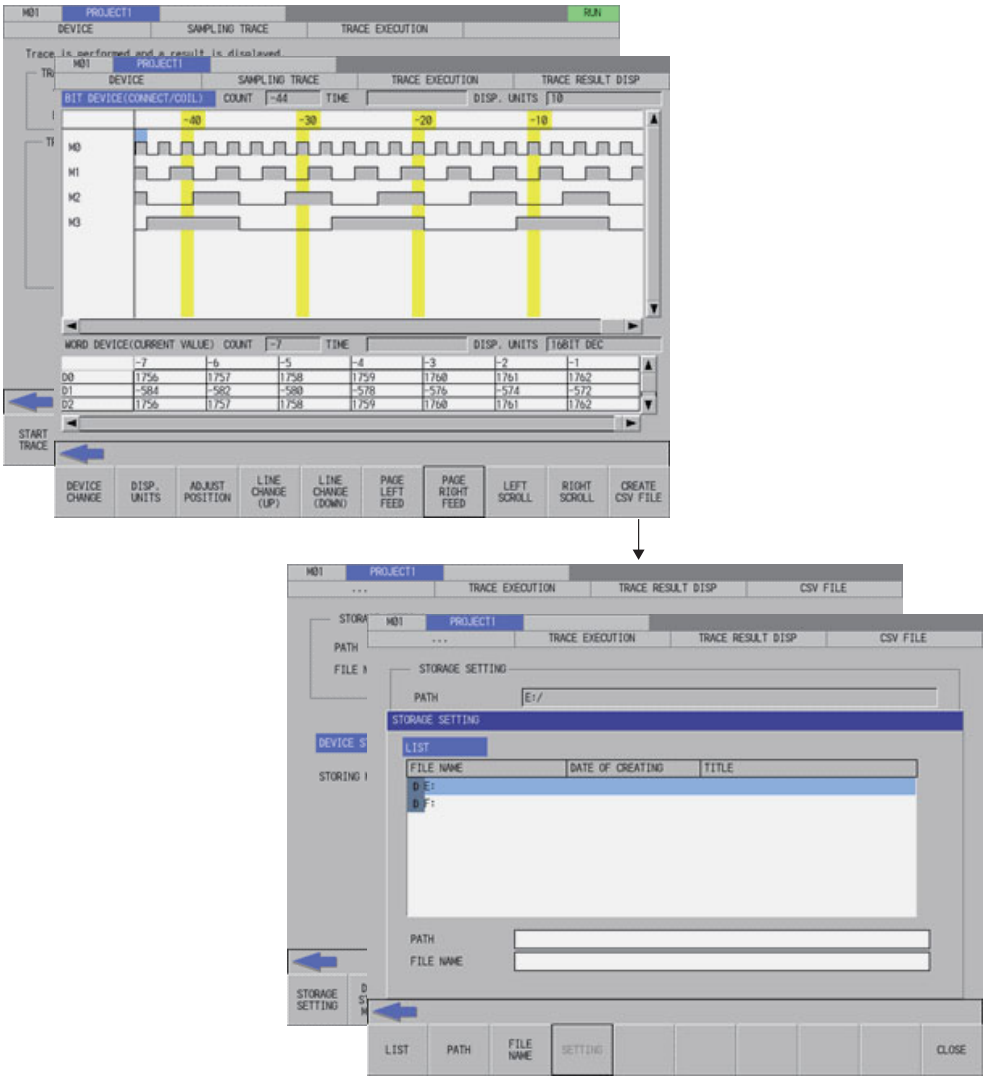
6.15.4 Sampling Trace

The sampling trace function traces (data collection) PLC device (Bit devices and word devices) signals , and displays the trace results in chronological order to confirm and analyze the device signal status.

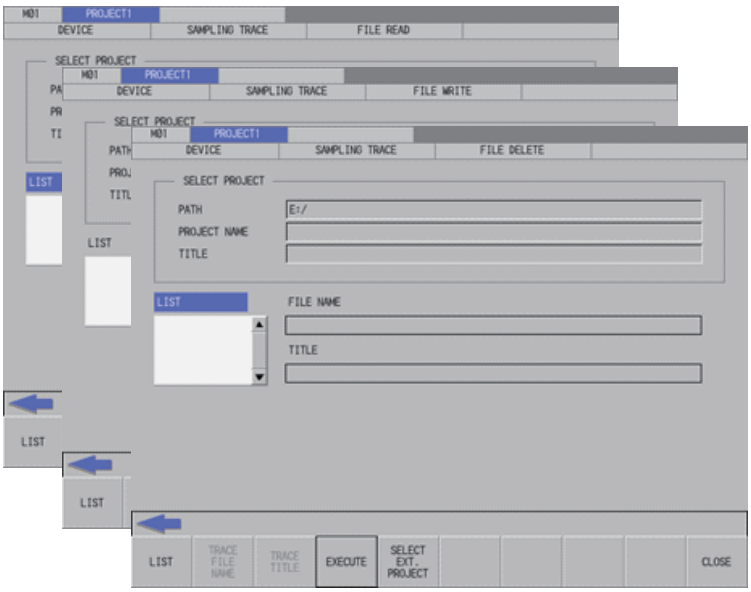




Trace execution screen



Trace file screen



Trace conditions (Data collection conditions)

Items	Specifications	
No. of traces (number of times for collecting trace data)	The number between 1 and 8192 can be set. Note that, however, when the max project No. is 1, the trace data size has to be smaller than 220 kilobytes. For the trace data size calculation and the size of each max project No., refer to (Note1).	
No. of traces after trigger	Sets the number smaller than the number of traces.	
Trace repeat	The trace execution can be repeated. (After a trace execution, the trace is restarted automatically.) The trace is repeated until the trace stops.	
Trace point (Timing of collecting data)	Each high scan	Traces per scan of the PLC high speed process. (Note) The trace data can be set are limited to 8 points or less of bit devices. (Note) This cannot be selected with the user safety sequence "SafePLC1" or "SafePLC2". If this is selected, the error occurs when the sampling trace is executed.
	Each main scan	Traces per scan of PLC main process.
	Trace data change	Traces when the device that is set by trace data at every scan of the main process changed. (Bit device: OFF -> ON, ON -> OFF, Word device: value)
	Specified devices	Traces when the setup condition of specified devices on the "Trace point setup" screen is satisfied at every scan of the main process. Refer to (Note2) for the applicable devices.
Trigger point (The point of trigger condition satisfied)	Operation	Executes trigger by pressing [TRIGGER EXECUTION] button on the trigger execution screen.
	Specified devices	Executes trigger by one of the following methods. - Press the [EXECUTE TRIGGER] button on the trigger execution screen. - When the setup conditions of specified devices on the trigger point setup screen are satisfied. Refer to (Note2) for the applicable devices.
Trace addition data	Time (Displayed in hour:minute:second) (Note) The step No., program name cannot be added.	

Trace data(data collection)

Items	Specifications
Bit device	50 points of word devices and 50 points of bit devices can be set. Note that, however, when the max project No. is 1, the trace data size has to be smaller than 220 kilobytes. For the trace data size calculation and each size of max project No., refer to (Note1). Refer to (Note3) for the applicable devices.
Word device	

Trace execution

Items	Specifications
Start trace	This starts a trace (data collection) by pressing the [START TRACE] button on the trace execution screen.
Stop trace	This stops a trace (data collection) by pressing the [STOP TRACE] button on the trace execution screen.

Trace result display

Items	Specifications
Trace result display screen	This displays the data for the number of traces (or the number of traces until the trace stop) on the trace result display screen.
Output trace result	This outputs the trace result to the external device in CSV file format.

File I/O (read/write)

Items	Specifications
Input (read)	This reads the trace files (trace conditions and trace results) stored in the external device. (The race files are included in GX-Developer projects.) For the file convertibility with GX-Developer, refer to (Note4).
Output (write)	This writes the trace files (trace conditions and trace results) to the external device. (The trace files are included in GX-Developer projects.) For the file convertibility with GX-Developer, refer to (Note4).
Delete	This deletes the trace files (trace conditions and trace results) of the external device. (The trace files are included in GX-Developer projects.)

(Note1) Trace data size calculation

The size of trace data per project depends on the max project No.

The size of trace data for the user safety sequence "SafePLC1" and "SafePLC2" are fixed to 220 kilobytes respectively.

The size of trace data per project for different numbers of maximum project No.

Max project No.	Maximum size of trace data per project
1	220 kilobytes
2	103 kilobytes
3	64 kilobytes
4	44 kilobytes
5	32 kilobytes
6	25 kilobytes

Set the number of traces and the trace devices when the maximum project No. is 6, so that the trace device data size will be 25 kilobytes (25600 bytes) or smaller.

Trace data size is calculated as follows.

[Trace data size (byte)] = [Size required for one trace (byte)] x [Number of traces]

Size required for one trace is calculated from word device points and bit device points of the trace device and the size required for one trace of each device.

Trace device type	Size (byte) required for one trace
Word device	2 bytes per point.
Bit device	2 bytes per unit. (1 unit = 16 points) 1 to 16 points -> 1 unit -> 2 bytes 17 to 32 points -> 2 units -> 4 bytes 33 to 48 points -> 3 units -> 6 bytes 49 to 50 points -> 4 units -> 8 bytes

Calculation example for trace data size is shown below.

Trace data size calculation example

(When the maximum project No. is 3: The maximum project size is 64 kilobytes)

No.	Bit device points	Word device points	Trace points	Trace data size	Sampling
1	16 points (1 unit)	2 points	8192 points	(1×2+2×2)×8192 = 49152 bytes	Possible
2	8 points (1 unit)	8 points	1000 points	(1×2+8×2)×1000 = 18000 bytes	Possible
3	50 points (4 units)	50 points	606 points	(4×2+50×2)×606 = 65448 bytes	Possible
4	50 points (4 units)	50 points	607 points	(4×2+50×2)×607 = 65556 bytes	Not Possible

(Note2) Applicable devices with trace/trigger point details setting

Applicable devices when the project is selected
Bit device: X, Y, M, L, F, SB, B, SM, T (contact), ST (contact), C (contact) Word device: T (current value), ST (current value), C (current value), D, R, SW, SD, W, ZR
Applicable devices when the user safety sequence is selected
Bit device: X, Y, M, SM, T (contact), ST (contact), C (contact) Word device: T (current value), ST (current value), C (current value), D, R (SafePLC1 only), SD, W, ZR

The qualifications, "bit device digit designation" and "word device bit designation", are available for the following device.

When an inapplicable device is set, an error will be displayed when reading a trace setup file for trace execution.

(Note3) Applicable devices with device setting

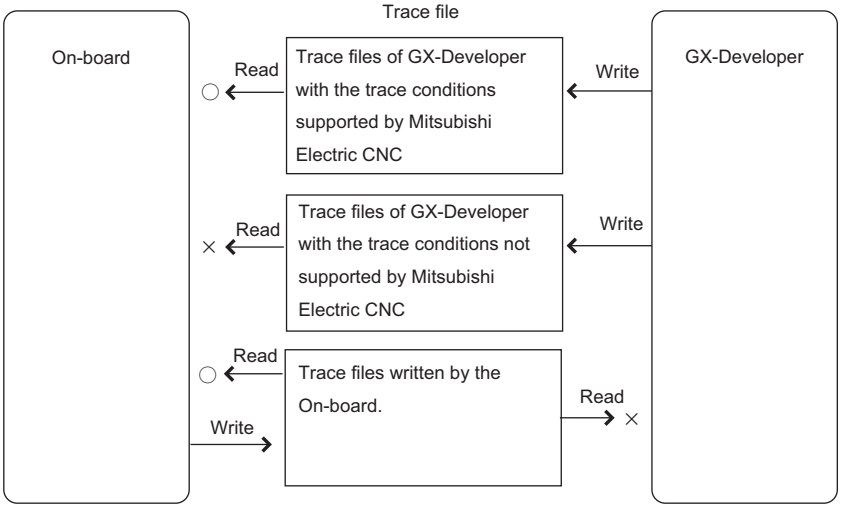
Applicable devices when the project is selected
Bit device: X, Y, M, L, F, SB, B, SM, T (contact), T (coil), ST (contact), ST (coil), C (contact), C (coil) Word device: T (current value), ST (current value), C (current value), D, R, SW, SD, W, ZR
Applicable devices when the user safety sequence is selected
Bit device: X, Y, M, SM, T (contact), T (coil), ST (contact), ST (coil), C (contact), C (coil) Word device: T (current value), ST (current value), C (current value), D, R (SafePLC1 only), SD, W, ZR

The qualifications, "bit device digit designation" and "word device bit designation", are available for the following device.

The following indicates the process of when an inapplicable device has been set.

- If one or more applicable devices already exist, the setting of the inapplicable device will be ignored.
- If no applicable devices exist, an error will be displayed when reading a trace setup file for trace execution.

(Note4) For the trace file compatibility



* The trace files which can be deleted are limited to the files written by the On-board.

(Note5) For the trace file written in NC with GX-Developer.

The trace files written in NC by GX-Developer can be read because of the upper compatibility with the Onboard trace files.

(Note6) For the multi-project

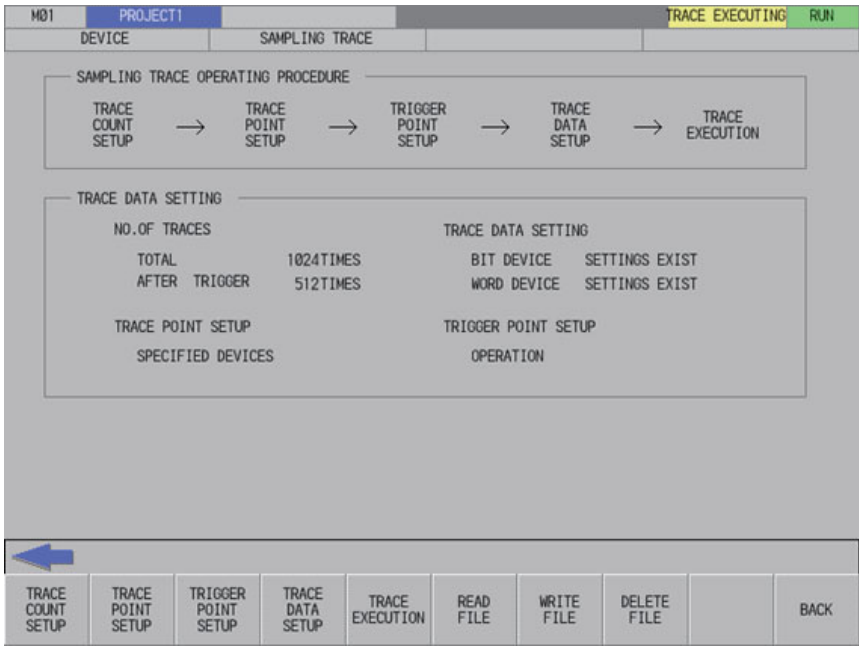
The sampling trace can be set up a trace for each project.The target is the connected project of the connected NC (displayed upper left on the screen).To switch the target, change the connected project or connected NC.The trace continues with NC even if the target is switched during the trace execution.

For example, even when switching to project 3 and executing the trace after executing the trace by connecting project 1, the change does not effect to the project 1. Moreover, it is possible to check the trace result of project 1 by reconnecting project 1.

6.15.4.1 Sampling Trace Main Screen

Outline

This displays menus for controlling sampling trace of PLC.



Screen display items

The following table describes the screen display items for the sampling trace main screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Trace status display	This displays the trace status (EXECUTION FAILED, TRACE EXECUTING, TRACE SUSPEND or TRACE FINISHED).
PLC RUN/STOP	This displays the PLC status (RUN/STOP) of the trace target project.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Sampling trace operating procedure	This displays the operating procedure to execute the sampling trace.
Trace data setting	The trace condition details are displayed.

Enabled/disabled state of menu keys

The menu keys displayed on the sampling trace main screen are always enabled.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/back menu key	These transition to the main menu.
Various menu key	This displays the specified screen.

6.15.4.2 Trace count setup screen

Outline

The total number of traces and the number of traces after trigger can be specified.

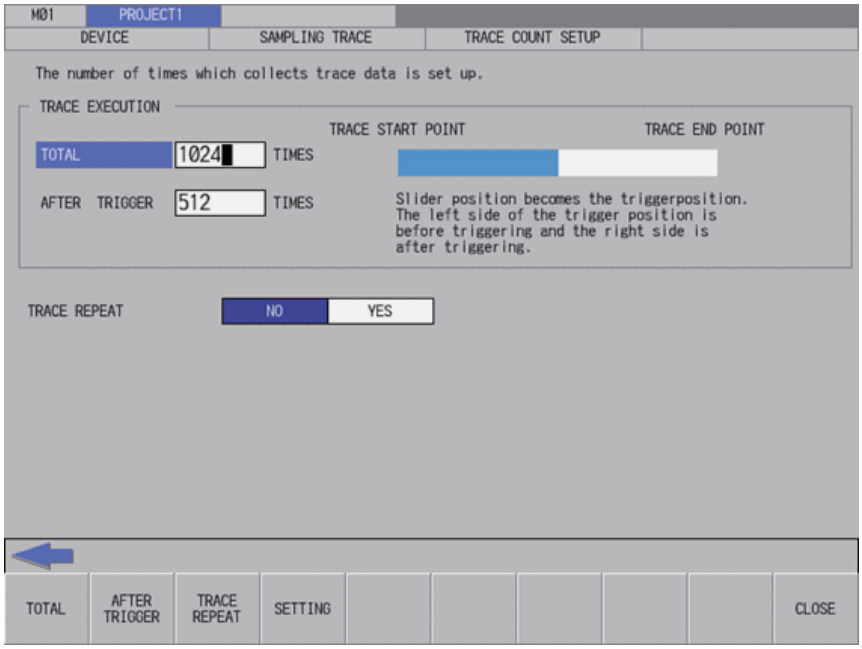
Total (Default: 1024 times)	Sets the number of traces between 1 to 8192.
After trigger (Default: 512 times)	Sets the number of traces after trigger. The setting value has to be smaller than the number of traces.

(Note1) The settings such as the "No. of traces" and so on are valid after pressing the [SETTING] menu key.

(Note2) The trace conditions are retained in the NC at the start of tracing.
If you start the on-board and open the sampling trace screen, the screen shows the retained conditions even after the NC power OFF.
If you set the trace conditions, and then turn OFF the NC power before starting tracing, the previous conditions before the setting are applied.

(Note3) The entry settings are disabled during the trace execution. (An error message appears.)

(Note4) If the value greater than 8192 times is input to the total number and the focus is moved to the other entry field or selection field, the input value of total number is changed to "8192" automatically.



Screen display items

The following table describes the screen display items on the trace count setup screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Total	This displays the total number of traces.
After trigger	This displays the number of traces after trigger.
Trace repeat	This displays the trace repeat status.

Enabled/disabled state of menu keys

The menu keys displayed on the trace count setup screen are always enabled.

Status during screen displays

The following table describes the status when the trace count setup screen is displayed.

Item name	Operation
Total	"1024" is displayed.
After trigger	"512" is displayed.
Trace repeat	This selects "NO".

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace count setup screen".
Total	The focus is applied to the Total.
After trigger	The focus is applied to the After trigger.
Trace repeat	The focus is applied to the Trace repeat. This changes the Trace repeat selection when the focus is already applied.
Setting	Refer to "Trace count setup".
Close	Refer to "Closing the trace count setup screen".

Trace count setup

(1) Normal operation

1. Press the menu key [TOTAL], and enter the number of traces.
2. Press the menu key [AFTER TRIGGER], and enter the number of traces after trigger.
3. Press the menu key [TRACE REPEAT], and then select the repeat.
4. Press the menu key [SETTING] to fix the setting values of traces. Pressing the menu key [SETTING] also closes the trace count setup screen. Then, the screen returns to the sampling trace main screen.

(Note) If the number of traces is less than the number of traces after trigger when entering and setting the trace count setup, the number of traces after trigger is corrected to the number of traces.

(2) Abnormal operation

This information describes the details of error messages displayed on the trace count setup screen and the corrective action thereof.

Error message	Error description	Corrective action
There is an error in the total times setting.	This is displayed when the total number of traces exceeds the setting range.	Enter the total number of traces within the setting range.
There is an error in the number of times after trigger setting.	This is displayed when the number of traces after trigger exceeds the setting range.	Enter the total number of traces after trigger within the setting range.
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when setting is executed during trace.	Execute the operation during trace stop.

Closing the trace count setup screen

Use any of the following methods to close the trace count setup screen.

Methods to close the screen
Press the [SETTING] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.3 Trace Point Setup Screen

Outline

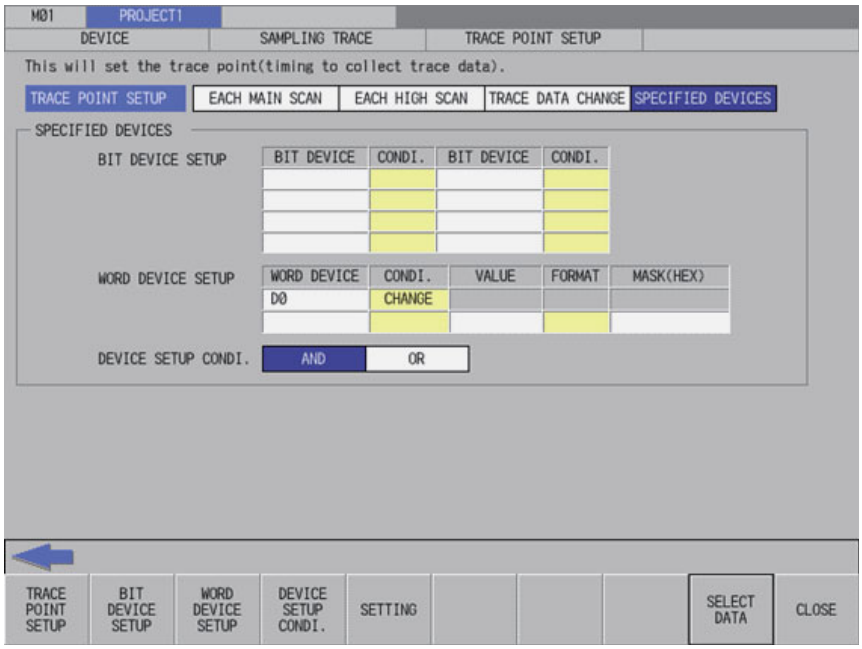
The trace point (the timing to collect data) can be specified.
How to specify the trace point is as follows.

Each main scan (default)	This collects trace data every times after executing the main scan.
Each high scan	This collects trace data after every scan of PLC high speed process. The bit devices which can be set up as the trace data are limited to 8 points or less. This cannot be selected with the user safety sequence "SafePLC1" or "SafePLC2". If this is selected, the error occurs when the sampling trace is executed.
Trace data change	This collects the trace data when changing the status of device set in the trace data setup per main process scanning. If many devices are registered for the trace data setup, the trace data is collected even when any one of them changes. The available devices which can be set as the trace data are limited to 8 points for the bit device and 2 or less points for the word device.
Specified devices	This collects the trace data when the setup condition registered in the specified devices field per scan of the main process is satisfied. Up to 8 points of bit device and 2 points of word device can be specified.

The followings can be set for the trace point conditions when the devices are specified.

	CONDI.	
Bit device setup	↑	When the bit device is changed from OFF to ON
	↓	When the bit device is changed from ON to OFF
	ON	When the bit device is ON
	OFF	When the bit device is OFF
Word device setup	=	Equal to the value
	<>	Not equal to the value
	<	Smaller than the value
	>	Bigger than the value
	<=	Smaller than or equal to the value
	>=	Bigger or equal to the value
	Change	The value changed
	Mask	This checks the satisfied condition after masking (AND) the value of traced device with the mask value. (e.g.) Device D100: Current value 12A5 (hex) Trace condition =, Value of trace condition 1200 (hex), Mask of trace condition FF00 (hex) (1) Masking the trace point data. 12A5 & FF00 = 1200 (2) Checking the trace condition. Equal to the value ? 1200 = 1200 Therefore, the condition is satisfied.
Device setup condi.	AND	When all the setup conditions in bit device setup and word device setup are satisfied.
	OR	When any of the setup conditions in bit device setup and word device setup is satisfied.

(Note1) The settings such as "trace point setup" and so on are valid after pressing the [SETTING] menu key.
(Note2) The trace conditions are retained in the NC at the start of tracing.
If you start the on-board and open the sampling trace screen, the screen shows the retained conditions even after the NC power OFF.
If you set the trace conditions, and then turn OFF the NC power before starting tracing, the previous conditions before the setting are applied.
(Note3) The entry settings are disabled during the trace execution. (An error message appears.)



Screen display items

The following table describes the screen display items on the trace point setup screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Specified devices	This displays the specified device and device setup conditions when the trace point is "SPECIFIED DEVICES".

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace point setup screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Bit device setup	Enabled when the trace point is "SPECIFIED DEVICES".
Word device setup	Enabled when the trace point is "SPECIFIED DEVICES".
Device setup condi.	Enabled when the trace point is "SPECIFIED DEVICES".
Select data	Enabled when the trace point is "SSPECIFIED DEVICES", and the focus is at the "SPECIFIED DEVICES".

Status during screen displays

The following table describes the status when the trace point setup screen is displayed.

Item name	Operation
Trace point setup	This selects "EACH MAIN SCAN".
Specified devices	This is left blank with entry disabled state.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

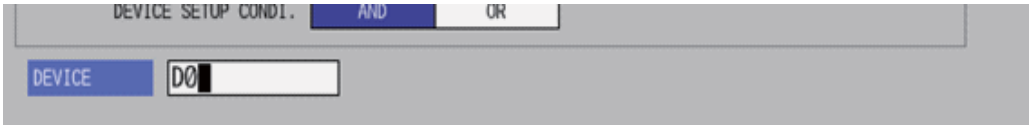
Item name	Operation	
Left arrow key	Refer to "Close trace point setup screen".	
Trace point setup	The focus is applied to the trace point setup. This changes the trace point setup selection when the focus is already applied.	
Bit device setup	The focus is applied to the bit device field. The cursor is displayed at the beginning of the bit device list.	
Word device setup	The focus is applied to the word device field. The cursor is displayed at the beginning of the word device list.	
Device setup condi.	The focus is applied to the device setup condi. field. This changes the device setup condi. selection when the focus is already applied.	
Setting	Refer to "Trace point setup".	
Select data	Cursor position	
	Bit device ("BIT DEVICE" column)	This displays the device entry field.
	Bit device ("CONDI." column)	This changes the condition selection.
	Word device ("WORD DEVICE" column)	This displays the device entry field.
	Word device ("VALUE" column)	This displays the value entry field.
	Word device ("MASK(HEX)" column)	This displays the mask entry field.
	Word device ("CONDI./FORMAT" column)	This changes the selection.
	Device setup condi.	This changes the selection.
Close	Refer to "Closing the trace point setup screen".	

Entering specified devices

When the trace point is set to "specified devices", the specified device field becomes enabled.
How to enter the specified devices fields is as follows.

(1) Entering devices

1. Press the menu key [BIT DEVICE SETUP] or [WORD DEVICE SETUP] to select the bit device setup or word device setup.
2. Use up, down, left or right arrow key to move to the arbitrary position of device column.
3. Press the [INPUT] key to display the device entry field below the list, and the focus is applied.



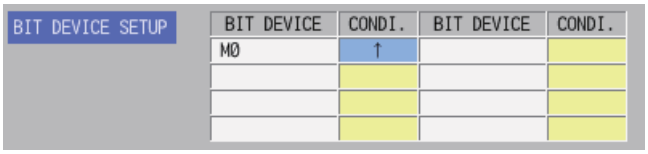
4. Enter the device you want to specify, and press the [INPUT] key. Then, the device entry field is closed, and the entered device is displayed at the cursor position in the specified devices.

(2) Deleting devices

1. Use up, down, left or right arrow key to move the cursor to the device position you want to delete in the device column.
2. Press the [DELETE] key. The device at the cursor position will be deleted by pressing the [DELETE] key.

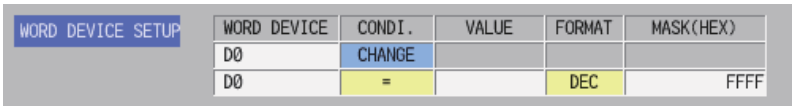
(3) Entering the condition for bit devices

1. Press the menu key [BIT DEVICE SETUP] to select the bit device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position in the condition column.
3. Press the [INPUT] key in the condition field based on "Setting selection items in lists" in "Operation key List: Screen Items (Control)". The conditions will be displayed in order. (↑ => ↓ => ON => OFF => ↑ =>...)



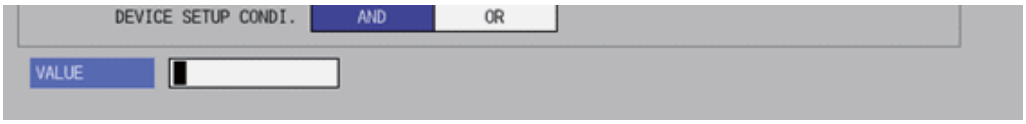
(4) Entering the condition for word devices

1. Press the menu key [WORD DEVICE SETUP] to select the word device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position in the condition column.
3. Press the [INPUT] key in the condition field based on "Setting selection items in lists" in "Operation key List: Screen Items (Control)". The conditions will be displayed in order.
(= => <> => < => > => <= => >= => CHANGE => = =>...)



(5) Entering the value of word devices

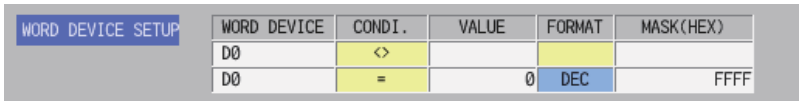
1. Press the menu key [WORD DEVICE SETUP] to select the word device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position of value column.
3. Press the [INPUT] key to display the value entry field below the list, and the focus is applied.



4. Enter the value you want to specify, and press the [INPUT] key. When pressing [INPUT] key, the value entry field is closed, and the entered value is displayed at the cursor position in the specified devices.

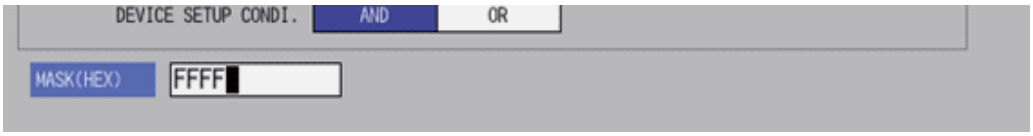
(6) Entering the format for word devices

1. Press the menu key [WORD DEVICE SETUP] to select the word device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position of format column.
3. Press the [INPUT] key in the format field based on "Setting selection items in lists" in "Operation key List: Screen Items (Control)". The format will be displayed in order. (DEC => HEX => DEC =>...)



(7) Entering the mask for word devices

1. Press the menu key [WORD DEVICE SETUP] to select the word device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position of mask column.
3. Press the [INPUT] key to display the mask entry field below the list, and the focus is applied.



4. Enter the value you want to specify, and press the [INPUT] key. Press the [INPUT] key to close the device entry field. The entered device displays at the cursor position in the specified devices.

Trace point setup

(1) Normal operation

1. Press the menu key [TRACE POINT SETUP] to select the trace point. Go to 3 other than the specified devices .
2. Enter the specified devices in reference to "Entering specified devices".
3. Press the menu key [SETTING] to fix the trace point setup entries. Pressing the menu key [SETTING] also closes the trace point setup screen, and the screen returns to the sampling trace main screen.

(2) Abnormal operation

This information describes the details of error messages displayed on the trace point setup screen and the corrective action thereof.

Error message	Error description	Corrective action
There was an error in the device specification method. Input a bit device for the device.	This is displayed when something other than a bit device was set.	Set a bit device.
There was an error in the device specification method. Input a word device for the device.	This is displayed when something other than a word device was set.	Set a word device.
The NC cannot execute during trace. Execute again after trace is completed.	This is displayed when setting is executed during trace.	Execute the operation during trace stop.
A bit device setup of specified devices is incorrect.	This is displayed when either the bit device or the condition is not set.	Set both of the bit device and the condition.
A word device setup of specified devices is incorrect.	This is displayed when either the word device or the condition is not set.	Set both of the word device and the condition.
The trace point setup is not selected.	This is displayed when none of the trace point is set.	Set the trace point.

Closing the trace point setup screen

Use any of the following methods to close the trace point setup screen.

Methods to close the screen
Press the [SETTING] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.4 Trigger Point Setup Screen

Outline

The trigger point (the starting point (0 point) of the trace execution) can be specified.
How to specify the trigger point is as follows.

Operation (default)	Set up the trigger at the "Execute trigger" on the trace execution screen.
Specified devices	Set up the trigger when the trigger execution by the "Execute trigger" in the trace execution screen and the registered setup conditions on the specified devices are satisfied. It is possible to specified up to 8 points for the bit device and 2 points for the word device.

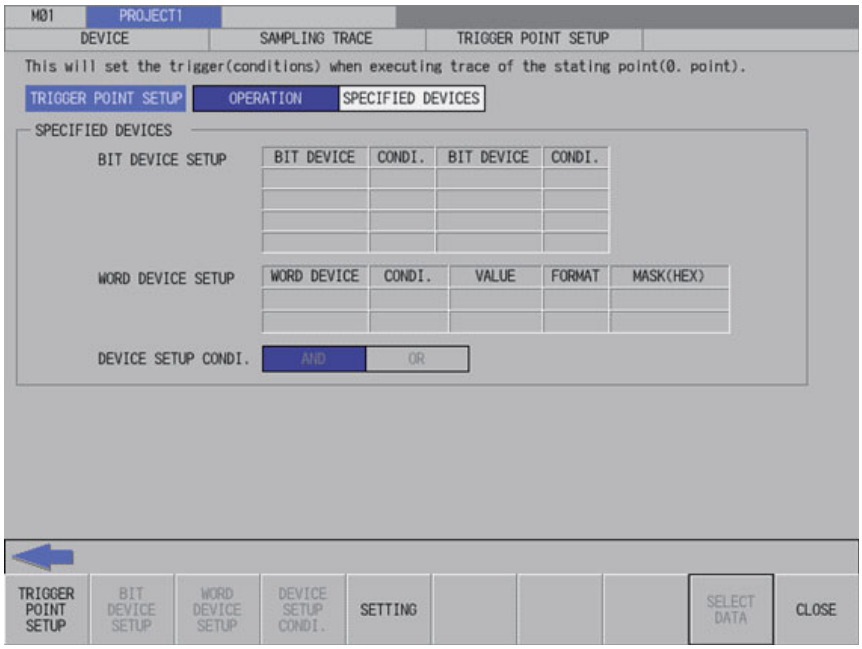
The followings can be set for the trigger point conditions when the devices are specified.

	CONDI.	
Bit device setup	↑	When the bit device is changed from OFF to ON
	↓	When the bit device is changed from ON to OFF
	ON	When the bit device is ON
	OFF	When the bit device is OFF
Word device setup	=	Equal to the value
	<>	Not equal to the value
	<	Smaller than the value
	>	Bigger than the value
	<=	Smaller than or equal to the value
	>=	Bigger or equal to the value
	Mask	This checks the satisfied condition after masking (AND) the value of traced device with the mask value. (e.g.) Device D100: Current value 12A5 (hex) Trigger condition =, Value of trigger condition 1200 (hex), Mask of trigger condition FF00 (hex) (1) Masking the trigger point data. 12A5 & FF00 = 1200 (2) Checking the trigger condition. Equal to the value ? 1200 = 1200 Therefore, the condition is satisfied.
Device setup condi.	AND	When all the setup conditions in bit device setup and word device setup are satisfied.
	OR	When any of the setup conditions in bit device setup and word device setup is satisfied.

(Note1) The entry settings such as trigger point setup and so on are valid after pressing the [SETTING] menu key.

(Note2) The trigger conditions are retained in the NC at the start of tracing.
If you start the on-board and open the sampling trace screen, the screen shows the retained conditions even after the NC power OFF.
If you set the trigger conditions, and then turn OFF the NC power before starting tracing, the previous trigger conditions before the setting are applied.

(Note3) The entry settings are disabled during the trace execution. (An error message appears.)



Screen display items

The following table describes the screen display items on the trigger point setup screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Specified devices	This displays the specified device and device setup conditions when the trigger point is "SPECIFIED DEVICES".

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trigger point setup screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Bit device setup	Enabled when the trigger point is "SPECIFIED DEVICES".
Word device setup	Enabled when the trigger point is "SPECIFIED DEVICES".
Device setup condi.	Enabled when the trigger point is "SPECIFIED DEVICES".
Select data	Enabled when the trigger point is "SPECIFIED DEVICES", and the focus is at the "SPECIFIED DEVICES".

Status during screen displays

The following table describes the status when the trigger point setup screen is displayed.

Item name	Operation
Trigger point setup	This selects "OPERATION".
Specified devices	This is left blank with entry disabled state.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation	
Left arrow key	Refer to "Closing the trigger point setup screen".	
Trigger point setup	The focus is applied to the trigger point setup. This changes the trigger point setup selection when the focus is already applied.	
Bit device setup	The focus is applied to the bit device fields.	
Word device setup	The focus is applied to the word device fields.	
Device setup condi.	The focus is applied to the device setup condi. field. This changes the device setup condi. selection when the focus is already applied.	
Setting	Refer to "Trigger point setup".	
Select data	Cursor position	
	Bit device ("BIT DEVICE" column)	This displays the device entry field.
	Bit device ("CONDI." column)	This changes the condition selection.
	Word device ("WORD DEVICE" column)	This displays the device entry field.
	Word device ("VALUE" column)	This displays the value entry field.
	Word device ("MASK(HEX)" column)	This displays the mask entry field.
	Word device ("CONDI./FORMAT" column)	This changes the selection.
	Device setup condi.	This changes the selection.
Close	Refer to "Closing the trigger point setup screen".	

Trigger point setup

(1) Normal operation

1. Press the menu key [TRIGGER POINT SETUP] to select the trigger point. Go to 3 other than the specified devices.
2. Enter the specified devices in reference to the "Entering specified devices".
3. Press the menu key [SETTING] to fix the trigger point setup entries. Pressing the menu key [SETTING] also closes the trigger point setup screen, and the screen returns to the sampling trace main screen.

(2) Abnormal operation

The error messages in abnormal operations are same as the error message displayed on the trace point setup screen.

Refer to "Trace point setup screen: Trace point setup".

Closing the trigger point setup screen

Use any of the following methods to close the trigger point setup screen.

Methods to close the screen
Press the [SETTING] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.5 Trace Data Setup Screen

Outline

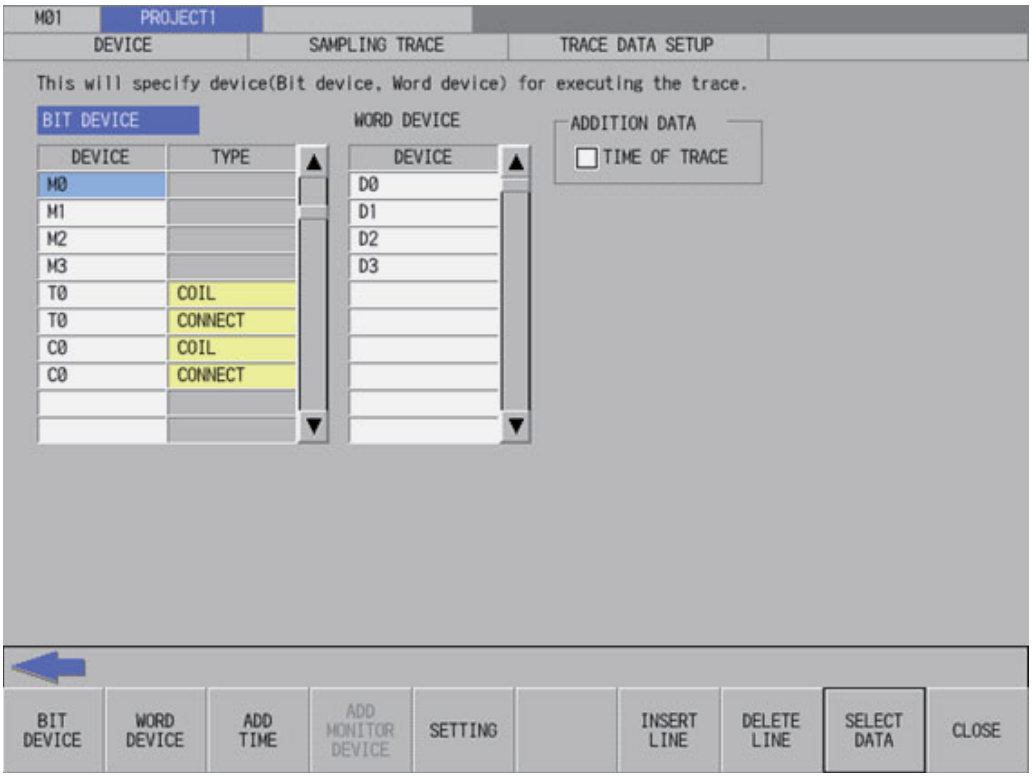
The device of the trace execution can be specified.

Bit device	The devices can be registered up to 50 points. When the trace point is set at "EACH HIGH SCAN", the effective bit devices are limited to 8 points or less. When the trace point is set at "TRACE DATA CHANGE", the effective bit devices are limited to 8 points or less.
Word device	The devices can be registered up to 50 points. When the trace point is set at "TRACE DATA CHANGE", the effective word devices are limited to 2 points or less.
Add time (time added in the result information)	This enables to display the time of trace point in the "time" field on the trace result display screen. However, the available data size for trace will be smaller than normal when the add time is used.

(Note1) The settings are valid after pressing the [SETTING] menu key.

(Note2) The trace conditions are retained in the NC at the start of tracing.
If you start the on-board and open the sampling trace screen, the screen shows the retained conditions even after the NC power OFF.
If you set the trace conditions, and then turn OFF the NC power before starting tracing, the previous conditions before the setting are applied.

(Note3) The entry settings are disabled during the trace execution. (An error message appears.)



Screen display items

The following table describes the screen display items on the trace data setup screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Bit device	This displays the specified bit device and the type.
Word device	This displays the specified word device.
Addition data	This displays the add time status.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace data setup screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Add monitor device	Enabled when a monitor device is registered.
Select data	Enabled when the focus is applied to the Bit device (type).

Status during screen displays

The following table describes the status when the trace data setup screen is displayed.

Item name	Operation
Bit device	This is left blank.
Word device	This is left blank.
Add time	This is displayed with the check box not selected.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation	
Left arrow key	Refer to "Closing the trace data setup screen".	
Bit device	The focus is applied to the Bit device field.	
Word device	The focus is applied to the Word device field.	
Add time	The focus is applied to the Addition data field. This changes the Add time selection when the focus is already applied.	
Add monitor device	This adds the device registered in the entry device monitor to the bit device field or the word device field.	
Setting	Refer to "Trace data setup ".	
Insert line	This inserts a blank line at the cursor position. Lines are not inserted when a device is already set at the last line.	
Delete line	This deletes a line at the cursor position and moves remaining data up.	
Select data	Cursor position	
	Bit device field ("DEVICE" column)	Device entry field is displayed.
	Bit device field ("TYPE" column)	Type selection can be changed.
	Word device field ("DEVICE" column)	Device entry field is displayed.
	Add time field	This changes the selection.(check/uncheck)
Close	Refer to "Closing the trace data setup screen".	

Entering trace devices

The entry method of trace device is as follows.

(1) Entering devices

1. Press the menu key [BIT DEVICE] or [WORD DEVICE] to select the bit device or word device.
2. Use the up or down arrow key, or the Page-up or Page-down key to move the cursor to the arbitrary position of device column.
3. Press the [INPUT] key to display the device entry field below the list, and the focus is applied.

4. Enter the device you want to specify, and press the [INPUT] key to close the device entry field. The entered device is displayed at the cursor position in the specified devices.

(2) Deleting devices 1

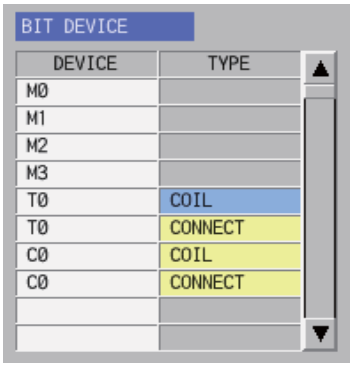
1. Use up or down arrow key, PageUp, or PageDown key to move the cursor to the position where the device you want to delete is displayed in the device display column.
2. Press the [DELETE] key. Pressing the [DELETE] key deletes the device at the cursor position.

(3) Deleting devices 2

1. Use up or down arrow key, PageUp, or PageDown key to move the cursor the position where the device you want to delete is displayed in the device display column.
2. Press the [DELETE LINE] menu key. Pressing the [DELETE LINE] menu key deletes the line at the cursor position in the list and moves the remaining lines below the cursor position up one line.

(4) Entering the type of bit devices

1. Press the menu key [BIT DEVICE] to select the bit device setup.
2. Use up, down, left or right arrow key to move the cursor to the arbitrary position of type column.
3. Press the [INPUT] key in the type field based on "Setting selection items in lists" in "Operation key List: Screen Items (Control)". The type will be displayed in order. (COIL => CONNECT => COIL =>...)



Trace data setup

(1) Normal operation

1. Enter the trace device in reference to "Entering trace devices".
2. Press the menu key [ADD TIME] to select the add time.
3. When pressing the [INPUT] key in the condition display field based on "Setting selection items in lists" in "Operation key List: Screen Items (Control)", the check or uncheck mark in the check box at the time of trace is switched.
4. Press the menu key [SETTING] to fix the trace data setup entries. Pressing the menu key [SETTING] also closes the trace data setup screen, and the screen returns to the sampling trace main screen.

(2) Abnormal operation

This information describes the details of error messages displayed on the trace data setting screen and the corrective action thereof.

Error message	Error description	Corrective action
There was an error in the device specification method. Input a bit device for the device.	This is displayed when something other than a bit device was set.	Set a bit device.
There was an error in the device specification method. Input a word device for the device.	This is displayed when something other than a word device was set.	Set a word device.
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when setting is executed during trace.	Execute the operation during trace stop.
Please set device data.	This is displayed when none of device data is set as a trace data.	Set device data.
Since the last line has data, a bit device cannot be copied.	This is displayed when a device is set in the last line.	Delete the device in the last line.
Since the last line has data, a word device cannot be copied.	This is displayed when a device is set in the last line.	Delete the device in the last line.
No bit devices were able to be copied.	This is displayed when the device entry monitors (bit device) are more than the word device setting field.	Delete the setup bit devices to gain the setting fields, or reduce the number of entered bit devices of entry device monitor (bit device) .
No word devices were able to be copied.	This is displayed when the device entry monitors (word device) are more than the word device setting field.	Delete the setup word devices to gain the setting fields, or reduce the number of entered bit devices of entry device monitor (word device) .

Closing the trace data setup screen

Use any of the following methods to close the trace data setup screen.

Methods to close the screen
Press the [SETTING] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.6 Trace Execution Screen

Outline

The trace is executed and the results are displayed on this screen.

Start trace	This writes the trace conditions set by the On-board to the NC control unit automatically, and starts the trace.
Stop trace	This stops the trace.
Execute trigger	This enables the trigger to be executed forcibly from the screen. Also, this enables the trigger to be executed forcibly when the trigger point setup is "SPECIFIED DEVICES".
Suspend monitor	This performs the start or suspend the trace status monitor. When closing the "TRACE EXECUTION" screen during the trace, the monitor indications are stopped automatically. If you want to display them again, press the [START MONITOR] button.
Trace result	This displays the "trace result display" screen.

(Note1) If the trace is already started, an error occurs and the trace execution cannot start.

(Note2) If the PLC stops, an error occurs and the trace cannot start.

(Note3) If the trace data (trace conditions and trace results) are not correctly set up, the trace cannot start. (An error message appears.)

(Note4) The trace conditions are retained in the NC at the start of tracing.
If you start the on-board and open the sampling trace screen, the screen shows the retained conditions even after the NC power OFF.
If you set the trace conditions, and then turn OFF the NC power before starting tracing, the previous conditions before the setting are applied.

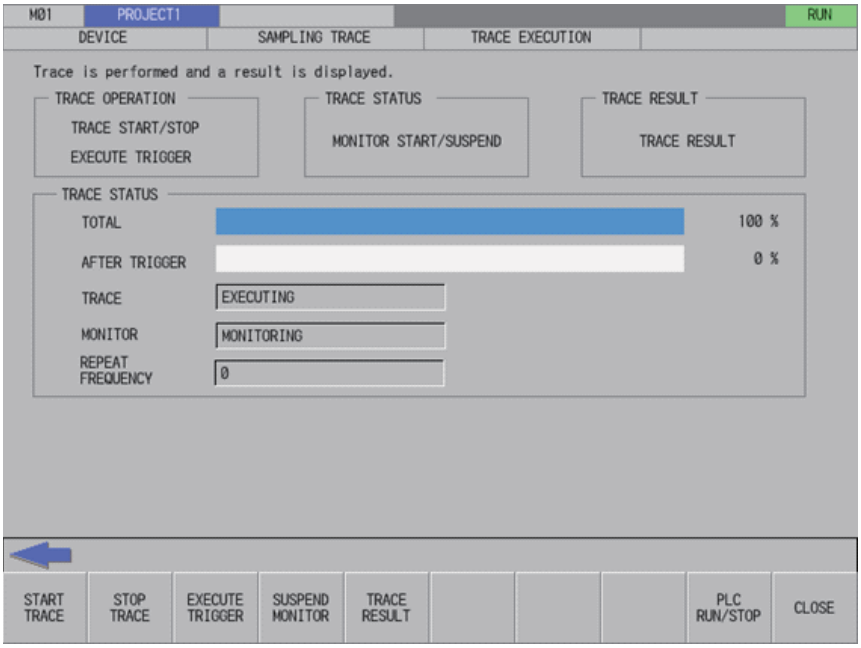
(Note5) If the trigger is not executed and exceeds the number of traces, the trace data will be cleared in the chronological order.

(Note6) When the trace point is "EACH HIGH SCAN", the available bit devices for the trace data are limited to 8 points or lower. (If more than 8 point devices are set, the first 8 points are the target device for the trace.)

(Note7) When the trace point is "TRACE DATA CHANGE", the available devices for the trace data are limited to 8 points for a bit device, and 2poins for a word device.

(Note8) The trace execution status is retained in the NC even after the NC power is turned OFF. Thus when you open the trace execution screen, tracing may already have started.

(Note9) If the trigger is executed forcibly or the trigger is established with the set trigger point, the trace is executed for the number of times of trigger. Therefore, the number of executed traces may be below the total number depending on the timing at which the trigger is established.



Screen display items

The following table describes the screen display items on the trace execution screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Trace status	This displays the trace status with the scroll bar and percentage (ratio).
Monitor	This displays the trace monitor information.
Repeat frequency	This displays the number of repeated times during the trace execution.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace execution screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
PLC RUN/STOP	Disabled when the function is restricted.

Status during screen displays

The following table describes the status when the trace execution screen is displayed.

Item name	Operation
Trace status (Total)	This displays "0%" .
Trace status (After trigger)	This displays "0%" .
Trace status (Trace)	This displays "EXECUTION FAILED".
Trace status (Monitor)	This displays "MONITORING".
Trace status (Repeat frequency)	This displays "0" .

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace execution screen".
Start trace	Refer to "Starting or stopping the trace".
Stop trace	Refer to "Starting or stopping the trace".
Execute trigger	Refer to "Executing the trigger".
Start monitor/Suspend monitor	Refer to "Starting or suspending the trace status monitor".
Trace result	The trace result display screen is displayed.
PLC RUN/STOP	The PLC RUN/STOP screen is displayed. Refer to "NC File Operation Menu: PLC RUN/STOP popup screen".
Close	Refer to "Closing the trace execution screen".

Starting or stopping the trace

(1) For starting the trace

1. Press the menu key [START TRACE].
   At the point of key pressed, setup trace condition is written to the NC and trace is started.
   If the trace is already started, an error will occur and the trace cannot be executed.
2. The trace status is displayed as "EXECUTING" for the trace status (trace) and "MONITORING" for the trace status (monitor). Then, the trace status (total) is updated.Also the menu is updated to [SUSPEND MONITOR].
3. When the trace repeat is set, the trace status (repeat) is updated when executing trace the number of its times after trigger performed. Then, the total and after trigger returns to "0". The repeat continues until the trace stops.

(2) For stopping the trace

1. Press the menu key [STOP TRACE] during the trace execution.At the point of key pressed, the trace is stopped.
2. The trace status (trace) becomes "SUSPEND" .

Executing the trigger

1. Press the menu key [EXECUTE TRIGGER] during the trace. At the point of the menu key pressed, the trigger (start point (0 point) of the trace execution) is recorded in the trace data.
2. The trace data (after trigger) is updated.

Starting or suspending the trace status monitor

(1) Starting the trace status monitor

1. Press the menu key [START MONITOR]
   The menu key changes to [SUSPEND MONITOR], and the trace status monitor is started. The each type of information for trace status is continually-updated.
   When closing the trace execution screen during the trace, and then displaying the trace execution screen again, although the trace status monitor is suspended, it can be started by the menu [START MONITOR].

(2) Suspending the trace status monitor

1. Press the menu key [SUSPEND MONITOR]
   The menu key changes to [START MONITOR], and the trace status monitor is suspended. The each type of information for trace status stops the updates.

Trace execution

(1) Abnormal operation

This information describes the details of error messages displayed on the trace execution screen and the corrective action thereof.

Error message	Error description	Corrective action
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when the start trace is executed during trace.	Start the trace during trace stop.
No results information.	This is displayed when attempting to display trace result even though none trace has executed.	Display trace result after trace is completed.

Closing the trace execution screen

Use any of the following methods to close the trace execution screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the [TRACE RESULT] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.7 Trace result display screen

Outline

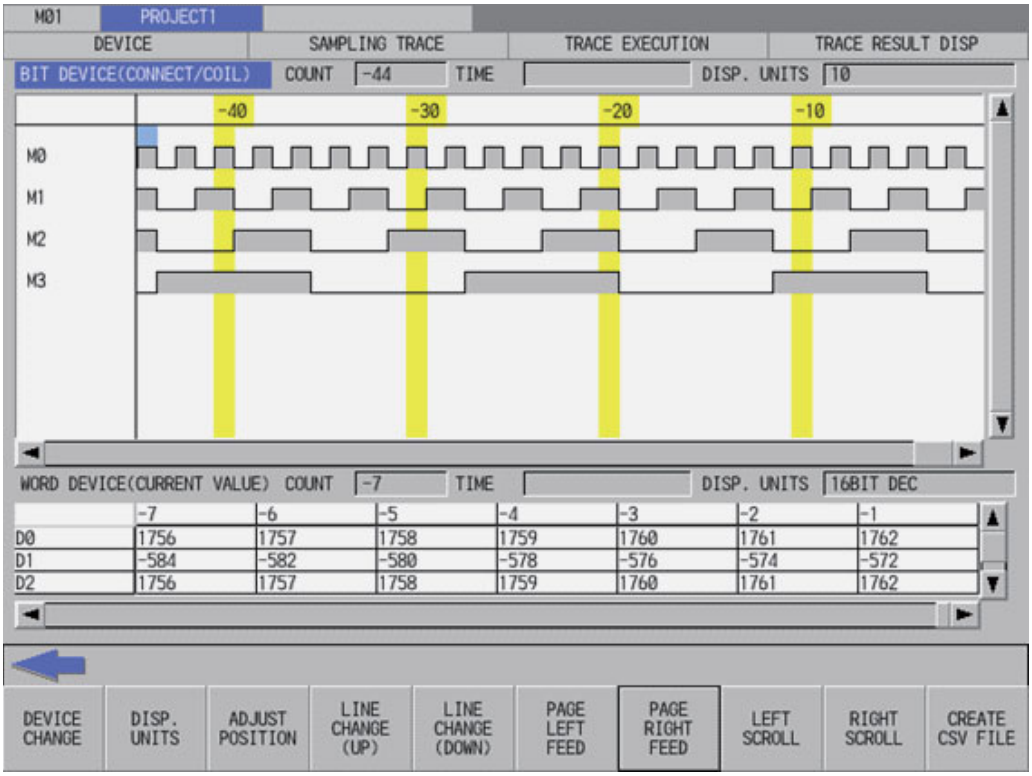
After the trace execution, the collected trace results can be displayed in chronological order. Also the output results can be written to the external devices in CSV file format.

Bit device	Displayed device field	This displays the trace result of bit device (connect/coil) on the upper side of screen. The changes of the devices are displayed in chronological order based on the trigger point as a base point "0".
	Count	This displays the number of traces at the cursor position in the bit device display field.
	Time	This displays the trace time (h:m:s) at the cursor position in the bit device display field.
	Disp. units	The displayed scale (number of traces to be displayed) can be changed with the following range. 10 (Default), 20, 50 and 100
Word device	Displayed device field	This displays the word devices (Current values) on the lower screen. The value change is displayed in chronological order based on the trigger point as a base point "0".
	Count	This displays the number of traces at the cursor position in the word device display field.
	Time	This displays the trace time (h:m:s) at the cursor position in the word device display field.
	Disp. units	16BIT DEC (Default) 16BIT HEX 32BIT DEC 32BIT HEX To display the "32BIT", upper or lower device is required to configure in the trace data setup.
Common	Device change	This moves the cursor between bit device display field and word device display field. The screen with the cursor can be scrolled to display the result details.
	Disp. units	This changes the unit to be displayed in the bit device display field or word device display field where the cursor is on.
	Adjust position	This changes the display position of other screen (e.g. word device display field) based on the cursor position of the screen with the cursor . (e.g. bit device display field).
	Line change (up)	This moves up the device with the cursor in the bit device display field or word device display field.
	Line change (down)	This moves down the device with the cursor in the bit device display field or word device display field.
	Page left feed	This moves the display position to the left for 1 page on the cursor located screen in the bit device display field or word device display field.
	Page right feed	This moves the display position to the right for 1 page on the cursor located screen in the bit device display field or word device display field.
	Left scroll	This moves the trace result to the left for 1 trace on the cursor positioned screen in the bit device display field or word device display field.
	Right scroll	This moves the trace result to the right for 1 trace on the cursor positioned screen in the bit device display field or word device display field.
	Create CSV file	This enables the trace results to output (write) to the external file in CSV file format.

(Note1) The trace results are cleared by the power OFF of NC.

(Note2) When displaying the trace result with the repeat status, if more than 1 trace has been completed, the trace data completed last is displayed.

(Note3) The trace results view displays the trace results collected by the NC.
However, when the trace conditions and the trace results are obtained by the file read, the trace results obtained by the file read are displayed until the next trace is started. The trace results obtained by the file read are displayed even if the trace conditions are changed on trace count setup screen, trace point setup screen, trigger point setup screen or trace data setup screen.



Screen display items

The following table describes the screen display items on the trace result display screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Bit device	This displays 7 points of the trace result of bit devices (connect/coil). (with software keyboard: 4 points display) The changes of the devices are displayed in chronological order based on the trigger point as a base point "0".
Bit device(count)	This displays the number of traces at the cursor position in the displayed bit device field. The number of traces is indicated as the trigger position is "0", before trigger is negative, and after trigger is positive.
Bit device(time)	This displays the trace time (h:m:s) at the cursor position in the bit device display field.
Bit device(display units))	This displays the display scale (number of traces to be displayed) in the bit device display field.
Word device	This displays 3 points of the trace result of word devices. The changes of the values are displayed in chronological order based on the trigger point as a base point "0".
Word device (count)	This displays the number of traces at the cursor position in the displayed word device field. The number of traces is indicated as the trigger position is "0", before trigger is negative, and after trigger is positive.
Word device (time)	This displays the trace time (h:m:s) at the cursor position in the word device display field.
Word device (display units)	This displays the display scale (bit and DEC/HEX) in the word device display field.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace result display screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Page left feed	Disabled when there is no page to feed.
Page right feed	Disabled when there is no page to feed.
Left scroll	Disabled when there is no object to scroll.
Right scroll	Disabled when there is no object to scroll.

Status during screen displays

The following table describes the status when the trace result display screen is displayed.

Item name	Operation
Bit device	This displays the trace data of the bit device.
Bit device(count)	This displays the number of traces in the top of trace data.
Bit device(time)	This displays the trace time in the top of trace data.
Bit device(display units)	This displays "10".
Word device	This displays the trace data of the word device.
Word device (count)	This displays the number of traces in the top of trace data.
Word device (time)	This displays the trace time in the top of trace data.
Word device (display units)	This displays "16BIT DEC".

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace result display screen".
Device change	This moves the cursor between bit device display field and word device display field. The screen with the cursor can be scrolled to display the result details.
Disp. units	This changes the unit to be displayed on the screen with the cursor in the bit device display field or word device display field. Bit device: 10 -> 20 -> 50 ->100 -> 10 Word device: 16BIT DEC -> 16BIT HEX -> 32BIT DEC -> 32BIT HEX -> 16BIT DEC To display 32 bit, it requires to configure the upper or lower device in the trace data setup.
Adjust position	This changes the display position of other screen based on the cursor position of the screen with the cursor .
Line change (up)	This moves up the cursor positioned device in the device display field.
Line change (down)	This moves down the cursor positioned device in the device display field.
Page left feed	This moves the display position to the left for 1 page on the cursor positioned screen in the device display field.
Page right feed	This moves the display position to the right for 1 page on the cursor positioned screen in the device display field.
Left scroll	This moves the trace result to the left for 1 trace on the cursor positioned screen in the device display field.
Right scroll	This moves the trace result to the right for 1 trace on the cursor positioned screen in the device display field.
Create CSV file	This displays the create CSV file screen.

Closing the trace result display screen

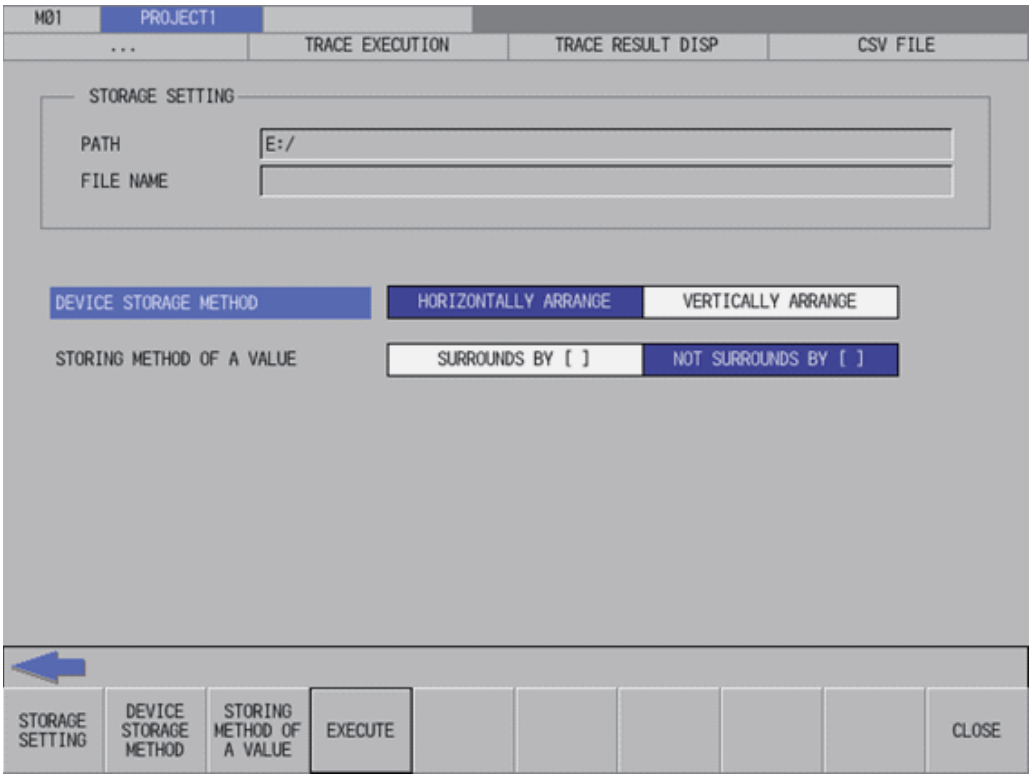
Use any of the following methods to close the trace result display screen.

Methods to close the screen
Press the [CREATE CSV FILE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.8 Create CSV File Screen

Outline

This is used to save the trace execution results in CSV file format.



Screen display items

The following table describes the screen display items on the create CSV file screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Storage setting	This displays the path and file name where the CSV file is being stored.
Device storage method	This displays the storage method of the device being stored.
Storing method of a value	This displays the storage method of the device values being stored.

Enabled/disabled state of menu keys

The menu keys displayed on the create CSV file screen are always enabled.

Status during screen displays

The following table describes the status when the create CSV file screen is displayed.

Item name	Operation
Storage setting (path)	This is blank or displays the path that is specified in the storage setting.
Storage setting (file name)	This is blank or displays the file name that is specified in the storage setting.
Device storage method	This selects "HORIZONTALLY ARRANGE".
Storing method of a value	This selects "NOT SURROUNDS BY [ ]".

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the create CSV file screen".
Storage setting	This displays the storage setting screen.
Device storage method	The focus is applied to the device storage method. This changes the device storage method selection when the focus is already applied.
Storing method of a value	The focus is applied to the storing method of a value. This changes the storing method selection when the focus is already applied.
Execute	This stores the trace data using the storage method in CSV file format with the specified file name to the path set in the storage setting.
Close	Refer to "Closing the create CSV file screen".

Closing the create CSV file screen

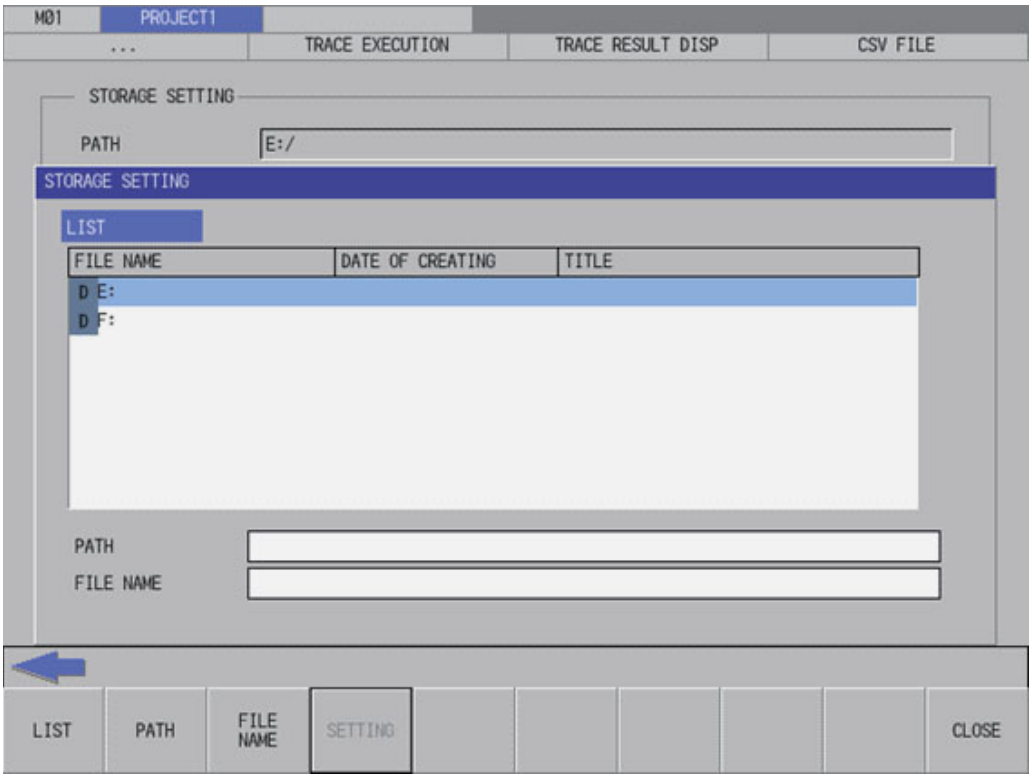
Use any of the following methods to close the create CSV file screen.

Methods to close the screen
Press the [EXECUTE] menu key.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.9 Storage Setting Popup Screen

Outline

This displays a list of the trace execution result files stored in the external devices. Selects or creates a file to be stored.



Screen display items

The following table describes the screen display items on the storage setting popup screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the directory and files of the specified path.
Path	This displays the path where the CSV file is stored. (The path can be entered.)
File name	This displays the file name selected in the list. (The file name can be entered.)

Enabled/disabled state of menu keys

The menu keys displayed on the storage setting popup screen are always enabled.

Status during screen displays

The following table describes the status when the storage setting popup screen is displayed.

Item name	Operation
List	Refer to "Displaying CSV files".
Path	This is blank or displays the path that is displayed in the list.
File name	This is blank or displays the file name that is selected in the list.

Displaying CSV file

This displays the directory and CSV file name stored directly under the root path of the default external device when the storage setting popup screen is displayed for the first time.

This displays the details of the path where the previously selected CSV file is stored when the storage setting popup screen is displayed after a storage setting is already performed. This displays path details directly under the root of the default external device when there is no specified path.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to " Closing the storage setting popup screen".
List	The focus is applied to the list.
Path	The focus is applied to the path entry field.
File name	The focus is applied the file name entry field.
Setting	Refer to " Specify CSV file".
Close	Refer to " Closing the storage setting popup screen".

Specify CSV file

(1) To directly input the path and file name

1. Press the [PATH] menu key , then the focus is moved to the path entry field. Enter the path where the CSV file is stored.
   This operation is not necessary if the save destination does not need to be changed.
2. Press the [FILE NAME] menu key to move the focus to the file name entry field. Enter the name for the CSV file.
3. After pressing the [SETTING] menu key closes the storage setting popup screen, the screen returns to the create CSV file screen. The selected path and file name are displayed in the select project of the create CSV file screen.

(2) To select a file name from the list

1. Press the [LIST] menu key to move the focus to the list. Use the up or down arrow key to select an existing fine name.
2. Pressing the [INPUT] menu key or pressing the [SETTING] menu key closes the storage setting popup screen and returns to the create CSV file screen. The selected path and file name are displayed in the select project of the create CSV file screen.

Closing the storage setting popup screen

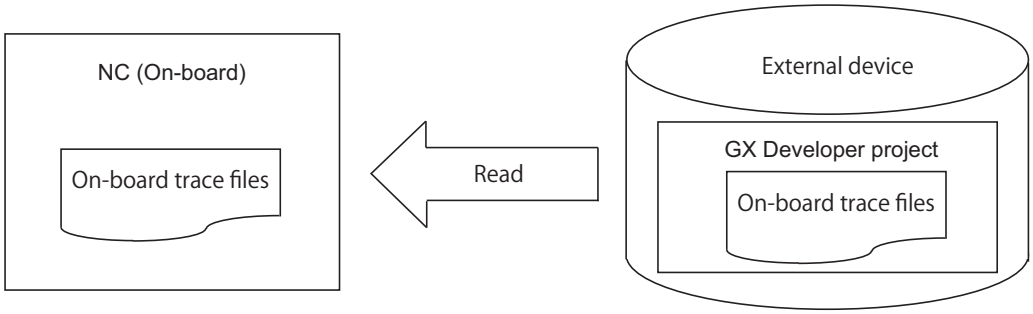
Use any of the following methods to close the storage setting popup screen.

Methods to close the screen
Specify the storage destination.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.10 Trace File Read Screen

Outline

This displays a list of the trace files in the specified project, and reads the specified trace file.



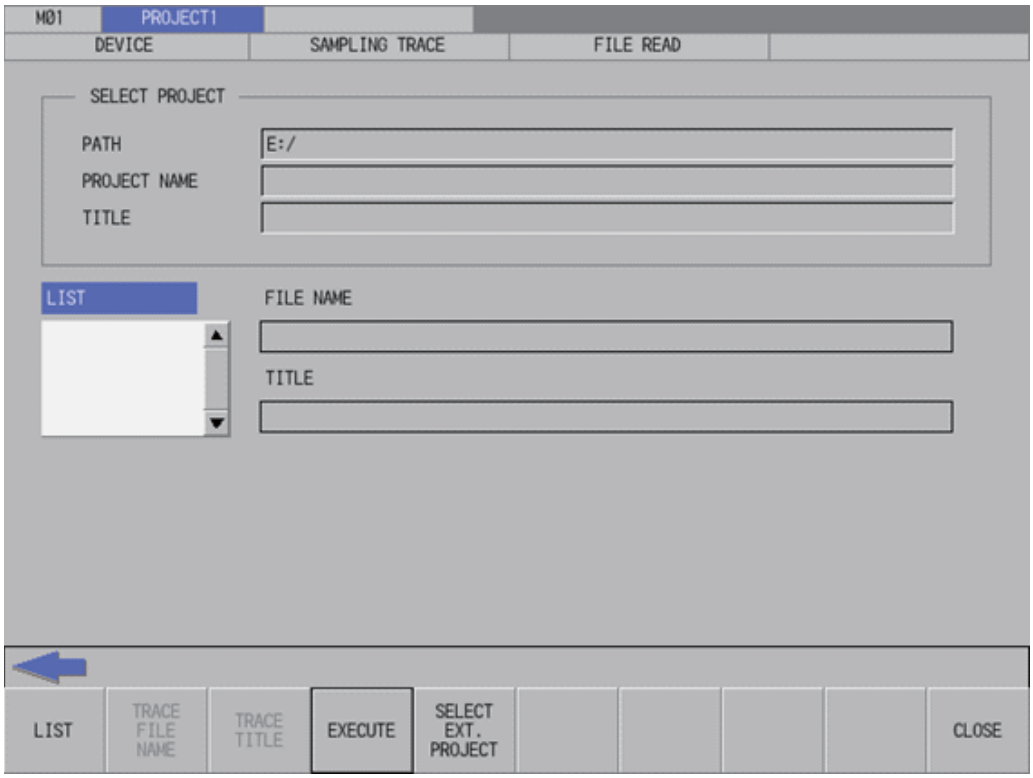
Read data	Trace conditions	Number of traces, trace points, trigger points, trace data, etc.
	Trace results	Trace data of bit devices and word devices
Write data	Trace files of GX-Developer projects or trace files written by On-board (Note) The format between GX-Developer and the On-board are different.	

(Note1) The trace conditions are retained in the NC at the start of tracing, and they are retained even if the NC power is OFF.
The trace results are discarded when the NC power is turned OFF.

(Note2) Reading or writing the trace files are disabled during a trace.

(Note3) The trace condition of the files, which were created by GX-Developer and is not supported with Mitsubishi Electric CNC, cannot be read.

(Note4) The trace files that were created in different projects can be read, however, since the size and device range checks are performed at the trace execution, if the trace file is either the size over or out of the device range, an error message appears and the trace cannot be executed.



Screen display items

The following table describes the screen display items on the trace file read screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Path	This displays the path where the project data is stored.
Project name	This displays the name of the specified project data.
Title	This displays the title set in the specified project data.
List	This displays the trace file stored in the specified project.
File name	This displays the selected file name.
Title	This displays the title set in the selected file.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace file read screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Execute	Enabled when the file name is not blank.

Status during screen displays

The following table describes the status when the trace file read screen is displayed.

Item name	Operation
Path	This displays the default path or the path of the selected project name.
Project name	This is blank or displays the selected project name.
List	This is blank or displays the trace files stored in the selected project.
File name	This is blank or displays the file name that is selected in the list.
Title	This is blank or displays the title that is set in the selected file in the list.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace file read screen".
List	This selects the list.
Execute	This obtains the specified trace file and then stores to the built-in PLC.
Select ext. project	This displays the select external project popup screen. (Refer to "Select external project popup screen".)
Close	Refer to "Closing the trace file read screen".

Abnormal operation

This information describes the details of error messages displayed on the trace file read screen and the corrective action thereof.

Error message	Error description	Corrective action
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when executing an operation during trace.	Execute the operation during trace stop.
The trace file of the trace condition not supporting it with Mitsubishi Electric CNC in the trace file made with GX-Developer cannot be deleted.	This is displayed when reading a trace file of the trace condition that was created by GX-Developer and is not supported with Mitsubishi Electric CNC.	Input a trace file of the trace condition which is supported with Mitsubishi Electric CNC.

Closing the trace file read screen

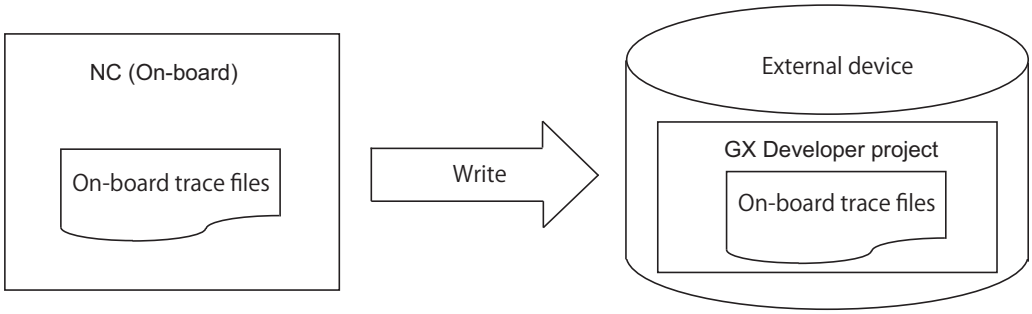
Use any of the following methods to close the trace file read screen.

Methods to close the screen
Execute the trace file read.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.11 Trace File Write Screen

Outline

This displays a list of the trace files in the specified project, and writes to the specified trace file.

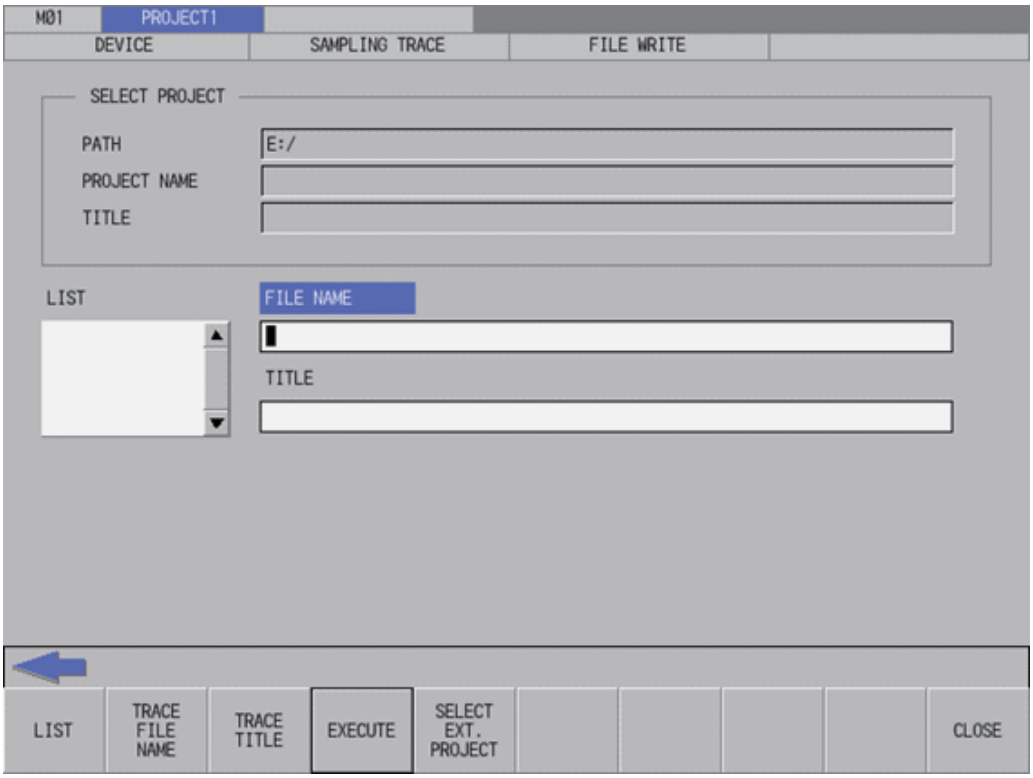


Write data	Trace conditions	Number of traces, trace points, trigger points, trace data, etc.
	Trace results	Trace data of bit devices and word devices
Read data	The On-board original trace files	

(Note1) Reading or writing the trace files is disabled during a trace.

(Note2) The trace files written by the On-board cannot be read by GX Developer. (incompatible)

(Note3) When you execute file write after changing the trace conditions, only the trace conditions are written. If you change the trace conditions, start tracing, and then attempt to export the trace results to a file without displaying the results, only the trace conditions are output to a file. To have the trace results exported to a file, start tracing and then view the results before executing the file export.



Screen display items

The following table describes the screen display items on the trace file write screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Path	This displays the path where the project data is stored.
Project name	This displays the name of the specified project data.
Title	This displays the title set in the specified project data.
List	This displays the trace file stored in the specified project.
File name	This displays the selected file name.
Title	This displays the title set in the selected file.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace file write screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Execute	Enabled when the file name is not blank.

Status during screen displays

The following table describes the status when the trace file write screen is displayed.

Item name	Operation
Path	This displays the default path or the path of the selected project name.
Project name	This is blank or displays the selected project name.
List	This is blank or displays the trace files stored in the selected project.
File name	This is blank or displays the file name that is selected in the list.
Title	This is blank or displays the title that is set in the selected file in the list.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace file write screen".
List	This selects the list.
Execute	This obtains the trace file from the built-in PLC, and writes to the external device with the specified file name.
Select ext. project	This displays the select external project popup screen. (Refer to "Select external project popup screen".)
Close	Refer to "Closing the trace file write screen".

Abnormal operation

This information describes the error messages and caution messages displayed on the trace file write screen.

Error message	Error description	Corrective action
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when executing an operation during trace.	Execute the operation during trace stop.

Caution message	Description
Trace condition has been changed. Output only trace conditions to the file.	This message appears when you change the trace conditions after obtaining the trace results, and then execute the trace file write.

Closing the trace file write screen

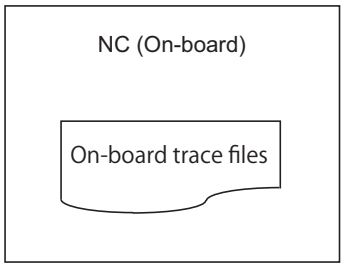
Use any of the following methods to close the trace file write screen.

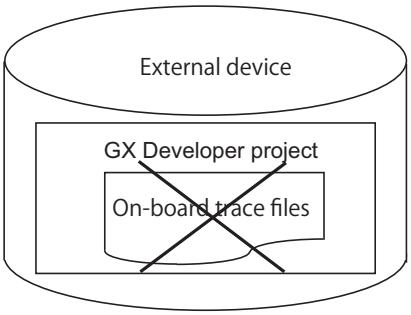
Methods to close the screen
Execute the trace file output.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.12 Trace File Delete Screen

Outline

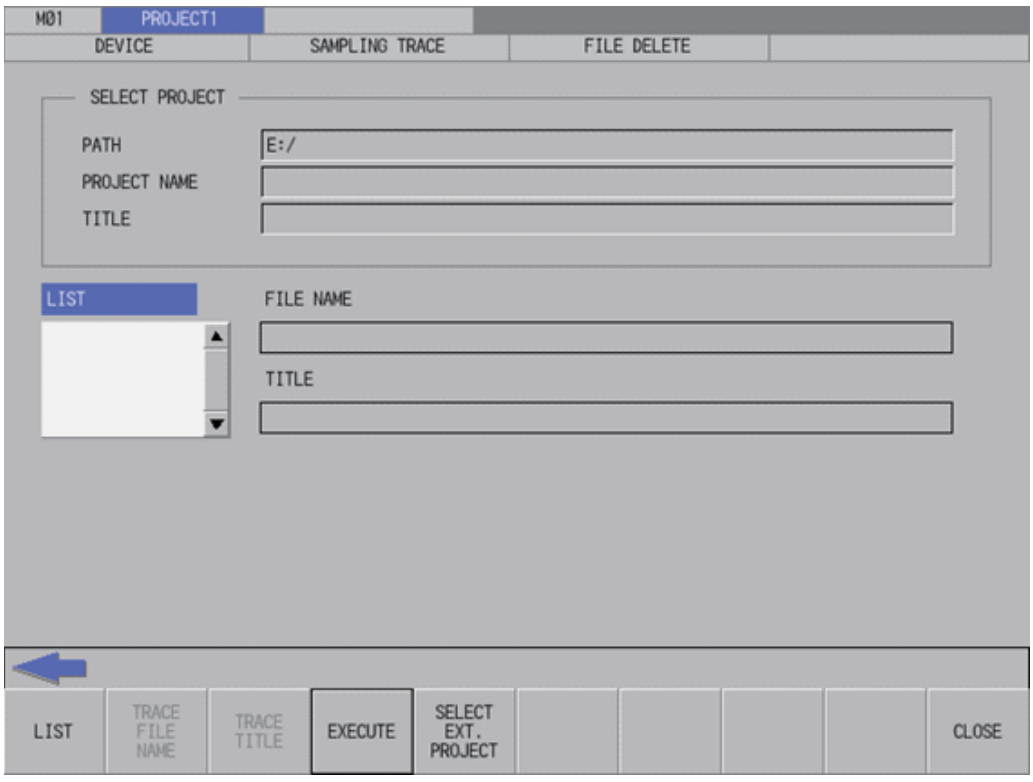
This displays a list of the trace files in the specified project, and deletes the specified trace file.





Delete data	Trace conditions	Number of traces, trace points, trigger points, trace data, etc.
	Trace results	Trace data of bit devices and word devices
File format	Trace files written by the On-board.	

(Note1) Only the trace files written by the On-board can be deleted. The trace files created by GX-Developer cannot be deleted.



Screen display items

The following table describes the screen display items on the trace file delete screen.

Item name	Display state
Connect NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Path	This displays the path where the project data is stored.
Project name	This displays the name of the specified project data.
Title	This displays the title set in the specified project data.
List	This displays the trace file stored in the specified project.
File name	This displays the selected file name.
Title	This displays the title set in the selected file.

Enabled/disabled state of menu keys

The following table describes the conditions upon which menu keys displayed on the trace file delete screen are enabled/disabled.

The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Execute	Enabled when the file name is not blank.

Status during screen displays

The following table describes the status when the trace file delete screen is displayed.

Item name	Operation
Path	This displays the default path or the path of the selected project name.
Project name	This is blank or displays the selected project name.
List	This is blank or displays the trace files stored in the selected project.
File name	This is blank or displays the file name that is selected in the list.
Title	This is blank or displays the title that is set in the selected file in the list.

Operation of key presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the trace file delete screen".
List	This selects the list.
Execute	This reads the specified trace file.
Select ext. project	This displays the select external project popup screen. (Refer to "Select external project popup screen".)
Close	Refer to "Closing the trace file delete screen".

Abnormal operation

This information describes the details of error messages displayed on the trace file delete screen and the corrective action thereof.

Error message	Error description	Corrective action
The PLC cannot execute during trace. Execute again after trace is completed.	This is displayed when executing an operation during trace.	Execute the operation during trace stop.

Closing the trace file delete screen

Use any of the following methods to close the trace file delete screen.

Methods to close the screen
Execute trace file deletion.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.15.4.13 Example of Trace File Write

Outline

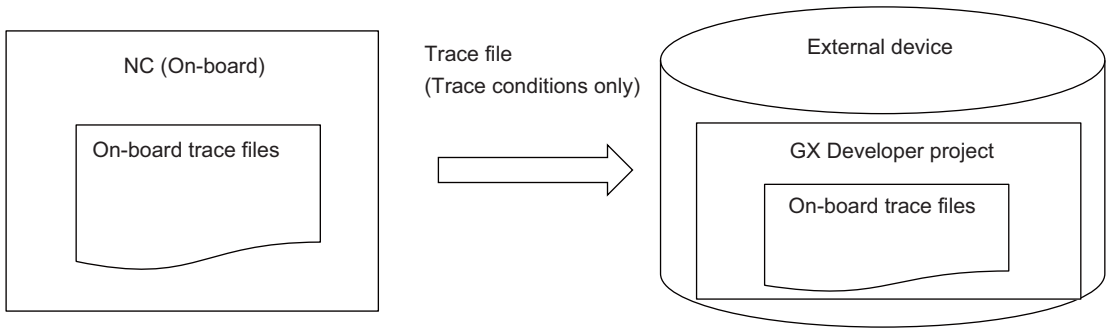
There are following writing patterns for a trace file.

- Write the trace conditions only
- Write the trace conditions and trace results

The writing pattern is determined by the trace file of the NC (on-board) and screen operation.

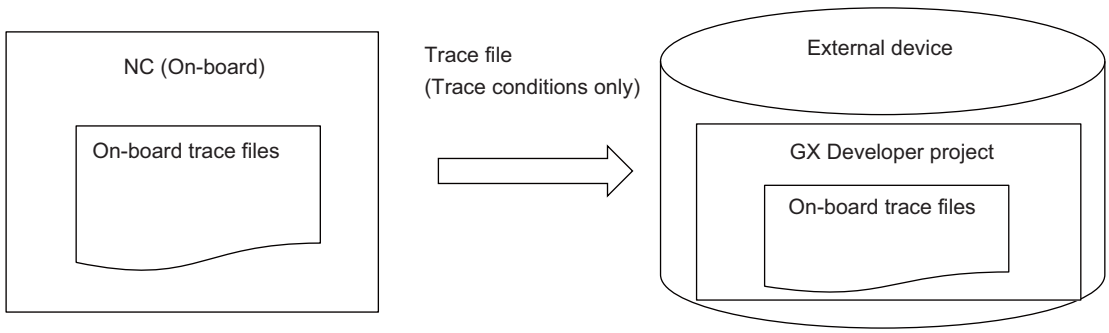
Initial status

Trace results do not exist and only initialized trace conditions are stored in the initial state NC (On-board). When a file is written in this state, only the trace conditions are written to a trace file.



After starting a trace

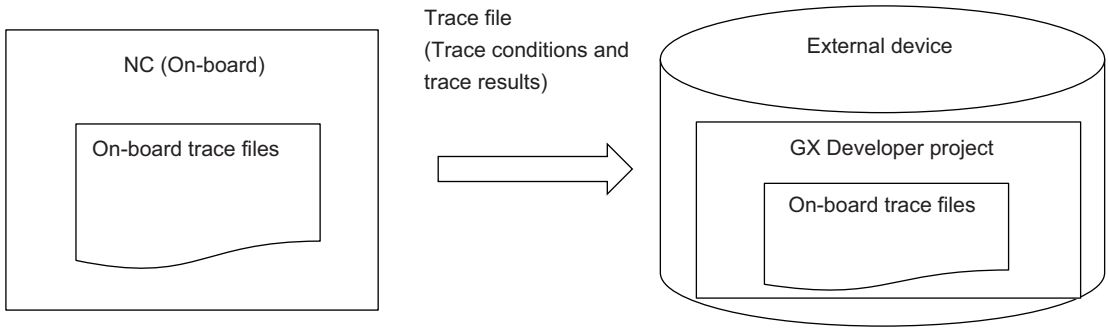
Sampling trace is executed according to the trace conditions, and trace results are created by trace start operations. When a file is written in this state, only the trace conditions are written to a trace file, because trace results have not been displayed.



Start of trace -> After displaying results

When you open the trace result display screen by trace start operations, the results of currently performed trace are displayed. When a file is written in this state, the trace conditions and the results of currently performed trace are output in a form of trace file (trace conditions and trace results).

The same applies to Start of trace -> End of trace -> After displaying results.

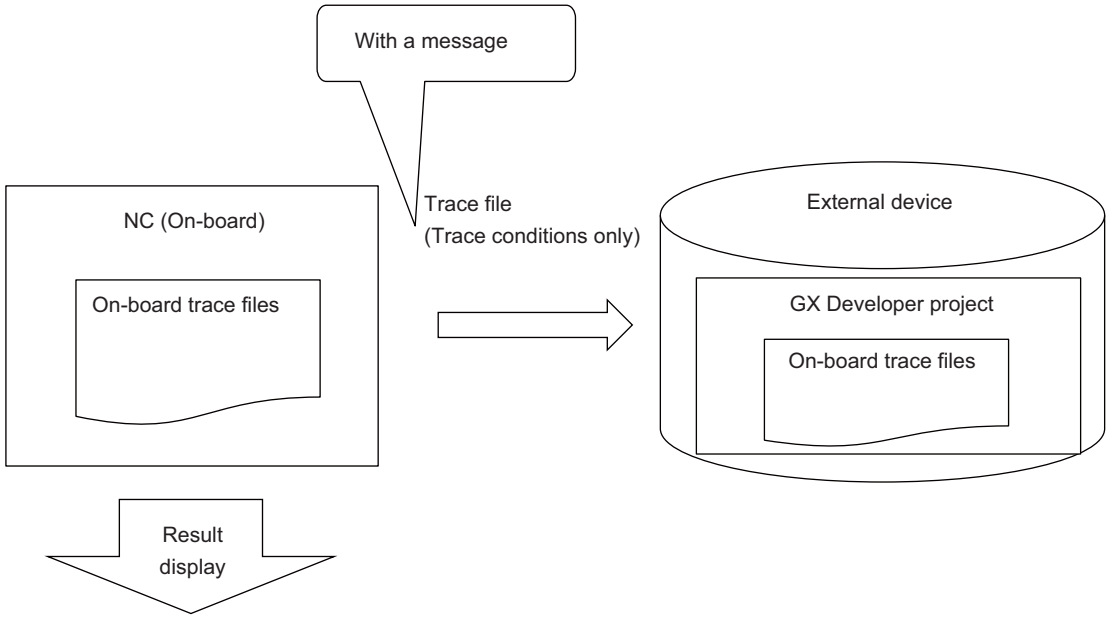


End of trace -> After displaying results -> Trace condition change

Trace results for file write are discarded when you change the trace conditions.

When a file is written in this state, a message appears saying that only the trace conditions are written, and only the trace conditions are written to a trace file.

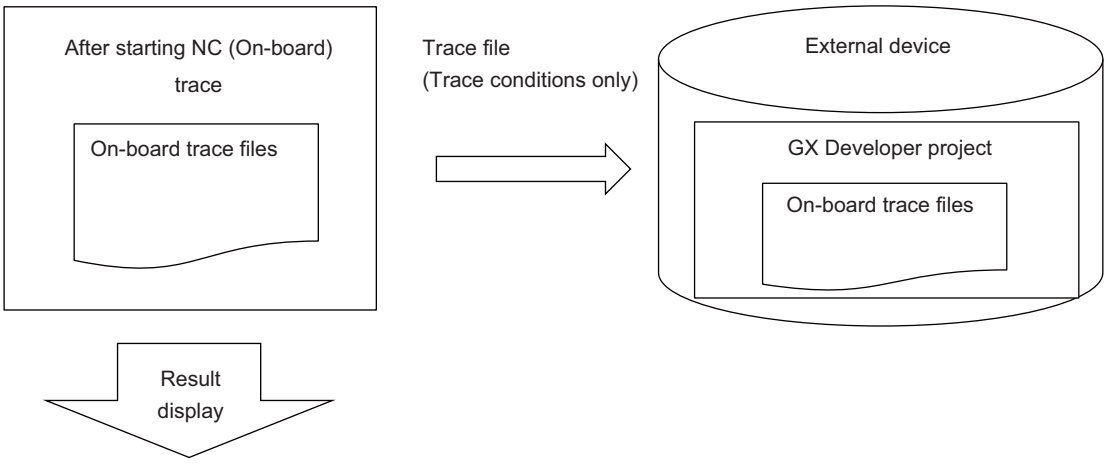
Note that the previous trace conditions and trace results before change are displayed if the trace result screen is displayed.



Displays the previous trace conditions and trace results before change

End of trace -> After displaying results -> Start of trace

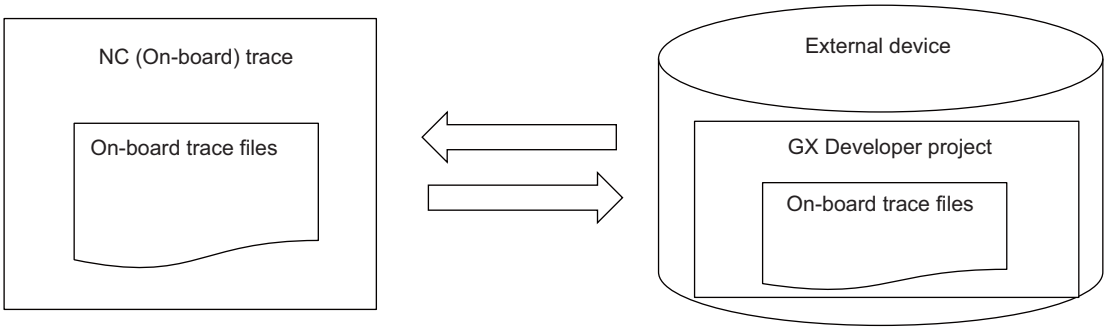
The obtained trace results are discarded when the trace start is performed. When a file is written in this state, only the trace conditions are written to a trace file, because trace results have not been displayed.
When you open the trace result display screen, the results of currently performed trace are displayed.
The file cannot be written after displaying the results because trace is being executed.



Displays the previous trace conditions and trace results before change

Trace read

If you use trace read to import a trace file into the NC, and perform the above-described screen operations to do file write, the resulting trace file is equivalent to that made through the above-described screen operations.

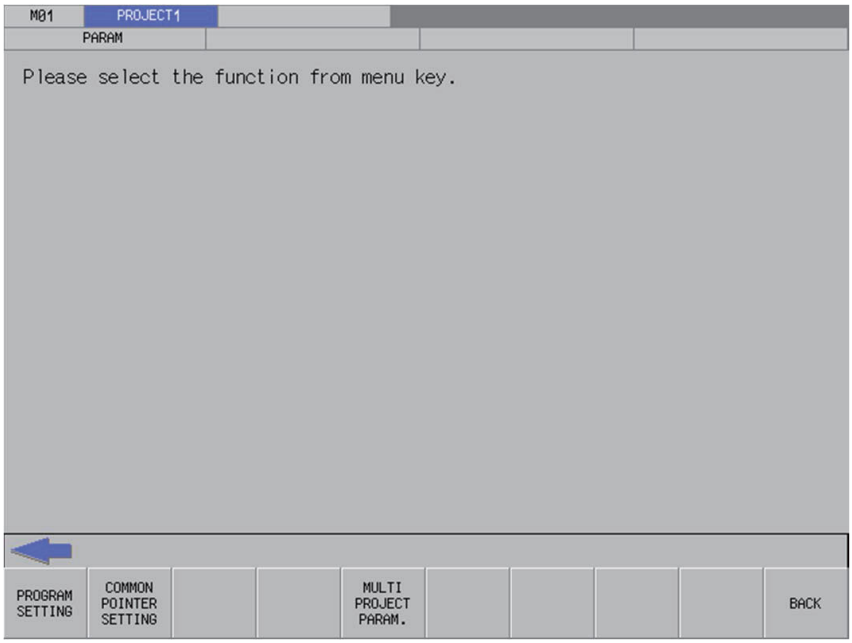


6.16 Parameter Menu

6.16.1 Parameter Main Screen

6.16.1.1 Outline

This displays menus for parameters that control PLC operation.



6.16.1.2 Screen Display Items

The following table describes the screen display items on the parameter main screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.16.1.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the parameter main screen are always enabled.

6.16.1.4 Operation of Key Presses

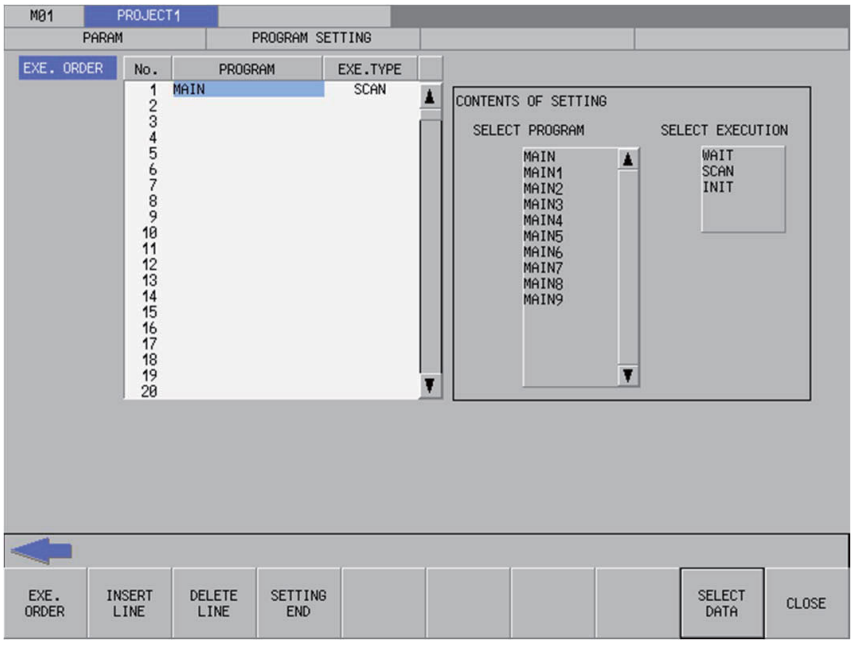
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/return menu key	These transition to the main menu.
Various menu keys	This displays the specified screen.

6.16.2 Program Settings Screen

6.16.2.1 Outline

The execution order of programs when running multiple PLCs stored in the current project on the NC can be specified. Programs are executed in order from the lowest number configured in the set list as illustrated in the following diagram.



6.16.2.2 Screen Display Items

The following table describes the screen display items for the program settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Execution sequence	The details of the program settings are displayed.
Contents of setting	This displays the file names of sequence programs and the selected type of execution.

6.16.2.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the program settings screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Insert line	Enabled when the focus is set on the execution sequence
Delete line	Enabled when the focus is set on the execution sequence

6.16.2.4 Status during Screen Displays

The following table describes the status when displaying the program settings screen.

Item name	Operation
Execution sequence	This displays the details of the program settings for the current project.
Contents of setting	This displays the selectable execution type and files names of sequence programs stored in the current project.

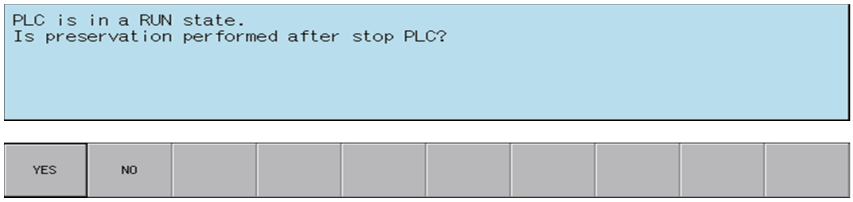
6.16.2.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

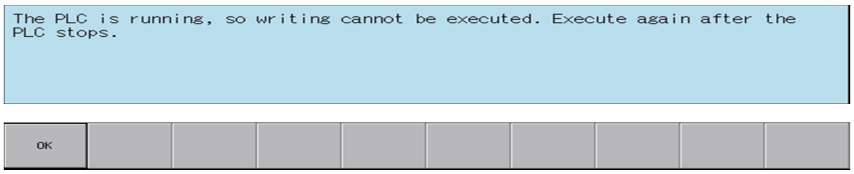
Item name	Operation
Left arrow key	Refer to "Closing the Program Settings Screen."
Execution sequence	This sets the focus to the execution sequence.
Insert line	This inserts one blank line at the cursor position in the execution sequence. Lines are not inserted when data is already set at the last line in the set list.
Delete line	This deletes one line at the cursor position in the execution sequence and moves remaining data up one line.
Complete settings	Refer to "Setting the Program Execution Sequence."
Close	Refer to "Closing the Program Settings Screen."

6.16.2.6 Setting the Program Execution Sequence

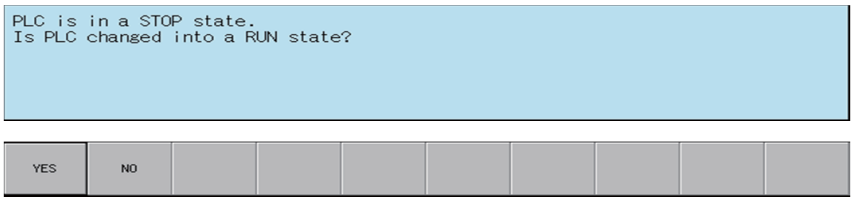
1. Press the [EXE. ORDER] menu key to select the execution order.
2. Use the up/down arrow keys, Page Up key, and Page Down key to move the cursor to the position in the program name column to set the execution sequence for programs.
3. Press the [INPUT] key. Pressing the [INPUT] key selects the select program field of Contents of setting.
4. Use the up/down arrow keys, Page Up key, and Page Down key to select the program for which you want to set the program execution sequence.
5. Press the [INPUT] key. Pressing the [INPUT] key displays the name of the program selected in the select program field at the cursor position in the the execution order.
   [WAIT] is automatically set for the execution type in the line where the program is displayed.
6. Use the right arrow key to move the cursor from the program name column to the execution type column.
7. Press the [INPUT] key. Pressing the [INPUT] key selects the selection execution field of Contents of setting.
8. Use the up/down arrow keys, Page Up key, and Page Down key to select the execution type for the program.
9. Press the [INPUT] key. Pressing the [INPUT] key displays the execution type selected in the select execution field at the cursor position in the execution order.
10. Repeat steps 3-8 to set the execution sequence for all programs.
11. Press the [COMPLETE SETTINGS] menu key after all settings are complete.
    The following message screen displays when the PLC is running.



12-1.Pressing the [NO] menu key displays the following error message.
Closing the error message returns to the program settings screen.



12-2.Pressing the [YES] menu key closes the message screen and executes the program settings. The following message displays after the settings are complete.



Press the [YES] menu key restarts the PLC stopped to complete the settings and closes the message screen.
Pressing the [NO] menu key closes the message screen without restarting the PLC.

13. The complete message displays if the program settings complete without error. Closing the complete message returns the system to the program settings screen.

6.16.2.7 Abnormal Operation

This information describes the details of error messages displayed on the program settings screen and the corrective action thereof.

Error message	Error description	Corrective action
Failed to obtain the maximum number of registration programs. Please set it within the PLC specified range.	This message appears when you use the PLC on-board of version C0 or later to connect to the NC of version B2 or earlier.	Update the connected NC to version C0 or later. Note however that the program setting can be executed within the PLC specification ranges.

6.16.2.8 Closing the Program Settings Screen

Use any of the following methods to close the program settings screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.16.3 Common Pointer Settings Screen

6.16.3.1 Outline

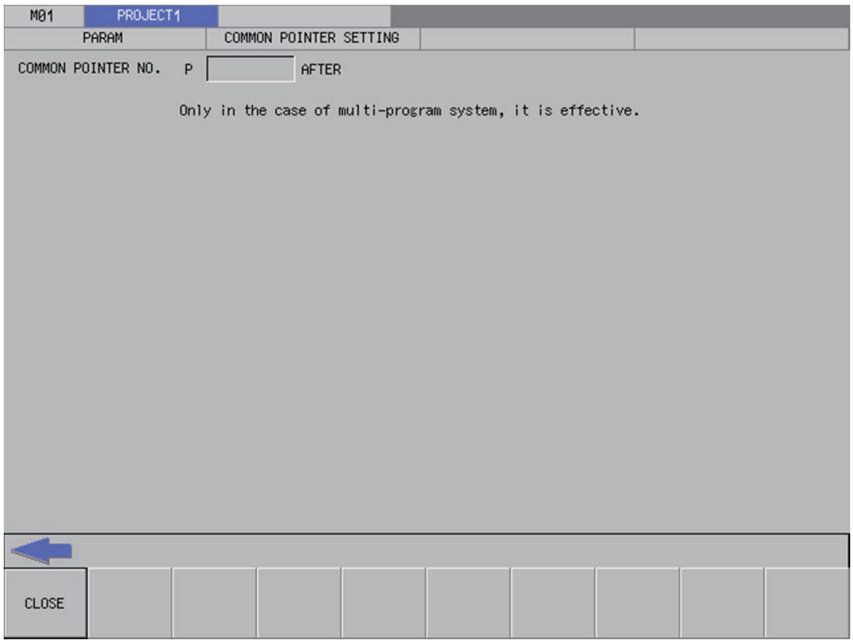
The initial P number can be checked for common pointers (pointers used to call subroutines from all programs) in the current project.

*Note 1: Configure common pointers using GX Developer/GX Works2 in range between P0-P4095.

*Note 2: The initial P number in common pointers is enabled when executing multiple programs.

*Note 3: When executing single programs, leave this blank (press the [SET] button without configuring any settings).

*Note 4: If the common pointer setting is left blank (not configuring any settings) when using multiple programs, this is set to the default of P1800 or higher.



6.16.3.2 Screen Display Items

The following table describes the screen display items for the common pointer settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Common pointer No.	This displays the initial P number for common pointers.

6.16.3.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the common pointer settings screen are always enabled.

6.16.3.4 Status during Screen Displays

The following table describes the status when displaying the common pointer settings screen.

Item name	Operation
Common pointer No.	This is the default focus position when the screen is displayed. This displays the initial P number for common pointers set to the project specified for operation.

6.16.3.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Common Pointer Settings Screen."
Close	

6.16.3.6 Closing the Common Pointer Screen

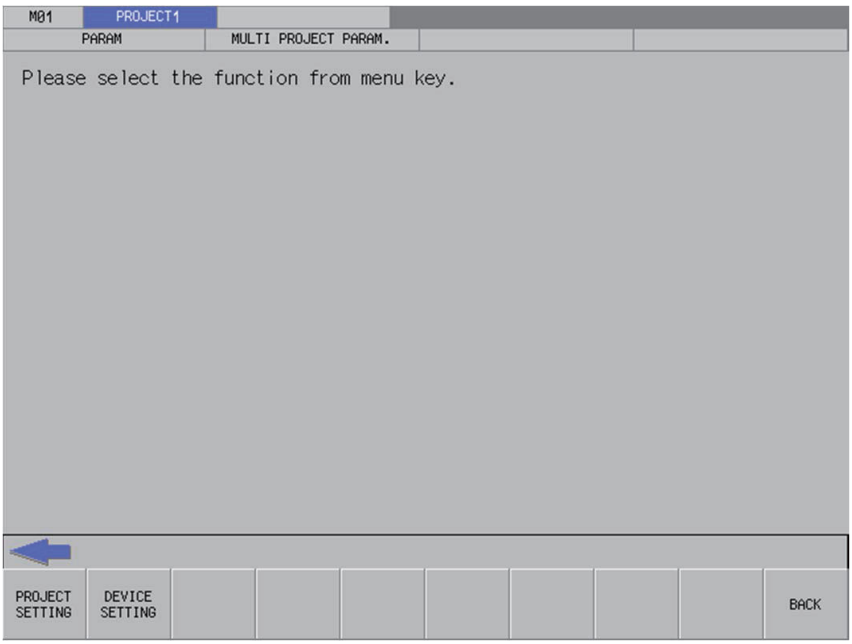
Use any of the following methods to close the common pointer settings screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.16.4 Multiple Project Parameters Main Screen

6.16.4.1 Outline

This configures parameters for multiple projects.



6.16.4.2 Screen Display Items

The following table describes the screen display items on the multiple project main screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.

6.16.4.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the multiple project parameters main screen are always enabled.

6.16.4.4 Operation of Key Presses

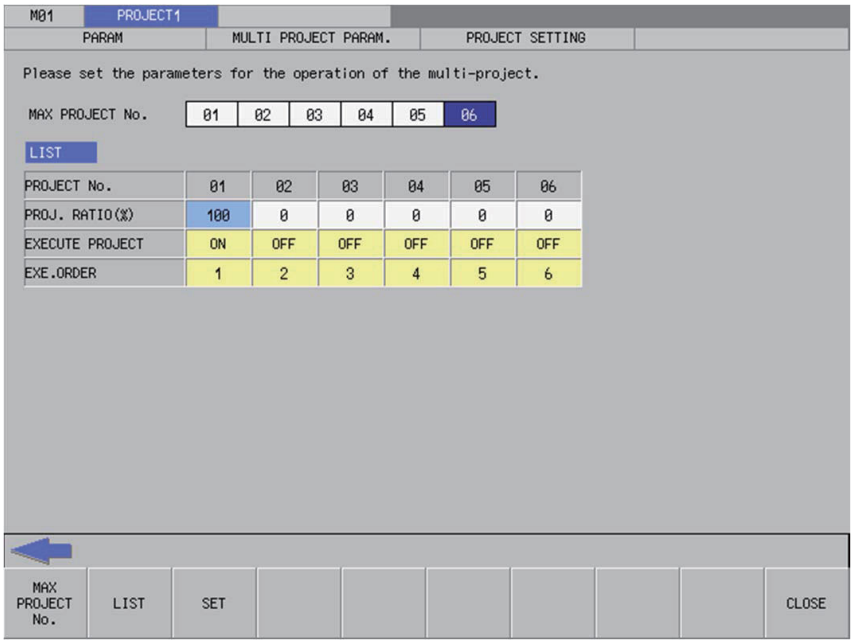
The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key/return menu key	This transitions to the parameter main screen.
Various menu keys	This displays the specified screen.

6.16.5 Project Settings Screen

6.16.5.1 Outline

This enables parameters for operating multiple projects to be configured such as the maximum project No. and the project to execute.



6.16.5.2 Screen Display Items

The following table describes the screen display items for the project settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Maximum project No.	This displays the number of usable projects.
List	This displays the project ratio, execution project, and the execution sequence.

6.16.5.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the project settings screen are always enabled.

6.16.5.4 Status during Screen Displays

The following table describes the status when displaying the project settings screen.

Item name	Operation
Maximum project No.	This is the default focus position when the screen is displayed. This displays the highest project number that can be used within the project numbers set in the NC.
List	This displays the project ratio, execution project, and execution sequence set for each project.

6.16.5.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Project Settings Screen."
Maximum project No.	This sets the focus to the maximum project No. This changes the maximum project no. selection when the focus is already set.
List	This selects the list.
Settings	Refer to "Configuring the Project Settings."
Close	Refer to "Closing the Project Settings Screen."

6.16.5.6 Setting the Project Ratio

Rules for project ratio settings

The following table describes the rules and precautions regarding the configuration of project ratio settings using the PLC On-board.

Setting Rules and Precautions
Set the total ratios for all usable projects so that it is no more than 100.
The ratio cannot be set for projects that are not usable.
The size of each setting should be 4 steps/byte. (Fractions are added to project 1 to prevent multiples of 4.)
The size of the project ration cannot be set to a value less than the size of the data and sequence programs currently stored.

Entering the project ratio

1. Press the [LIST] menu to select the list.
2. Use the up and down arrow keys to move to a position in the project ratio column in the list.
3. Press the [INPUT] key to display the label input field at the bottom of the list and move the focus.

4. Enter the project ratio in accordance with the previously described rules and precautions, and then press the [INPUT] key. Press the INPUT key to close the project ratio input field. The entered project ratio is displayed at the cursor position in the list.

Deleting ratios

1. Press the [LIST] menu to select the list.
2. Use the up and down arrow keys to move to a position in the project ratio column in the list.
3. Press the [DELETE] menu key. Pressing the [DELETE] key deletes the project ratio at the cursor position. The project ratio at the deleted position becomes 0%.

6.16.5.7 Setting Execution Projects

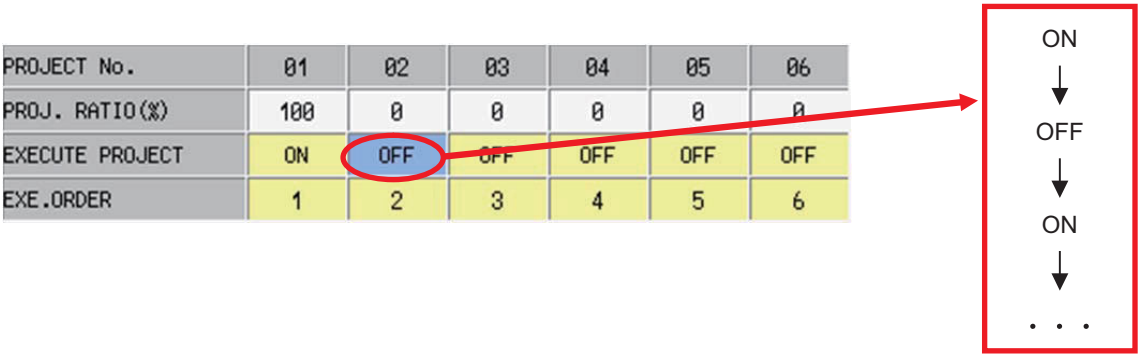
Rules for execution project settings

The following table describes the rules and precautions regarding the configuration of execution project settings using the PLC On-board.

Setting Rules and Precautions
Projects that are not usable will not execute even if set to ON.
You cannot turn off all projects.

Entering the execution projects

1. Press the [LIST] menu to select the list.
2. Use the up and down arrow keys to move to the position of the line for the project in the list for which the execution is to be set.
3. Refer to "Setting selection items in lists" in "Operation Key List :Screen Items (Control)". Pressing the [INPUT] key while the cursor is in the execution project display field changes the display between [ON] and [OFF].



4. In accordance with the previously described rules and precautions, select [ON] to execute the project at the set position or select [OFF] to not execute the project.

6.16.5.8 Setting the Execution Sequence

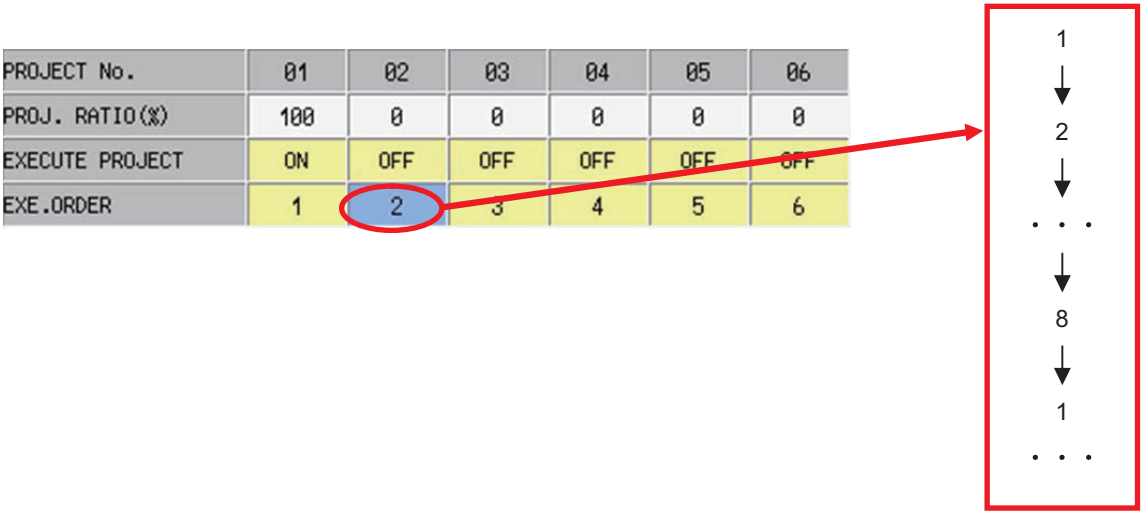
Rules for execution sequence settings

The following table describes the rules and precautions regarding the configuration of execution sequence settings using the PLC On-board.

Setting Rules and Precautions
The sequence cannot be set for projects that are not usable.
The same execution sequence number cannot be set to multiple projects for which the execution project is set to [ON].
The execution sequence is ignored if the execution project is set to [OFF].
The execution sequence when the execution project is set to [OFF] is automatically set to the next sequence number from the execution end position of executing projects set in the NC.
Projects for which the execution project is set to [ON] are executed in order from the lowest number set in the execution sequence.

Entering the execution sequence

1. Press the [LIST] menu to select the list.
2. Use the up and down arrow keys to move to the position of the line for the execution sequence to be set in the list.
3. Refer to "Setting selection items in lists" in "Operation Key List :Basic Operation Keys." Pressing the [INPUT] key while the cursor is in the execution sequence display field changes the display of the sequence between one to the maximum project no. from the lowest number.

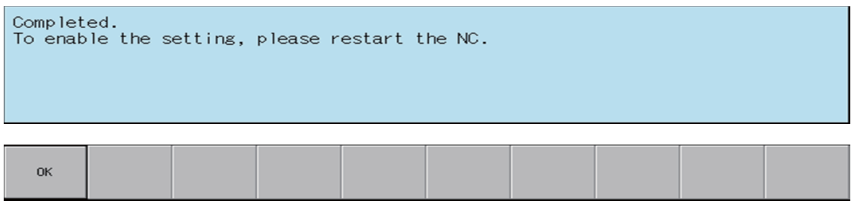


4. In accordance with the previously described rules and precautions, select the execution sequence for the project at the set position.

6.16.5.9 Configuring the Project Settings

Normal operation

1. Press the [MAX PROJECT No.] and select the number of projects to use.
2. Refer to "Setting the Project Ratio" and enter the project ratio.
3. Refer to "Setting Execution Projects" and select the execution projects.
4. Refer to "Setting the Execution Sequence" and enter the execution sequence.
5. Press the [SET] menu key.
6. The following message screen displays if the project settings complete without error. Closing the message screen closes the project settings screen and returns to the multiple project parameters screen.



Abnormal operation

This information describes the details of error messages displayed on the project settings screen and the corrective action thereof.

Error message	Error description	Corrective action
The project ratio is not 100%.	This is displayed if the set project ratio is more than 100%.	Set the ratios so that the total ratio is 100% or less.
The project ratio is less than the size of PLC data.	This is displayed if the set project ratio is less than the storage size of PLC data.	Format the PLC data storing the project ratio or set the ratio larger than the size of the PLC data.
All execution projects are turned off.	This is displayed if all execution projects are turned off.	Turn on at least one of the execution projects.
Execution projects are set with the same execution sequence number.	This is displayed if used projects are set with the same execution sequence number.	Set each used project with a different execution sequence number.

6.16.5.10 Closing the Project Settings Screen

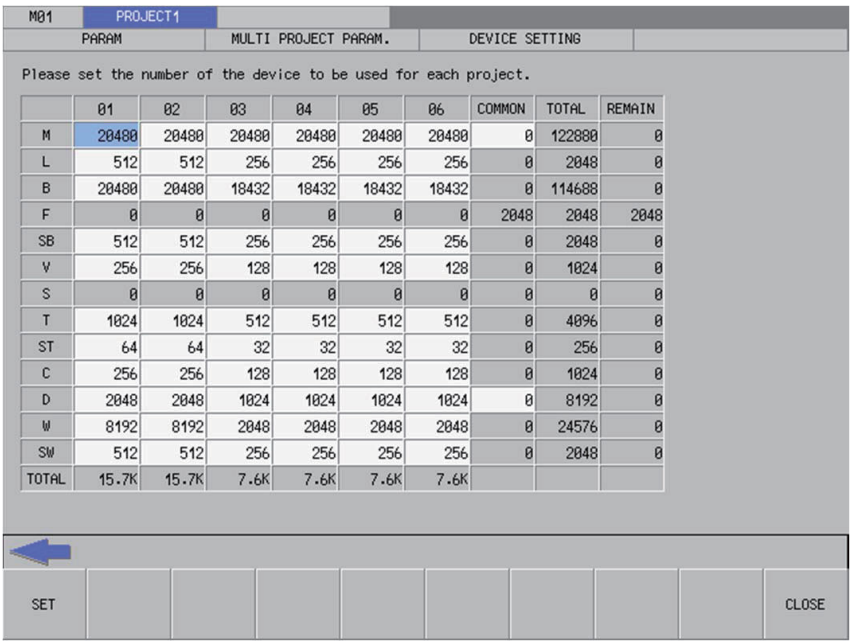
Use any of the following methods to close the project settings screen.

Methods to close the screen
Press the [SET] menu key to complete the project settings without errors.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.16.6 Device Settings Screen

6.16.6.1 Outline

This enables the number of devices used in multiple projects to be set.



	01	02	03	04	05	06	COMMON	TOTAL	REMAIN
M	20480	20480	20480	20480	20480	20480	0	122880	0
L	512	512	256	256	256	256	0	2048	0
B	20480	20480	18432	18432	18432	18432	0	114688	0
F	0	0	0	0	0	0	2048	2048	2048
SB	512	512	256	256	256	256	0	2048	0
V	256	256	128	128	128	128	0	1024	0
S	0	0	0	0	0	0	0	0	0
T	1024	1024	512	512	512	512	0	4096	0
ST	64	64	32	32	32	32	0	256	0
C	256	256	128	128	128	128	0	1024	0
D	2048	2048	1024	1024	1024	1024	0	8192	0
W	8192	8192	2048	2048	2048	2048	0	24576	0
SW	512	512	256	256	256	256	0	2048	0
TOTAL	15.7K	15.7K	7.6K	7.6K	7.6K	7.6K			

6.16.6.2 Screen Display Items

The following table describes the screen display items for the device settings screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	This is displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
List	This displays the number of devices and the number of common M devices set in projects.

6.16.6.3 Enabled/Disabled State of Menu Keys

The menu keys displayed on the device settings screen are always enabled.

6.16.6.4 Status during Screen Displays

The following table describes the status when displaying the device settings screen.

Item name	Operation
List	This displays the status of the number of devices for projects set in the NC.

6.16.6.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Device Settings Screen."
Maximum project No.	This sets the focus to the maximum project No. This changes the maximum project no. selection when the focus is already set.
Settings	Refer to "Configuring Device Settings."
Close	Refer to "Closing the Device Settings Screen."

6.16.6.6 Entering the Number of Devices

Rules for setting the number of devices

The following table describes the rules and precautions regarding the setting of the number of devices using the PLC On-board.

Setting Rules and Precautions
Set the number of devices in intervals of 16 (multiples of 16).
Up to 61,440 points can be set for each device, but the number of devices cannot be set over the maximum number of all devices.
The total number of devices that can be used in one project is 29,000 words.
The total number of devices set in a project cannot be changed.
Changing the number of devices clears the number of common M devices.
The number of devices can be set to projects that are not used, but this decreases the number of devices that can be set for used projects.

Entering the number of devices

1. Use the cursor keys to move the position to set the number of devices.
2. Press the [INPUT] key to display the device number entry field at the bottom of the list and move the focus.

3. Enter the number of devices in accordance with the previously described rules and precautions, and then press the [INPUT] key. Press the INPUT key to close the device number entry field. The entered number of devices displays at the cursor position in the list.

Enter the number of common M devices

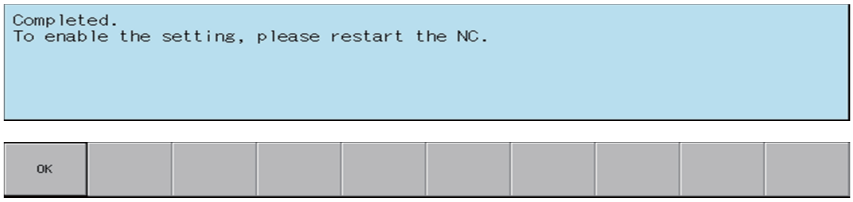
1. Use the cursor keys to move the position to set the number of common devices.
2. Press the [INPUT] key to display the common device number entry field at the bottom of the list and move the focus.

3. Enter the number of common devices and press the [INPUT] key. Press the INPUT key to close the common device number entry field. The entered number of common devices displays at the cursor position in the list.

6.16.6.7 Configuring Device Settings

Normal operation

1. Refer to "Entering the Number of Devices" and specify the number of devices.
2. Refer to "Entering the Number of Devices" and specify the number of common M devices.
3. Press the [SET] menu key.
4. The following message screen displays if the device settings complete without error. Closing the message screen closes the device settings screen and returns to the multiple project parameters screen.



Abnormal operation

This information describes the details of error messages displayed on the device settings screen and the corrective action thereof.

Error message	Error description	Corrective action
Please set the number of devices by delimiting 16 points.	This is displayed when the number of devices is not delimited by 16.	Enter a device number that is an interval of 16.
Set the total number of devices per project to 29,000 words or less.	This is displayed when the total number of devices per project is over 29,000 words.	Enter the device numbers so that the total number of devices per project is less than 29,000 words.
The maximum number of devices that can be set is 60,000.	This is displayed when there are areas where the number of devices entered is more than 60,000.	Enter a number of devices that is less than 60,000.

6.16.6.8 Closing the Device Settings Screen

Use any of the following methods to close the device settings screen.

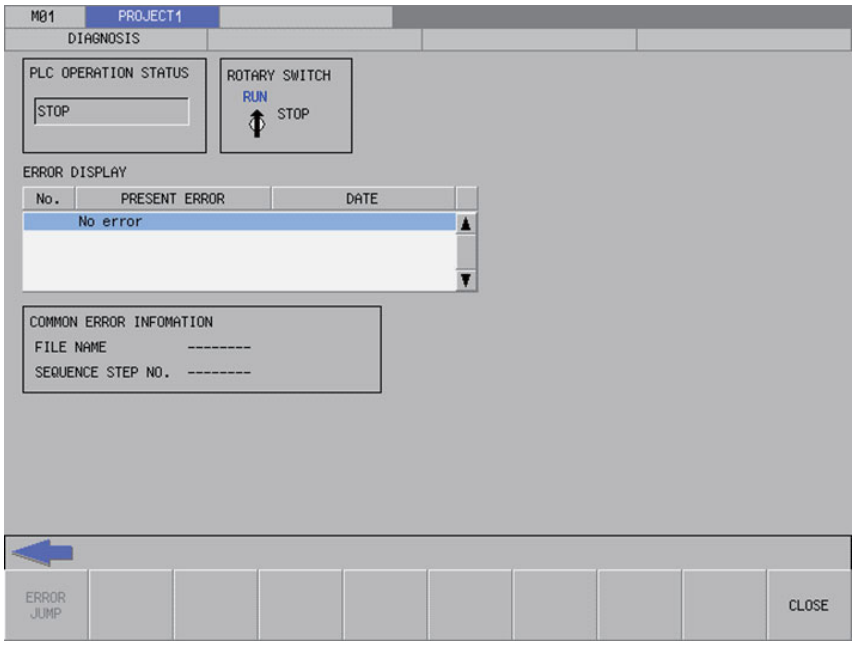
Methods to close the screen
Press the [SET] menu key to complete the device settings without errors.
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.17 PLC Diagnosis Menu

6.17.1 PLC Diagnosis Screen

6.17.1.1 Outline

This displays the details of error that occur when executing sequence programs.
Refer to "Peripheral Development Environment Description: Checking PLC Alarms on the CNC Controller" for details on errors.



6.17.1.2 Screen Display Items

The following table describes the screen display items for the PLC diagnosis screen.

Item name	Display state
Connected NC name	This displays the name of the connected NC.
Current project No.	This displays the current project number.
Current project label	This displays the project label.
Alarm messages	Alarm messages are displayed when alarms occur.
Left arrow key	This is displayed when enabled.
Soft keyboard	This is displayed only when parameters are enabled.
Rotary switch	This displays the status of the "CS2" rotary switch on the NC device body.
PLC operation status	This displays the PLC operation status of the currently used project.
Error display	This displays information on errors that occurred with the currently used project.
Common error information	This displays detailed information on errors that occurred with the project selected in the error information.

6.17.1.3 Enabled/Disabled State of Menu Keys

The following table describes the conditions upon which menu keys displayed on the program settings screen are enabled/disabled. The menu keys which are not described in the following table are always enabled.

Menu name	Condition upon which it is enabled/disabled
Error jump	This is enabled when an error occurs with a sequence program and the sequence step No. that generated the error is known.

6.17.1.4 Status during Screen Displays

The following table describes the status when displaying the PLC diagnosis screen.

Item name	Operation
Rotary switch	This displays the current status of the rotary switch.
PLC operation status	This displays the PLC operation status of the currently used project.
Error display	This displays information on errors that occurred with the currently used project.
Common error information	This displays detailed information on errors that occurred with the project selected in the error information.

6.17.1.5 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the PLC Diagnosis Screen."
Error jump	Refer to "Error Jump."
Close	Refer to "Closing the PLC Diagnosis Screen."

6.17.1.6 Rotary Switch Status

This displays the status of the "CS2" rotary switch on the NC device body. The display changes depending on the status of the "CS2" rotary switch as illustrated in the following diagram.

• When 0 (normal)

• When 1 (PLC is not running)

6.17.1.7 Error Display

This displays the project number, error number, type of error, date and time the error occurred (hour, minute, seconds), file name, sequence step number, and the parameter number.

This displays "--------" for errors in which the file name, sequence step number, and parameter number are unknown.

The date is displayed using 4 digits according to the Western calendar. (2000-2099)

6.17.1.8 Error Jump

This jumps to the step in the ladder program shown in the common error information regarding the current error. If the project in which the error occurred is different from the current project, this changes the connected project and then opens the ladder screen.

If the error jump cannot be performed, perform the corrective action steps according to the "PLC Alarm List."

6.17.1.9 Closing the PLC Diagnosis Screen

Use any of the following methods to close the PLC diagnosis screen.

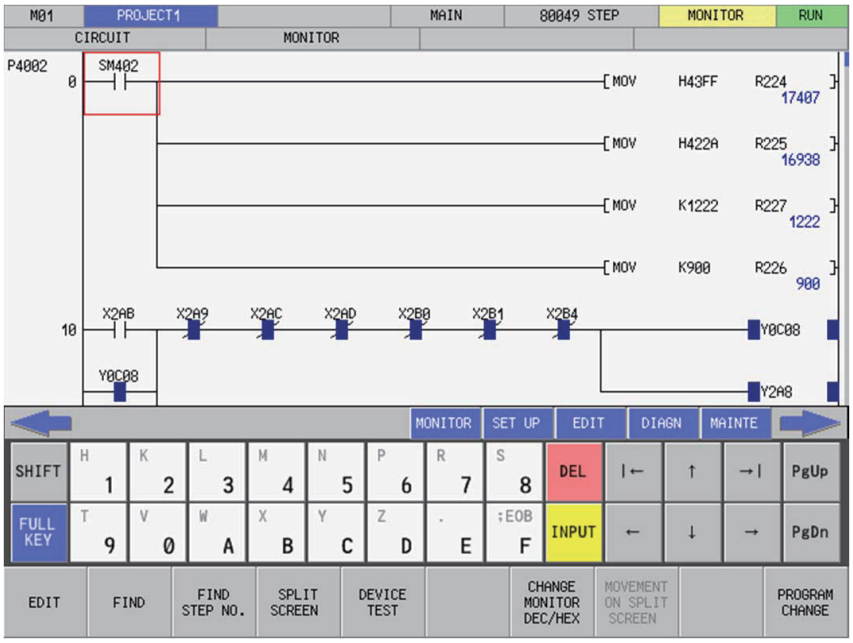
Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.18 Soft Keyboard

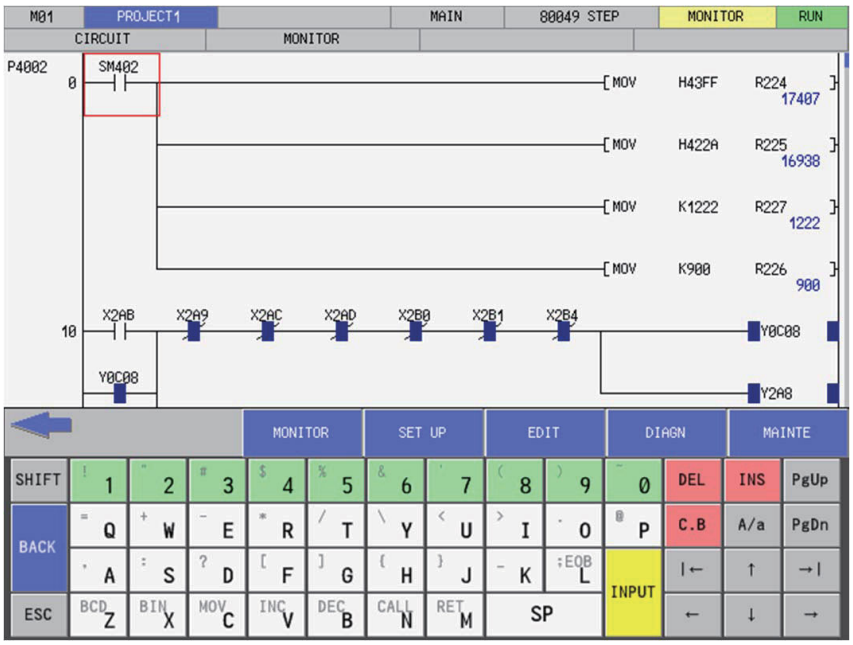
6.18.1 Outline

A soft keyboard is placed on the screen of touch panel display devices to enable operation by the user.
A 2-row keyboard is displayed for normal use. The 2-row keyboard displays quick keys intended for entering step numbers and devices.
A 4-row keyboard displays when it is necessary to enter commands and text strings. Menu keys are not displayed when the 4-row keyboard is displayed.

• 2-row keyboard display



• 4-row keyboard display



6.18.2 Description of Keys

6.18.2.1 Alphanumeric Keys, Symbol Keys

Key	Operation
1 2 3 4 5 6 7 8 9 0 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z SP ; E0B	The entry of each character key is displayed in the corresponding input parameter. Enabling the Caps mode allows switching between uppercase and lowercase English letters (same as a normal keyboard).
! " # $ % & ' ( ) ~ = + – * / ¥ < > . @ , : ? [ ] { } _	Pressing the [Shift] key plus some character key issues the corresponding control.

6.18.3 Special Keys

Key	Operation
INPUT	Pressing the [Enter] key issues the command to the corresponding input parameter.
ESC	Pressing the [ESC] key issues the command to the corresponding input parameter.
A/a	Turns the keyboard CapsLock on. Pressing this again turns CapsLock off. CapsLock is disabled while pressed. (lower case input) CapsLock is enables when released. (uppercase input)
SHIFT	Sets the keyboard to the Shift mode so that the key to the upper-left of keys can be input. Pressing again or entering one character cancels the Shift mode. Pressing [Ctrl] does not cancel the Shift mode. Pressing Ctrl+Shift+some other key issues the key code corresponding to the combination of Ctrl and the key. Shift mode is enabled by being pressed. Shift mode is disabled by being released.
PgUp	Pressing the [Page Up] key issues the command to the corresponding input parameter.
PgDn	Pressing the [Page Down] key issues the command to the corresponding input parameter.

Key	Operation
INS	This changes the input mode from overwrite to insert and from insert to overwrite. Pressing the [Insert] key issues the command to the corresponding input parameter.
DEL	This deletes one character before the cursor. Pressing the [Delete] key issues the command to the corresponding input parameter.
C. B	This deletes all data input into the corresponding parameter. Pressing the [Shift + Home] keys issues the command to the corresponding input parameter.
← → ↑ ↓	These move the cursor. Press the cursor keys issues the command to the corresponding input parameter.
→|	Pressing the TAB key issues the command to the corresponding input parameter.
|←	Pressing the Shift + TAB keys issues the command to the corresponding input parameter.
MONITOR	This switches from the PLC On-board to the operation screen in the Mitsubishi Standard Display.
SET UP	This switches from the PLC On-board to the set up screen in the Mitsubishi Standard Display.
EDIT	This switches from the PLC On-board to the edit screen in the Mitsubishi Standard Display.
DIAGN	This switches from the PLC On-board to the diagnosis screen in the Mitsubishi Standard Display.
MAINTE	This switches from the PLC On-board to the maintenance screen in the Mitsubishi Standard Display.

* The operation of each key must be supported by the processing performed for the corresponding input parameter. If not supported, there is no resulting operation from pressing these buttons.
* Only the cursor keys, the Tab key, the reverse Tab key, the Pg Up key, and the Pg Dn key can issue repeatedly by pressing and holding the keys.

6.19 Canceling File Passwords

6.19.1 Outline

There are two methods to cancel file passwords: canceling with menu keys (password cancellation menu) and canceling when accessing files.

* Refer to "NC File Operation Menu: Cancel Password Popup Screen" for information on canceling passwords with menu keys.

The screen for canceling passwords when accessing files displays when the file access attribute matches the password attribute due to key operation.

* Refer to "PLC Data: PLC Data File Passwords" for more information.

Operation	Registered attribute		Displayed password cancellation screen
	Writes not allowed	Reads and writes not allowed	
NC File Operation Menu	No	Yes	List cancellation
Open (Opened screen display) -> Open			
File operation (file operation screen display)	Yes	Yes	Single deletion
Delete data (delete data popup display) -> Delete			
Rename data (rename data popup display) -> Change	Yes	Yes	Single deletion
Cancel password	Not applicable		List cancellation
PLC version up	Yes	Yes	List cancellation
External file operation menu	Yes	Yes	List cancellation
External -> NC (External -> NC screen display) -> Execute			
NC -> External (NC -> External screen display) -> Execute	No	Yes	List cancellation
Verify external file (verify external file screen) -> Execute	No	Yes	Single deletion
Cancel password	Not applicable		List cancellation
Ladder edit menu	Yes	Yes	Single deletion
Ladder edit (ladder screen) -> Edit -> Convert ladder			
Starting PLC On-board with single project settings	Not applicable		Not displayed
Changing projects with multiple project settings	Not applicable		Not displayed

6.19.2 Canceling Individual File Passwords

6.19.2.1 Screen Display Items

The following table describes the screen display items for the cancel individual file password screen.

Item name	Display state
Password	Enter the password. Entered passwords are displayed using asterisks. Input range: 4 single-byte alphanumeric characters

6.19.2.2 Enabled/Disabled State of Menu Keys

The menu keys displayed on the cancel individual file passwords screen are always enabled.

6.19.2.3 Status during Screen Displays

The following table describes the status when displaying the cancel individual file passwords screen.

Item name	Operation
Password	This is the default focus position when the screen is displayed. This is left blank.

6.19.2.4 Operation of Key Presses

The following table describes the operation of each menu key and the keys on the NC keyboard when pressed.

Item name	Operation
Left arrow key	Refer to "Closing the Cancel Individual File Passwords Screen."
Execute	Refer to "Canceling Passwords."
Close	Refer to "Closing the Cancel Individual File Passwords Screen."

6.19.2.5 Canceling Passwords

Normal operation

1. Enter the password.
2. Press the [EXECUTE] menu key.
   Pressing the menu key closes the password cancellation screen and continues with the original process.

Abnormal operation

This information describes the details of error messages displayed when entering passwords and pressing the [EXECUTE] menu key and the corrective action thereof.

Error message	Error description	Corrective action
Invalid Password. Enter correct password.	This is displayed when the [EXECUTE] menu key is pressed after entering an incorrect password.	The file for which an incorrect password was entered is displayed again. Enter the correct password and then press the [EXECUTE] menu key again.

6.19.2.6 Closing the Cancel Individual File Passwords Screen

Use any of the following methods to close the cancel individual file passwords screen.

Methods to close the screen
Press the [CLOSE] menu key.
Press the left arrow key.
Press the [ESC] key on the soft keyboard.

6.19.3 Canceling Batch File Passwords

Refer to "NC File Operation Menu: Cancel Password Popup Screen" for more information on canceling batch file passwords.

6.20 Restrictions

6.20.1 Enhanced PLC Security Mode

When enhanced PLC security mode is enabled on a CNC, some functions of PLC on-board development are restricted. For details on the enhanced PLC security mode, refer to "9.1 Enhanced PLC Security Mode".

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Appx.1: Comparison of PLC Related Sections in Each Model

7.1 Device Comparison

Table 1.1 List of device differences (Machining center system)

		M7 Series Device range		M8 Series Device range	
X		X0 to X1FFF	8192 points	X0 to X1FFF	8192 points
Y		Y0 to Y1FFF	8192 points	Y0 to Y1FFF	8192 points
M		M0 to M10239	10240 points	M0 to M61439	61440 points
L		L0 to L511	512 points	L0 to L1023	1024 points
F		F0 to F1023	1024 points	F0 to F2047	2048 points
SB		SB0 to SB1FF	512 points	SB0 to SB3FF	1024 points
B		B0 to B1FFF	8192 points	B0 to BDFFF	57344 points
SM		SM0 to SM1023	1024 points	SM0 to SM2047	2048 points
V		V0 to V255	256 points	V0 to V511	512 points
SW		SW0 to SW1FF	512 points	SW0 to SW3FF	1024 points
SD		SD0 to SD1023	1024 points	SD0 to SD2047	2048 points
T		T0 to T703	704 points	T0 to T2047	2048 points
ST		ST0 to ST63	64 points	ST0 to ST127	128 points
C		C0 to C255	256 points	C0 to C511	512 points
D		D0 to D2047	2048 points	D0 to D4095	4096 points
R		R0 to R32767	32768 points	R0 to R32767	32768 points
ZR		Unsupported		ZR0 to ZR13311	13312 points
W		W0 to W1FFF	8192 points	W0 to W2FFF	12288 points
Z		Z0 to Z13	14 points	Z0 to Z13	14 points
N		N0 to N7	8 points	N0 to N14	15 points
P		P0 to P2047 P4000 to P4005	2048 points	P0 to P4095	4096 points
K	16-bit command	K-32768 to K32767		K-32768 to K32767	
	32-bit command	K-2147483648 to K2147483647		K-2147483648 to K2147483647	
H	16-bit command	H0 to HFFFF		H0 to HFFFF	
	32-bit command	H0 to HFFFFFFFF		H0 to HFFFFFFFF	

8

Appx.2: List of PLC Alarms

PLC diagnosis for each CNC PLC alarm, as well as the error details, causes and remedies are provided below.

NC alarm display (M8 Series)				NC operating status	PLC diagnosis				
Message	Level	Sub-status			Error code SD0	Diagnosis display character string	File name	Step No.	
		1	2						
U01 No user PLC	ALM (Red)	-	-	Emergency stop (S/W EMG)	-	-	-	-	
U10 Illegal PLC (User PLC is illegal) "xx" in the lower 16 bits of the sub-status 1 indicates the program No. (0x01 to 0x78(in the hexadecimal form)) The sub-alarm No. "yy" of sub-status 1 indicates the project No. ("yy" is not displayed when the maximum number of projects is 1)	ALM (Red)	0x04xx	Step No.	Emergency stop (S/W EMG)	4	S/W INT. ERR	○	○	
	ALM (Red)	0x100*	-	Emergency stop (S/W EMG)	10	H/W ERR			
	ALM (Red)	0x110*	-	Emergency stop (S/W EMG)	11	PLC SYS INIT ERR			
	ALM (Red)	0x120*		Emergency stop (S/W EMG)	12	LAD NUM OVER			
	ALM (Red)	0x130*		Emergency stop (S/W EMG)	13	DATA NUM OVER			
	ALM (Red)	0x20xx.yy	Step No.	Emergency stop (S/W EMG)	20	JUMP LABEL ERR	○	○	
	ALM (Red)	0x21xx.yy	Step No.	Emergency stop (S/W EMG)	21	DUP. LABEL(P)	○	○	
	ALM (Red)	0x22xx.yy	-	Emergency stop (S/W EMG)	22	LOCAL LABEL OVER	○		
	ALM (Red)	0x230*.yy	-	Emergency stop (S/W EMG)	23	LABEL PARA. ERR			
	ALM (Red)	0x24xx.yy	Step No.	Emergency stop (S/W EMG)	24	RSV. LABEL ERR	○	○	
	ALM (Red)	0x25xx.yy	-	Emergency stop (S/W EMG)	25	PRG. PARA. ERR	○		

	Error Contents and Cause	Remedy
	No sequence program is included in the built-in ROM or temporary memory area. (1) Sequence program is not stored in the built-in ROM. (2) Sequence program is not written from the GX Developer/GX Works2 or internal PLC edit function. (3) Sequence program cannot be read due to broken built-in ROM. (4)No large capacity PLC additional specifications.	(1) Write the sequence program from the GX Developer/GX Works2 or internal PLC edit function, and then execute the built-in ROM writing. (2) Check the presence of additional specification "Large PLC capacity" and reconsider the storable size. (3) If (1) or (2) does not solve the problem, there is a possibility that built-in ROM is broken.
	Software instruction interruption illegal An error was found in data for the sequence program in execution. (1) Sequence program stored in the built-in ROM is broken. (2) Sequence program under development (before writing into F-ROM) is broken.	Contact Mitsubishi.
	A H/W error was detected during the PLC execution.	Contact Mitsubishi.
	The PLC system execution preparation failed.	Contact Mitsubishi.
	Ladder count is over limit (at PLC system startup) The total number of "ladder files" stored in the built-in ROM exceeded the maximum.	Write "sequence program", "comment file", "PLC message file", and "symbolic information file" again.
	Data count is over limit (at PLC system startup) The total number of "comment files", "PLC message files", and "symbolic information files" stored in the built-in ROM exceeded the maximum.	Remedy the error in either of the following methods. (1) Select [Format PLC memory] with GX Developer/GX Works2 and format the memory after setting [Target memory] to [Memory card(RAM)]. After that, write "comment file", "PLC message file", and "symbolic information file" again. (2) Create a ladder with [Add New Data] using the built-in PLC editing function and execute "Format". After that, write "sequence program", "comment file", "PLC message file", and "symbolic information file" again.
	Label branching error (Before executing PLC) Occurs only when the bit selection parameter (#6452 bit6) "branch destination label check valid" is set to "1". (1) The CJ and CALL instructions were placed to a nonexistent label. (2) The CJ instruction was placed to the global label. (Branching is possible only with the CALL instruction.)	Check the branch destination of the CJ and CALL instructions existing in the steps occurred.
	Label duplication error (Before executing PLC) (1) When using the multi-programming method: - Labels of common pointer are duplicated - Labels of local pointer are duplicated within the same file (2) When using the independent program method, labels are duplicated.	Correct the duplication of the labels existing in the steps occurred.
	Local label over (Before executing PLC) * "Local label" is as "labels of local pointer". The boundary value set with the PC parameter (common pointer boundary value) has been exceeded by the total number of labels of local pointer.	(1) Reduce the number of local labels used. - Use as sequentially as possible from P0. (2) Reset the PC parameter (common pointer boundary value).
	Global label boundary value error (Before executing PLC) * "Global label" is as "labels of common pointer". The content of PC parameter (common pointer boundary value) is not normal. (1) When using the multi-programming method, a value greater than the maximum value is set. (2) When using the independent program method, the label boundary value of common pointer is set.	(1) When using the multi-programming method, correct the common pointer boundary value to an appropriate value. (2) When using the independent program method, delete the common pointer boundary value.
	Reserved label error (Before executing PLC) (1) When using the multi-programming method, disabled reserved label exists. (2) When using the independent program method, reserved labels are duplicated.	(1) When using the multi-programming method, delete the reserved label. (2) When using the independent program method: - Delete the PC parameter program settings. - Correct the duplication of reserved labels.
	Program setting error (Before executing PLC) (1) When using the multi-programming method, PC parameter setting is not correct. - PC parameter (program setting) is not set. - Unstored program name is set. - The contents of the program name is abnormal. - More than the maximum number of programs that can be set (120 programs) are set (2) When using the independent program method, multiple programs are stored. (3) When the multi-project is valid, the sum of all projects exceeds the number of the programs which can be set (120 programs).	(1) When using the multi-programming method, check the PC parameter program settings. - Check the program settings. - Check the program name stored in the NC. - Review the program name and rename it if necessary. e.g. The program name and the M device number in the PLC program are overlapped. - Set the number to 120 or less. (2) When using the independent program method: - Store only one program file. (3) When the multi-project is valid, set the number of programs that can be set to be less than 120 programs as the sum of all projects.

NC alarm display (M8 Series)				NC operating status	PLC diagnosis				
Message	Level	Sub-status			Error code SD0	Diagnosis display character string	File name	Step No.	
		1	2						
U10 Illegal PLC (User PLC is illegal) "xx" in the lower 16 bits of the sub-status 1 indicates the program No. (0x01 to 0x78(in the hexadecimal form)) The sub-alarm No. "yy" of sub-status 1 indicates the project No. ("yy" is not displayed when the maximum number of projects is 1)	ALM (Red)	0x26xx.yy	-	Emergency stop (S/W EMG)	26	MISSING RET INS.	○		
	ALM (Red)	0x27xx.yy	Step No.	Emergency stop (S/W EMG)	27	LAD. CODE ERR	△	△	
	ALM (Red)	0x280*	-	Emergency stop (S/W EMG)	28	MISSING LAD(M)			
	ALM (Red)	0x29xx.yy	-	Emergency stop (S/W EMG)	29	EXE. AREA OVER	○		
	ALM (Red)	0x30xx.yy	Step No.	Emergency stop (S/W EMG)	30	FOR INS. OVER	○	○	
	ALM (Red)	0x31xx.yy	Step No.	Emergency stop (S/W EMG)	31	NEXT INS. ERR	△	△	
	ALM (Red)	0x32xx.yy	Step No.	Emergency stop (S/W EMG)	32	BREAK INS. ERR	○	○	
	ALM (Red)	0x400*	-	Emergency stop (S/W EMG)	40	PLC SYSTEM DOWN			
	ALM (Red)	0x500*	-	Emergency stop (S/W EMG)	50	MLT PRJ NUM ILL			
	ALM (Red)	0x510*	-	Emergency stop (S/W EMG)	51	PRJ RATE PRM ILL			
	ALM (Red)	0x520*	-	Emergency stop (S/W EMG)	52	LAD TMP AREA OVR			
	ALM (Red)	0x530*	-	Emergency stop (S/W EMG)	53	LAD ROM AREA OVR			
	ALM (Red)	0x540*	-	Emergency stop (S/W EMG)	54	COM AREA OVR			
	ALM (Red)	0x550*	-	Emergency stop (S/W EMG)	55	MLT EXE-TYPE ILL			

	Error Contents and Cause	Remedy
	RET instruction error (1) RET instruction was not executed at the branch destination of the CALL instruction. (2) RET instruction was executed without execution of CALL instruction.	Check the following matters for the entire sequence program to be executed. (1) Check if RET instruction is programmed at the end of sub-routine (2) Check if diverged to the other operation in the middle of sub-routine and RET instruction is not executed. (3) Check if jumped to the END reservation label (P4005) in the middle of sub-routine. (4) Check if there is delimiter (FEND instruction) between adjacent program and sub-routine program.
	Ladder code error (Before executing PLC) An error was found in data for the sequence program to be executed. (1) Disabled PLC instruction is used. (2) Sequence program stored in the built-in ROM is broken. (3) Sequence program under development (before writing into the built-in ROM) is broken.	Transferring, storing and F-ROM writing of the sequence program must be re-executed with the GX Developer/GX Works2 or PLC on-board edit function.
	No main processing ladders (Before executing PLC) Main processing program to be executed cannot be> (1) When using the multi-programming method, check the PC parameter program settings. (2) When using the independent program method, add the reservation label (P4002) for the medium speed ladder.	(1) When using the multi-programming method, check the PC parameter program settings. (2) When using the independent program method, add the reservation label (P4002) for the medium speed ladder.
	Execution area over (Before executing PLC) The total number of steps for the ladder to be executed has exceeded the size of PLC processor execution area.	Check the PC parameter (program setting) and set so that the total number of steps for the ladder to be executed does not exceed the PLC processor execution area.
	FOR instruction nesting over 17th level of nesting for FOR instruction was executed.	Check the number of FOR instruction's nesting depth in the steps to which the error occurred, and limit the number to 16 or less.
	NEXT instruction error (1) NEXT instruction was executed before FOR instruction. (2) After FOR instruction, END(FEND) was executed before NEXT instruction.	(1) Check and correct the NEXT instruction in the step to which the error occurred. (2) Check and correct the ladder circuit of the program to which the error occurred. (Note that the number of steps at the error position is displayed as "0".) - Check if JMP,CALL,CJ instructions were executed between FOR and NEXT instruction, and NEXT instruction was jumped. - Check if FOR instruction and NEXT instruction are all paired.
	BREAK instruction error BREAK was executed outside the range between FOR and NEXT instruction.	Check and correct the BREAK instruction in the step to which the error occurred.
	PLC system error	Contact Mitsubishi.
	Maximum project No. illegal (at PLC system startup) Multi-project parameter setting is illegal (due to the following reason). - The value outside the setting range (1 to number of usable project) was detected.	(1) Check the presence of the expansion project additional specification and reconsider the setting range. (2) The multi-project parameter (maximum project No.) setting is illegal. Set the multi-project parameter again. (3) If (1) or (2) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Project ratio illegal Multi-project parameter setting is illegal (due to the following reason). - It was detected that the total of ratios of all projects was outside the range from 0 to 100.	(1) The multi-project parameter (project ratio) setting is illegal. Set the multi-project parameter again. (2) If (1) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Temporary memory area over (at the PLC system startup) Multi-project parameter setting is illegal (due to the following reason). - The ratio to which the area after the project ratio setting is smaller than the size of ladder stored in the temporary memory area was detected.	(1) Check the presence of the large-capacity PLC additional specification and reconsider the size that can be stored. (2) The multi-project parameter (project ratio) setting is illegal. Set the multi-project parameter again. (3) If (1) or (2) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Built-in ROM area over (at the PLC system startup) Multi-project parameter setting is illegal (due to the following reason). - The ratio to which the area after the project ratio setting is smaller than the size of ladder stored in the built-in ROM area was detected.	(1) Check the presence of the large-capacity PLC additional specification and reconsider the size that can be stored. (2) The multi-project parameter (project ratio) setting is illegal. Set the multi-project parameter again. (3) If (1) or (2) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Comment area over (at the PLC system startup) Multi-project parameter setting is illegal (due to the following reason). - The ratio to which the area after the project ratio setting is smaller than the size of comment and message stored in the built-in ROM area.	(1) The multi-project parameter (project ratio) setting is illegal. Set the multi-project parameter again. (2) If (1) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Execution project illegal (at the PLC system startup) Multi-project parameter setting is illegal (due to the following reasons). - The value outside the setting range (ON/OFF) was detected. - All execution projects are OFF.	(1) The multi-project parameter (execution project) setting is illegal. Set the multi-project parameter again. (2) If (1) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.

NC alarm display (M8 Series)				NC operating status	PLC diagnosis				
Message	Level	Sub-status			Error code SD0	Diagnosis display character string	File name	Step No.	
		1	2						
U10 Illegal PLC (User PLC is illegal) "xx" in the lower 16 bits of the sub-status 1 indicates the program No. (0x01 to 0x78(in the hexadecimal form)) The sub-alarm No. "yy" of sub-status 1 indicates the project No. ("yy" is not displayed when the maximum number of projects is 1)	ALM (Red)	0x560*	-	Emergency stop (S/W EMG)	56	MLT EXE-NO ILL			
	ALM (Red)	0x570*	-	Emergency stop (S/W EMG)	57	COM DEV PARA ILL			
	ALM (Red)	0x580*.yy	-	Emergency stop (S/W EMG)	58	DEV NUM PARA ILL			
	WNG (Yellow)	0x700*.yy	-	PLC RUN	70	RUNWRT ILL. MODE			
	WNG (Yellow)	0x71xx.yy	Step No.	PLC RUN	71	RUNWRT CPOINT(F)	○	○	
	WNG (Yellow)	0x720*	-	PLC RUN	72	RUNWRT SIZOVR(F)			
	WNG (Yellow)	0x730*.yy	-	PLC RUN	73	RUNWRT LLABEL(F)			
	WNG (Yellow)	0x80xx.yy	Step No.	PLC RUN	80	EXC.INT(BCD)	○	○	
	WNG (Yellow)	0x81xx.yy	Step No.	PLC RUN	81	EXC.INT(BIN)	○	○	
	ALM (Red)	0x82xx.yy	Step No.	Emergency stop (S/W EMG)	82	EXC.INT(D-BUS)	△	△	
	ALM (Red)	0x83xx.yy	Step No.	Emergency stop (S/W EMG)	83	EXC.INT(INST.)	△	△	
	ALM (Red)	0x84xx.yy	Step No.	Emergency stop (S/W EMG)	84	EXC.INT(I-FMT)	△	△	
	ALM (Red)	0x85xx.yy	Step No.	Emergency stop (S/W EMG)	85	EXC.INT(I-BUS)	△	△	
	ALM (Red)	0x86xx.yy	Step No.	Emergency stop (S/W EMG)	86	EXC.INT(CALL)	△	△	
	ALM (Red)	0x87xx.yy	Step No.	Emergency stop (S/W EMG)	87	EXC. INT(MEM.)	△	△	
	ALM (Red)	0x8Bxx.yy	Step No.	Emergency stop (S/W EMG)	91	EXC.INT(A-BUS)	△	△	

	Error Contents and Cause	Remedy
	Project execution order illegal (at the PLC system startup) Multi-project parameter setting is illegal (due to the following reasons). - The value outside the setting range (1 to 6) was detected. - The redundant project execution order number was detected.	(1) The multi-project parameter (project execution order) setting is illegal. Set the multi-project parameter again. (2) If (1) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Parameter setting illegal for the number of common device points (at PLC system startup) Multi-project parameter setting is illegal (due to the following reasons). - The value outside the setting range (0 to the minimum number of points in all projects) was detected. - It was detected that the number of points was not a multiple of 16.	(1) Check the presence of the expansion project additional specification and reconsider the setting range. (2) The multi-project parameter setting is illegal. Set the multi-project parameter again. (3) If (1) or (2) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Parameter setting illegal for number of device points (at PLC system startup) (1) The parameter setting for the number of device points is illegal (due to the following reasons). - The total number of points in one project 29K or more was set. - The illegal value (-1 point or less, or 61441 points or more) for the number of device points was detected. - It was detected that the number of device points was not a multiple of 16. - The number outside the usable number of device points in whole projects was detected.	(1) The parameter setting for the number of device points is illegal. Set the parameter of the number of device points again and reboot the system. (2) If (1) does not solve the problem, there is a possibility that the NC system is broken. Contact Mitsubishi.
	Caution; Ladder program writing during RUN is disabled (In independent program method) With RUN write ON, sequence program is operated in independent program method. Run write is not available with this condition.	The ladder program writing (RUN write) can not be used in independent program method. Disable RUN write, or change the method into multi-program one.
	Caution; Ladder program writing during RUN is disabled (common pointer is used in high-speed processing) With RUN write is ON, high-speed program with common pointer is running. RUN write is not available with this condition.	RUN write is not available when high-speed processing with common pointer is running. Change the high-speed processing program to the one without common pointer.
	Caution; Ladder program writing during RUN is disabled (high-speed processing size is exceeding) With RUN write ON, the execution size of high-speed processing program has exceeded 4000 steps. RUN write is not available with this condition.	RUN write is not available when execution size of high-speed processing program exceeds 4000 steps. Edit the high-speed processing program to reduce the execution size to 4000 steps or less. (When multi-project is valid, edit the program to reduce the execution size to 4000 steps or less in total of all the project.)
	Caution; Ladder program writing during RUN is disabled (number of labels in high-speed processing is beyond the capacity) * "Local label" is as "labels of local pointer". With RUN write ON, the number of labels of local pointer in high-speed processing program has exceeded 256. RUN write is not available with this condition.	RUN write is not available when the number of labels of local pointer in high-speed processing program exceeds 256. Edit the high-speed program to reduce the number of labels of local pointer to less than 256. (When multi-project is valid, edit the program to reduce the number of labels of local pointer to less than 256 per project.)
	Software exceptional interruption (BCD instruction error) has occurred. With BCD and DBCD instructions, BIN value outside its input range was attempted to be converted into BCD.	Check the usage of BCD, DBCD instructions existing in the steps occurred.
	Software exceptional interruption (BIN instruction error) has occurred. With BIN and DBIN instructions, BCD value outside its input range was attempted to be converted into BIN.	Check the usage of BIN, DBIN instructions existing in the steps occurred.
	Software exceptional interruption (Bus error) has occurred.	Contact Mitsubishi.
	Software exceptional interruption (Unmounted instruction error) has occurred. (1) When the bit selection parameter (#6452 bit6) "branch destination label check valid" is set to "0", jumped to an undefined label. (2) Sequence program in execution is broken.	(1) Set the bit selection parameter (#6452 bit6) "branch destination label check valid" to "1" and check the branching step to the undefined label. (2) Contact Mitsubishi.
	Software exceptional interruption (Instruction format error) has occurred.	Contact Mitsubishi.
	Software exceptional interruption (Instruction bus error) has occurred. (1) When the bit selection parameter (#6452 bit6) "branch destination label check valid" is set to "0", jumped to an undefined label. (2) Sequence program in execution is broken.	(1) Set the bit selection parameter (#6452 bit6) "branch destination label check valid" to "1" and check the branching step to the undefined label. (2) Contact Mitsubishi.
	Software exceptional interruption （CALL/RET instruction error）has occurred.	Contact Mitsubishi.
	Software exceptional interruption (memory area error) has occurred.	Contact Mitsubishi.
	Software exceptional interruption (ASYNC BUS error) has occurred.	Contact Mitsubishi.

NC alarm display (M8 Series)				NC operating status	PLC diagnosis				
Message	Level	Sub-status			Error code SD0	Diagnosis display character string	File name	Step No.	
		1	2						
U50 Ladder stopped	WNG (Yellow)	-	-	Emergency stop (S/W EMG)	-	-	-	-	
U55 Ladder stopped / is not saved	WNG(Yellow)	-	-	Emergency stop (S/W EMG)	-	-	-	-	
U60 Ladder is not saved	WNG(Yellow)	-	-	PLC RUN	-	-	-	-	

	Error Contents and Cause	Remedy
	The ladder is stopped.	RUN the PLC
	The ladder is stopped and the edited sequence program is not stored in the built-in ROM. (The contents of temporary memory area and sequence program in the built-in ROM are mismatched.)	Run the PLC. Use GX Developer/GX Works2 or the built-in PLC edit function to perform write to the built-in ROM.
	The edited sequence program is not stored in the built-in ROM. (The contents of temporary memory area and sequence program in the built-in ROM are mismatched.)	Use GX Developer/GX Works2 or the built-in PLC edit function to perform write to the built-in ROM.

9

Appx.3: PLC Function

9.1 Enhanced PLC Security Mode

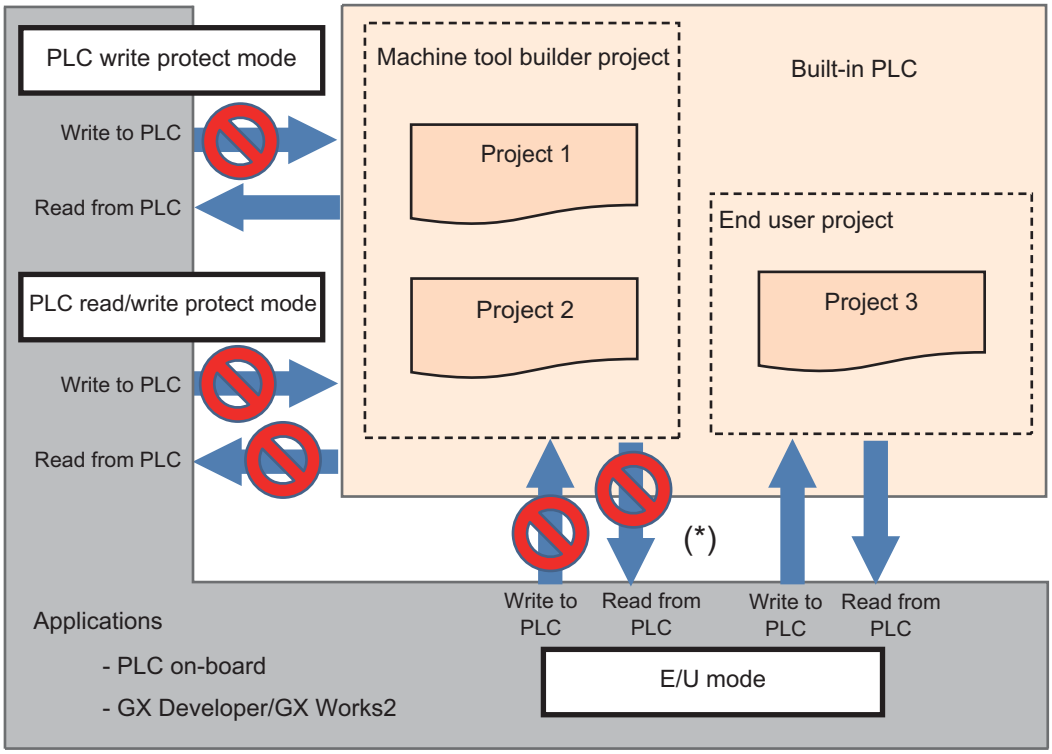
This function restricts connections to the built-in PLC from applications such as PLC on-board and GX Developer/GX Works2. This function helps protect the assets in the built-in PLC.

Two modes are available in this function.

(1) PLC write protect mode, which inhibits only write operations by applications
This mode prevents accidentally overwriting sequence programs and modifying device values when a sequence program is monitored.

(2) PLC read/write protect mode, which inhibits write operations and monitoring operations by applications
This mode protects sequence programs from being overwritten or read out by an unauthorized user.

While this function is used, one of the multi-projects can be set as the "E/U project". (The "E/U mode")
Using this project enables end users to create sequence programs to which a new jig or sensor is to be added. The other sequence programs created by the MTB are protected from changing or deleting, because these projects are prohibited the end users from being connected.



(*) Read/write operations between the application and the machine tool builder project depend on the enhanced PLC security mode settings.

9.1.1 Function Details

9.1.1.1 Definitions of Terms

The following table provides the definitions for the terms used in this section.

Term	Definition
PLC write protect mode	A mode that inhibits write operations to the built-in PLC from PLC on-board and GX Developer/GX Works2.
PLC read/write protect mode	A mode that inhibits read/write operations to the built-in PLC from PLC on-board and GX Developer/GX Works2.
Enhanced PLC security mode	A generic term for PLC write protect mode and PLC read/write protect mode.
E/U	This represents an end user.
MTB	This represents a machine tool builder.
PLC E/U customization	Partial PLC customization by the end user
E/U mode	A mode that allows the end user to partially customize PLC
E/U project	A project that can be customized by the end user
E/U program	A sequence program created and stored in the E/U project by the end user
E/U open device	A project-common device that can be output by an E/U program
E/U open interface	Interface that associates between E/U open devices and output of NC-PLC interface and remote I/O
MTB project	A project other than E/U project
MTB program	A sequence program created and stored in an MTB project by MTB
MTB password	A machine tool builder password It can be changed on the protection setting screen.
Password status	Status of whether the MTB password is disabled or not. The operation level when the password is disabled can be set on the protection setting screen. This section explains on the assumption that all data is accessible when the password is disabled.

9.1.1.2 Enabling Conditions

(1) Enhanced PLC security mode

This function is enabled by setting the following value to the dedicated parameter.

Enhanced PLC security mode		#11761 PLC Security Mode (Enhanced PLC security mode)
Enabled	PLC write protect mode	1
	PLC read/write protect mode	2
Disabled		0

(2) E/U mode

This function is enabled when the following conditions are satisfied.

E/U mode	Enhanced PLC security mode	#11762 E/U Project No. (End-user project number)
Enabled	Enabled (#11761 is set to "1" or "2".)	1 to 6
Disabled	Enabled (#11761 is set to "1" or "2".)	0
	Disabled (#11761 is set to "0".)	-

(3) The connection restriction on GX Developer/GX Works2

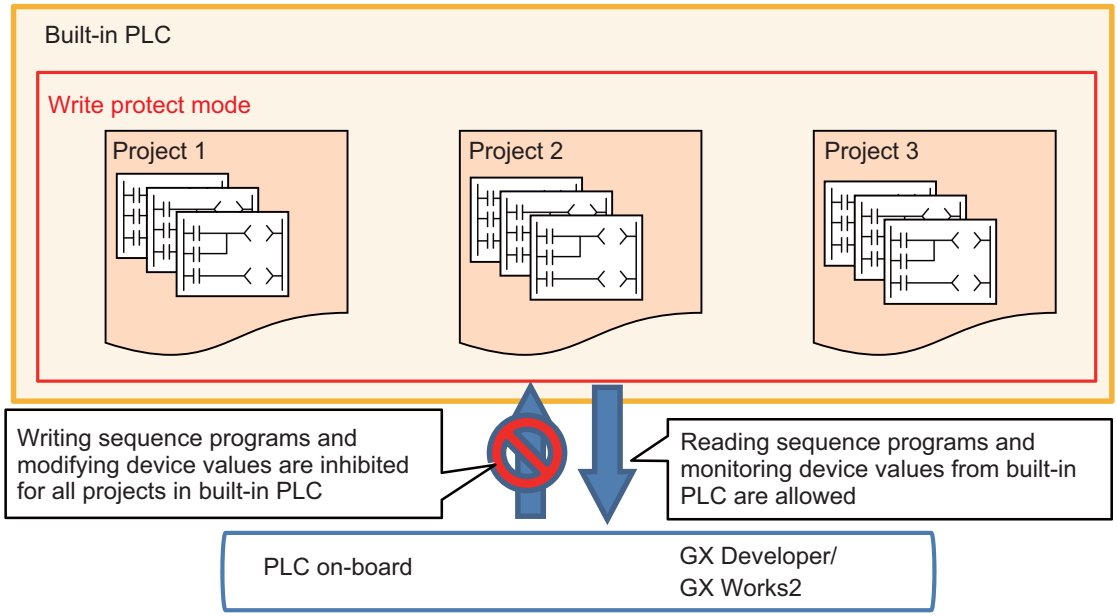
When the parameter "#11094 GX Restriction" (Inhibiting GX Developer/GX Works2 connection) is set to "1", the connection restriction is enabled. When the connection restriction is enabled, the connections to the built-in PLC from GX Developer/GX Works2 are inhibited.

(Note) To certainly secure sequence programs and device values which are managed by the MTB, change the default password for MTB to another one. The following changes can be made on the protect setting screen.
- Changing operation level
- Changing password for each operation level
- Changing protective level for each data

For details on the protect setting screen, refer to "M800S/M80/E80 Series Connection and Setup Manual" or "M800W/M80W Series Connection and Setup Manual".

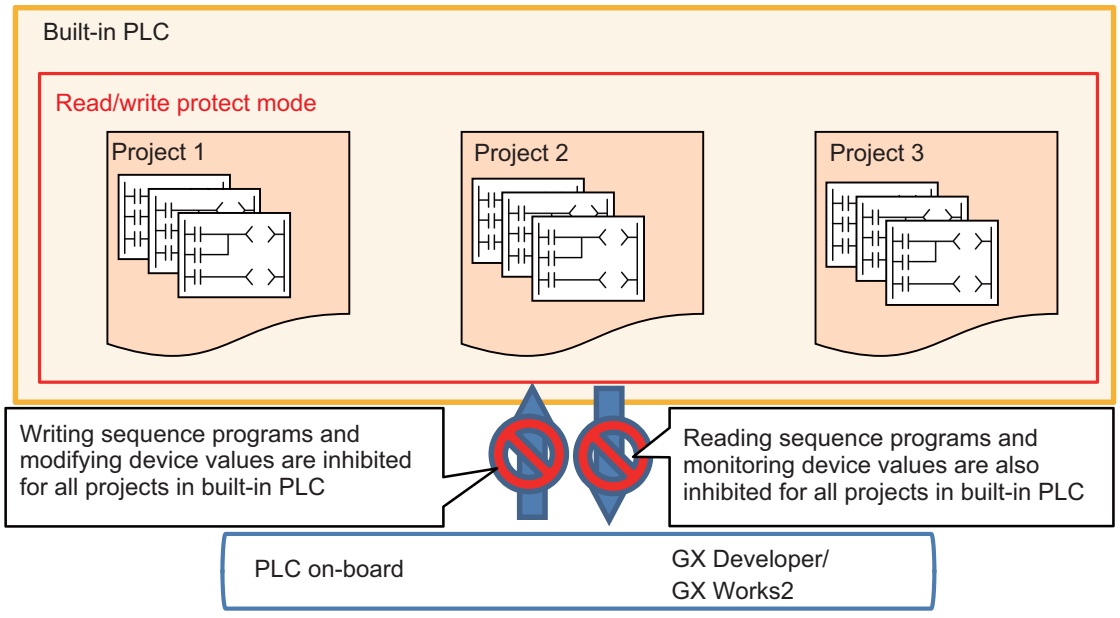
9.1.1.3 PLC Write Protect Mode

The PLC write protect mode inhibits PLC on-board and applications, such as GX Developer or GX Works2, from writing sequence programs and modifying PLC device values for all projects in the built-in PLC. Reading sequence programs and monitoring PLC device values are allowed.
This prevents accidentally overwriting the sequence programs in the built-in PLC and modifying device values when sequence programs are read out or device values are monitored by applications.
For details on the application functions available during the PLC write protect mode, refer to "9.1.1.6 Functions Available in Each Mode".



9.1.1.4 PLC Read/Write Protect Mode

The PLC read/write protect mode inhibits PLC on-board or applications, such as GX Developer or GX Works2, from writing sequence programs and modifying PLC device values for all projects in the built-in PLC. In addition, it also prohibits them from monitoring device values.
This prevents an unauthorized user to connect to the built-in PLC from reading/writing the sequence programs in the built-in PLC and monitoring/modifying PLC device values.
For details on the application functions available during the PLC read/write protect mode, refer to "9.1.1.6 Functions Available in Each Mode".



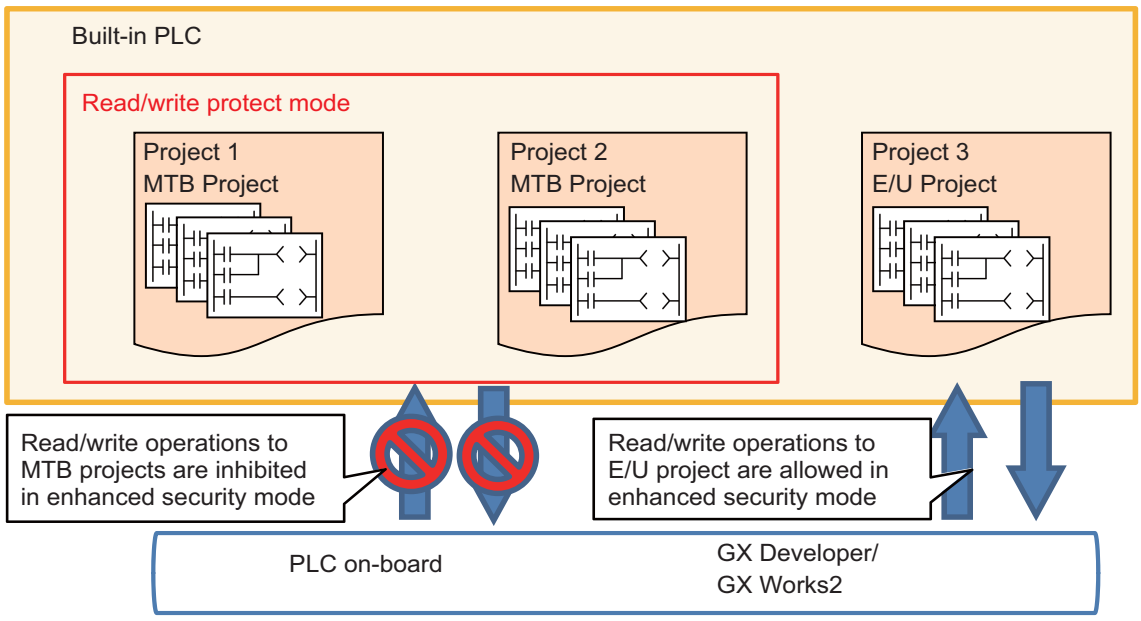
9.1.1.5 E/U mode

In the E/U mode, one of the multi-projects can be set as the "E/U project".
The E/U project can be connected with PLC on-board and GX Developer/GX Works2 irrespective of the enhanced PLC security mode setting and the password status. The connection restrictions between non-E/U project (MTB projects) and the applications depend on the enhanced PLC security mode setting and password status.
This allows end users to create custom sequence programs (E/U programs) in the E/U project and to create necessary control programs when a new jig or sensor is added. The end users, however, are prevented from modifying and deleting sequence programs created by the MTB (MTB programs) because connection restrictions are effective for MTB projects. Note that different restrictions than the enhanced PLC security mode apply to the connection with the E/U project. For details, refer to "Limitations of E/U Project" described later.

The MTB can set whether the E/U mode is enabled and which project number is used for the E/U project via parameters. End users cannot change these settings.
To enable the E/U mode, the enhanced PLC security mode must be set to the PLC write protect mode or the PLC read/write protect mode. When the enhanced PLC security mode is not set, the E/U mode cannot be enabled.

(Note) To enable the E/U mode, change the default password for MTB to another one. The following changes can be made on the protect setting screen.
- Changing operation level
- Changing password for each operation level
- Changing protective level for each data

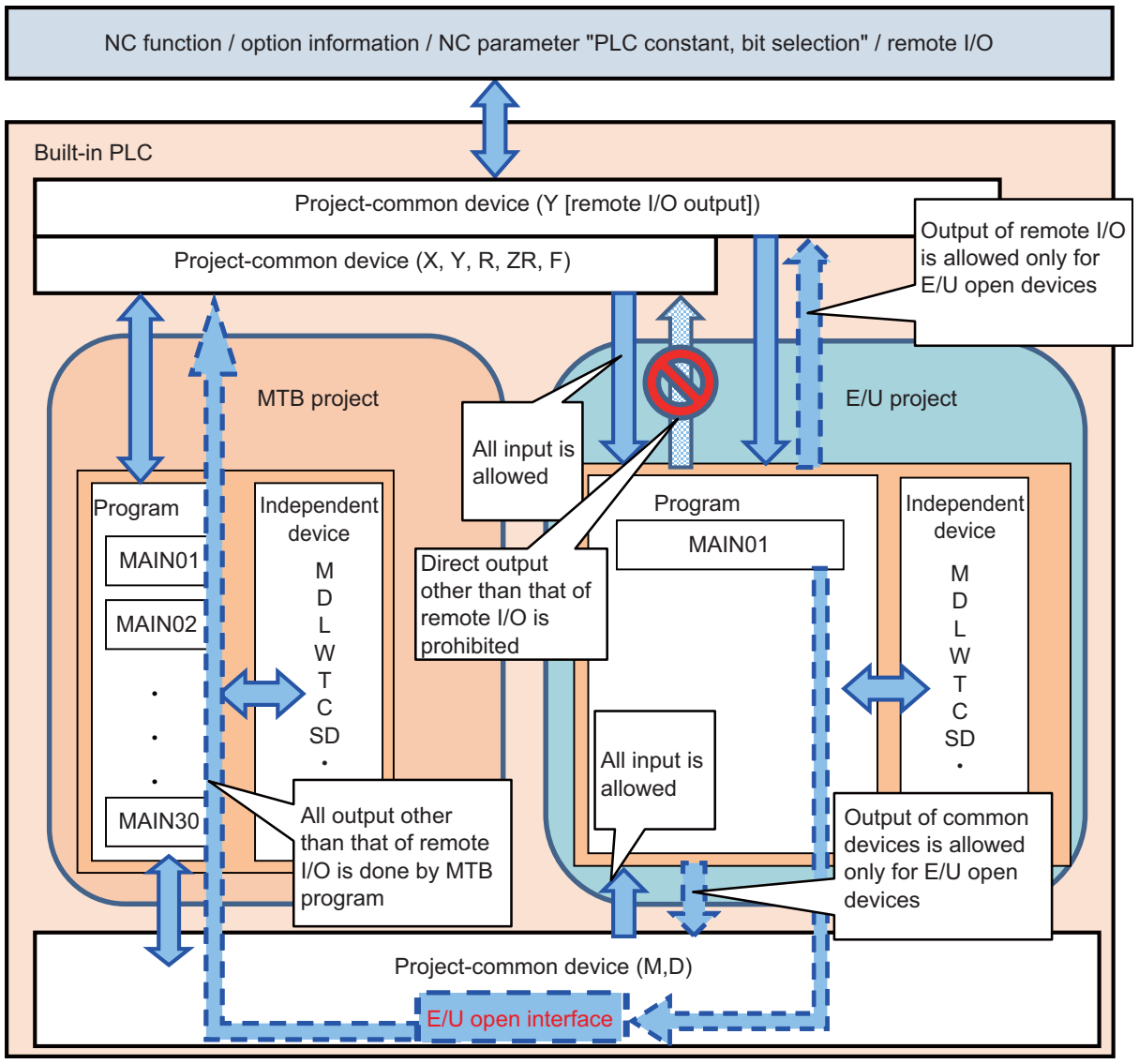
For details on the protect setting screen, refer to "M800S/M80/E80 Series Connection and Setup Manual" or "M800W/M80W Series Connection and Setup Manual".



Built-in PLC configuration

In the E/U mode, end users can create and store sequence programs in the E/U project.
On the other hand, if sequence programs were allowed to be output from E/U programs to all devices without any restrictions, MTB programs might be affected and it could lead to malfunction of the machine.
Consequently, only part of remote I/O (Y device) is available for output from an E/U program. Other output is indirectly performed via project-common devices (M, D devices) by creating interface in MTB programs.
The MTB can set the device range that can be customized by the end user (E/U open device) via parameters.
No restrictions apply to input to E/U programs.

The following shows the configuration of the built-in PLC when the E/U mode is enabled.



Limitations of E/U Project

There are certain limitations on the use of instructions and PLC devices in an E/U program because of the configuration of the built-in PLC in the E/U mode.
Similar limitations on devices apply to the input/output of values between the devices in the E/U project and PLC on-board or GX Developer/GX Works2.
Note that there are also limitations on the application functions that are available for connections with the E/U project in order to prevent end users from modifying the data and the setting of MTB projects.
The following describes these limitations.

(1) Limitations on instructions

The following instructions cannot be used in an E/U program.
BMOV(P), FMOV(P), DECO(P), DSFR(P), DSFL(P), S.ROT, S.ATC, G(P).RIRD, G(P).RIWT, Z(P).REMFR, Z(P).REMTO

A sequence program containing these instructions cannot be written to the E/U project. If a sequence program with these instructions has already been written before the E/U project is set, the program can be read from the E/U project to applications, but when you attempt to execute the sequence program, PLC STOP applies and the alarm "U10 Illegal PLC" is issued.

(2) Limitations on devices

The limitations on devices for an E/U program are listed in the following table. Note that write operations to the devices through index modification are inhibited, while read operations of device values through index modification are allowed for an E/U program.
The listed limitations also apply to the device input/output between the E/U project and PLC on-board or GX Developer/GX Works2.

Category	Device	Limitations on device	Number of devices	Range of output from end user
Common device	X, Y, F, R, ZR	Can be input/only part of Y can be output	Fixed	Output range of Y can be set via NC parameters
Independent device (variable)	L, B, V, T, ST, C, W	Can be input/output	Can be set via multi-project parameter	Fixed (all devices can be output)
Independent device (fixed)	SM, SD, Z	Can be input/output	Fixed	Fixed (all devices can be output)
Independent device (fixed)	N, P	Can be input/cannot be output	Fixed	Fixed (none of devices can be output)
Common/independent device (independent area)	M, D, SB, SW	Can be input/output	Can be set via multi-project parameter	Fixed (all devices can be output)
Common/independent device (common area)	M, D, SB, SW	Can be input/only part of M and D can be output	Can be set via multi-project parameter	Output range of M and D can be set via NC parameters

Sequence programs not in line with these limitations on devices cannot be written to the E/U project. If a sequence program which does not follow these limitations has already been written before the E/U project is set, the program can be read from the E/U project to applications, but when you attempt to execute the sequence program, PLC STOP applies and the alarm "U10 Illegal PLC" is issued.
Outputting a range including both ranges that can be output and cannot be output, and a range including both ranges of common and independent devices are treated to be not in line with the limitations on devices.
For details of which arguments of the available instructions in the built-in PLC are output, refer to "PLC Programming Manual".

(3) Limitations on functions

Formatting from PLC on-board and GX Developer/GX Works2 is not possible while connected to the E/U project. It is also impossible to modify multi-project parameters from PLC on-board.
These limitations prevent end users from deleting MTB programs and modifying MTB project settings.
For details on the functions available for the E/U project, refer to "9.1.1.6 Functions Available in Each Mode".

Limitations of MTB Project

The enhanced PLC security mode setting determines what restrictions apply to the input/output of sequence programs and to the input/output of data values to PLC devices for MTB projects.
For details on the functions available for each mode, refer to "9.1.1.6 Functions Available in Each Mode".

PLC Messages

The PLC messages for MTB and the PLC messages for end users, which have been created by MTB and end users respectively, are treated as different files and can be managed separately. Both of them can be input/output via the NC standard screen. For details on how to input/output via the standard screen, refer to "Chapter 4 Peripheral Development Environment (GX Developer): PLC Message Development" and "Chapter 5 Peripheral Development Environment (GX Works2): PLC Message Development".
The PLC messages for end users can be displayed only when the E/U mode is enabled. They are not displayed when the E/U mode is disabled.
It is also possible to input/output PLC messages from GX Developer/GX Works2.
If there are duplicate indices of PLC messages between input methods, only one message is displayed according to the priorities indicated in the following table.
For both MTB and end users, when they create and write PLC messages from GX Developer/GX Works2, the E/U project must be the last project of multi-projects.

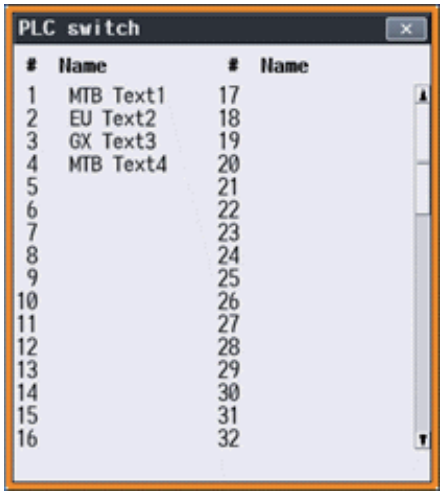
Message type	Input method	File name	Priority	Remarks
PLC message for MTB	Input via the standard screen when the E/U mode is disabled	PLCMSG_XXX.TXT	1	
PLC message for end users	Input via the standard screen when the E/U mode is enabled	PLCUMSG_XXX.TXT	2	Displayed only during E/U mode
GX Developer/GX Works2 PLC message	Input from GX Developer/ GX Works2	MXXxxxx.WPG	3	If there are duplicate indices between projects, the message with the smallest project No is displayed.

The PLC messages as shown in the table below, for example, are displayed.

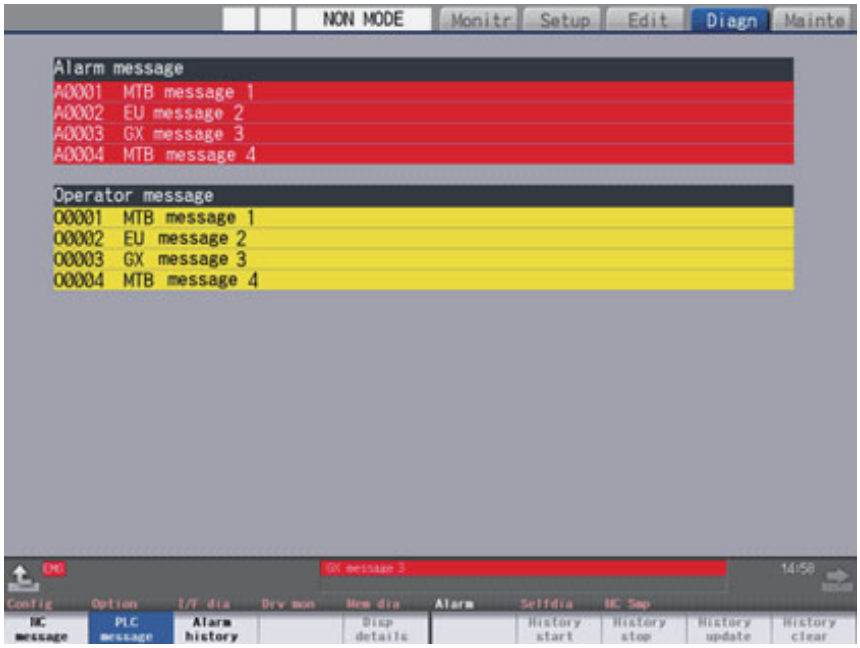
Message type	PLC message for MTB	PLC message for E/U	GX Developer/GX Works2 PLC message
Alarm message	A, 1, 0, MTB message 1 A, 4, 0, MTB message 4	A, 1, 0, E/U message 1 A, 2, 0, E/U message 2 A, 4, 0, E/U message 4	A, 1, 0, GX message 1 A, 2, 0, GX message 2 A, 3, 0, G/U message 3
Operator messages	O, 1, 0, MTB message 1 O, 4, 0, MTB message 4	O, 1, 0, E/U message 1 O, 2, 0, E/U message 2 O, 4, 0, E/U message 4	O, 1, 0, E/U message 1 O, 2, 0, GX message 2 A, 3, 0, GX message 3
PLC switch	P, 0, MTB Text1 P, 3, MTB Text4	P, 0, EU Text1 P, 1, EU Text2 P, 3, EU Text4	P, 0, GX Text1 P, 1, GX Text2 P, 2, GX Text3

Display examples of messages are shown below (when when the E/U mode is enabled).

PLC switch



Alarm message and operator messages



Operation Procedure

To use the E/U mode, configure the setting by following the steps below.

(1) Determine the setting details
(2) Set the multi-project parameters
(3) Create MTB programs
(4) Set NC parameters (E/U customization setting)
(5) Save an empty E/U project
(6) Provide information to end users

(1) Determine the setting details

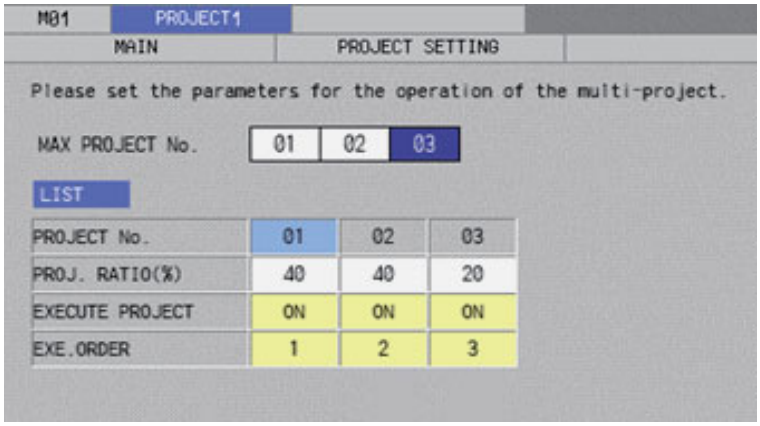
When the E/U mode setting is desired, MTB must decide the setting details of the following items.

Setting item	Setting details
E/U project No.	The project number to be used as the E/U project among multi-projects
Number of devices	The number of available devices for the projects including the E/U project
E/U open device	A range of project-common devices (Y, M, D) that are used by the E/U project
Project execution order	The execution order of the projects including the E/U project
Maximum number of steps	The maximum value for the total number of steps of a sequence program that can be stored in each of the projects including the E/U project
MTB program	A sequence program executed by an MTB project Machine control programs and E/U open interface are included
Enhanced PLC security mode	Security setting for MTB projects (write protect or read/write protect)

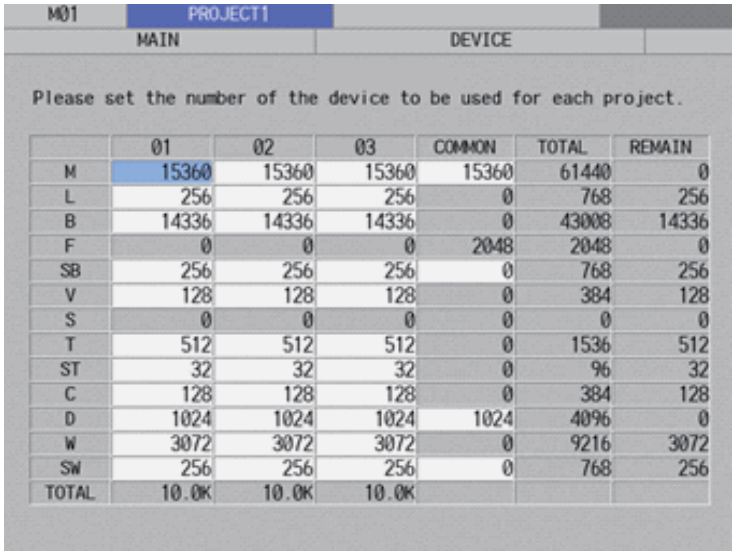
(2) Set the multi-project parameters

Modify the multi-project parameters from PLC on-board based on the setting details determined in (1).
Specify the number of devices, project execution order, and the number of steps for each project.
The number of steps refers to the upper limit of the total number of steps of the sequence programs stored in each project, and is determined by the project ratio.

Project setting



Device setting



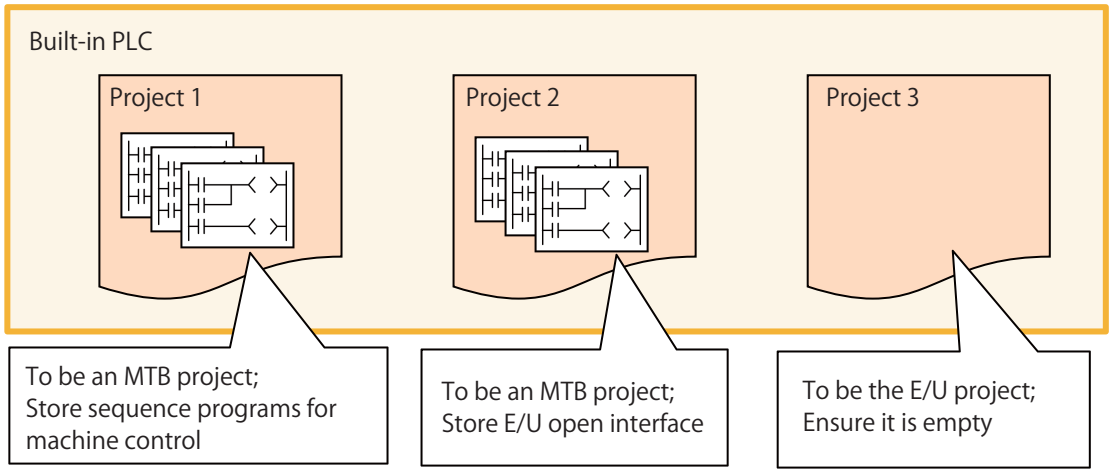
	01	02	03	COMMON	TOTAL	REMAIN
M	15360	15360	15360	15360	61440	0
L	256	256	256	0	768	256
B	14336	14336	14336	0	43008	14336
F	0	0	0	2048	2048	0
SB	256	256	256	0	768	256
V	128	128	128	0	384	128
S	0	0	0	0	0	0
T	512	512	512	0	1536	512
ST	32	32	32	0	96	32
C	128	128	128	0	384	128
D	1024	1024	1024	1024	4096	0
W	3072	3072	3072	0	9216	3072
SW	256	256	256	0	768	256
TOTAL	10.0K	10.0K	10.0K			

(3) Create MTB programs

Store MTB programs in projects that is to be set as MTB projects.

The MTB programs must include the programs that will be the interface between the output of remote I/O and the E/U open devices as well as the sequence programs for machine control.

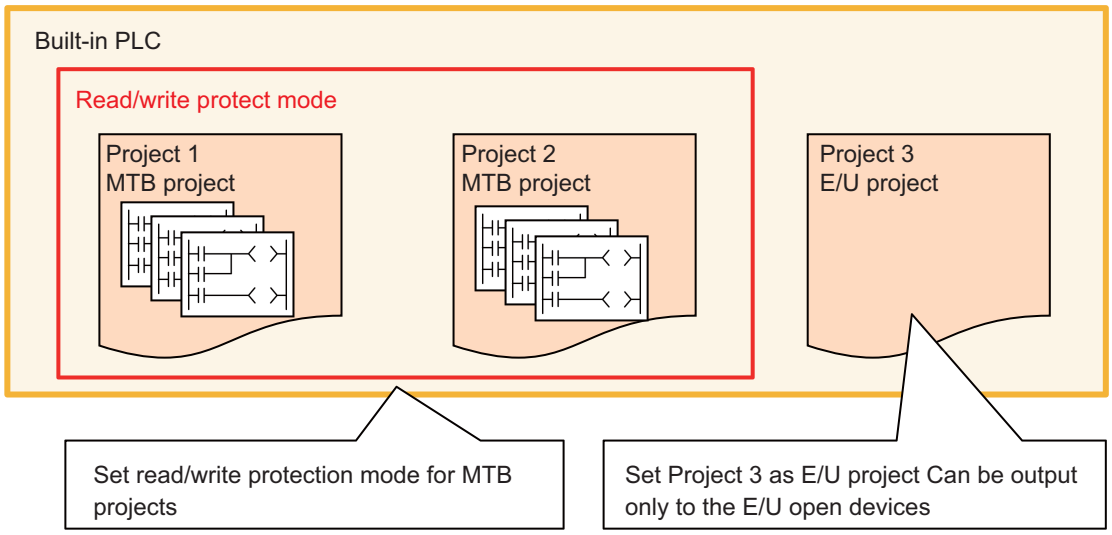
Ensure that the project that is to be set as the E/U project is empty.



(4) Set NC parameters (E/U customization setting)

Set the NC parameters based on the setting details determined in (1).

Configure the enhanced PLC security mode, E/U project number, and E/U open devices.



To allow end users to connect to the E/U project from PLC on-board, set the parameter "#6453 R7826-L/bit3" to "1".

To prevent end users from connecting to the E/U project from PLC on-board, set the parameter "#6453 R7826-L/bit3" to "0".

(5) Save an empty E/U project

Create the backup of the empty E/U project in case end users forget the file password and the modification and deletion of the E/U program become impossible.

For details on how to create backup, refer to "Chapter 4 Peripheral Development Environment (GX Developer): Backing Up Sequence Programs and Other Data" and "Chapter 5 Peripheral Development Environment (GX Works2): Backing Up Sequence Programs and Other Data".

(6) Provide information to end users

Describe the configured settings in the manual. For details, refer to "9.1.4 Information to be Shared with End Users".

9.1.1.6 Functions Available in Each Mode

The following table summarizes the functions of PLC on-board and GX Developer/GX Works2 available for each project type, enhanced PLC security mode setting, and MTB password status.

Function Matrix by Project Type, Enhanced PLC Security Mode, MTB Password Status

○: Available, ×: Unavailable

Function	MTB project						E/U project
	No mode		Write protect mode		Read/write protect mode		-
	Password not disabled	Password disabled	Password not disabled	Password disabled	Password not disabled	Password disabled	-
Start	○ (*1)	○	○ (*1)	○	○ (*1)	○	○
NC FILE OPERATION - File list	○	○	○	○	×	×	○
NC FILE OPERATION - Open	○	○	○	○	×	×	○
NC FILE OPERATION - File operation	×	○	×	×	×	×	○
NC FILE OPERATION - Format	×	○	×	×	×	×	×
NC FILE OPERATION - ROM write	×	○	×	×	×	×	○
NC FILE OPERATION - PLC RUN/STOP	×	○	×	○	×	×	○
NC FILE OPERATION - Password cancellation (*2)	×	○	×	○	×	×	○
NC FILE OPERATION - PLC version up	×	○	×	×	×	×	○
NC FILE OPERATION - External -> NC	×	○	×	×	×	×	○
NC FILE OPERATION - NC- > External	○	○	○	○	×	×	○
NC FILE OPERATION - Delete external file	○	○	○	○	×	×	○
NC FILE OPERATION - Verify external file	○	○	○	○	×	×	○
Monitor ladder	○	○	○	○	×	×	○
Edit ladder	×	○	×	×	×	×	○
Device test	○	○	×	×	×	×	○
ENVIRON. SETTING - Comment display	○	○	○	○	×	×	○
ENVIRON. SETTING - Ladder display	○	○	○	○	×	×	○
ENVIRON. SETTING -Connect NC changing	○	○	○	○	○	○	○
DEVICE - Device batch monitor	○	○	○	○	×	×	○
DEVICE - Entry data monitor	○	○	○	○	×	×	○
DEVICE - Sampling trace	○	○	○	○	×	×	○
PARAMETER - Program setting	×	○	×	×	×	×	○
PARAMETER - Common pointer setting	×	○	×	○	×	×	○
PARAMETER - Multi-project parameter	×	○	×	×	×	×	×
PLC diagnosis	○	○	○	○	×	×	○

(*1) To start while the MTB password is not disabled, the parameter "#6453 R7826-L/bit3" must be set to 1.

(*2) "Password" in this case means a file password.

GX Developer Function Matrix by Project Type, Enhanced PLC Security Mode, MTB Password Status

○: Available, ×: Unavailable

Function	MTB project						E/U project
	No mode		Write protect mode		Read/write protect mode		-
	Password not disabled	Password disabled	Password not disabled	Password disabled	Password not disabled	Password disabled	-
Connection confirmation	○	○	○	○	×	×	○
Read from PLC	○	○	○	○	×	×	○
Write to PLC	○	○	×	×	×	×	○
Verify with PLC	○	○	○	○	×	×	○
Delete PLC data	○	○	×	×	×	×	○
Write the program memory to ROM	○	○	×	×	×	×	○
Monitor	○	○	○	○	×	×	○
Device test	○	○	(*1)	(*1)	×	×	○
Sampling trace	○	○	○	○	×	×	○
Remote operation	○	○	○	○	×	×	○
Password register (*2)	○	○	×	×	×	×	○
Password delete (*2)	○	○	×	×	×	×	○
Password disable (*2)	○	○	○	○	×	×	○
Format PLC memory	○	○	×	×	×	×	×
PLC diagnosis	○	○	○	○	×	×	○
Write during RUN	○	○	×	×	×	×	○

(*1) Device test is available only for SM and SD devices.

(*2) "Password" in this case means a file password.

GX Works2 Function Matrix by Project Type, Enhanced PLC Security Mode, MTB Password Status

○: Available, ×: Unavailable

Function	MTB project						E/U project
	No mode		Write protect mode		Read/write protect mode		-
	Password not disabled	Password disabled	Password not disabled	Password disabled	Password not disabled	Password disabled	-
Connection confirmation	○	○	○	○	×	×	○
Read from PLC	○	○	○	○	×	×	○
Write to PLC	○	○	×	×	×	×	○
Verify with PLC	○	○	○	○	×	×	○
Delete PLC data	○	○	×	×	×	×	○
Write the program memory to ROM	○	○	×	×	×	×	○
Monitor	○	○	○	○	×	×	○
Watch	○	○	○	○	×	×	○
Current value change	○	○	(*1)	(*1)	×	×	○
Sampling trace	○	○	○	○	×	×	○
Remote operation	○	○	○	○	×	×	○
Password register (*2)	○	○	×	×	×	×	○
Password delete (*2)	○	○	×	×	×	×	○
Password disable (*2)	○	○	○	○	×	×	○
Format PLC memory	○	○	×	×	×	×	×
Memory size calculation	○	○	○	○	×	×	○
PLC diagnosis	○	○	○	○	×	×	○
Write during RUN	○	○	×	×	×	×	○

(*1) Current values can be changed only for SM and SD devices.

(*2) "Password" in this case means a file password.

9.1.1.7 GX Developer/GX Works2 Connection Restrictions

When the connection restriction on GX Developer/GX Works2 is enabled, connections to the built-in PLC from GX Developer/GX Works2 are prohibited.
Unlike the enhanced PLC security mode, connections from PLC on-board are not prohibited.
Note that it is not possible to connect to the E/U project when the connection restriction on GX Developer/GX Works2 is enabled, even if the E/U mode is enabled.

9.1.1.8 File Password

A file password is a four-digit password of a file in the built-in PLC. A file password is set from GX Developer/GX Works2. There are two attributes for a file password, read/write protect and write protect. To perform write operations and read operations from PLC on-board or GX Developer/GX Works2, the file password must be disabled.
By setting a file password, you can protect resources such as sequence programs and PLC messages in the built-in PLC.
For details on setting a file password, refer to "Chapter 4 Peripheral Development Environment (GX Developer): File Password Function" and "Chapter 5 Peripheral Development Environment (GX Works2):File Password Function".

Relationship with Enhanced PLC Security Mode

(1) PLC write protect mode
Although registering and clearing the file password of a file in the built-in PLC from GX Developer/GX Works2 are prohibited, disabling the file password and reading a file are allowed.

(2) PLC read/write protect mode
Registering, clearing, and disabling the password of a file in the built-in PLC from GX Developer/GX Works2 are prohibited.

(3) E/U mode
Registering, clearing, and disabling the password of a file in the E/U project from GX Developer/GX Works2 are allowed.
Since the enhanced security mode does not apply to the E/U project, end users must set a file password to protect each file.

9.1.2 Relationship with Other Functions

9.1.2.1 Built-in PLC (Built-in Edit Function)

When the enhanced security mode is active, restrictions apply to the input/output between the built-in PLC and PLC on-board. Note that built-in edit function can be started for E/U project irrespective of the enhanced security mode setting and password status.

For details on the PLC on-board function, refer to "Chapter 6 Explanation of Built-in Editing Function (PLC On-board)".

9.1.2.2 Built-in PLC (Peripheral Development Environment)

When the enhanced security mode is enabled, restrictions apply to the input/output between the built-in PLC and GX Developer.

For details on DX Developer functions, refer to "Chapter 4 Peripheral Development Environment (GX Developer)".

9.1.2.3 Built-in PLC (Peripheral Development Environment (GX Works2))

When the enhanced security mode is enabled, restrictions apply to the input/output between the built-in PLC and GX Works2.

For details on DX Works2 functions, refer to "Chapter 5 Peripheral Development Environment (GX Works2)".

9.1.2.4 Protection Setting Screen

The following changes can be made on the protect setting screen.

- Changing operation level
- Changing password for each operation level
- Changing protective level for each data To certainly secure programs which are managed by the MTB, change the default password for MTB to another one.

For details on the protect setting screen, refer to "M800S/M80/E80 Series Connection and Setup Manual" or "M800W/M80W Series Connection and Setup Manual".

9.1.3 Precautions

Precautions for MTB

(1) If E/U project is output through E/U customization after the project which stores the E/U open interface, the output timing delays by one scan compared to direct output.
(2) When end users write a sequence program, PLC STOP applies. Take appropriate measures, such as remote I/O initialization function, to ensure secure machine operation when PLC STOP applies.
(3) When an E/U project is empty, PLC can run only with MTB projects.
(4) When an E/U program contains an error, PLC STOP applies, including MTB projects. Take appropriate measures, such as remote I/O initialization function, to ensure secure machine operation when PLC STOP applies.
(5) In the following cases, the alarm "Z105 end-user parameter error" occurs and PLC STOP applies:
- PLC end-user parameter values and multi-project parameter values do not match
- The range determined by the starting device number of E/U open devices and the total number of devices exceeds the upper limit
In such cases, the E/U mode is disabled even if the enhanced security mode is enabled.
(6) Since end users cannot set the connection restriction on GX Developer/GX Works2, MTB must determine and set the connection restriction on GX Developer/GX Works2 (#11094), taking into account whether the end users use GX Developer/GX Works2.
(7) Since end users cannot make settings for "Writing during RUN", MTB must set for that (#6455 bit6/bit7), taking into account whether the end users use the function.
(8) If the end user forgets the file password for an E/U program, it will be impossible to delete the E/U program. To avoid this, create "PROJECTxx.LAD" that stores an empty E/U project ("xx" represents the E/U project number).
(9) When the parameter "#11018 M password hold" is set to "1", the operation is the same as when the MTB password is input after NC restart even if the MTB password is not actually input. To ensure the security of MTB projects, set #11018 to "0".

Precautions for End Users

(1) PLC STOP is needed when files such as sequence programs are written to the E/U project. Ensure safety before performing a write operation.
(2) When an E/U project is empty, PLC can run only with MTB projects.
(3) When an E/U program contains an error, PLC STOP applies, including MTB projects.
(4) When an E/U program is created as a simple project (with label) on GX Works2, devices automatically assigned may not in line with the limitations on devices. Limit the range of automatic device assignment to the range of E/U open devices.
(5) If the file password for an E/U program is forgotten, it becomes impossible to change or delete the E/U program.
(6) If an E/U program is created with following three conditions, "The specified device No. exceeds the permissible range.……<ES:010a4031>" is displayed when a write operation to the PLC is attempted.
- The program is created as a simple project (with label) on GX Works2.
- The item "Clear the device ranges set in the Device/Label Automatic-Assign setting to 0 at time of PLC write after a Rebuild All operation" has been checked.
- Restricted devices for an E/U program are included in the automatic device assignment setting.
When this error is displayed, modify the automatic device assignment setting to an appropriate value, and try a write operation to the PLC again.

9.1.4 Information to be Shared with End Users

When the E/U mode is enabled, provide the information about the built-in PLC and the E/U mode to end users.
The information to be provided to end users are as follows:

(1) CNC Manual
(2) E/U project No.
(3) Limitations on instructions
(4) Limitations on devices
(5) Limitations on functions
(6) Maximum number of steps for E/U project
(7) Common devices for E/U open interface and the meaning of the signals to be assigned
(8) Example of E/U program
(9) Precautions

(1) CNC Manual
End users need to know the specifications of the built-in PLC in M800/M80 series NCs to create sequence programs.
Provide "PLC Development Manual" (this manual) and "PLC Programming Manual".

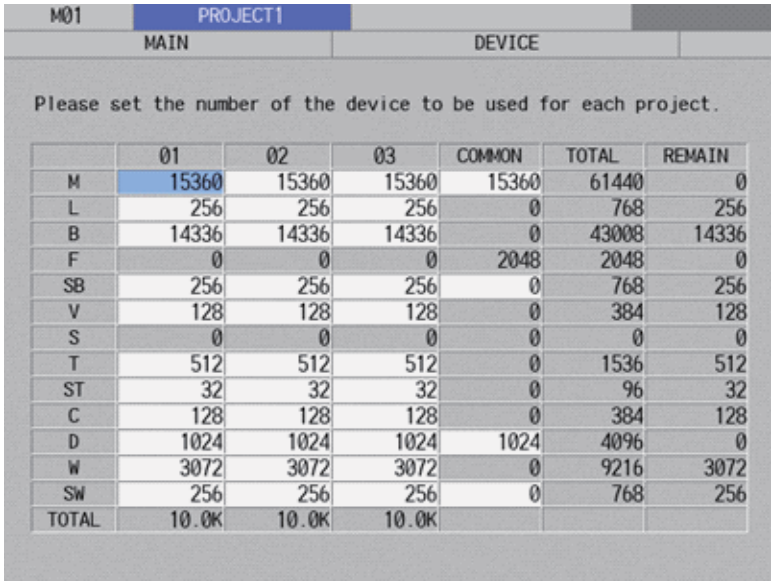
(2) E/U project No.
Inform end users which project is the E/U project among the multi-projects.

(3) Limitations on instructions
The following dedicated instructions cannot be used in E/U programs
S.ROT, S.ATC, G(P).RIRD, G(P).RIWT, Z(P).REMFR, Z(P).REMTO
Inform end users that these instructions are unavailable.

(4) Limitations on devices
There are limitations on the devices that can be input/output to the E/U project.
Apart from those limitations posed by the specifications of the NC, certain limitations on devices can be set by the MTB.
Inform end users of the limitations on devices after the MTB configured the PLC end-user parameters and multi-project parameters.
For example, when the number of devices for PLC end-user parameters and multi-project parameters are configured as (a) and (b) indicated as follows,, the limitations on devices to be provided to end users are described in the next table.
(a) PLC end-user parameter setting

#	Item		Details	Setting value
11762 (PR)	E/U Project No.	E/U project number	Specify the project number to be used as the E/U project by the end user.	3
11763 (PR)	E/U Y Dev No.	Initial number of Y device for E/U	Specify the starting device number of the Y devices customizable by the end user.	0
11764 (PR)	E/U Y Dev Size	Quantity of Y devices for E/U	Specify the number of Y devices customizable by the end user.	100
11765 (PR)	E/U M Dev No.	Initial number of M device for E/U	Specify the starting device number of the project-common M devices customizable by the end user.	1024
11766 (PR)	E/U M Dev Size	Quantity of M devices for E/U	Specify the number of project-common M devices customizable by the end user.	1024
11767 (PR)	E/U D Dev No.	Initial number of D device for E/U	Specify the starting device number of the project-common D devices customizable by the end user.	128
11768 (PR)	E/U D Dev Size	Quantity of D devices for E/U	Specify the number of project-common D devices customizable by the end user.	384

(b) Device setting



	01	02	03	COMMON	TOTAL	REMAIN
M	15360	15360	15360	15360	61440	0
L	256	256	256	0	768	256
B	14336	14336	14336	0	43008	14336
F	0	0	0	2048	2048	0
SB	256	256	256	0	768	256
V	128	128	128	0	384	128
S	0	0	0	0	0	0
T	512	512	512	0	1536	512
ST	32	32	32	0	96	32
C	128	128	128	0	384	128
D	1024	1024	1024	1024	4096	0
W	3072	3072	3072	0	9216	3072
SW	256	256	256	0	768	256
TOTAL	10.0K	10.0K	10.0K			

Category	Device	Limitations on device
Common device	X, Y, F, R, ZR	All devices can be input. Y0 to YFF can be output.
Independent device (variable)	L, SB, B, V, SW, T, ST, C, W	All devices can be input. All devices can be output.
Independent device (fixed)	SM, SD, Z	All devices can be input. All devices can be output.
Independent device (fixed)	N, P	All devices can be input. None of devices can be output
Common/independent device	M, D	All devices can be input. The following devices can be output: M1024 to M2047, M15360 to M31719, D128 to D511, D1024 to D2047

(5) Limitations on functions

Inform end users of the limitations on functions for the E/U project.

For example, add a phrase like this to the manual.

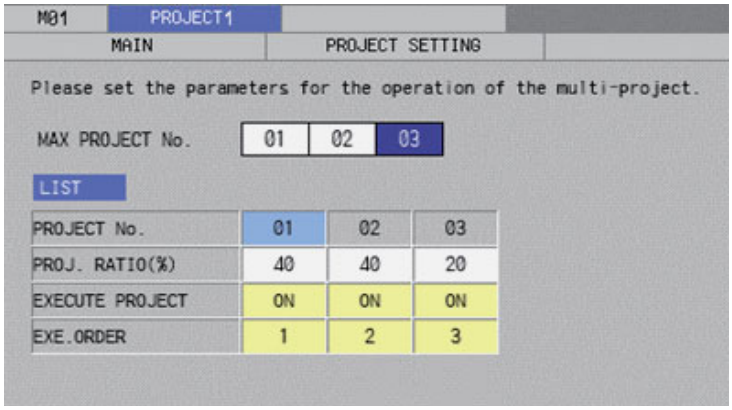
"Connecting to a project other than the E/U project is not possible. Formatting from PLC on-board and GX Developer/GX Works2 is not possible. It is also impossible to modify multi-project parameters from PLC on-board."

(6) Maximum number of steps for E/U project

Inform end users of the limit for the total number of steps of an E/U program that can be stored in the E/U project. The maximum number of steps depends on the project ratio of multi-project parameter.

For example, when the NC is M80, E/U project No is 3, and the project ratio is like the following figure, the maximum number of steps is calculated to be "13107" by the formula below.

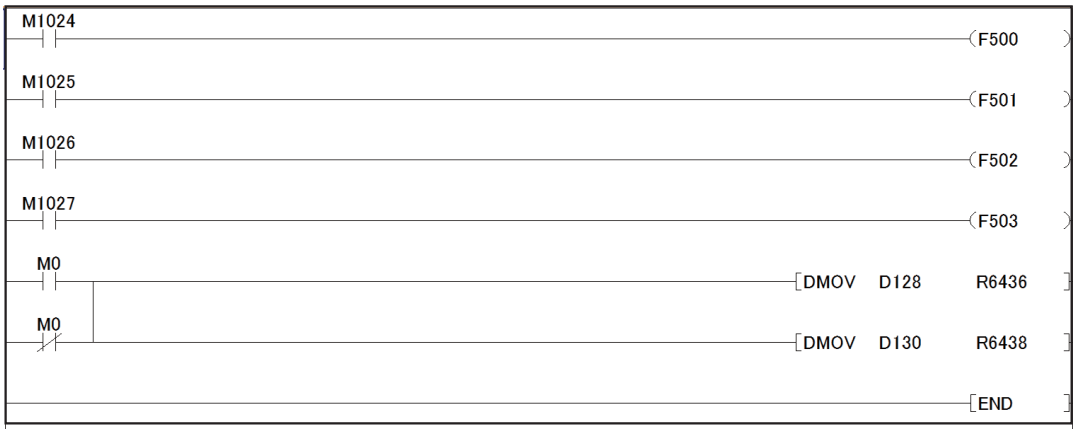
64K (steps) × 0.20 = 13107.2 (steps)



(7) Common devices for E/U open interface and the meaning of the signals to be assigned

Inform end users of the input side devices (M, D devices), output side devices (X, Y, R, ZR devices), and the signals assigned to output side devices of the E/U open interface created by MTB program.

For example, if M1024 to M2047 and D128 to D511 are set as E/U open devices and the E/U open interface is set like the following figure, provide end users with information in the table below.

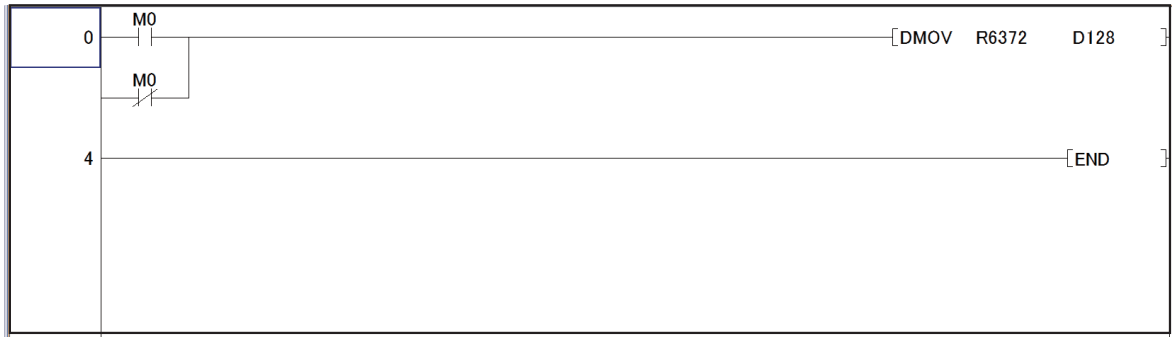


Signal name	Input to PLC	Output to NC
PLC alarm	F500	M1024
PLC alarm	F501	M1025
PLC alarm	F502	M1026
PLC alarm	F503	M1027
User macro input #1033 (PLC -> NC) (low-order)	R6436	D128
User macro input #1033 (PLC -> NC) (high-order)	R6437	D129
User macro input #1034 (PLC -> NC) (low-order)	R6438	D130
User macro input #1034 (PLC -> NC) (high-order)	R6439	D131

(8) Example of E/U program

Provide end users with an example of E/U program for E/U project setting.

For example, when an E/U open interface is created like the example in (7), the E/U program that outputs the value of "User macro output #1132 (NC -> PLC)" (R6372, R6373) to "User macro input #1033 (PLC -> NC)" is as shown below.



(9) Precautions

Inform end users of the precaution described on "Precautions for End Users" in "9.1.3 Precautions" so that they can develop PLC safely.

Revision History

Date of revision	Manual No.	Revision details
May. 2015	IB(NA)1501270-A	First edition created.
Sep. 2015	IB(NA)1501270-B	The descriptions were revised corresponding to S/W version A4 of Mitsubishi Electric CNC M800/M80 series. The following chapters were added/revised. - 6.5.6 Executing Ladder Program Writing during RUN - 7.12.2.11 Ladder Program Writing during RUN by Conversion The following chapters were revised. - Appendix 2 List of PLC Alarms (Errors for ladder program writing during RUN were added.) Other mistakes were corrected.
Mar. 2016	IB(NA)1501270-C	The descriptions were revised corresponding to S/W version B2 of Mitsubishi Electric CNC M800/M80 series. The following chapters were added. - 1.2.4 Setting Example When Connecting Directly to the Control Unit - 7.2.2.3 Items Displayed on the Sampling Trace Screen - 7.5.1.5 Trace File Details - 7.5.1.6 CSV Format File Details - 7.5.2.1 Readable PLC Data with PLC On-board - 7.14.4 Sampling Trace Other mistakes were corrected.
Nov. 2016	IB(NA)1501270-D	The descriptions were revised corresponding to S/W version C1 of Mitsubishi Electric CNC M800/M80 series. The following chapters were added. - 7.4 Touch Gestures - 7.6.3.4 Precautions for File Password Setting - 7.9.6 Basic Operation 6 (Updating the Program Version) - 7.11.12 PLC Version Up Screen - 7.11.13 Select Version Up Data Popup Screen - 7.15.4.13 Example of Trace File Write - 7.16.2.7 Abnormal Operation Other mistakes were corrected.
Mar. 2017	IB(NA)1501270-E	The descriptions were revised corresponding to S/W version C3 of Mitsubishi Electric CNC M800/M80 series. The following chapter was added. - 1.4 PLC I/F Axis Random Device Assignment The following chapter was revised corresponding to the remote I/O unit FCU8-DX408. - 1.2 Relation of RIO Unit and Devices Other mistakes were corrected.
Dec. 2017	IB(NA)1501270-F	The descriptions were revised corresponding to S/W version C7 of Mitsubishi Electric CNC M800/M80 series. The following chapter was added. - 6.3.2.2 Confirming Inhibiting GX Developer Connection Setting on the CNC Unit (Continue to the next page)

Date of revision	Manual No.	Revision details
Dec. 2017	IB(NA)1501270-F	(Continued from the previous page) The following chapters were revised. - 6.3.2 Preparation for Ethernet Communication - 6.9.1 List of Errors During GX Developer Online Operations - 7.10.5.1 Cases in which sequence programs are stored - 7.10.5.2 Cases in which sequence programs are not stored - 7.12.4.6 Storing PLC Data Stored in the Current Project into an External Device The interface signals corresponding to S/W version C7 to the following chapter. - 3 Input/Output Signals with Controller Other mistakes were corrected.
Apr. 2018	IB(NA)1501270-G	The descriptions were revised corresponding to the specifications of Mitsubishi Electric CNC E80 series. The descriptions were revised corresponding to S/W version D1 of Mitsubishi Electric CNC M800/M80 series. The following chapters were revised. - 6 Peripheral Development Environment - 7 Explanation of Built-in Editing Function (PLC On-board) Other mistakes were corrected.
Apr. 2019	IB(NA)1501270-H	The descriptions were revised corresponding to S/W version E0 of Mitsubishi Electric CNC M800/M80/E80 series. The following chapters were deleted. - 3 Input/Output Signals with Controller - 4 Other Devices The following chapter was added. - 5 Peripheral Development Environment (GX Works2) The following chapters were revised. - 4 Peripheral Development Environment (GX Developer) - 6 Explanation of Built-in Editing Function (PLC On-board) Other mistakes were corrected.
Sep. 2019	IB(NA)1501270-J	The descriptions were revised corresponding to S/W version E1 of Mitsubishi Electric CNC M800/M80/E80 series. The following chapters were added. - 4.11 Restrictions - 5.6.8 Executing Ladder Program Writing during RUN - 5.7 Developing Structured Project - 5.12.5 Checking the File Password Registration Status - 5.15 Project Protection Function - 5.17.5 Enhanced PLC Security Mode - 6.20 Restrictions - 9 Appx.3: PLC Function 9.1 Enhanced PLC Security Mode The following chapters were revised. - 4.6.3 Message Data Description Method - 4.6.4 Writing Message to CNC Controller on Standard Screen - 4.6.5 Reading out from CNC Controller on Standard Screen - 5.2.1 Support Status of Project Types, Program Types and POUs - 5.3.1 Function Support Status (Common Functions) - 5.3.5 Function Support Status (Online) - 5.8.3 Writing Message Data - 5.8.4 Writing Message to CNC Controller on Standard Screen - 5.8.5 Reading out from CNC Controller on Standard Screen - 5.12.6 File Password: Cautions on Setting Other mistakes were corrected.

Date of revision	Manual No.	Revision details
Jun. 2020	IB(NA)1501270-K	The descriptions were revised corresponding to S/W version F1 of Mitsubishi Electric CNC M800/M80/E80 series. The following chapter was added. - 5.5.12 Checking Data Size The following chapters was revised. - 5 Peripheral Development Environment (GX Works2)
Aug. 2023	IB(NA)1501270-L	The descriptions were revised corresponding to S/W version FB of Mitsubishi Electric CNC M800/M80/E80 series. The following chapter was added. - 4.5.8.2 Precautions - 5.6.9.2 Precautions The following chapters was revised. - 1.7 Outline of Analog Signal Input Circuit - 1.9 Outline of I/O Assignment with PROFIBUS-DP - 4.1.2 Operating Environment - 4.4.3.1 Executing Sequence Program - 4.4.3.3 Display of storage area on GX Developer - 4.6.10 Writing to the CNC Controller Using GX Developer - 5.5.4.1 Naming Conventions for Sequence Programs, Parameters, and Device Comment Files - 5.8.3.3 File Name Rule - 5.8.10.1 Operating Procedure - 5.11.4 Considerations - 5.13.1 List of Errors during GX Works2 Online Operation - 6.1 Outline - 6.5.1 Screen Display Language - 6.5.2 Language for Device Comments, Statements, Notes, and Machine Names - 6.11.3.5 Operation of Key Presses - 6.11.5.6 Adding PLC Data - 6.11.7.6 Renaming the PLC Data - 6.11.11.6 Entering Passwords - 6.12.5.7 Saving to External Projects - 6.13.2.6 Editing Ladders - 6.16.5.9 Configuring the Project Settings The chapter title was corrected. - 4.2 GX Developer Functions Supported by Mitsubishi Electric CNC - 5.2 Types of GX Works2 Projects and Programs Used for Mitsubishi Electric CNC - 5.3 GX Works2 Functions Available for Mitsubishi Electric CNC Other mistakes were corrected.

Date of revision	Manual No.	Revision details
Jan. 2024	IB(NA)1501270-M	The descriptions were revised corresponding to S/W version FC of Mitsubishi Electric CNC M800/M80/E80 series. The following chapters were revised. - 5.5.8.5 Setting Labels and Comments to Each Project - 5.8.7.3 Caution - 6.11.12.1 Outline - 6.11.12.6 Update the PLC Version - 6.11.13.5 Storing Method of the Updating Version Data - 6.12.3.7 Select External Projects - 6.12.5.7 Saving to External Projects - 6.12.6.7 Deleting External Projects - 6.15.4.4 Trigger Point Setup Screen Other mistakes were corrected.

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Detroit, MI Service Satellite
Grand Rapids, MI Service Satellite
Cleveland, OH Service Satellite
St. Louis, MO Service Satellite
Indianapolis, IN Service Saltellite

South/East Region Service Center (Georgia)
1845 SATELLITE BOULEVARD STE. 450, DULUTH, GEORGIA 30097, U.S.A.
TEL +1-678-258-4529 / FAX +1-678-258-4519
Charleston, SC Service Satellite
Charlotte, NC Service Satellite
Raleigh, NC Service Satellite
Dallas, TX Service Satellite
Houston, TX Service Satellite
Hartford, CT Service Satellite
Knoxville, TN Service Satellite
Nashville, TN Service Satellite
Huntsville, AL Satellite
Pittsburg, PA Service Satellite
Tampa, FL Service Satellite
Miami, FL Satelite
Lafayette, LA Service Satellite
Allentown, PA Satelite

Western Region Service Center (California)
5900-B KATELLA AVE. - 5900-A KATELLA AVE. CYPRESS, CALIFORNIA 90630, U.S.A.
TEL: +1-714-699-2625 / FAX: +1-847-478-2650
San Francisco, CA Satelite
Seattle, WA Service Satellite
Denver, CO Service Satellite

Canada Region Service Center (Toronto)
4299 14TH AVENUE MARKHAM, ONTARIO L3R OJ2, CANADA
TEL: +1-905-475-7728 / FAX: +1-905-475-7935
Edmonton, AB Service Satellite
Montreal, QC Service Satellite

Mexico Region Service Center (Queretaro)
Parque Tecnológico Innovación Querétaro, Lateral Carretera Estatal 431, Km 2+200, Lote 91 Modulos 1 y 2
Hacienda la Machorra, CP 76246, El Marqués, Querétaro, México
TEL: +52-442-153-6050
Monterrey, NL Service Satellite
Mexico City, DF Service Satellite

BRAZIL

MITSUBISHI ELECTRIC DO BRASIL COMÉRCIO E SERVIÇOS LTDA.
Votorantim Office
AV. GISELE CONSTANTINO,1578, PARQUE BELA VISTA, VOTORANTIM-SP, BRAZIL CEP:18.110-650
TEL: +55-15-3023-9000
Blumenau, Santa Catarina Office

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South Germany Service Center (Stuttgart)
SCHELMENWASENSTRASSE 16-20, 70567 STUTTGART, GERMANY
TEL: + 49-711-770598-123 / FAX: +49-711-770598-141

France Service Center (Paris)
2 RUE DE L'UNION, 92565 RUEIL-MALMAISON CEDEX, FRANCE
TEL: +33-1-41-02-83-13 / FAX: +33-1-49-01-07-25

France Service Satellite (Lyon)
240, ALLEE JACQUES MONOD 69800 SAINT PRIEST FRANCE
TEL: +33-1-41-02-83-13 / FAX: +33-1-49-01-07-25

Italy Service Center (Milan)
VIA ENERGY PARK 14, VIMERCATE 20871 (MB) ITALY
TEL: +39-039-6053-342 / FAX: +39-039-6053-206

Italy Service Satellite (Padova)
VIA G. SAVELLI, 24 - 35129 PADOVA, ITALY
TEL: +39-039-6053-342 / FAX: +39-039-6053-206

U.K. Service Center
TRAVELLERS LANE, HATFIELD, HERTFORDSHIRE, AL10 8XB, U.K.
TEL: +44-1707-288-780 / FAX: +44-1707-278-695

Spain Service Center
CTRA. RUBI, 76-80 8174 SAINT CUGAT DEL VALLES, BARCELONA, SPAIN
TEL: +34-935-65-2236 / FAX: +34-935-89-1579

Poland Service Center
UL.KRAKOWSKA 50, 32-083 BALICE, POLAND
TEL: +48-12-347-6500 / FAX: +48-12-630-4701

Hungary Service Center
MITSUBISHI ELECTRIC EUROPE B.V. HUNGARIAN BRANCH
BUDAÖRS OFFICE PARK, SZABADSÁG ÚT 117., 2040 BUDAÖRS, HUNGARY
TEL: +36-70-433-2263

Turkey Service Center
MITSUBISHI ELECTRIC TURKEY ELEKTRİK ÜRÜNLERİ A.Ş
SERIFALI MAHALLESI KALE SOKAK. NO.41 34775
UMRANIYE, ISTANBUL, TURKEY
TEL: +90-216-969-2500 / FAX: +90-216-661-44-47

Czech Republic Service Center
MITSUBISHI ELECTRIC EUROPE B.V. PRAGUE OFFICE
Pekařská 621/7, 155 00 PRAHA 5, CZECH REPUBLIC
TEL: +420-734-402-587

Sweden Service Center
HAMMARBACKEN 14, P.O.BOX 750 SE-19127, SOLLENTUNA, SWEDEN
TEL: +46-8-6251200 / FAX: +46-8-6251014

Bulgaria Service Center
AKHNATON Ltd. (Service Partner)
4 ANDREJ LJAPCHEV BLVD. POB 21, BG-1756 SOFIA, BULGARIA
TEL: +359-2-8176009 / FAX: +359-2-9744061

Ukraine Service Center (Kiev)
CSC Automation Ltd. (Service Partner)
4 B, YEVHENA SVERSTYUKA STR., 02002 KIEV, UKRAINE
TEL: +380-44-494-3344 / FAX: +380-44-494-3366

South Africa Service Center
Adroit Technologies (Service Partner)
20 WATERFORD OFFICE PARK, WATERFORD DRIVE, CNR OF WITKOPPEN ROAD,
FOURWAYS JOHANNESBURG SOUTH AFRICA
TEL: +27-11-658-8100 / FAX: +27-11-658-8101

ASEAN

MITSUBISHI ELECTRIC ASIA PTE. LTD. (ASEAN FA CENTER)
Singapore Service Center
307 ALEXANDRA ROAD MITSUBISHI ELECTRIC BUILDING SINGAPORE 159943
TEL: +65-6473-2308 / FAX: +65-6476-7439

PHILIPPINES

MELCO FACTORY AUTOMATION PHILIPPINES INC.
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Philippines Service Center
KM.23 WEST SERVICE ROAD SSH, CUPANG ,MUNTINLUPA CITY, PHILIPPINES
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VIETNAM

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HO CHI MINH CITY, VIETNAM
TEL: +84-28-3910-5945 / FAX: +84-28-3910-5947

Vietnam Hanoi Service Center
14TH FLOOR, CAPITAL TOWER, 109 TRAN HUNG DAO STREET, CUA NAM WARD,
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INDONESIA

PT. MITSUBISHI ELECTRIC INDONESIA
Indonesia Service Center (Cikarang)
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MALAYSIA

MITSUBISHI ELECTRIC SALES MALAYSIA SDN. BHD.
Malaysia Service Center (Kuala Lumpur Service Center)
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TEL: +60-3-7626-5032

Johor Bahru Service Center
9, Jalan Perjiranan 4/6, Bandar Dato Onn, 81100 Johor.
TEL: 07-3642250 / 2256

Pulau Pinang Service Center
25-G, Pusat Perniagaan Perdana Jaya, Jalan Permatang Rawa, 14000 Bukit Mertajam, Pulau Pinang
TEL: +60-4-510-1838 / Fax: +60-4-510-1835

THAILAND

MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO., LTD.
Thailand Service Center (Bangkok)
101, TRUE DIGITAL PARK OFFICE, 5TH FLOOR, SUKHUMVIT ROAD, BANGCHAK, PHRA KHANONG,
BANGKOK, 10260 THAILAND
TEL: +66-2-092-8600 / FAX: +66-2-043-1231-33

INDIA

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Service Head office and South India Service Center (Bangalore)
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TEL : +91-80-4655-2121
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Coimbatore Service Satellite
Hyderabad Service Satellite

North India Service Center (Gurgaon)
PLOT 517, GROUND FLOOR, UDYOG VIHAR PHASE-III, GURUGRAM 122008, HARYANA, INDIA
TEL : +91-124-463-0300
Ludhiana Service Satellite
Panthnagar Service Satellite
Delhi Service Satellite
Jamshedpur Service Satellite
Manesar Service Satellite

West India Service Center (Pune)
ICC-Devi GAURAV TECHNOLOGY PARK, UNIT NO.402, FOURTH FLOOR, NORTH WING,
SURVEY NUMBER 191-192 (P), NEXT to INDIAN CARD CLOTHING COMPANY Ltd,
OPP. VALLABH NAGAR, PIMPRI, PUNE- 411 018, MAHARASHTRA, INDIA
TEL : +91-20-6819-2274
Kolhapur Service Satellite
Aurangabad Service Satellite
Mumbai Service Satellite

West India Service Center (Ahmedabad)
204-209, 2ND FLOOR, 31FIVE, CORPORATE ROAD PRAHLADNAGAR,
AHMEDABAD -380015, GUJARAT, INDIA
TEL : + 91-79-6777-7888
Rajkot Service Satellite

CHINA

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. (CHINA FA CENTER)
CNC Call Center
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Shanghai Service Center
NO.1386 HONG QIAO ROAD, CHANG NING QU, SHANGHAI 200336, CHINA
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Qingdao Service Center
Suzhou Service Center
Wuhan Service Center
Ningbo Service Center
Hefei Service Center
Beijing Service Center
Tianjin Service Center
Xian Service Center
Dalian Service Center
Chengdu Service Center

Shenzhen Service Center
LEVEL8, GALAXY WORLD TOWER B, 1 YABAO ROAD, LONGGANG DISTRICT,
SHENZHEN 518129, CHINA
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KOREA

MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. (KOREA FA CENTER)
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2F KT BLDG. 8, HOGUK-RO, BUK-GU, DAEGU 41518, KOREA
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Korea Changwon Technical Center
#205, 888, CHANGWON-DAERO, SEONGSAN-GU, CHANGWON-SI,
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TAIWAN

MITSUBISHI ELECTRIC TAIWAN CO., LTD. (TAIWAN FA CENTER)
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Taiwan Tainan Service Center
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OCEANIA

MITSUBISHI ELECTRIC AUSTRALIA PTY. LTD.
Oceania Service Center
348 VICTORIA ROAD, RYDALMERE, N.S.W. 2116 AUSTRALIA
TEL: +61-2-9684-7269/ FAX: +61-2-9684-7245

Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible. Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE : TOKYO BLDG.,2-7-3 MARUNOUCHI,CHIYODA-KU,TOKYO 100-8310,JAPAN

MODEL	M800/M80/E80 Series
MODEL CODE	100-435
Manual No.	IB-1501270

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