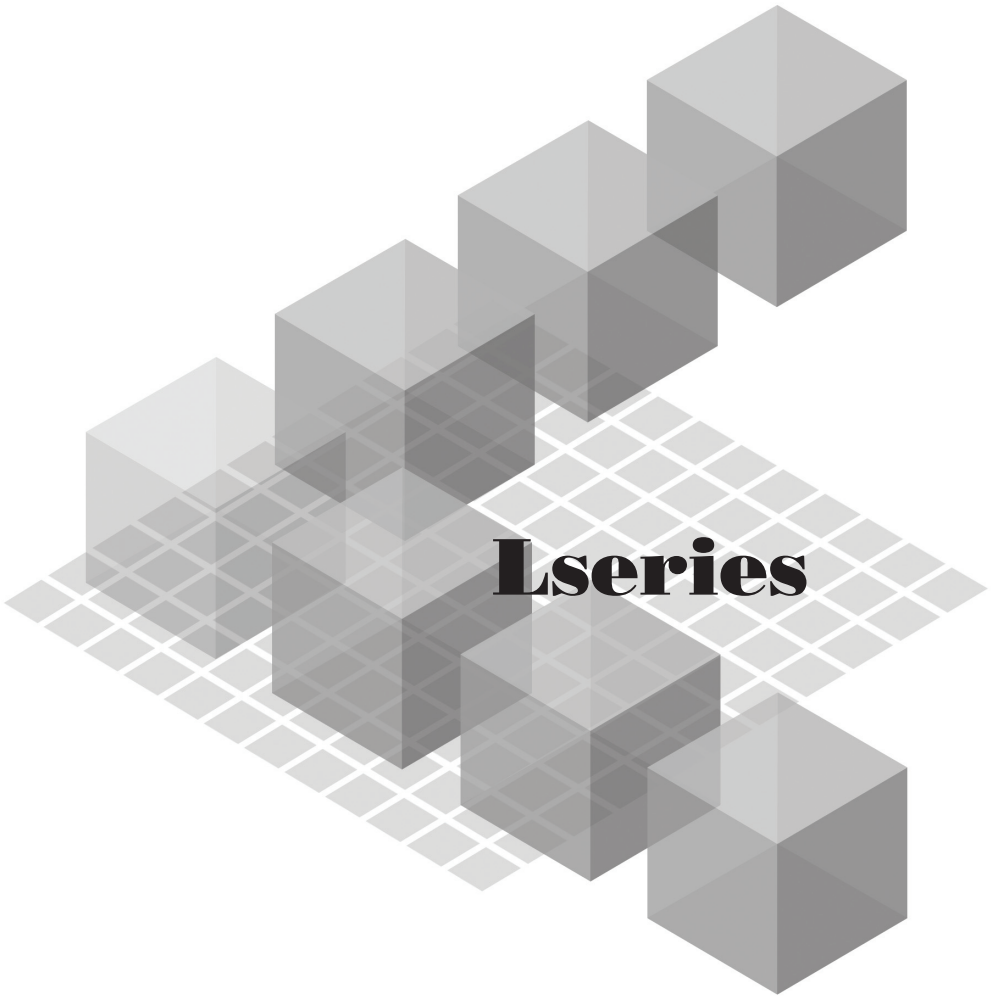
MITSUBISHI

Mitsubishi Programmable Controller

MELSEC *L series*

MELSEC-L Digital-Analog Converter Module User's Manual



MODEL

-L60DA4

●SAFETY PRECAUTIONS●

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual for the CPU module used.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠ WARNING

- Analog outputs may remain on due to a failure of the module. Configure an external interlock circuit for output signals that could cause a serious accident.
- Do not write any data to the "system area" and "write-protect area" (R) of the buffer memory in the intelligent function module.
  Also, do not use any "use prohibited" signals as an output signal from the programmable controller CPU to the intelligent function module.
  Doing so may cause malfunction of the programmable controller system.

[Design Precautions]

⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.
  Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- At power-on, a voltage may occur or a current may flow between output terminals for a moment. In this case, start the control after analog outputs become stable.
- Power on or off the external power supply while the programmable controller is on. Failure to do so may result in incorrect output or malfunction.

[Installation Precautions]

⚠ WARNING

- Shut off the external power supply for the system in all phases before mounting or removing a module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠ CAUTION

- Use the programmable controller in an environment that meets the general specifications in the MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection). Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To interconnect modules, engage the respective connectors and securely lock the module joint levers. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- Tighten the screw within the specified torque range.
  Undertightening can cause drop of the screw, short circuit or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Do not directly touch any conductive parts and electronic components of the module. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠ WARNING

- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠ CAUTION

- Ground the FG terminal to the protective ground conductor dedicated to the programmable controller. Failure to do so may result in electric shock or malfunction.
- Tighten the terminal block screw within the specified torque range. Undertightening can cause short circuit, fire, or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.

[Wiring Precautions]

⚠CAUTION

- Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block.
  Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock.
  For wiring methods, refer to the MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection).

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Shut off the external power supply for the system in all phases before cleaning the module or retightening the terminal block screw. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

⚠CAUTION

- Do not disassemble or modify the module. Doing so may cause failure, malfunction, injury, or a fire.
- Shut off the external power supply for the system in all phases before mounting or removing a module. Failure to do so may cause the module to fail or malfunction.
- Tighten the terminal block screw within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.

●CONDITIONS OF USE FOR THE PRODUCT●

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC-L series programmable controllers.
This manual describes the functions and programming of a digital-analog converter module (hereafter abbreviated as D/A converter module).

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC-L series programmable controller to handle the product correctly.
When applying the program examples introduced in this manual to the actual system, ensure the applicability and confirm that it will not cause system control problems.

■Relevant module: L60DA4

Remark

Unless otherwise specified, this manual describes the program examples in which the I/O numbers of X/Y00 to X/Y0F are assigned for a D/A converter module.
For I/O number assignment, refer to the following.

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

Operating procedures are explained using GX Works2. When using GX Developer or GX Configurator-DA, refer to the following.

- When using GX Developer or GX Configurator-DA (Page 111, Appendix 8)

COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES

(1) For programmable controller system

To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to the MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection). The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product

No additional measures are necessary for the compliance of this product with the EMC and Low Voltage Directives.

RELEVANT MANUALS

(1) CPU module user's manual

Manual name <manual number (model code)>	Description
MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) <SH-080890ENG, 13JZ36>	Specifications of the CPU modules, power supply modules, display unit, SD memory cards, and batteries, information on how to establish a system, maintenance and inspection, and troubleshooting
MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals) <SH-080889ENG, 13JZ35>	Functions and devices of the CPU module, and programming

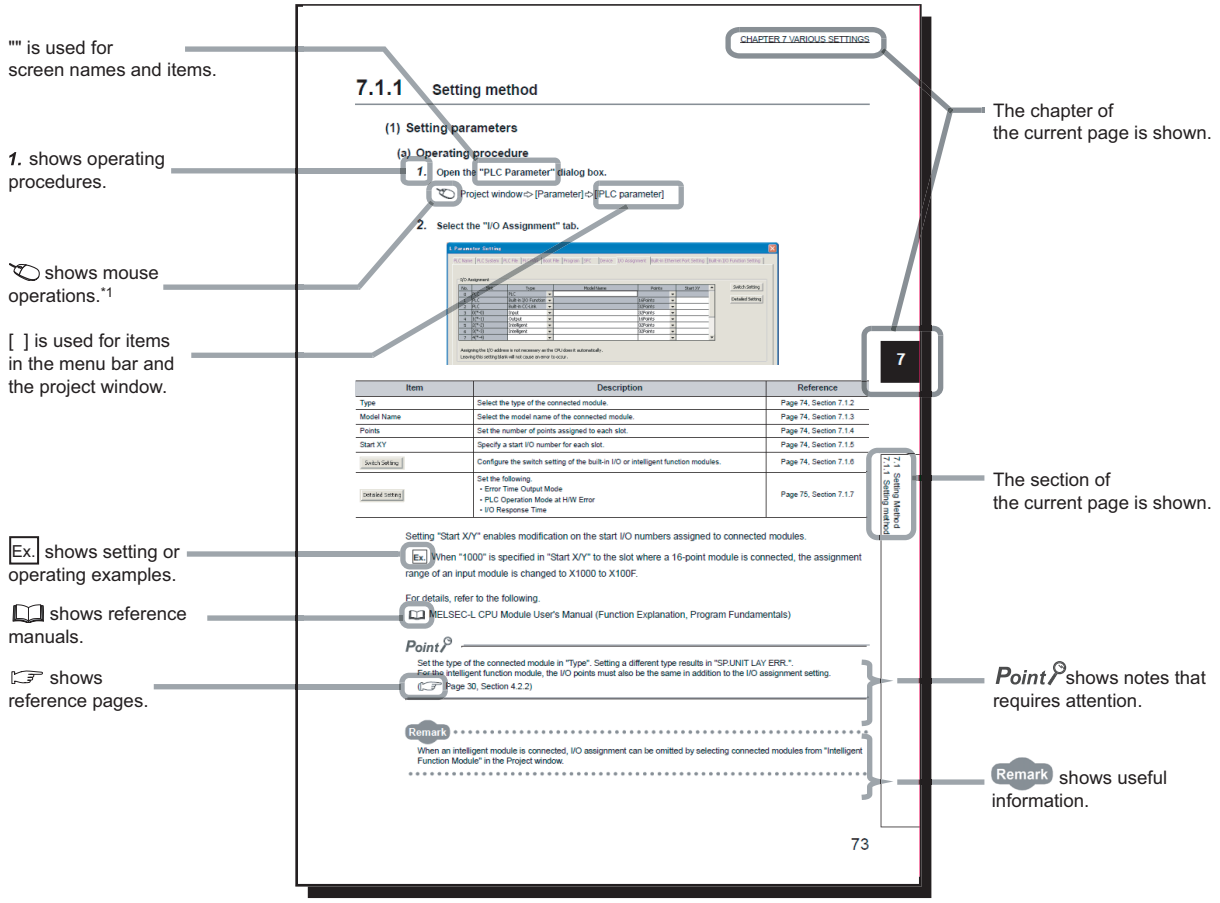
(2) Operating manual

Manual name <manual number (model code)>	Description
GX Works2 Version1 Operating Manual (Common) <SH-080779ENG, 13JU63>	System configuration, parameter settings, and online operations (common to Simple project and Structured project) of GX Works2
GX Developer Version 8 Operating Manual <SH-080373E, 13JU41>	Operating methods of GX Developer, such as programming, printing, monitoring, and debugging

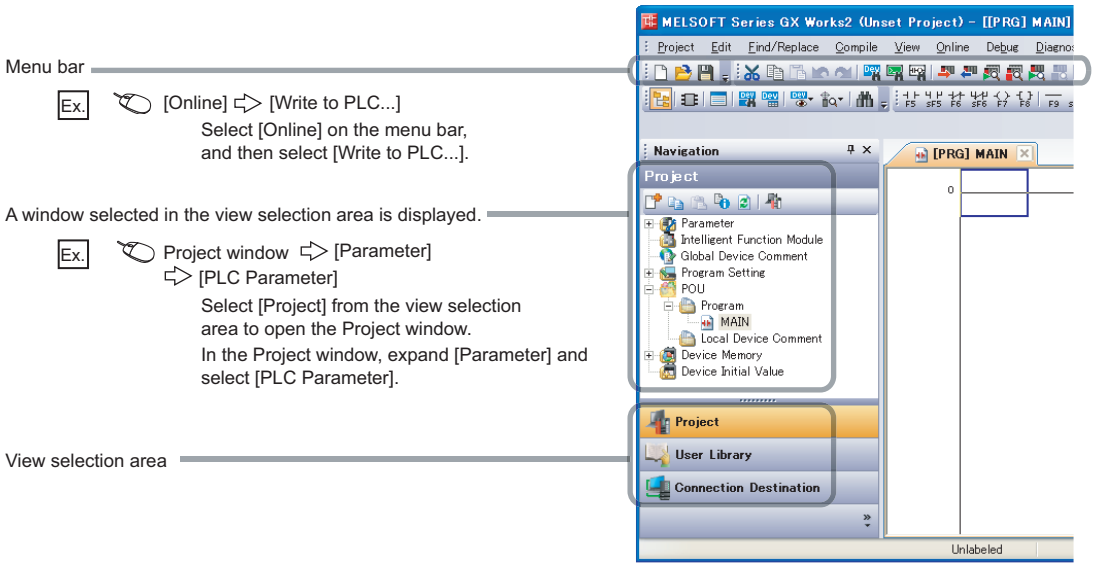
CONTENTS

MANUAL PAGE ORGANIZATION

In this manual, pages are organized and the symbols are used as shown below.
The following page illustration is for explanation purpose only, and is different from the actual pages.

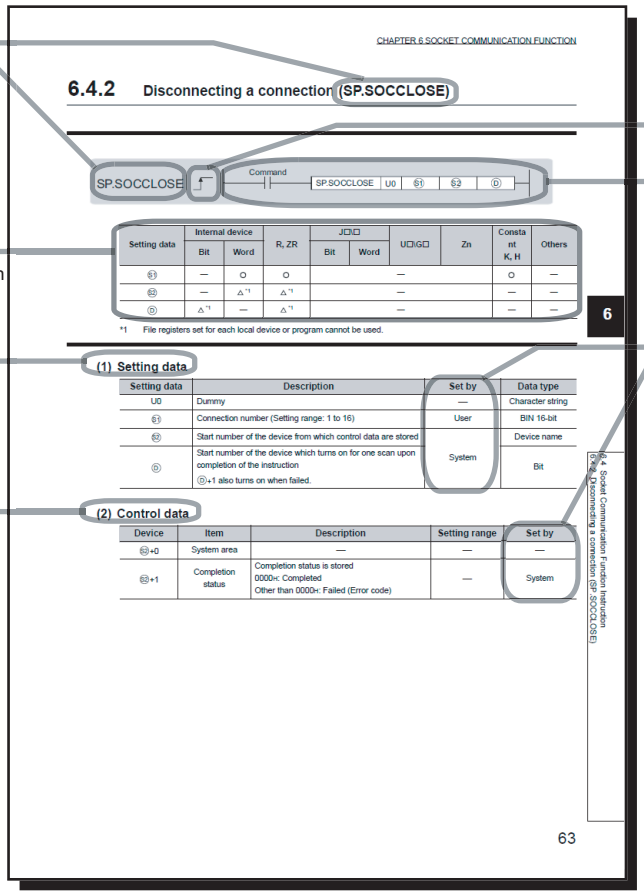


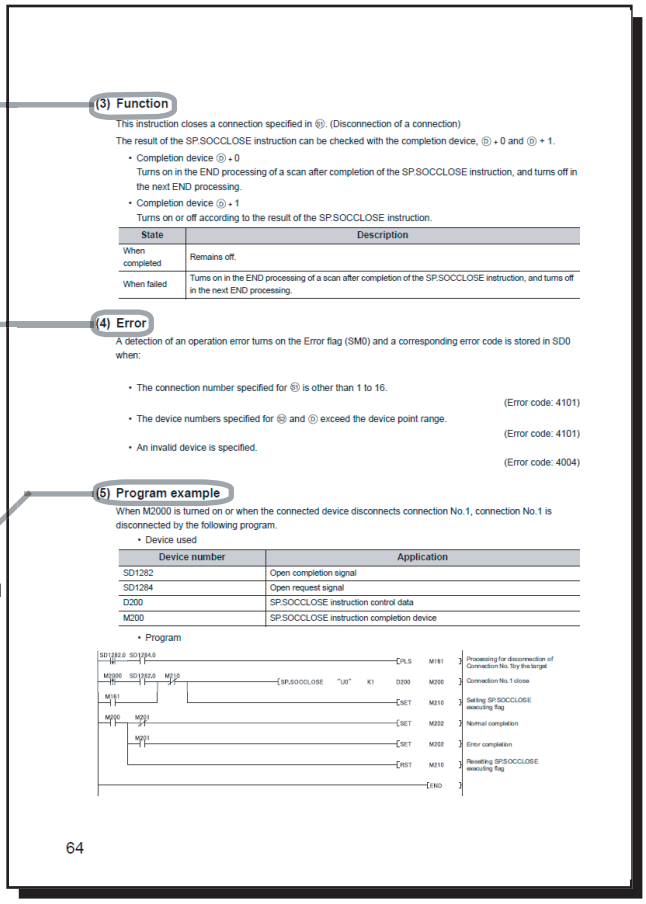
*1 The mouse operation example is provided below. (For GX Works2)



Pages describing instructions are organized as shown below.

The following page illustrations are for explanation purpose only, and are different from the actual pages.





• Instructions can be executed under the following conditions.

Execution condition	Any time	During on	On the rising edge	During off	On the falling edge
Symbol	No symbol				

• The following devices can be used.

Setting data	Internal device (system, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant *3	Others *3
	Bit	Word		Bit	Word				
Applicable device*1	X, Y, M, L, SM, F, B, SB, FX, FY*2	T, ST, C, D, W, SD, SW, FD, @□	R, ZR	—		U□\G□	Z	K, H, E, $	P, I, J, U, D, X, DY, N, BL, TR, BL\S, V

*1 For details on each device, refer to the following.

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

*2 FX and FY can be used for bit data only, and FD for word data only.

*3 In the "Constant" and "Others" columns, a device(s) that can be set for each instruction is shown.

• The following data types can be used.

Data type	Description
Bit	Bit data or the start number of bit data
BIN 16-bit	16-bit binary data or the start number of word device
BIN 32-bit	32-bit binary data or the start number of double-word device
BCD 4-digit	Four-digit binary-coded decimal data
BCD 8-digit	Eight-digit binary-coded decimal data
Real number	Floating-point data
Character string	Character string data
Device name	Device name data

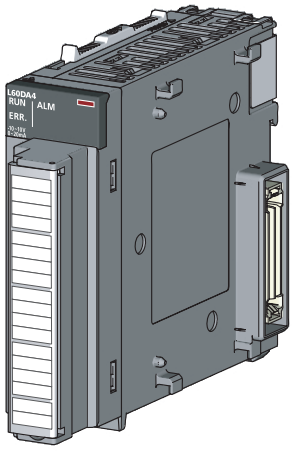
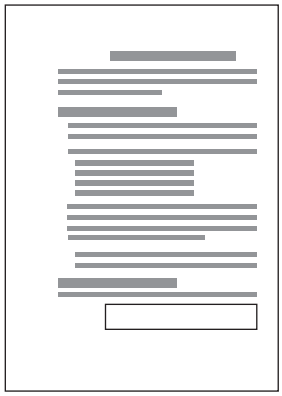
TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
D/A converter module	Another term for the MELSEC-L series digital-analog converter module
Display unit	A liquid crystal display to be attached to the CPU module
Programming tool	Generic term for GX Works2 and GX Developer
Factory default setting	Generic term for analog output ranges of 0 to 5V, 1 to 5V, -10 to 10V, 0 to 20mA, and 4 to 20mA
GX Works2	Product name of the software package for the MELSEC programmable controllers
GX Developer	
GX Configurator-DA	A setting and monitoring tool added in GX Developer (for D/A converter modules)
Buffer memory	The memory of an intelligent function module used to store data (such as setting values and monitored values) for communication with a CPU module.

PACKING LIST

The following items are included in the package of this product. Before use, check that all the items are included.

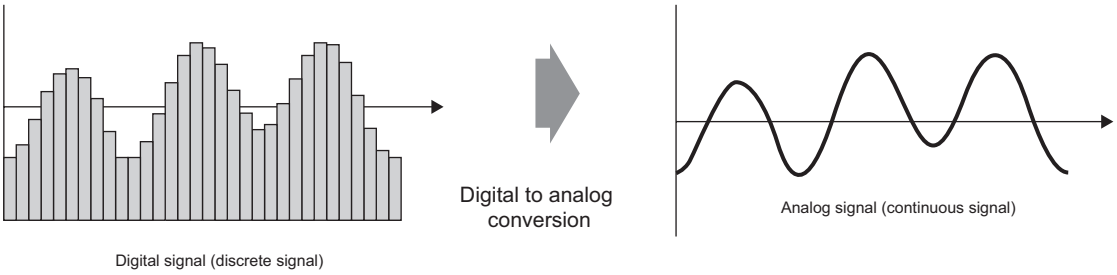
L60DA4	
	
L60DA4	Before Using the Product

CHAPTER 1 D/A CONVERTER MODULE

This chapter describes the application and features of the D/A converter module.

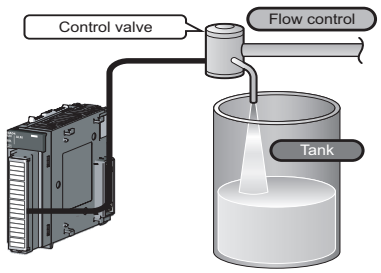
1.1 Application

This module converts the digital data received from the CPU module to the analog signal and outputs the signal to external devices. By converting the data, which has been processed through the CPU module, to an analog data, the input information can be sent to the devices including an inverter.

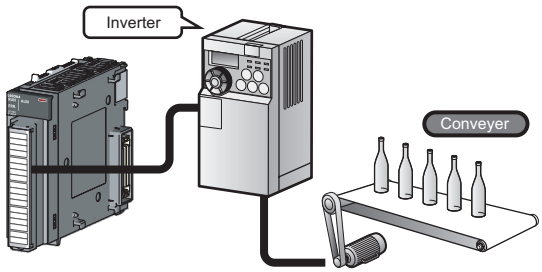


The D/A converter module enables works as follows.

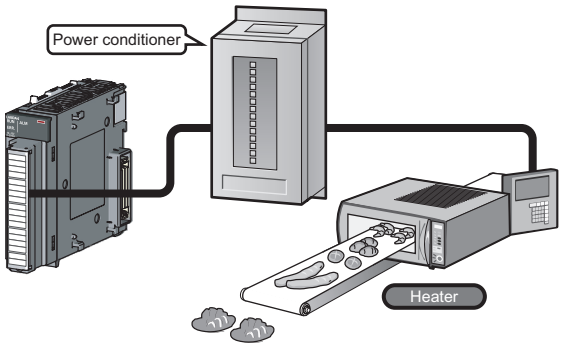
Connect the module to the control valve to control the flow to a tank.



Connect the module to an inverter to control the conveyer belt speed.



Connect the module to the power conditioning equipment to control the heating temperature of a heater or others.



1.2 Features

(1) Improved response by high-speed conversion

The high-speed conversion speed of 20μs/channel is achieved.

(2) Detailed control by high resolution

In all analog output ranges, the high resolution of 1/20000 is achieved.

(3) Reliability by high accuracy

The accuracy for the maximum value of analog output value is ± 0.1% (25 ± 5°C) and ± 0.3% (0 to 55°C).

(4) Scaling function

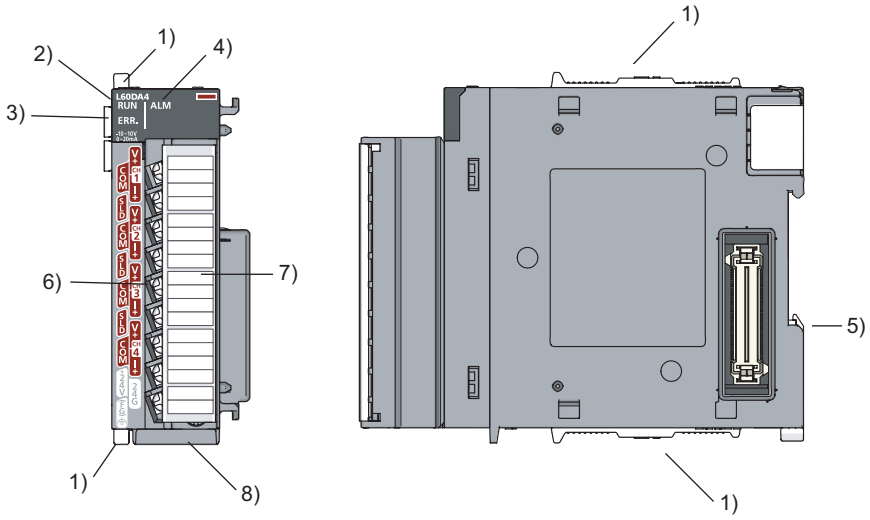
This function converts a digital value to the ratio value (%) in any width to represent the digital value in a numeric value easy to understand.

(5) Error detection and monitoring

When the digital value exceeds the specified range, the module detects an alarm so that the digital value error monitoring and the output control are enabled.

CHAPTER 2 PART NAMES

The following table shows the part names of the D/A converter module.



Number	Name	Description
1)	Module joint levers	Levers for connecting two modules
2)	RUN LED (green)	Displays the operating status of the D/A converter module. On: The module is operating normally. Flashing: In the offset/gain setting mode Off: The 5V power off or watchdog timer error has occurred.
3)	ERR. LED (red)	Displays the errors and status of the D/A converter module. On: an error has occurred except for error code: 112[*1] Flashing: Error code: 112 has occurred.[*1] Off : during normal operation
4)	ALM LED (red)	Displays the alarm status of the D/A converter module. On: Alarm output is occurring[*2] Off: The module is operating normally.[*2]
5)	DIN rail hook	A hook used to mount the module to a DIN rail
6)	Terminal block	18-pin screw terminal block for connecting output signal lines of such as external devices
7)	Terminal block cover	Cover for preventing electric shock while the power is on.
8)	Serial number display	Displays the serial number printed on the rating plate.

*1 Error Code List (☞ Page 79, Section 11.4)

*2 Alarm Code List (☞ Page 80, Section 11.5)

Memo

CHAPTER 3 SPECIFICATIONS

This chapter shows the general specifications, performance specifications, function list, list of I/O signals, and list of buffer memory addresses.

3.1 General Specifications

For the general specifications of the D/A converter module, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

3.2 Performance Specifications

The following table shows the performance specifications of the D/A converter module.

<table>
<tr><th colspan="3" rowspan="2">Item</th><th colspan="4">Model</th></tr>
<tr><th colspan="4">L60DA4</th></tr>
<tr><td colspan="3">Number of analog output points</td><td colspan="4">4 points (4 channels)</td></tr>
<tr><td colspan="2" rowspan="2">Digital input</td><td colspan="4">-20480 to 20479</td></tr>
<tr><td>When using the scaling function</td><td colspan="4">-32768 to 32767</td></tr>
<tr><td rowspan="2">Analog output</td><td>Voltage</td><td colspan="4">-10 to 10 VDC (external load resistance 1kΩ to 1MΩ)</td></tr>
<tr><td>Current</td><td colspan="4">0 to 20 mADC (external load resistance 0Ω to 600Ω))</td></tr>
<tr><td colspan="3" rowspan="8">I/O characteristics, resolution</td><td colspan="2">Analog output range</td><td>Digital value</td><td>Resolution</td></tr>
<tr><td rowspan="4">Voltage</td><td>0 to 5V</td><td rowspan="2">0 to 20000</td><td>250μV</td></tr>
<tr><td>1 to 5V</td><td>200μV</td></tr>
<tr><td>-10 to 10V</td><td rowspan="2">-20000 to 20000</td><td>500μV</td></tr>
<tr><td>User range setting</td><td>333μV*1</td></tr>
<tr><td rowspan="3">Current</td><td>0 to 20mA</td><td rowspan="2">0 to 20000</td><td>1000nA</td></tr>
<tr><td>4 to 20mA</td><td>800nA</td></tr>
<tr><td>User range setting</td><td>-20000 to 20000</td><td>700nA*1</td></tr>
<tr><td rowspan="2">Accuracy (accuracy for the maximum value of analog output value) *2</td><td>Ambient temperature 25±5°C</td><td colspan="4">Within ±0.1% (voltage: ±10mV, current: ±20μA)</td></tr>
<tr><td>Ambient temperature 0 to 55°C</td><td colspan="4">Within ±0.3% (voltage: ±30mV, current: ±60μA)</td></tr>
<tr><td colspan="3">Conversion speed</td><td colspan="4">20μs/channel</td></tr>
<tr><td colspan="3">Offset/gain setting count</td><td colspan="4">Up to 50000 counts</td></tr>
<tr><td colspan="3">Output short protection</td><td colspan="4">Protected</td></tr>
<tr><td colspan="3">Isolation method</td><td colspan="4">Between I/O terminals and programmable controller power supply: photocoupler isolation
Between output channels: no isolation
Between external power supply and analog output: transformer isolation</td></tr>
<tr><td colspan="3">Dielectric withstand voltage</td><td colspan="4">Between I/O terminals and programmable controller power supply: 500VACrms for 1 minute
Between external power supply and analog output: 500VACrms for 1 minute</td></tr>
<tr><td colspan="3">Insulation resistance</td><td colspan="4">Between I/O terminals and programmable controller power supply: 500VDC 10MΩ or higher</td></tr>
<tr><td colspan="3">Number of occupied I/O points</td><td colspan="4">16 points (I/O assignment: Intelligent 16 points)</td></tr>
<tr><td colspan="3">Connected terminal</td><td colspan="4">18-point terminal block</td></tr>
<tr><td colspan="3">Applicable wire size</td><td colspan="4">0.3 to 0.75mm^2</td></tr>
<tr><td colspan="3">Applicable solderless terminal</td><td colspan="4">R1.25 to 3 (solderless terminals with sleeve are not usable)</td></tr>
<tr><td colspan="3" rowspan="4">External supply power</td><td colspan="4">24VDC +20%, -15%</td></tr>
<tr><td colspan="4">Ripple, spike 500mV$_{P-P}$ or lower</td></tr>
<tr><td colspan="4">Inrush current: 4.3A, 1000μs or shorter</td></tr>
<tr><td colspan="4">Current consumption: 0.18A</td></tr>
<tr><td colspan="3">Internal current consumption (5VDC)</td><td colspan="4">0.16A</td></tr>
<tr><td colspan="3">Weight</td><td colspan="4">0.20kg</td></tr>
</table>

*1 Maximum resolution in the user range setting.

*2 Except when receiving noise influence.
Warm up (or power on) the module for 30 minutes to satisfy the accuracy shown in the table.

3.2.1 Number of parameter settings

Set the initial setting of D/A converter module and the parameter setting of auto refresh setting so that the number of parameters, including these of other intelligent function modules, does not exceed the number of parameters that can be set in the CPU module.
For the maximum number of parameters that can be set in the CPU module (maximum number of parameter settings), refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

(1) Number of the D/A converter module parameters

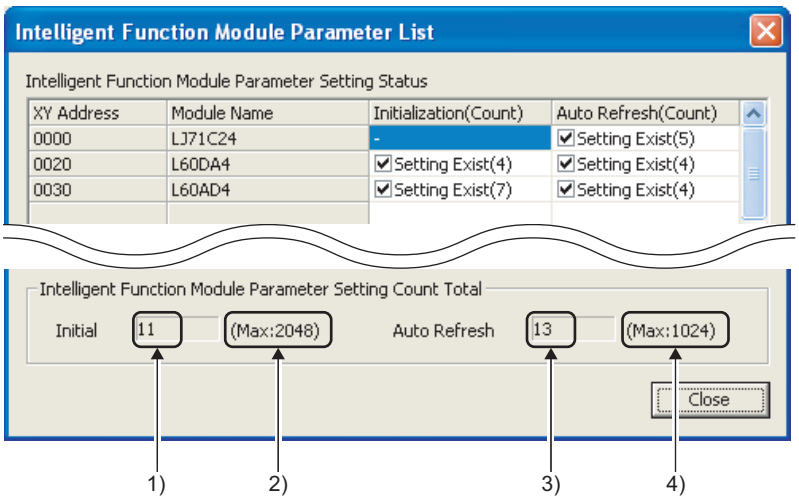
For D/A converter modules, the following number of parameters can be set per module.

Target module	Initial setting	Auto refresh setting
L60DA4	4	11 (maximum number of settings)

(2) Checking method

The maximum number of parameter settings and the number of parameter settings set for the intelligent function module can be checked with the following operation.

Project window ⇨ [Intelligent Function Module] ⇨ Right-click
⇨ [Intelligent Function Module Parameter List]



No.	Description
1)	The total number of parameters in the initial settings selected on the dialog box
2)	The maximum number of parameter settings in the initial settings
3)	The total number of parameters in the auto refresh settings selected on the dialog box
4)	The maximum number of parameter settings in the auto refresh settings

3.3 Function List

The following shows the function list of the D/A converter module.

Item	Description	Reference
D/A conversion enable/disable function	Sets whether to enable or disable D/A conversion for each channel. Disabling the D/A conversion for unused channels reduces the conversion cycles.	Page 45, Section 8.1
D/A output enable/disable function	This function sets whether to output the D/A conversion value or the offset value, for each channel. The conversion speed is constant, regardless of the output enable/disable status.	Page 45, Section 8.2
Range switching function	The output range to use can be selected from the factory default range (4mA to 20mA, 0mA to20mA, 1V to 5V, 0V to 5V or -10V to 10V) and user range (user range setting).	Page 39, Section 7.2
Offset/gain setting function	This function compensates for errors in analog output values.	Page 42, Section 7.5
Analog output HOLD/CLEAR function	This function sets whether to hold the output analog value (HOLD) or clear the output analog value (CLEAR), according to the CPU module operating status (RUN, STOP or stop error).	Page 46, Section 8.3
Analog output test when CPU module is in STOP status	When the CPU module is in STOP operation status, forcibly turning CH□ Output enable/disable flag (Y1 to Y4) ON outputs the D/A-converted analog value.	Page 47, Section 8.4
Scaling function	The D/A converter module scale-converts the input digital value with the setting range of the scaling upper limit value and scaling lower limit value. This omits the programming of the scale conversion.	Page 48, Section 8.5
Alarm output function	This function detects the digital value which exceeds the setting range.	Page 53, Section 8.6
External power supply READY flag (X7)	This signal turns ON when the external power supply 24VDC is supplied. When the flag is OFF, 0V/0mA are output to analog output values regardless of other settings.	Page 84, Appendix 1.1(2)
Error log function	The function stores up to latest 16 recodes of errors and alarms occurred in the D/A converter module to the buffer memory.	Page 55, Section 8.7
Module error collection	This function collects errors and alarms occurred in the D/A converter module and stores to the CPU module.	Page 57, Section 8.8
Error clear function	Clearing the error from the system monitor at error occurrence is possible.	Page 58, Section 8.9
Save/restoration of offset/gain value	The offset/gain value of the user range setting can be saved or restored.	Page 59, Section 8.10

3.4 I/O Signal List

The following shows the I/O signal list of the D/A converter module.

For details on the setting status, refer to the following.

- Details of I/O signals (☞ Page 84, Appendix 1)

Input signal		Output signal	
Device number	**Signal name**	**Device number**	**Signal name**
X0	Module READY	Y0	Use prohibited
X1	Use prohibited	Y1	CH1 Output enable/disable flag
X2		Y2	CH2 Output enable/disable flag
X3		Y3	CH3 Output enable/disable flag
X4		Y4	CH4 Output enable/disable flag
X5		Y5	Use prohibited
X6		Y6	
X7	External power supply READY flag	Y7	
X8	Use prohibited	Y8	
X9	Operating condition setting completed flag	Y9	Operating condition setting request
XA	Offset/gain setting mode flag	YA	User range writing request
XB	Channel change completed flag	YB	Channel change request
XC	Set value change completed flag	YC	Set value change request
XD	Use prohibited	YD	Use prohibited
XE	Warning output signal	YE	Warning output clear request
XF	Error flag	YF	Error clear request

Point

The I/O number (X/Y) described above shows the case that the start I/O number of the D/A converter module is set to "0".

3.5 Buffer Memory List

The following shows the buffer memory list of the D/A converter module.

For details on buffer memory, refer to the following.

- Detail of buffer memory (☞ Page 90, Appendix 2)

Point

Do not write data to the system area and the area where the data cannot be written from the program in buffer memory. Writing data to these areas may lead the module to malfunction.

(1) Un\G0 to Un\G1799

Address (decimal)	Address (hexadecimal)	Name	Default *1	Read/Write *2
0	0_H	D/A conversion enable/disable setting	$000F_H$	R/W
1	1_H	CH1 Digital value	0	R/W
2	2_H	CH2 Digital value	0	R/W
3	3_H	CH3 Digital value	0	R/W
4	4_H	CH4 Digital value	0	R/W
5 to 10	5_H to A_H	System area	—	—
11	B_H	CH1 Set value check code	0	R
12	C_H	CH2 Set value check code	0	R
13	D_H	CH3 Set value check code	0	R
14	E_H	CH4 Set value check code	0	R
15 to 18	F_H to 12_H	System area	—	—
19	13_H	Latest error code	0	R
20	14_H	Setting range	0	R
21	15_H	System area	—	—
22	16_H	Offset/gain setting mode Offset specification	0	R/W
23	17_H	Offset/gain setting mode Gain specification	0	R/W
24	18_H	Offset/gain adjustment value specification	0	R/W
25	19_H	System area	—	—
26	$1A_H$	HOLD/CLEAR function setting	0	R
27 to 46	$1B_H$ to $2E_H$	System area	—	—
47	$2F_H$	Warning output setting	$000F_H$	R/W
48	30_H	Warning output flag	0	R

Address (decimal)	Address (hexadecimal)	Name	Default *1	Read/Write *2
49 to 52	31_H to 34_H	System area	—	—
53	35_H	Scaling enable/disable setting	$000F_H$	R/W
54	36_H	CH1 Scaling lower limit value	0	R/W
55	37_H	CH1 Scaling upper limit value	0	R/W
56	38_H	CH2 Scaling lower limit value	0	R/W
57	39_H	CH2 Scaling upper limit value	0	R/W
58	$3A_H$	CH3 Scaling lower limit value	0	R/W
59	$3B_H$	CH3 Scaling upper limit value	0	R/W
60	$3C_H$	CH4 Scaling lower limit value	0	R/W
61	$3D_H$	CH4 Scaling upper limit value	0	R/W
62 to 85	3EH to 55_H	System area	—	—
86	56_H	CH1 Warning output upper limit value	0	R/W
87	57_H	CH1 Warning output lower limit value	0	R/W
88	58_H	CH2 Warning output upper limit value	0	R/W
89	59_H	CH2 Warning output lower limit value	0	R/W
90	$5A_H$	CH3 Warning output upper limit value	0	R/W
91	$5B_H$	CH3 Warning output lower limit value	0	R/W
92	$5C_H$	CH4 Warning output upper limit value	0	R/W
93	$5D_H$	CH4 Warning output lower limit value	0	R/W
94 to 157	$5E_H$ to $9D_H$	System area	—	—
158	$9E_H$	Mode switching setting	0	R/W
159	$9F_H$		0	R/W
160 to 199	$A0_H$ to $C7_H$	System area	—	—
200	$C8_H$	Pass data classification setting	0	R/W
201	$C9_H$	System area	—	—
202	CA_H	CH1 Industrial shipment settings offset value	0	R/W
203	CB_H	CH1 Industrial shipment settings gain value	0	R/W
204	CC_H	CH2 Industrial shipment settings offset value	0	R/W
205	CD_H	CH2 Industrial shipment settings gain value	0	R/W
206	CE_H	CH3 Industrial shipment settings offset value	0	R/W
207	CF_H	CH3 Industrial shipment settings gain value	0	R/W
208	$D0_H$	CH4 Industrial shipment settings offset value	0	R/W
209	$D1_H$	CH4 Industrial shipment settings gain value	0	R/W
210	$D2_H$	CH1 User range settings offset value	0	R/W

Address (decimal)	Address (hexadecimal)	Name	Default *1	Read/Write *2
211	$D3_H$	CH1 User range settings gain value	0	R/W
212	$D4_H$	CH2 User range settings offset value	0	R/W
213	$D5_H$	CH2 User range settings gain value	0	R/W
214	$D6_H$	CH3 User range settings offset value	0	R/W
215	$D7_H$	CH3 User range settings gain value	0	R/W
216	$D8_H$	CH4 User range settings offset value	0	R/W
217	$D9_H$	CH4 User range settings gain value	0	R/W
218 to 1799	DA_H to 707_H	System area	—	—

*1 The default value is a value set after power-on or after resetting the CPU module.

*2 This shows whether reading the data from or writing the data to the area with programs is possible.
R: Readable
W: Writable

(2) Error history (Un\G1800 to Un\G1969)

Address (decimal)	Address (hexadecimal)	Name				Default *1	Read/Write *2
1800	708_H	Latest error code address				0	R
1801 to 1809	709_H to 711_H	System area				—	—
1810	712_H	No. 1	Error code			0	R
1811	713_H		Error time	First two digits of the year	Last two digits of the year	0	R
1812	714_H			Month	Day	0	R
1813	715_H			Hour	Minute	0	R
1814	716_H			Second	Day of the week	0	R
1815 to 1819	717_H to $71B_H$		System area			—	—
1820 to 1829	$71C_H$ to 725_H	No. 2	Same as No. 1				
1830 to 1839	726_H to $72F_H$	No. 3	Same as No. 1				
1840 to 1849	730_H to 739_H	No. 4	Same as No. 1				
1850 to 1859	$73A_H$ to 743_H	No. 5	Same as No. 1				
1860 to 1869	744_H to $74D_H$	No. 6	Same as No. 1				
1870 to 1879	$74E_H$ to 757_H	No. 7	Same as No. 1				
1880 to 1889	758_H to 761_H	No. 8	Same as No. 1				
1890 to 1899	762_H to $76B_H$	No. 9	Same as No. 1				

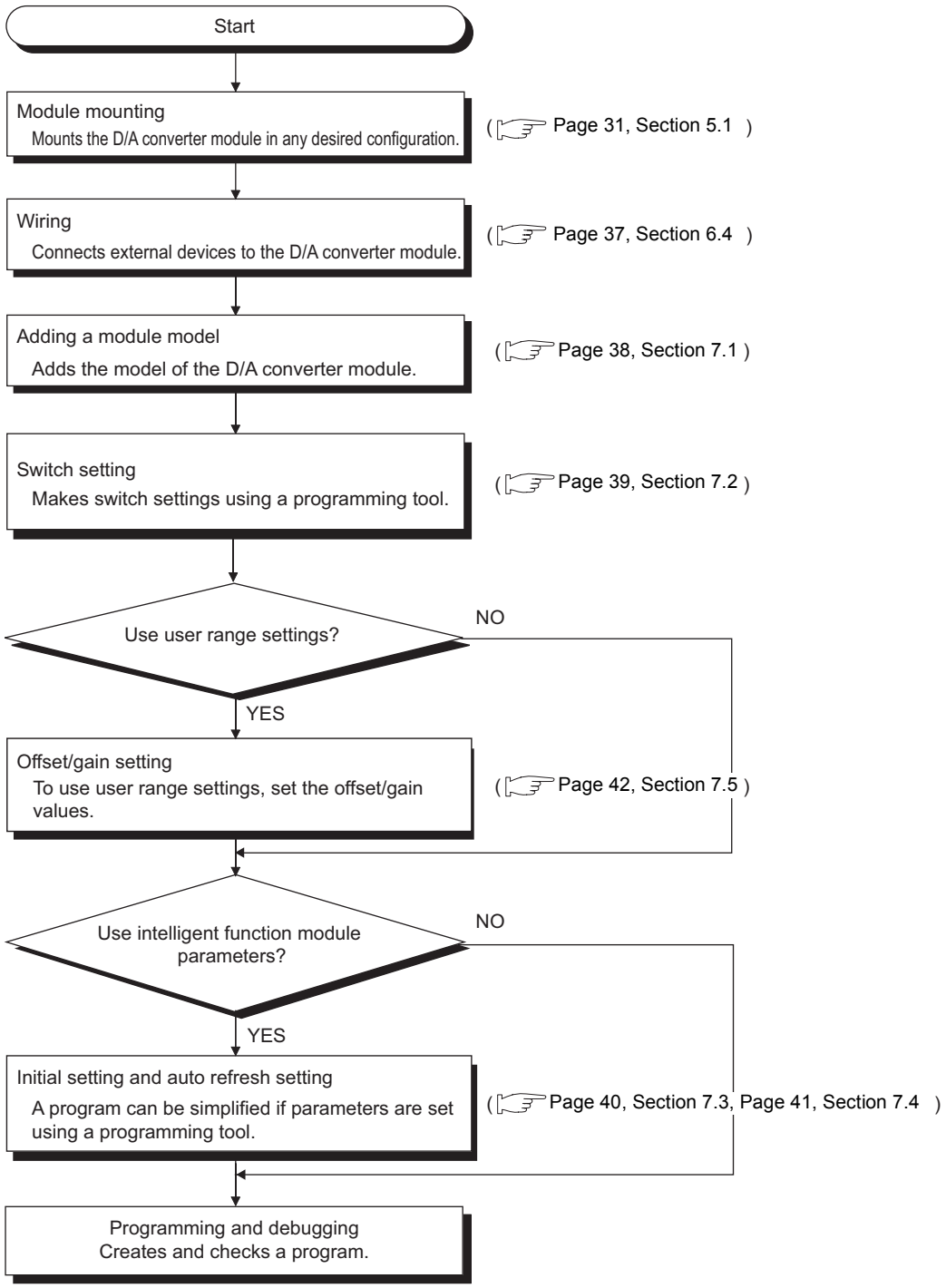
Address (decimal)	Address (hexadecimal)	Name		Default *1	Read/Write *2
1900 to 1909	$76C_H$ to 775_H	No. 10	Same as No. 1		
1910 to 1919	776_H to $77F_H$	No. 11	Same as No. 1		
1920 to 1929	780_H to 789_H	No. 12	Same as No. 1		
1930 to 1939	$78A_H$ to 793_H	No. 13	Same as No. 1		
1940 to 1949	794_H to $79D_H$	No. 14	Same as No. 1		
1950 to 1959	$79E_H$ to $7A7_H$	No. 15	Same as No. 1		
1960 to 1969	$7A8_H$ to $7B1_H$	No. 16	Same as No. 1		

*1 The default value is a value set after power-on or after resetting the CPU module.

*2 This shows whether reading the data from or writing the data to the area with programs is possible.
R: Readable
W: Writable

CHAPTER 4 PROCEDURES BEFORE STARTING THE OPERATION

This chapter describes the procedures before starting the operation.



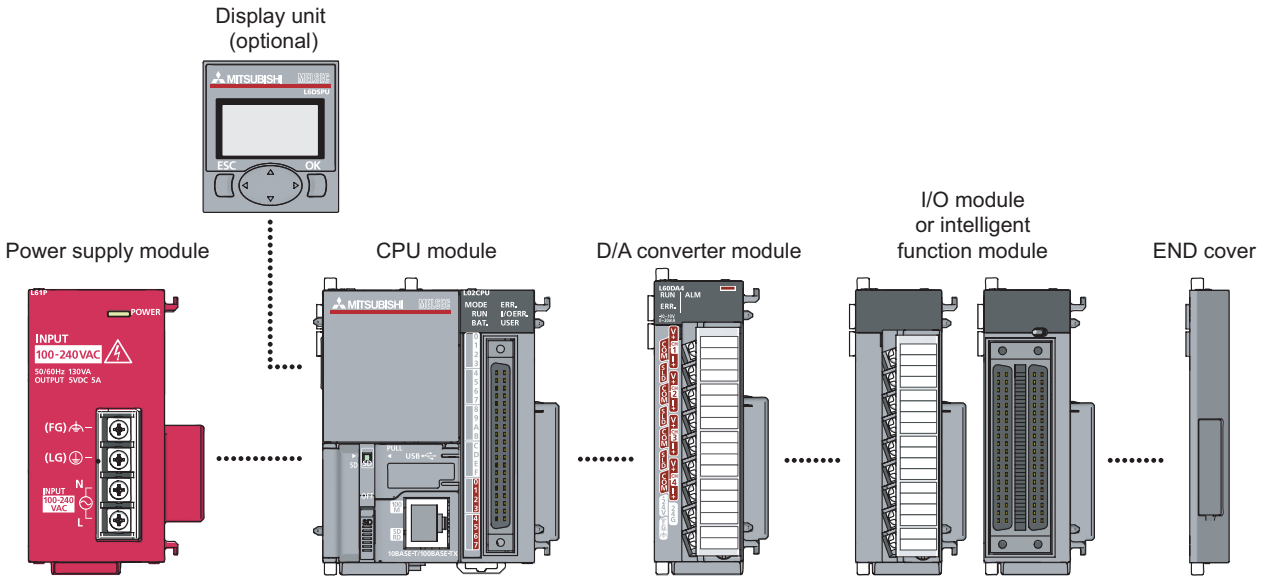
Memo

CHAPTER 5 SYSTEM CONFIGURATION

This chapter describes the overall configuration, number of connectable modules, and compatible software version of the D/A converter module.

5.1 Overall System Configuration

The following shows a system configuration example for using the D/A converter module.



5.2 Applicable System

(1) Number of connectable modules

For the number of connectable modules, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

(2) Compatible software version

For the compatible software versions, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

Memo

CHAPTER 6 INSTALLATION AND WIRING

This chapter describes the installation and wiring of the D/A converter module.

6.1 Installation Environment and Installation Position

For precautions for installation environment and installation position, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

6.2 Terminal Block

(1) Precautions

Tighten the terminal block screws within the following specified torque range.

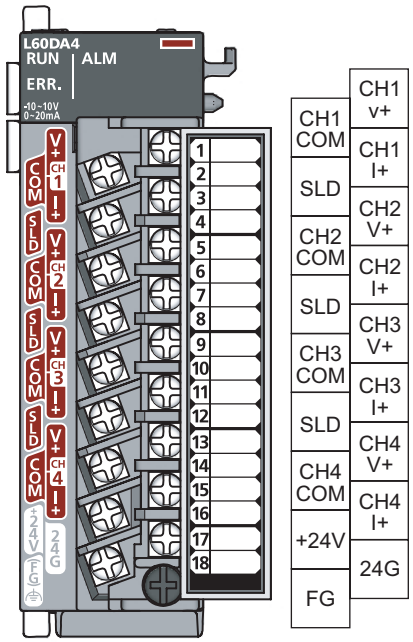
Screw type	Tightening torque range
Terminal screw (M3 screw)	0.42 to 0.58N • m
Terminal block mounting screw (M3.5 screw)	0.66 to 0.89N • m

The following table shows the applicable solderless terminal installed to the terminal block. For wiring, use the wire applicable to the following wire and mount with the applicable tightening torque. Use a UL-approved solderless terminal and tools recommended by the manufacturer of the solderless terminal. The sleeve solderless terminal cannot be used.

Solderless terminal		Wire			
Model Name	Applicable tightening torque	Wire diameter	Type	Material	Temperature rating
R1.25-3	0.42 to 0.58N • m	22 to 18 AWG	Stranded wire	Copper wire	75°C or higher

(2) Signal names of the terminal block

The following shows signal names of the terminal block.

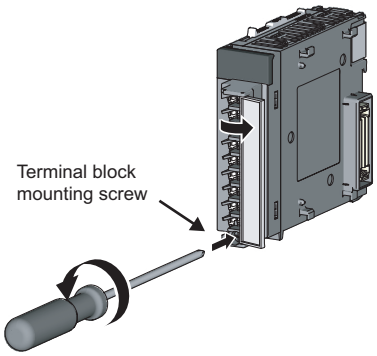


Pin number	Signal name	
1	CH1	V+
2		COM
3		I+
4	SLD	
5	CH2	V+
6		COM
7		I+
8	SLD	
9	CH3	V+
10		COM
11		I+
12	SLD	
13	CH4	V+
14		COM
15		I+
16	+24V	
17	24G	
18	FG	

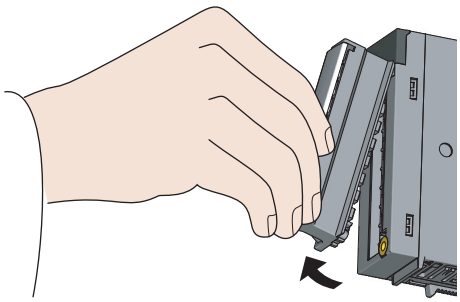
(3) Removal and installation of the terminal block

The following shows how to remove and install the terminal block.

(a) Removal procedure

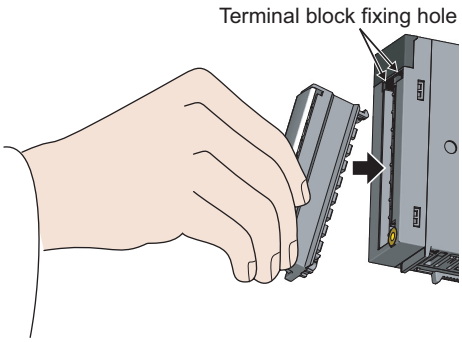


1. **Open the terminal cover and loosen the terminal block mounting screw.**

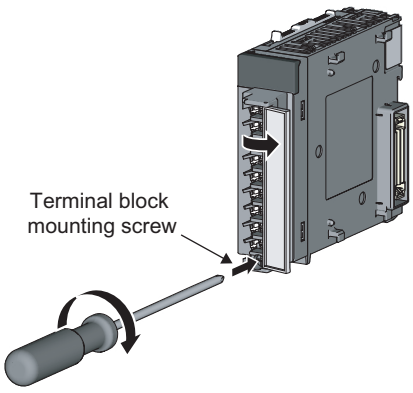


2. **Using the terminal block fixing holes as a fulcrum, remove the terminal block.**

(b) Installation procedure



1. **Fully insert the projections on the top of the terminal block into the terminal block fixing holes and press the terminal block until it snaps into place.**



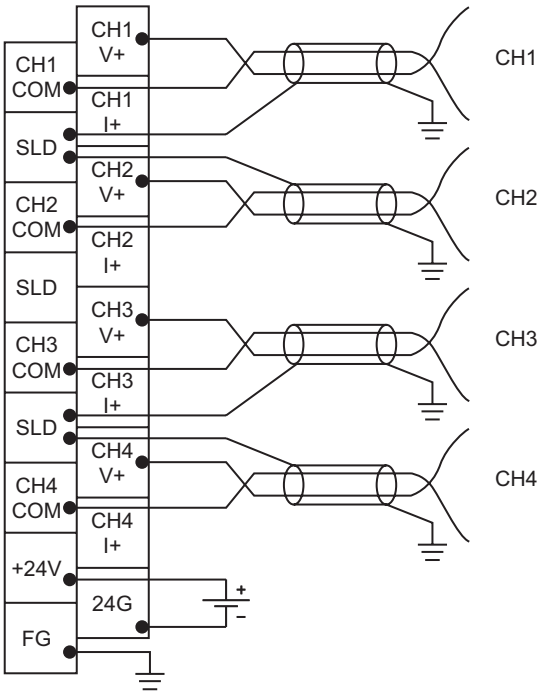
2. **Open the terminal cover and tighten the terminal block mounting screw.**

6.3 Wiring

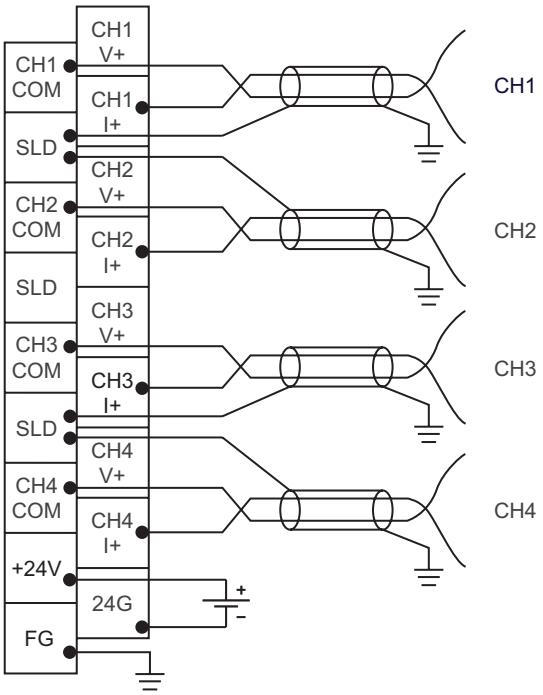
(1) Wiring to a terminal block

The following shows wirings to a terminal block.

(a) For voltage output



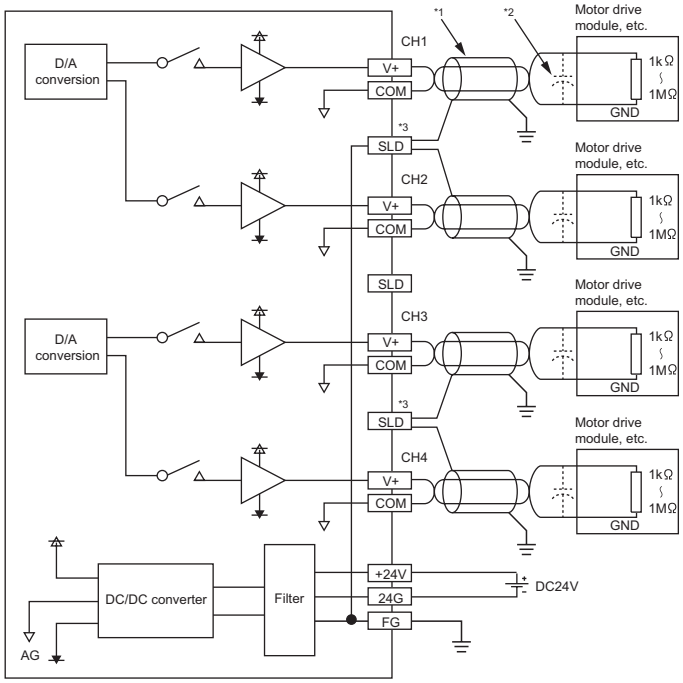
(b) For current output



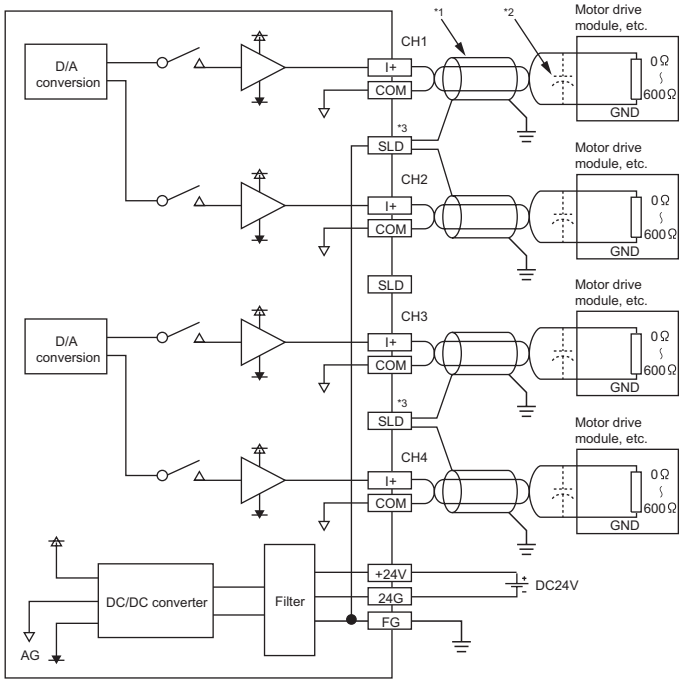
6.4 External Wiring

The following describes the external wiring.

(1) For voltage output



(2) For current output



*1 For wire, use the shielded twisted pair cable.

*2 For external wiring, if noise or ripple occurs, connect a capacitor with values between 0.1μF and 0.47μF with voltage around of 25V between terminal (V+) and COM.

*3 Connect the each channel shielded wire to any one of three shield terminals for the channel. Be sure to ground the FG terminal.
In addition, ground the FG terminal of the power supply module.

CHAPTER 7 VARIOUS SETTINGS

This chapter describes the setting procedures of the D/A converter module.

Point

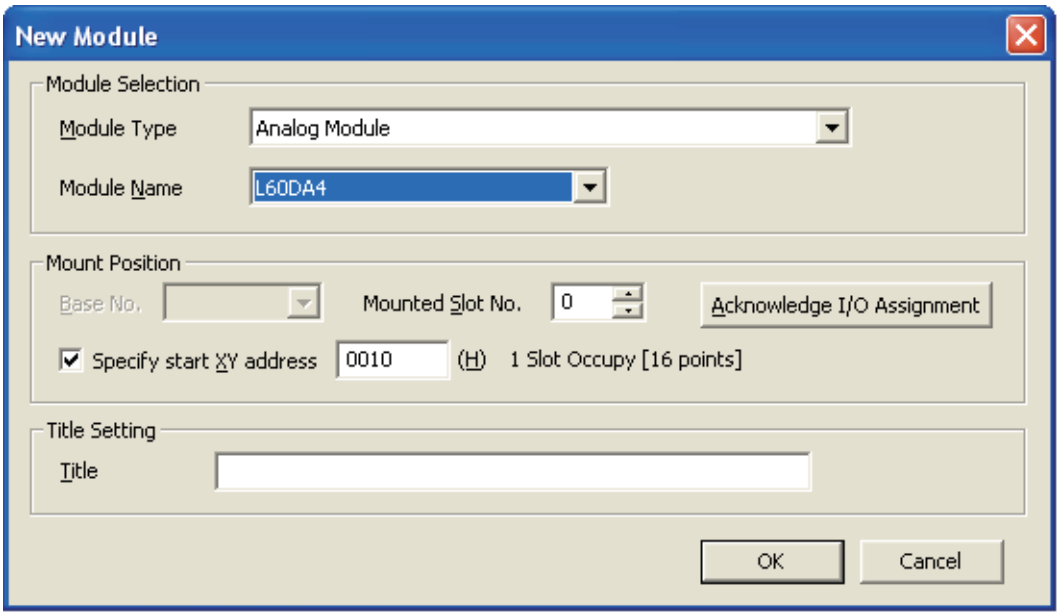
After writing the contents of new module, switch settings, parameter settings and auto refresh settings into the CPU module, reset the CPU module, switch STOP → RUN → STOP → RUN, or switch OFF → ON the power supply, to validate the setting contents.

7.1 Addition of Modules

Add the model name of D/A converter modules to use on the Project.

(1) Addition procedure

Project window ⇨ [Intelligent Function Module] ⇨ "New Module…"



Item		Description
Module Type	Module Type	Set "analog module".
	Module Name	Select the name of the module to be connected.
Mount Position	Mounted Slot No.	Set the slot No. where the target module is connected.
	Specify start X/Y address	The start I/O number (hexadecimal) of the target module is set, according to the mounted slot No. Setting any start I/O number is also possible.
Title Setting	Title	Set any title.

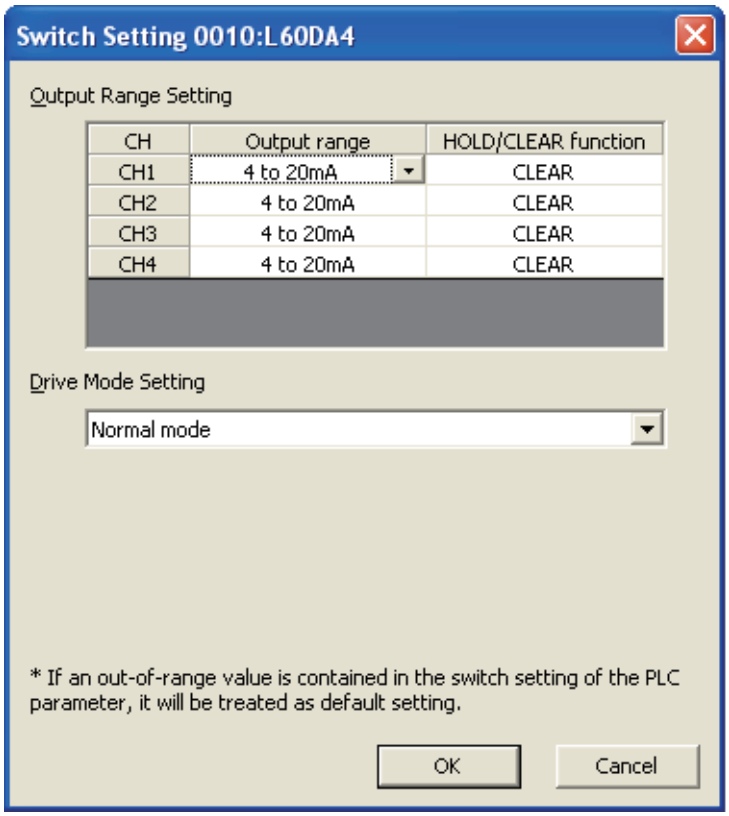
7.2 Switch Setting

Set the operation mode, HOLD/CLEAR function, and the output range used in each CH.

(1) Setting procedure

Set from "Switch Setting" in the project window.

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Switch Setting"



Item		Description	Setting value
Output Range Setting	Output range	Set the output range used in each CH.	• 4 to 20mA (default value) • 0 to 20mA • 1 to 5V • 0 to 5V • -10 to 10V • User range setting
	HOLD/CLEAR function	Set whether to hold or clear the output analog value in each CH when the CPU module enters to the STOP status or when an error occurs.	• CLEAR (default value) • HOLD
Operation Mode Setting		Set the operation mode of the D/A converter module.	• Normal mode (default value) • Offset/gain setting mode

7.3 Parameter Setting

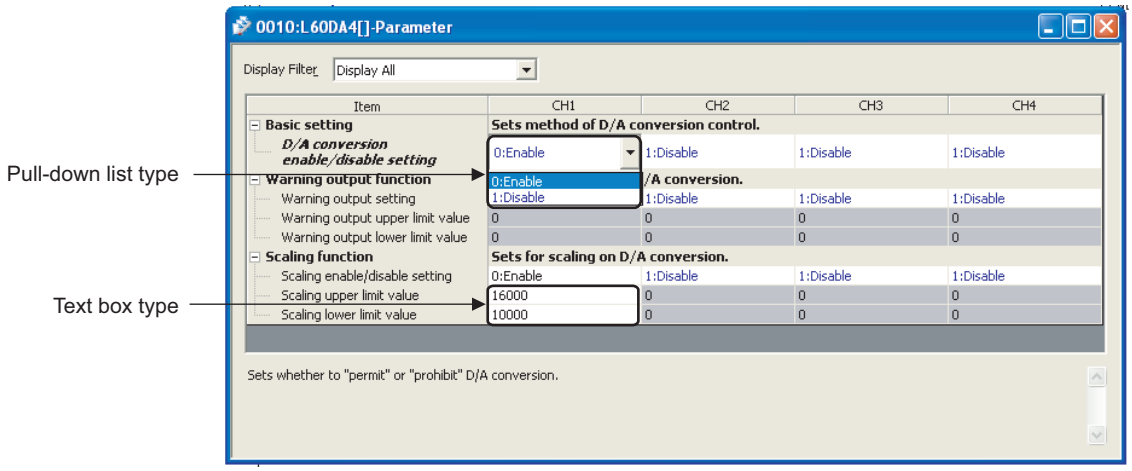
Set the parameters of each CH.

(1) Setting procedure

Set from "Parameter" in the project window.

1. Start "Parameter" from the project window.

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Parameter"



2. Double-click the item to change the setting, and input the setting value.

- Items to input from the pull-down list
  Double-click the item to set, to display the pull-down list. Select the item.
- Items to input from the text box
  Double-click the item to set, and input the setting value.

3. Use CH2 to CH4 with the operation in step 2.

Item		Setting value	Reference
Basic setting	D/A conversion enable/disable setting	0: Enable 1: Disable (default value)	Page 45, Section 8.1
Warning Output Function	Warning output setting	0: Enable 1: Disable (default value)	Page 53, Section 8.6
	Warning output upper limit value	-32768 to 32767 (default value: 0)	
	Warning output lower limit value	-32768 to 32767 (default value: 0)	
Scaling function	Scaling function	0: Enable 1: Disable (default value)	Page 48, Section 8.5
	Scaling upper limit value	-32000 to 32000 (default value: 0)	
	Scaling lower limit value	-32000 to 32000 (default value: 0)	

7.4 Auto Refresh

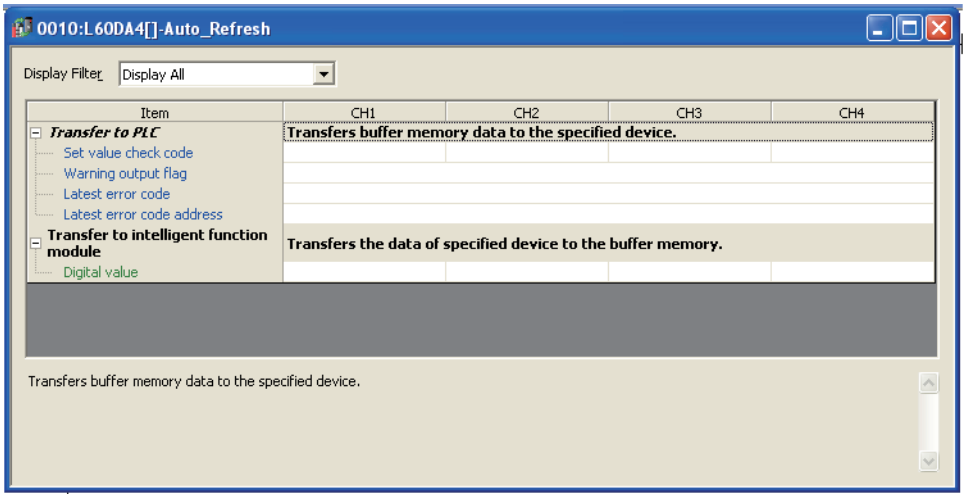
This setting transfers data in the buffer memory to specified devices.

(1) Setting procedure

1. Start "Auto_Refresh" from the project window.

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Auto_Refresh"

2. Click the item to setup, and input the auto refresh target device.

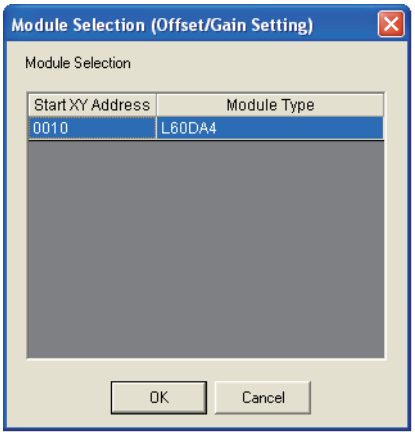


7.5 Offset/Gain Setting

When using the user range setting, configure the offset/gain setting with the following operations.
When using the factory default setting, the offset/gain setting is not necessary.

(1) Setting procedure

[Tool] ⇨ [Intelligent Function Module Tool] ⇨ [Analog Module] ⇨ [Offset/Gain Setting]



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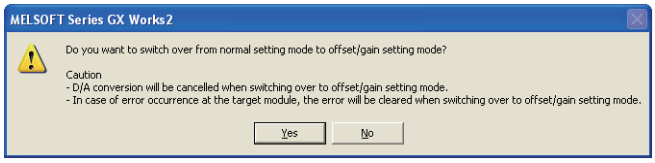

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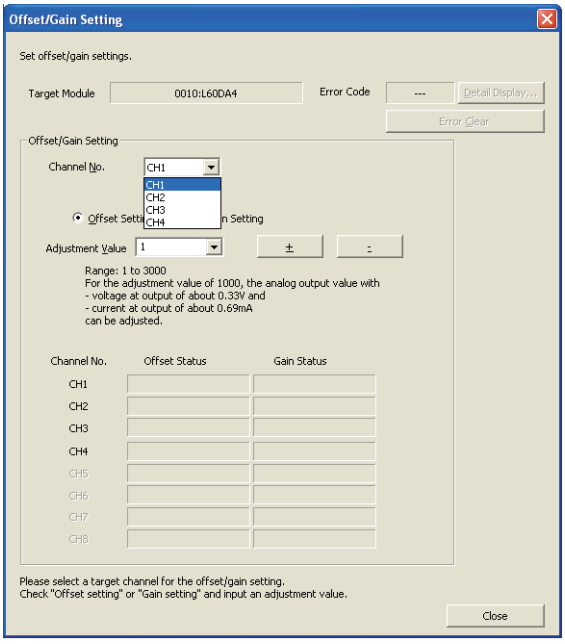
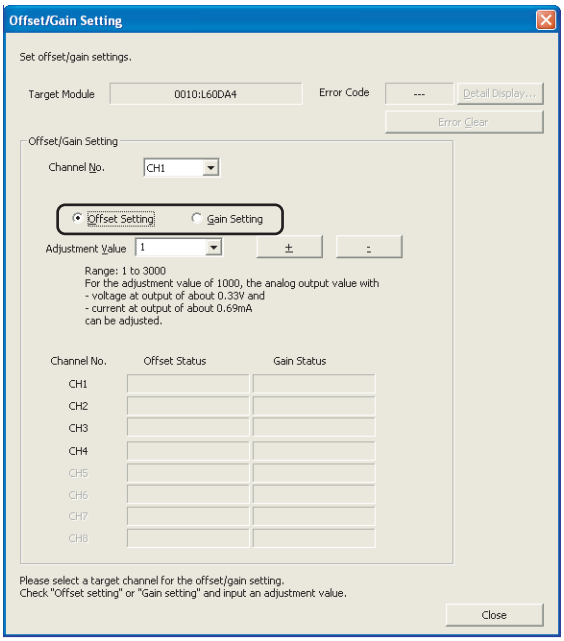


↓

1. **Select the module to configure the offset/gain setting, and click the** OK **button.**

2. **Click the** Yes **button.**

3. **Specify the channel to use the offset/gain setting.**



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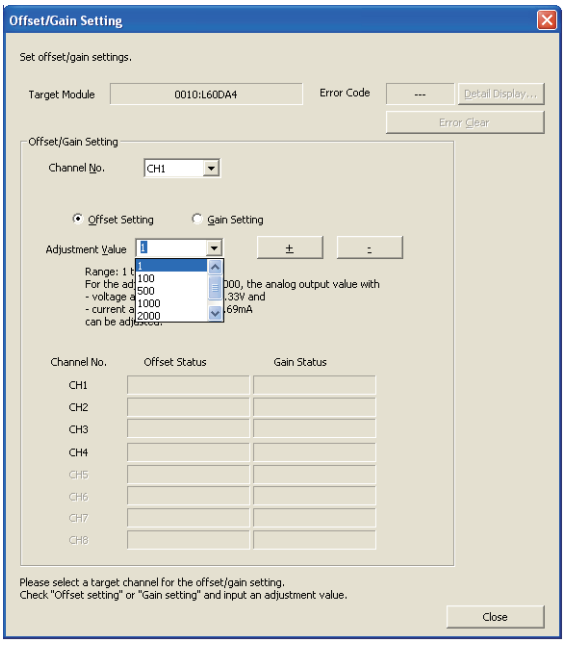

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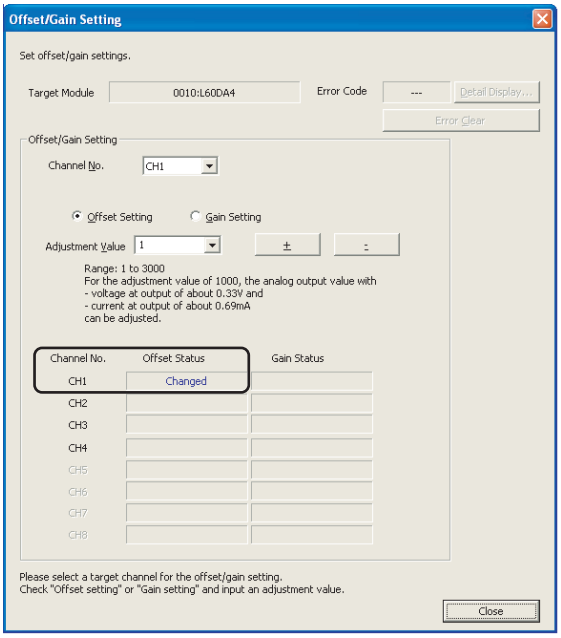
4. **Use the radio button to specify whether to perform the offset setting or gain setting.**
(Step 5 and later describes when the offset setting is specified.)

5. **The adjustment amount of the offset value or gain value can be selected from "1", "100", "500", "1000", "2000", and "3000" or it can be set by inputting any value (1 to 3000).**



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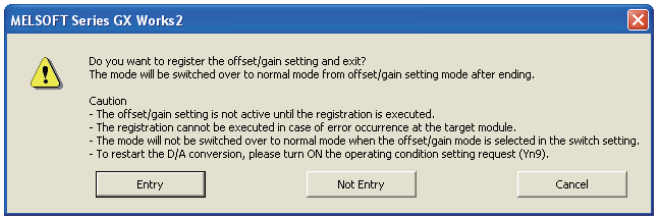


↓

End

6. **Clicking the ± or - button fine-adjusts the analog output voltage or analog output current value by the set adjusted value.**

7. **The offset status in the specified channel is changed to "Changed".**

8. **To perform the gain setting, repeat from step 4.**

9. **After setting, click the Close button.**

10. **Click the Entry button.**

CHAPTER 8 FUNCTIONS

This chapter describes the details on functions that can be used in the D/A converter module and the setting procedures.

For details on I/O signals and buffer memory, refer to the following.

- Detail of I/O signals (Page 84, Appendix 1)
- Details of buffer memory addresses (Page 90, Appendix 2)

8.1 D/A Conversion Enable/Disable Function

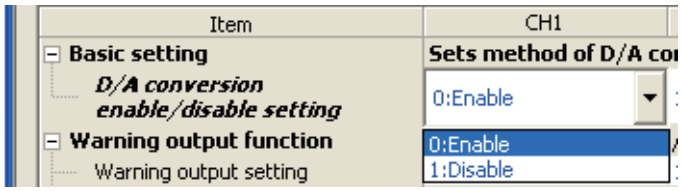
This function sets whether to enable or disable the analog value output for each channel.

Disabling the D/A conversion for unused channels reduces the conversion cycles.

(1) Setting procedure

Set "D/A conversion enable/disable setting" to "0: Enable".

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



8.2 D/A Output Enable/Disable Function

This function sets whether to output the D/A conversion value or the offset value, for each channel.

The conversion speed is constant, regardless of the output enable/disable status.

(1) Setting procedure

Configure the setting with CH☐ Output enable/disable flag (Y1 to Y4)

CH☐ Output enable/disable flag (Y1 to Y4)	Analog output
Enable (ON)	D/A conversion value is output.
Disable (OFF)	Offset value is output.

8.3 Analog Output HOLD/CLEAR Function

This function sets whether to hold the output analog value (HOLD) or clear the output analog value (CLEAR), according to the CPU module operating status (RUN, STOP or stop error).

(1) Combination of analog output statuses

The analog output status changes as shown in the following table, depending on the combination of settings for D/A conversion enable/disable setting (Un\G0) and CH☐ Output enable/disable flag (Y1 to Y4).

Execution status	D/A conversion enable/disable setting (Un\G0)	Enable			Disable
	CH☐ Output enable/disable flag (Y1 to Y4)	Enable		Disable	Enable or disable
	Analog output HOLD/CLEAR function setting	HOLD	CLEAR	HOLD or CLEAR	HOLD or CLEAR
Analog output status when CPU module is in RUN status		Analog value converted from digital value with D/A conversion is output.		Offset value	0V/0mA
Analog output status when CPU module is in STOP status		Hold	Offset value	Offset value*2	0V/0mA
Analog output status when CPU module is in stop error		Hold	Offset value	Offset value	0V/0mA
Analog output status when a watchdog timer error*1 occurs		0V/0mA	0V/0mA	0V/0mA	0V/0mA

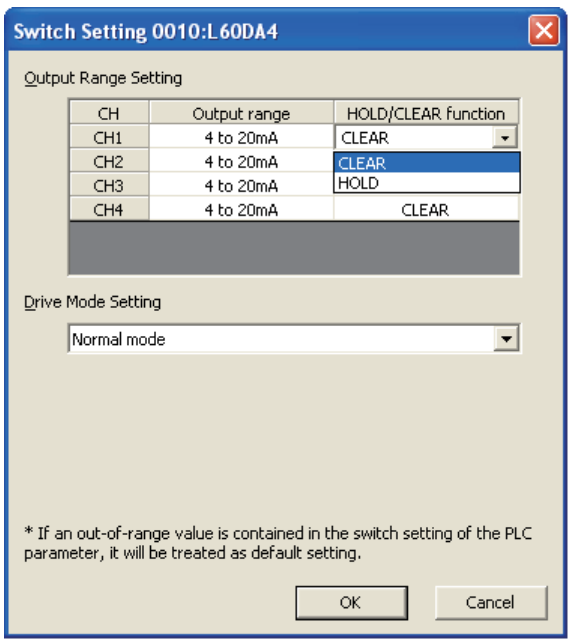
*1 Occurs when the program operation is not completed within the estimated time due to such as a hardware trouble in the D/A converter module. When a watchdog timer error occurs, Module READY (X0) turns OFF and the RUN LED on the D/A converter module turns off.

*2 The following operation is performed when the CPU module is in STOP status, D/A conversion enable/disable setting (Un\G0) is set to D/A conversion enabled (0) and Operating condition setting request (Y9) is turned to OFF → ON → OFF.
Output enable/disable flag OFF: 0 V/0 mA output
Output enable/disable flag OFF → ON: offset value output

(2) Setting procedure

Configure the setting from "HOLD/CLEAR function".

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Switch Setting]



8.4 Analog Output Test when CPU Module is in STOP Status

Analog output test can be performed when CPU module is in STOP status.

When the following settings are configured, the settings are enabled even during the analog output test.

- Alarm output function (☞ Page 53, Section 8.6)
- Scaling Function (☞ Page 48, Section 8.5)

When a digital value out of the range is written to each channel, a check code is stored in CH☐ Set value check code (Un\G11 to Un\G14).

(1) Setting procedure

For analog output test, configure the following settings in the device test of GX Works2.

1. **Set D/A conversion enable/disable setting (Un\G0) to "enable" for the channel where the analog output test is to be performed.**
2. **Turn OFF → ON → OFF Operating condition setting request (Y9).**
3. **Turn OFF → ON Output enable/disable flag (Y1 to Y4) for the channel where the analog output test is to be performed.**
4. **Set the digital value equivalent to the analog value to be output to CH☐ Digital value (Un\G1 to Un\G4) in buffer memory.**

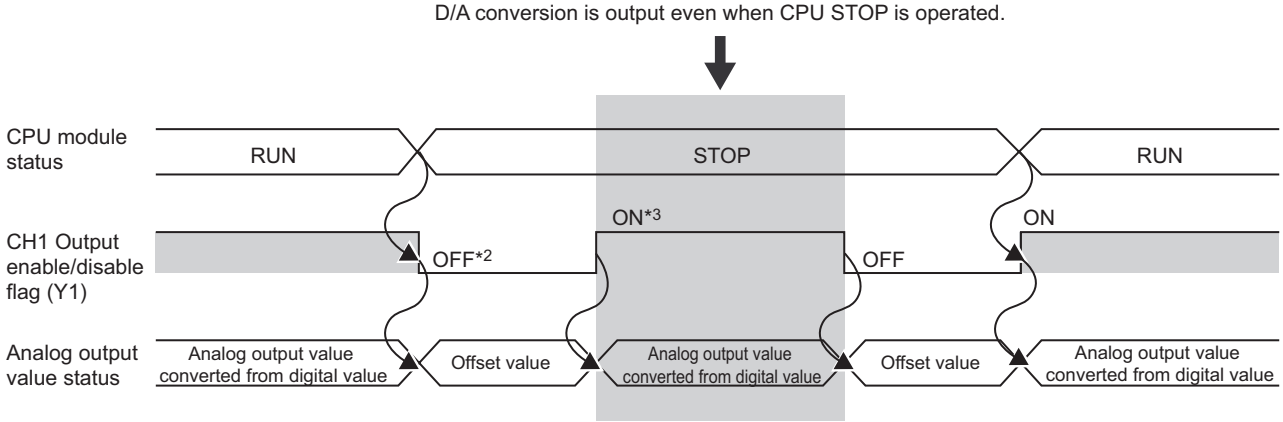
Setting combination	D/A conversion enable/disable setting (Un\G0)	Enable		Disable	
	CH☐ Output enable/disable flag (Y1 to Y4)	Enable	Disable	Enable	Disable
Analog output test		Allowed	Not allowed	Not allowed*1	

*1 When performing the analog output test, set D/A conversion enable/disable setting (Un\G0) to "enable" beforehand.

(2) Operation timing

By forcibly turning CH☐ Output enable/disable flag (Y1 to Y4) OFF → ON when the CPU module is in STOP status, analog output value is changed from offset value to D/A-converted analog value.

The following shows the relation between CH1 Output enable/disable flag (Y1) and analog output value when the CPU module is in STOP status.



*2 CH1 Output enable/disable flag (Y1) turns OFF with CPU STOP.

*3 By forcibly turning the CH1 Output enable/disable flag (Y1) OFF → ON, analog output value is changed from offset value to D/A-converted analog value.

8.5 Scaling Function

This function converts the input digital value to the scaled value of -20000 to 20000 (or 0 to 20000) using the specified scaling upper and lower limit values, and outputs the corresponding analog value.

(1) Concept of scaling setting

The setting for scaling lower and upper limit values differs depending on either the factory default setting or the user range setting is used for analog output range.

(a) When the factory default setting is used for analog output range

When using the factory default range, set a value corresponding to the upper limit value of the analog output value of the factory default range for the scaling upper limit value. Also, set a value corresponding to the lower limit value of the analog output of the factory default range for the scaling lower limit value.

(b) When the user range setting is used for analog output range

When using the user range, set a value corresponding to the analog output gain value for the scaling upper limit value. Also, set a value corresponding to the analog output offset value for the scaling lower limit value.

(2) Calculating the scaling value

Values converted using the following formulas are used for D/A conversion.
(Values lower than the decimal point are rounded down in scale conversion.)

$$\text{Digital value used for D/A conversion} = \frac{D_{Max} - D_{Min}}{S_H - S_L} \times (D_X - S_L) + D_{Min}$$

- Dx: digital value
- D_{Max}: digital maximum value of the used output range
- D_{Min}: digital minimum value of the used output range
- S_H: scaling upper limit value
- S_L: Scaling lower limit value

(a) When the factory default setting is used for output range

- Voltage: 1 to 5 V, 0 to 5 V
  Current: 4 to 20 mA, 0 to 20 mA

$$\text{Digital value used for D/A conversion} = \frac{20000}{S_H - S_L} \times (D_X - S_L)$$

- When the voltage is -10 to 10 V

$$\text{Digital value used for D/A conversion} = \frac{40000}{S_H - S_L} \times (D_X - S_L) - 20000$$

(b) When the user range setting is used for output range

$$\text{Digital value used for D/A conversion} = \frac{20000}{S_H - S_L} \times (D_X - S_L)$$

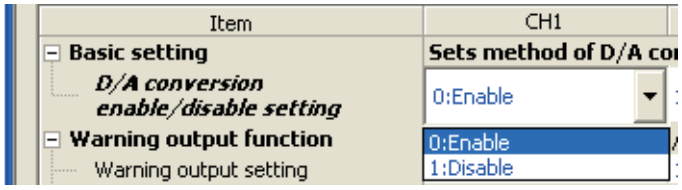
Point

Even if the input range of digital value is increased, the resolution does not become higher than that of when the scaling function is not used.

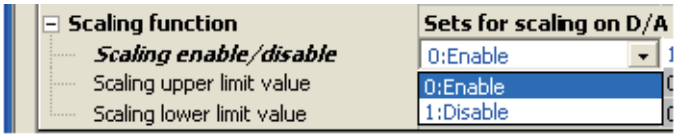
(3) Setting procedure

1. Set "D/A conversion enable/disable setting" to "0: Enable".

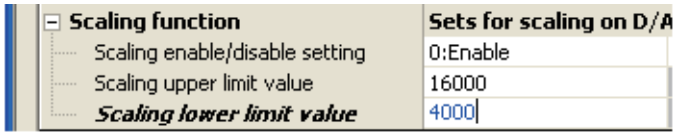
Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



2. Set "Scaling function" to "0: Enable".



3. Set values for "Scaling upper limit value" and "Scaling lower limit value".



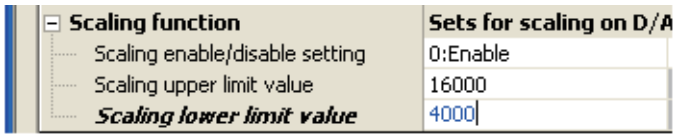
Item	Setting range
Scaling upper limit value	-32000 to 32000
Scaling lower limit value	

Point

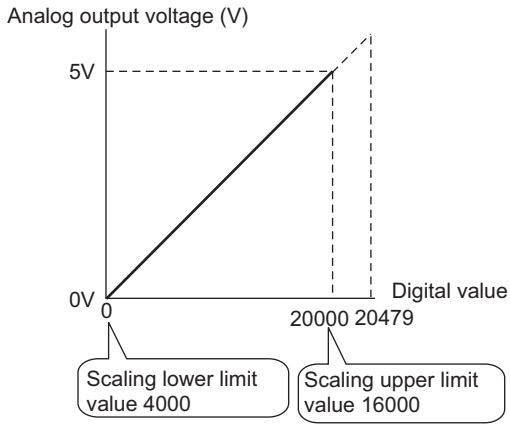
- Your scaling settings must meet the following condition:
  Scaling upper limit value > Scaling lower limit value

(4) Scaling setting example

Ex. 1. When setting the "Scaling upper limit value" to "16000" and the "Scaling lower limit value" to "4000" for a channel with output range of 0V to 5V:

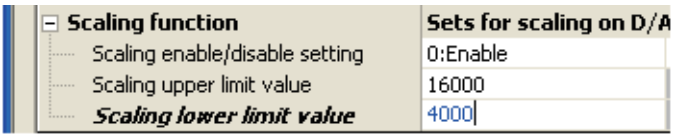


The following shows the digital values before and after scaling.

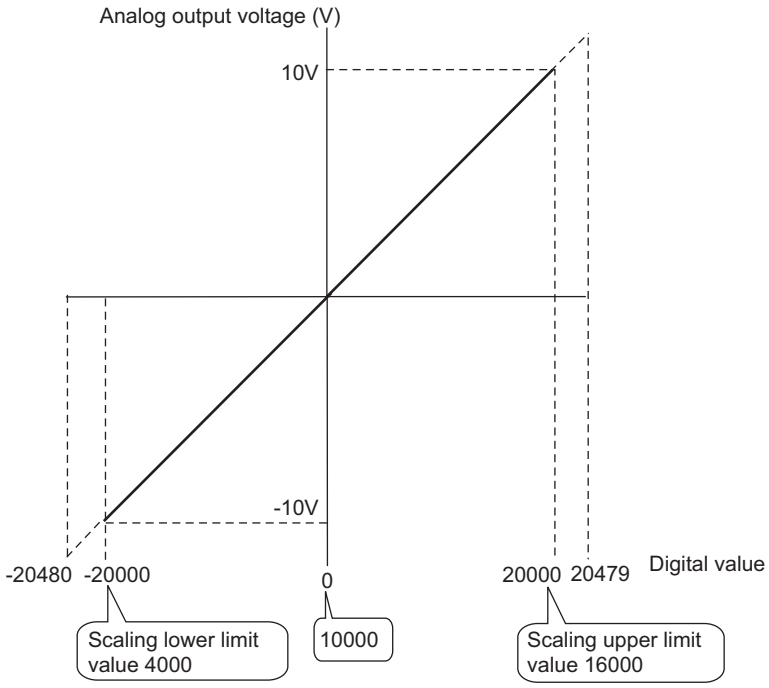


Analog output voltage (V)	Digital value	Digital value after scaling
0	4000	0
1	6400	4000
2	8800	8000
3	11200	12000
4	13600	16000
5	16000	20000

Ex. 2. When setting the "Scaling upper limit value" to "16000" and the "Scaling lower limit value" to "4000" for a channel with output range of -10V to 10V:



The following shows the digital values before and after scaling.

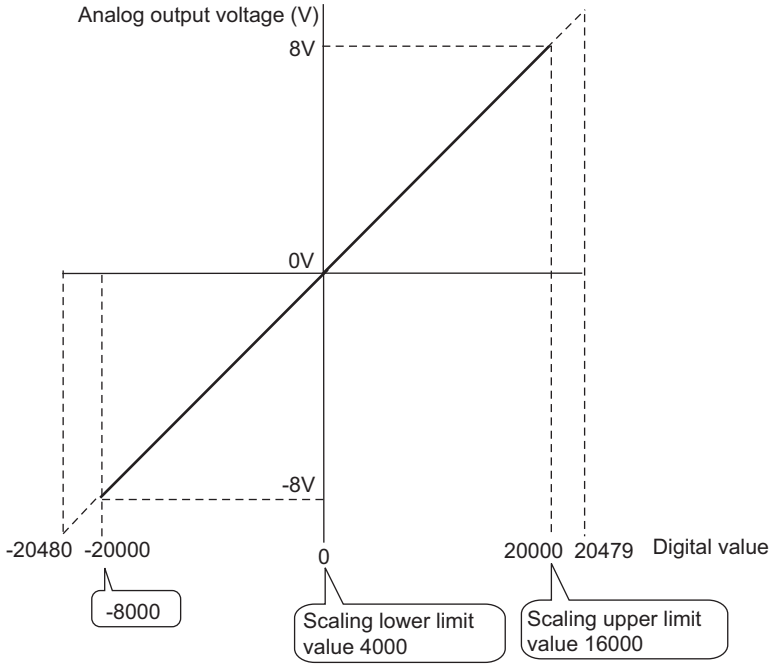


Analog output voltage (V)	Digital value	Digital value after scaling
-10	4000	-20000
-5	7000	-10000
0	10000	0
5	13000	10000
10	16000	20000

Ex. 3: When setting the "Scaling upper limit value" to "16000" and the "Scaling lower limit value" to "4000" for a channel with output range of -8V to 8V:

Scaling function	Sets for scaling on D/A
Scaling enable/disable setting	0:Enable
Scaling upper limit value	16000
Scaling lower limit value	4000

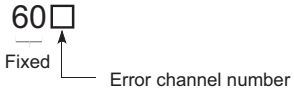
The following shows the digital values before and after scaling.



Analog output voltage (V)	Digital Value	Digital value after scaling
-8	-8000	-20000
-4	-2000	-10000
0	4000	0
4	10000	10000
8	16000	20000

Point

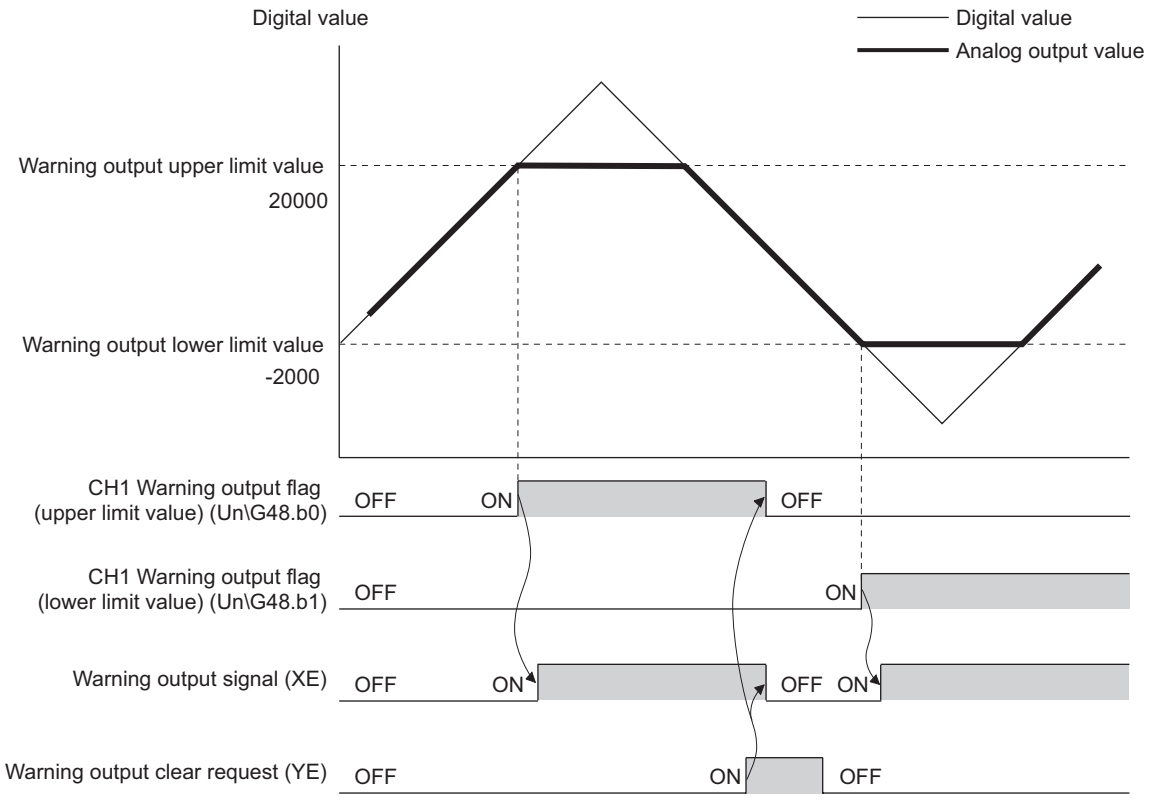
- When using the scaling function, the digital value before scaling can be set to a value out of the range of scaling upper and lower limit values (dotted line area in the I/O characteristics). However, use the scaling function within the range of analog output practical range (solid line area in the I/O characteristics). If the value exceeds the analog output practical range, the resolution and accuracy may not fall within the range of performance specifications.
- The default digital value "0" may not be appropriate, depending on the scaling function setting.
  Especially in the examples 1 and 2, the out-of-range digital value error (error code: 60□) occurs if the output enable/disable flag is turned on with the digital value "0".
  Therefore, be sure to set an appropriate digital value, within the scaling range, before turning on the output enable/disable flag.
  The following shows the error codes that occur.



- When using the user range, note that the scaling lower limit value is equal to the offset value.

8.6 Alarm Output Function

This function outputs an alarm when the digital value is out of the preset range.

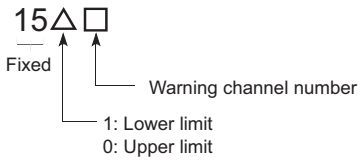


(1) Alarm output notification

When the digital value moves above the alarm output upper limit value, or below the alarm output lower limit value, alarm notifications are made by Warning output flag (Un\G48), Warning output signal (XE) and the ALM LED turning ON.

In addition, alarm code 15 △□ is stored in Latest error code (Un\G19).

The alarm code that is stored is shown below:



(2) Operation of alarm output function

When the digital value moves above the alarm output upper limit value, or below the alarm output lower limit value, alarm notifications are made, and the analog output value becomes any of the following.

- When the digital value exceeds the alarm output upper limit value: An analog value converted from the digital value of alarm output upper limit value is output.
- When the digital value is less than the alarm output lower limit value: An analog value converted from the digital value of alarm output lower limit value is output.

After an alarm has occurred, the analog output value returns to the normal value by changing the digital value to a value within the setting range. However, Warning output flag (Un\G48) and Warning output signal (XE) are not cleared. (ALM LED keeps ON.)

(3) Clearing the Warning output

The alarm output can be cleared in the following two procedures:

- Turning OFF → ON → OFF Warning output clear request (YE)
- Turning OFF → ON → OFF Operating condition setting request (Y9)

Clearing the alarm output puts the D/A converter module into the following status.

- Warning output flag (Un\G48) is cleared.
- Warning output signal (XE) is turned to OFF.
- ALM LED is turned off.
- Warning code: 15△☐ stored in Latest error code (Un\G19) is cleared.

(4) If the scaling function is enabled

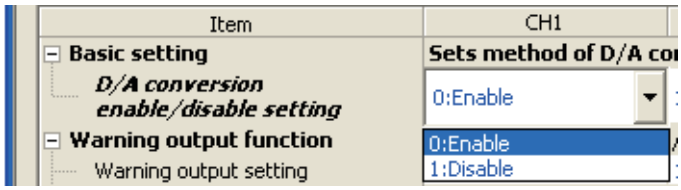
If Scaling enable/disable setting (Un\G53) is set to "Enable", the digital value converted to the scaling range becomes a subject for alarm detection.

When setting CH1 Warning output upper limit value (Un\G86) to CH4 Warning output lower limit value (Un\G93), make sure to specify values that reflect the scaling range.

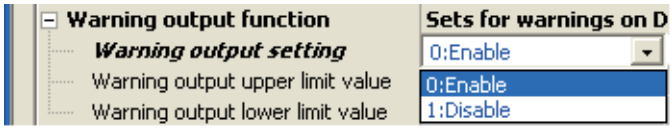
(5) Setting procedure

1. **Set "D/A conversion enable/disable setting" to "0: Enable".**

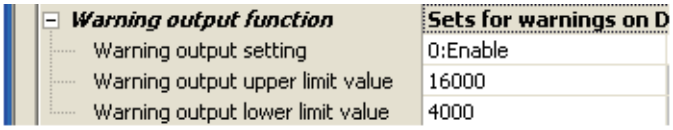
Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



2. **Set "Warning output setting" in "Warning output function" to "0: Enable".**



3. **Set a value for "Warning output upper limit value" and "Warning output lower limit value".**



Item	Setting range
Warning output upper limit value	-32768 to 32767
Warning output lower limit value	

8.7 Error Log Function

This function stores a history of errors and alarms that occurred in the D/A converter module to the buffer memory (Un\G1810 to Un\G1969).
A maximum of 16 errors and alarms can be stored.

(1) Process of the error log function

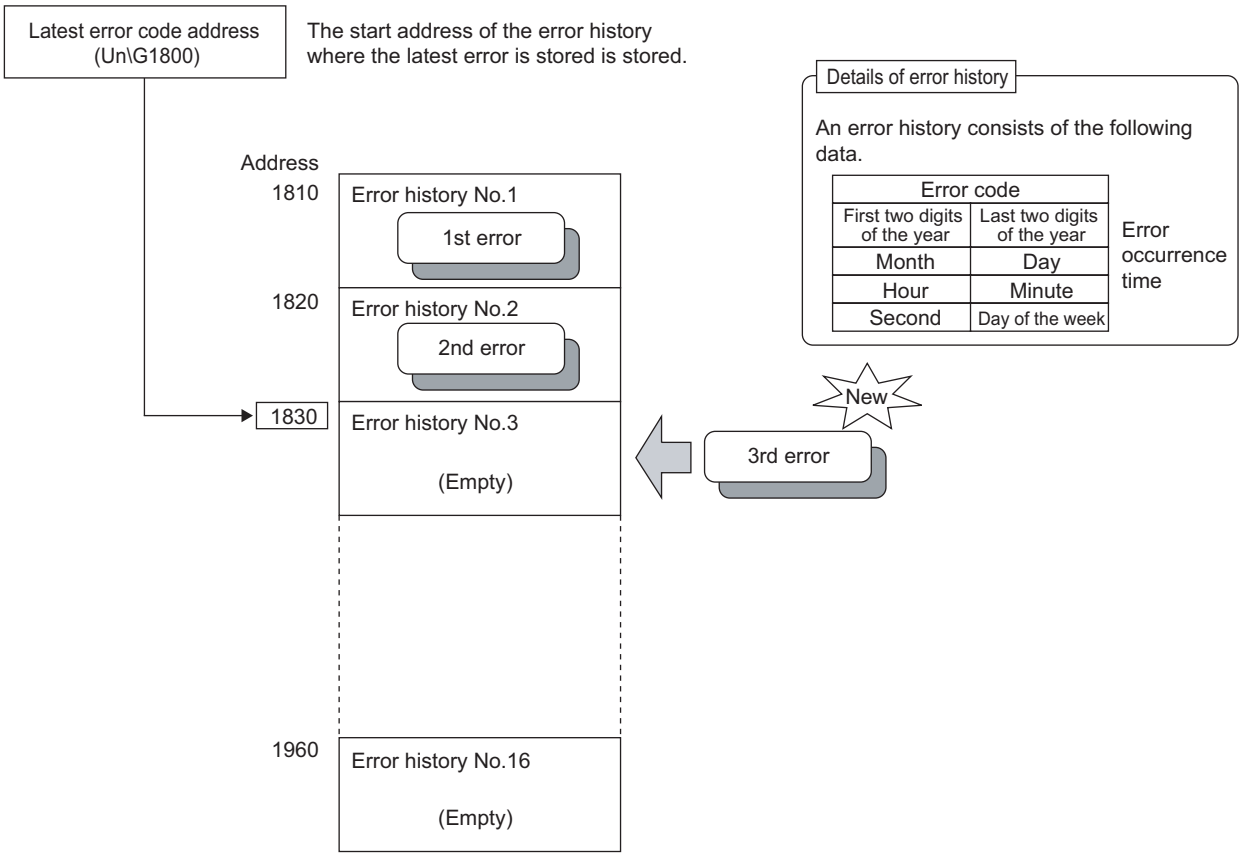
The error code and the time of error occurrence are stored in the buffer memory address, starting from error history No.1 (start address Un\G1810) and sequentially thereafter.

(2) Checking error history

You can check the start address of the latest stored error at Latest error code address (Un\G1800)

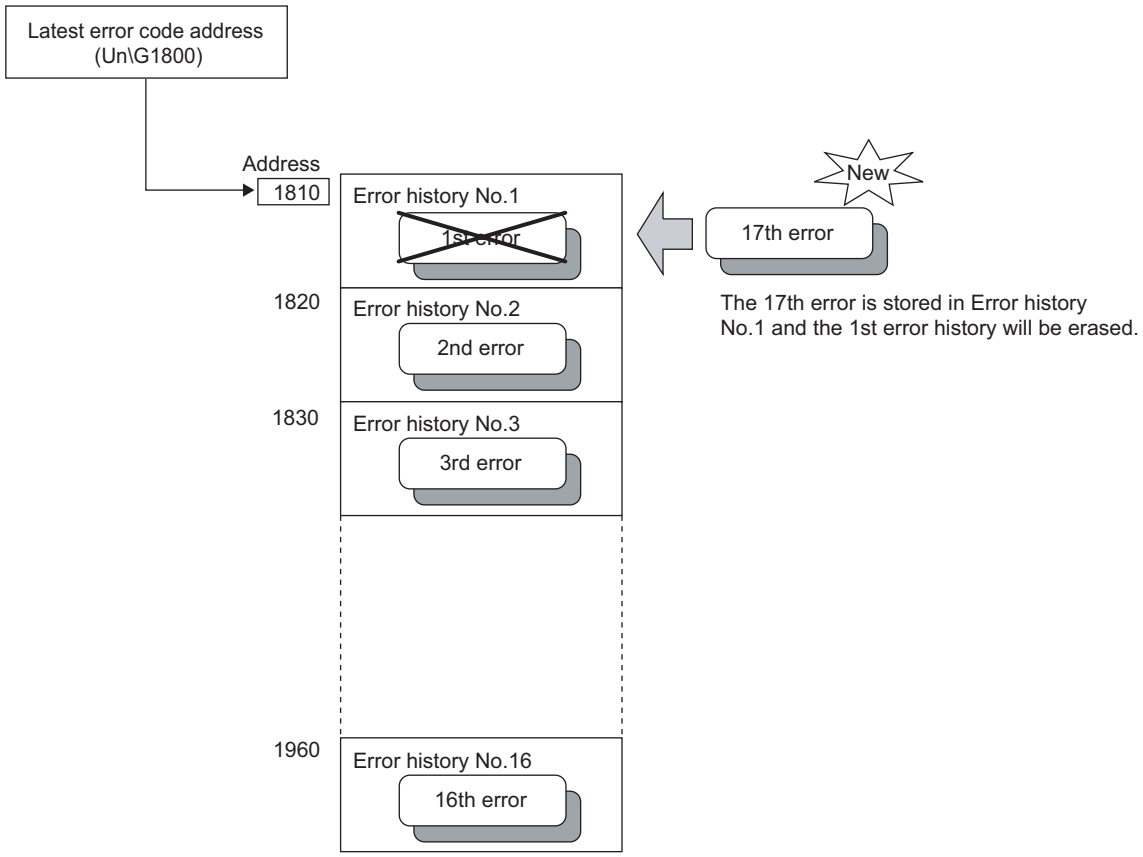
Ex. 1. When the third error occurs:

The third error is stored in error history No.3, and the value "1830" (start address of error history No.3) is stored to Latest error code address (Un\G1800).



Ex. 2. When the 17th error occurs:

The 17th error is stored in error history no.1, and the value "1810" (start address of error history No.1) is stored to Latest error code address (Un\G1800).

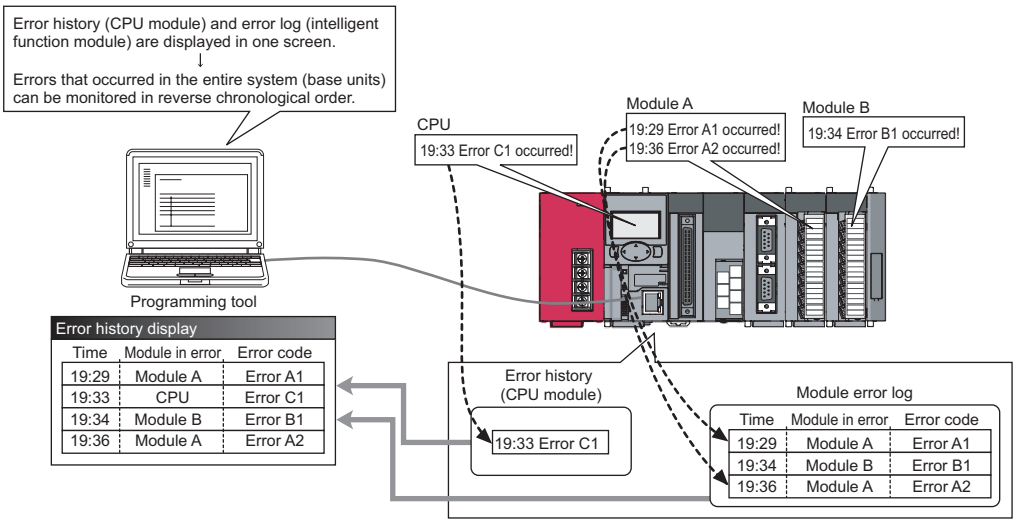


Point

- The same process for errors is used when an alarm occurs.
- Once the error history storage area becomes full, subsequent errors will overwrite the previous errors, starting from error history No.1, and continues sequentially thereafter (Un\G1810 to G1819). (The overwritten history is deleted.)
- The stored error history is cleared when power supply is turned OFF, or when the CPU module is reset.

8.8 Module Error Collection Function

This function collects the errors and alarms occurred in D/A converter module into the CPU module. By holding the module errors in a memory that can hold data in the event of power failure, the errors can be held even after power-off or reset.



[Example of screen display]

No.	Error Code	Date and Time	Model Name	Start I/O
00125	0070	2009/12/10 17:02:37	L60AD4	0030
00124	0070	2009/12/10 17:00:05	L60AD4	0030
00123	0CE4	2009/12/10 17:00:04	L26CPU-BT	----
00122	05DC	2009/12/10 16:15:50	L26CPU-BT	----
00121	0070	2009/12/10 15:59:30	L60DA4	0030
00120	0070	2009/12/10 15:45:02	L60DA4	0010
00119	05DC	2009/12/10 14:14:38	L26CPU-BT	----
00118	0070	2009/12/10 14:12:03	L60DA4	0010
00117	0CE4	2009/12/10 13:59:54	L26CPU-BT	----
00116	0CE4	2009/12/10 13:35:11	L26CPU-BT	----
00115	05DC	2009/12/10 11:11:45	L26CPU-BT	----
00114	0070	2009/12/10 11:07:05	L60AD4	0010
00113	0CE4	2009/12/10 11:07:04	L26CPU-BT	----
00112	0070	2009/12/10 11:03:49	L60AD4	0010
00111	0CE4	2009/12/10 11:03:48	L26CPU-BT	----
00110	05DC	2009/12/09 16:30:58	L26CPU-BT	----
00109	0070	2009/12/09 16:29:33	L60DA4	0010
00108	0070	2009/12/09 16:29:12	L60DA4	0010
00107	083B	2009/12/09 16:29:11	L26CPU-BT	----

Point

For details on the module error collection, refer to the following.

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

8.9 Error Clear Function

When an error occurs, you can clear the error from the system monitor.

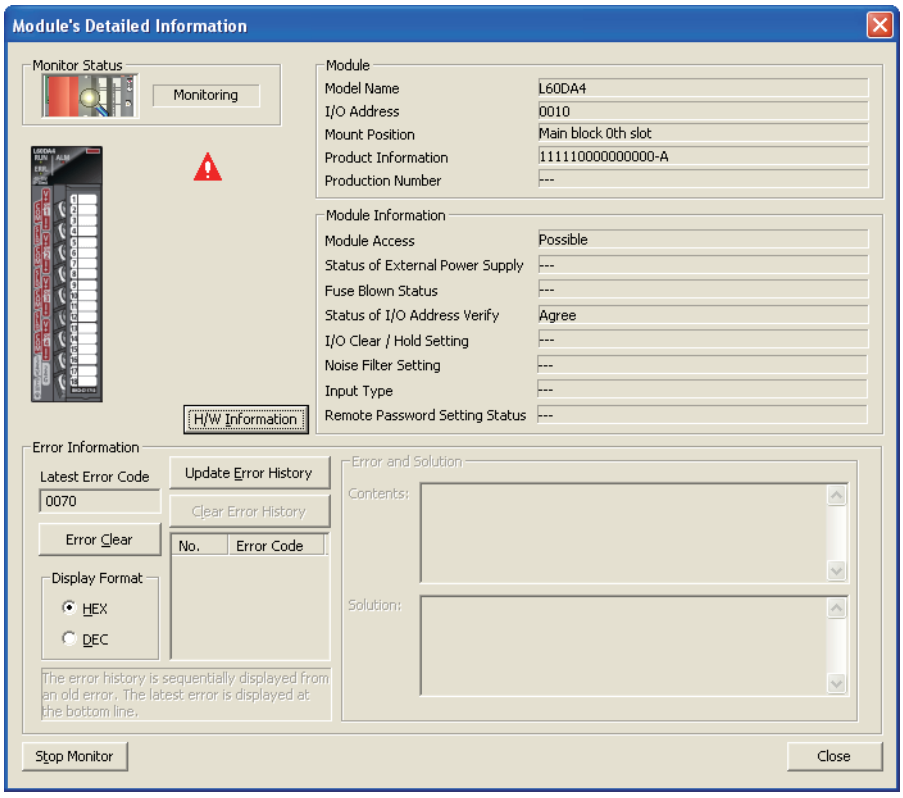
By clicking the Error Clear button in the system monitor, the latest error code stored in Latest error code (Un\G19) is cleared and the ERR. LED is also turned off. The operation is the same as Error clear request (YF) as well as executing error clear from the display unit.

However, error history cannot be cleared.

For instructions on error clear request and executing error clear from the display unit, refer to the following.

- Error clear request (YF) (☞ Page 84, Appendix 1)
- Checking/Clearing an Error (☞ Page 69, Section 9.4)

[Diagnostics] ⇨ [System Monitor…] ⇨ error module



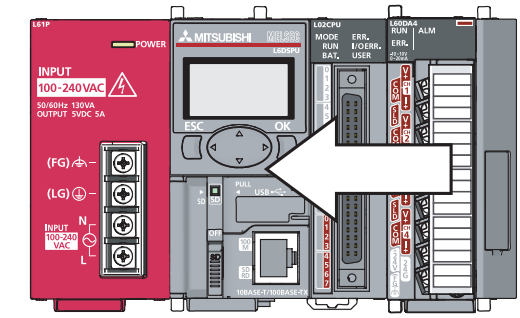
8.10 Saving and Restoring Offset/Gain Values

The D/A converter module can save and restore the offset/gain values in the user range setting.
When replacing a module in case of failure, this function enables to pass the offset/gain value from a module to be changed (disconnected) to the newly-connected CPU module.
If multiple D/A converter modules are installed in the same system, this function enables to apply the offset/gain value set to one module to the other modules.
However, if you save and restore the offset/gain values, the accuracy after the restoration decreases by approximately three times compared to that before the restoration.
Reconfigure the offset/gain as necessary.

(1) Procedure for saving and restoring offset/gain values

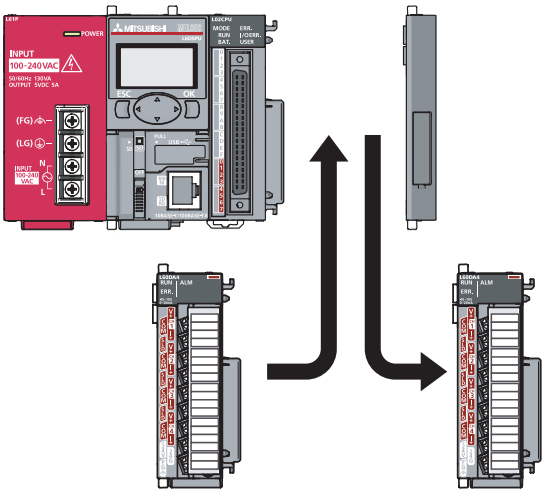
(a) To restore offset/gain values onto a new replacement module:

1. **Save the offset/gain values.**



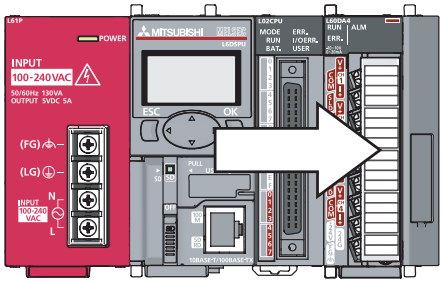
↓

2. **Replace the D/A converter module.**



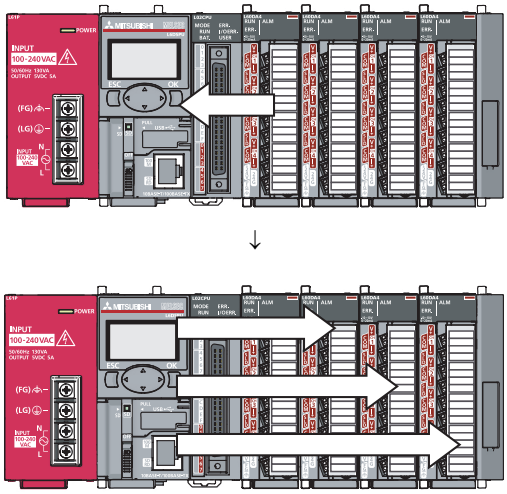
↓

3. **Restore the offset/gain values.**



(b) To apply the offset/gain values of one module to the other modules in the same system:

Ex. Here, the offset/gain setting of module No.1 is applied to modules No.2 to No.4.



1. **Save the offset/gain values of module No.1.**

2. **Apply the offset/gain values to modules No.2 to No.4.**

(2) Methods for saving and restoring offset/gain values

There are two methods for saving and restoring offset/gain values.

- Saving and restoring by dedicated instructions
- Saving and restoring by reading from and writing to the buffer memory

(a) Saving and restoring by dedicated instructions

Temporarily save the offset/ gain value in the source D/A converter module into the internal device of CPU module using G(P).OGLOAD of dedicated instruction. Then, write the data to the restoring target D/A converter module using G(P).OGSTOR.

You can prevent the saved offset/gain value data from getting deleted, by doing one of the following before replacing the modules:

- Use latch settings for the internal device of the destination module.
- Save the data onto an SD card
  To write data: use SP.FWRITE instruction
  To read data: use SP.FREAD instruction
- Store the saved data

For use of dedicated instructions, refer to the following.

- Dedicated Instructions (☞ Page 101, Appendix 5)

Point

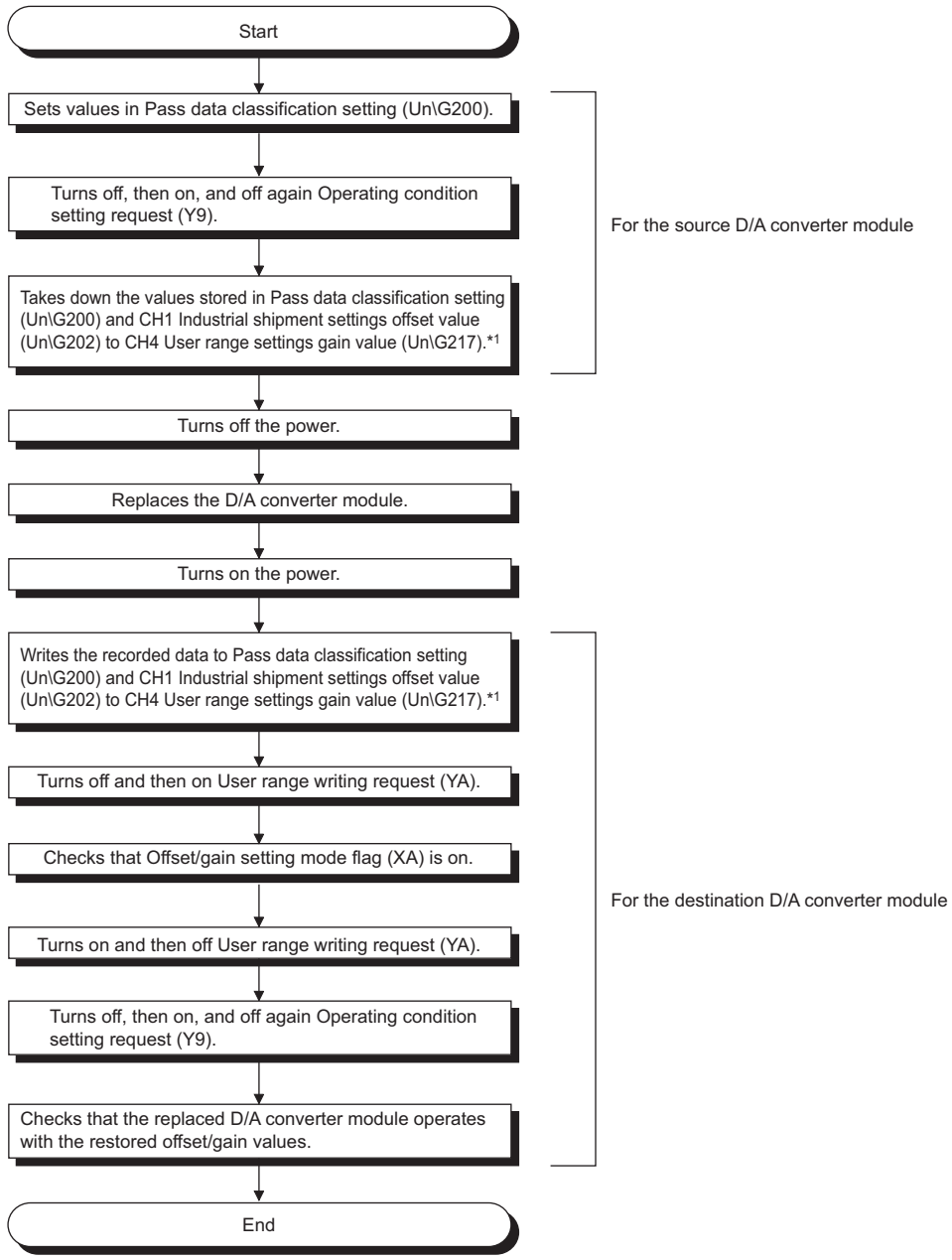
When performing the dedicated instruction G(P).OGSTOR, the D/A conversion is stopped.
Turn OFF → ON → OFF Operating condition setting request (Y9) to restart the D/A conversion.

(b) Saving and restoring by reading from and writing to the buffer memory

In the buffer memory, use Pass data classification setting (Un\G200), CH1 Industrial shipment settings offset value (Un\G202) to CH4 User range settings gain value (Un\G217) and User range writing request (YA) to read the offset/gain values from the source D/A converter module, then use the buffer memory again to write to the destination D/A converter module.

The procedure for using the buffer memory is described below.

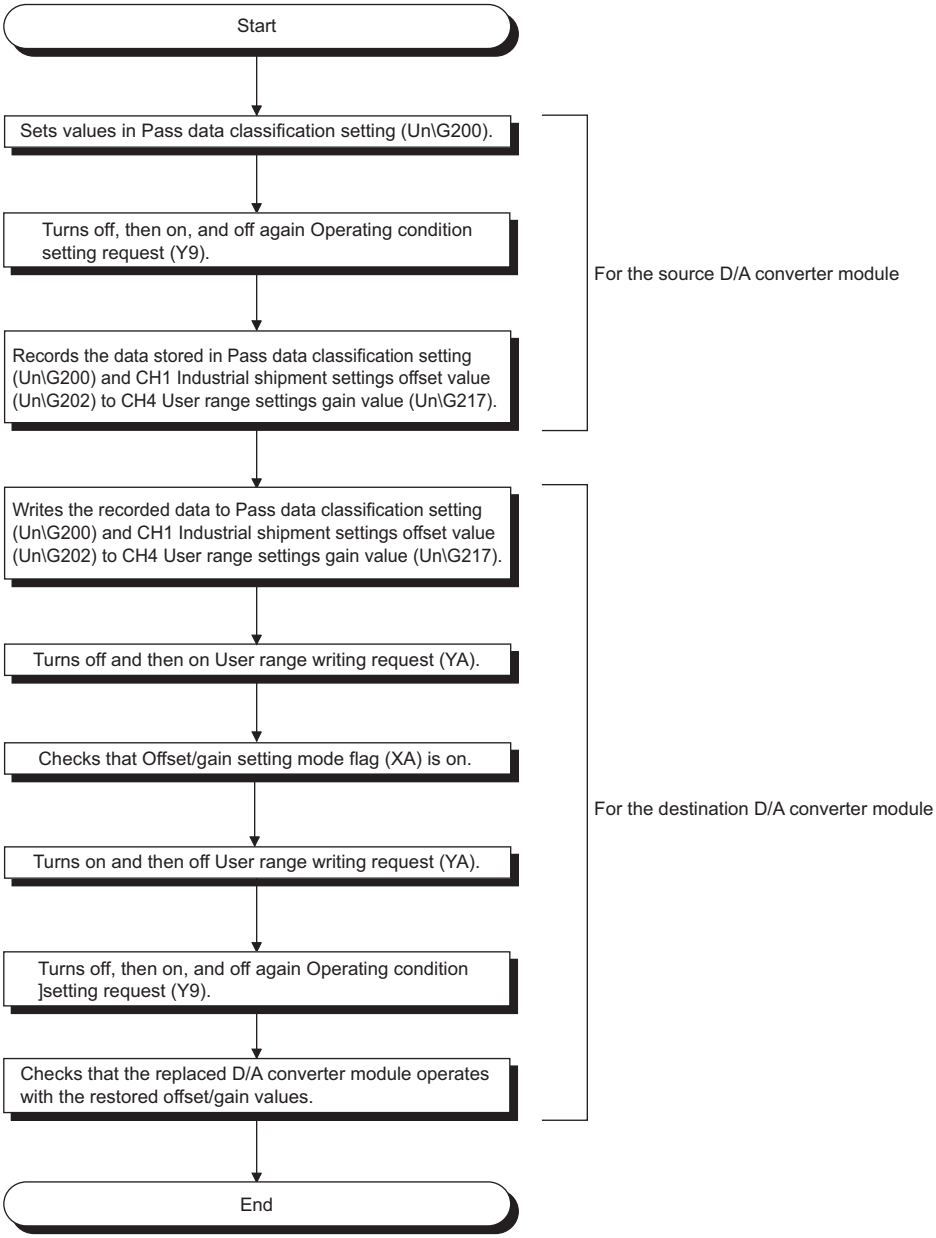
- To restore offset/gain values onto a new replacement module:



*1 When replacing modules, you can prevent the saved offset/gain value data from getting deleted, by doing one of the following before turning the power off:

- Use latch settings for the internal device of the destination module.
- Save the data onto an SD card.
  To write data: use SP.FWRITE instruction
  To read data: use SP.FREAD instruction
- Store the saved data.

• To apply the offset/gain values of one module to the other modules:



Point

When the data is written to the following buffer memory address in the source D/A converter module and User range writing request (YA) is turned from OFF to ON, the D/A conversion is stopped.

- Pass data classification setting (Un\G200)
- CH1 Industrial shipment settings offset value (Un\G202) to CH4 User range settings gain value (Un\G217)

Turn OFF → ON → OFF Operating condition setting request (Y9) to restart the D/A conversion.

(3) Range reference tables

Below are reference ranges to be used for saving and restoring offset/gain values.

(a) Reference table for CH1 Industrial shipment settings offset value (Un\G202) to CH4 Industrial shipment settings gain value (Un\G209)

The reference values will vary depending on the Pass data classification setting (Un\G200) (voltage or current).

Address (decimal)				Description	Pass data classification setting	Reference value (hexadecimal)
CH1	CH2	CH3	CH4			
202	204	206	208	Industrial shipment settings offset value	Voltage	Approx. 8000_H
					Current	Approx. 8000_H
203	205	207	209	Industrial shipment settings gain value	Voltage	Approx. $F712_H$
					Current	Approx. $F166_H$

(b) Reference table for CH1 User range settings offset value (Un\G210) to CH4 User range settings gain value (Un\G217)

Offset/gain value		Reference value (hexadecimal)
Voltage	0V	Approx. 8000_H
	1V	Approx. $8BE8_H$
	5V	Approx. $BB89_H$
	10V	Approx. $F712_H$
Current	0mA	Approx. 8000_H
	4mA*1	Approx. $96AE_H$
	20mA*2	Approx. $F166_H$

*1 This is the value that is stored in user range settings offset value at the time of shipping.
*2 This is the value that is stored in user range settings gain value at the time of shipping.

CHAPTER 9 DISPLAY UNIT

This chapter describes the functions of the display unit that can be used in D/A converter module.
For instruction on operating the display unit, or for details on the functions and menu configuration, refer to the following.

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

9.1 Display Unit

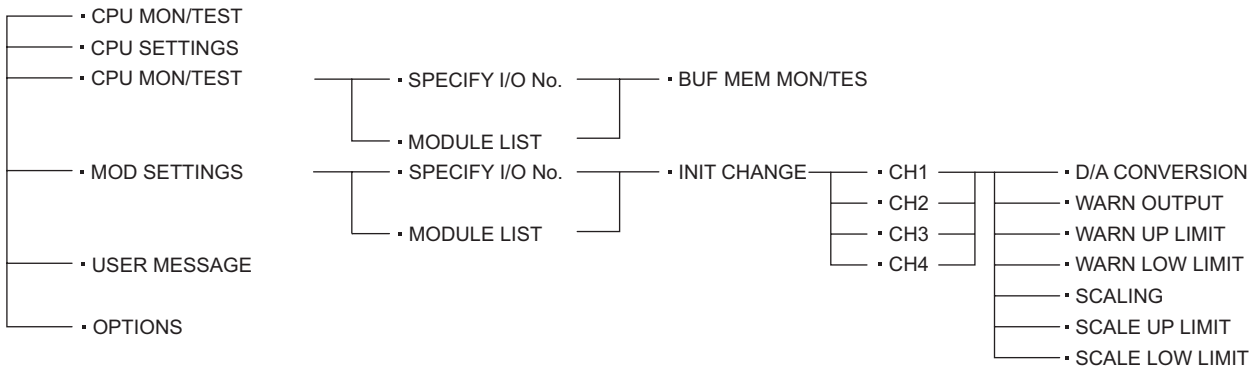
The display unit is an LCD to be attached to the CPU module. By attaching the display unit to the CPU module, you can check the status of the system and change system settings without the software package. In addition, in the event a problem occurs, you can identify the cause of the problem by displaying the error information on the display unit.
For details on how to check and clear an error from the display unit, refer to the following.

- Check/clear error (☞ Page 69, Section 9.4)

9.2 Menu Structure

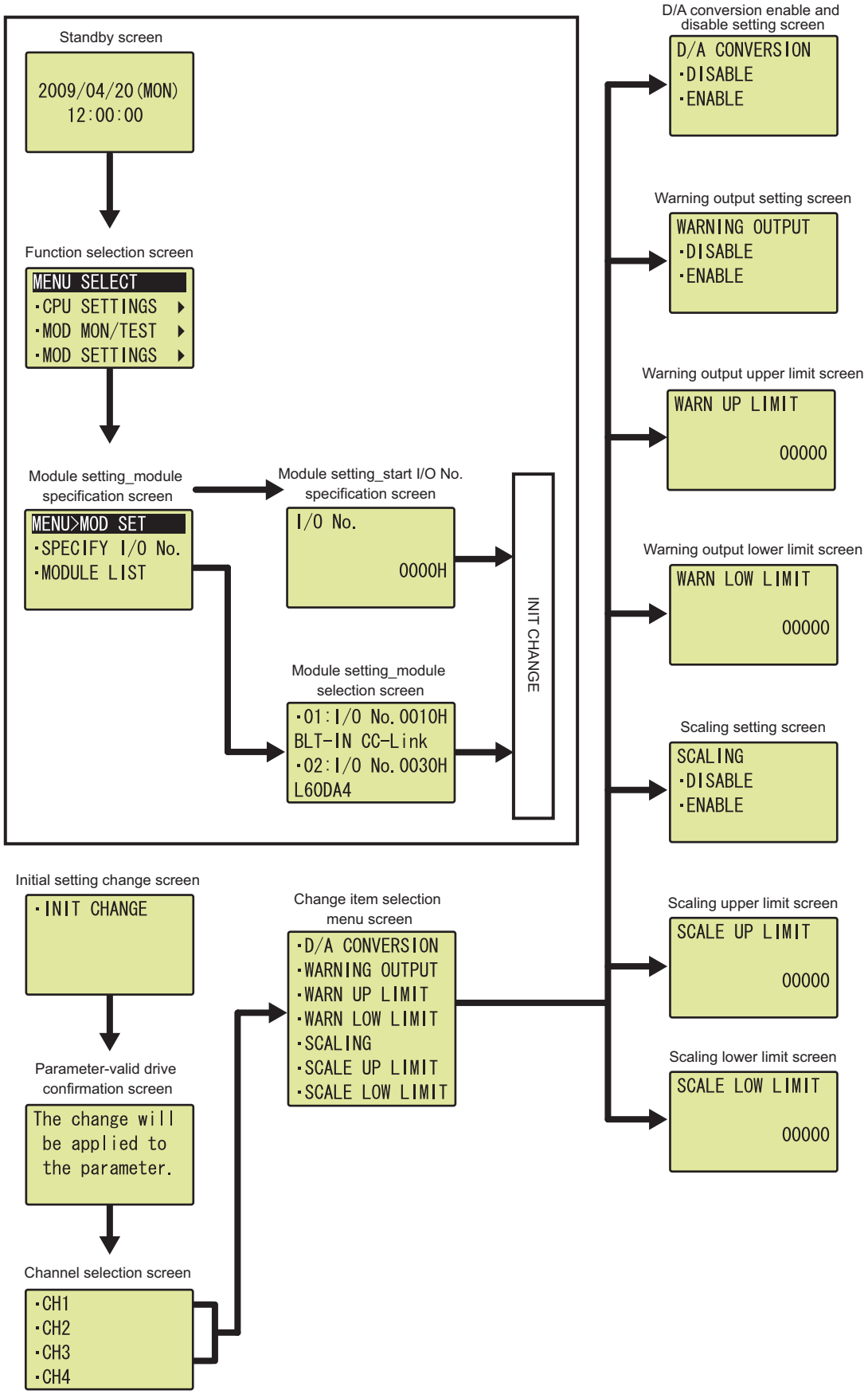
(1) Organization

The diagram below shows how the "MOD MON/TEST" menu and "MOD SETTINGS" are organized.



(2) Screen transitions up to the initial setting change screen

The diagram below shows how the screens transition to the initial setting change screen.



9.3 List of Setting Value Change Screens

The following is a list of setting value change screens.

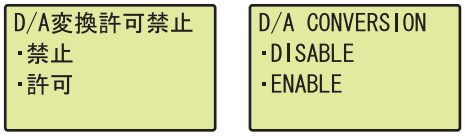
(1) Displayed in English:

Name		Screen format	Input regulation	
Setting item	Screen display		Upper limit value	Lower limit value
D/A conversion enable/disable setting	D/A CONVERSION	Selection	—	—
Warning output setting	WARNING OUTPUT	Selection	—	—
Upper limit warning output value	WARN UP LIMIT	Numeric value	32767	-32768
Lower limit warning output value	WARN LOW LIMIT	Numeric value	32767	-32768
Scaling enable/disable setting	SCALING	Selection	—	—
Upper limit scaling value	SCALE UP LIMIT	Numeric value	32000	-32000
Lower limit scaling value	SCALE LOW LIMIT	Numeric value	32000	-32000

(2) D/A CONVERSION

Select "DISABLE" or "ENABLE" in the "D/A conversion enable/disable conversion" screen.

"D/A conversion enable/disable conversion" screen

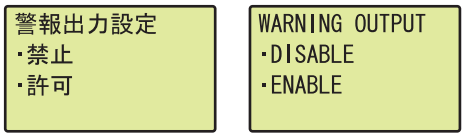


1. **Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the OK button.**

(3) Warning output setting

Select "DISABLE" or "ENABLE" on the "Warning output setting" screen.

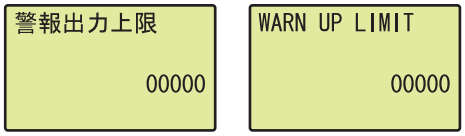
"Warning output setting" screen



1. **Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the OK button. (If you selected "ENABLE", follow the rest of the procedure.)**

↓

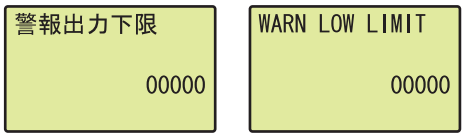
"Warning output upper limit" screen



2. **Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the OK button.**

↓

"Warning output lower limit" screen



3. **Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the OK button.**

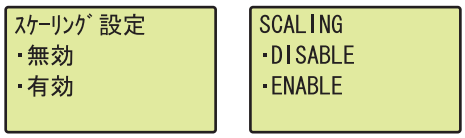
Table of input items

Input item	Input range	
	Input upper limit	Input lower limit
WARN UP LIMIT	32767	-32768
WARN LOW LIMIT		

(4) SCALING

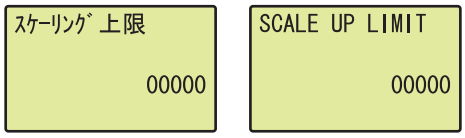
Select "DISABLE" or "ENABLE" in the "Scaling setting" screen.

"Scaling setting" screen



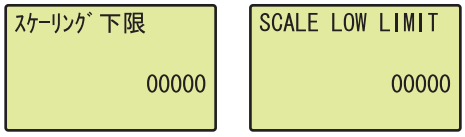
↓

"Scaling upper limit" screen



↓

"Scaling lower limit" screen



1. **Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the OK button. (If you selected "ENABLE", follow the rest of the procedure.)**

2. **Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the OK button.**

3. **Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the OK button.**

Table of input items

Input item	Input range	
	Input upper limit	Input lower limit
SCALE UP LIMIT	32000	-32000
SCALE LOW LIMIT		

9.4 Checking and Clearing Errors

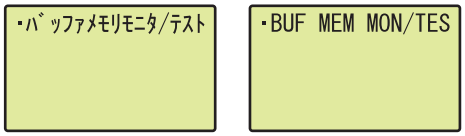
You can check the errors that occurred in the D/A converter module, from the display unit. In addition, you can also clear an error during its occurrence.

(1) Checking errors

You can check the error that occurred in the D/A converter module, by specifying Latest error code (Un\G19) from "buffer memory monitor/test".

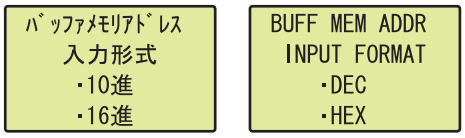
Ex. Suppose an error occurred in the D/A converter module with start I/O number of X/Y10 to 1F.

"Buffer memory monitor/test" screen



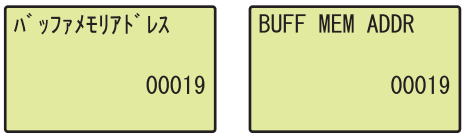
↓

"Buffer memory address input format selection" screen



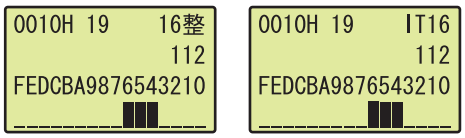
↓

"Buffer memory address setting" screen



↓

"Buffer memory monitor" screen



1. **Press the OK button.**

2. **Use the ▲ and ▼ buttons to select "DEC" for the input format of the buffer memory address, and then confirm with the OK button.**

3. **Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the OK button.**

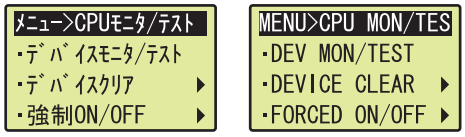
4. **You can check the error that occurred, in the "Buffer memory monitor" screen.**

(2) Clearing errors

You can clear an error by eliminating the cause of the error, and turning Error clear request (YF) OFF → ON → OFF from "Device Monitor/Test".

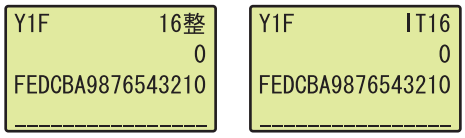
Ex. Suppose an error occurred in the D/A converter module with start I/O number of X/Y10 to 1F.

"CPU monitor/test" screen



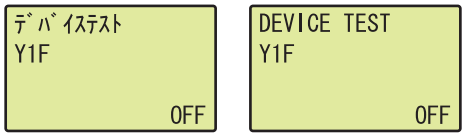
↓

"Device monitor" screen

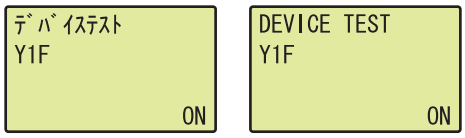


↓

"Device test" screen



↓



1. **Use the ▲ and ▼ buttons to select "DEV MON/TES", and then confirm with the OK button.**

2. **Set the device to Y and press the OK button.**

3. **Use the ▲ and ▼ buttons to set the device to Y1F, and then confirm with the OK button.**

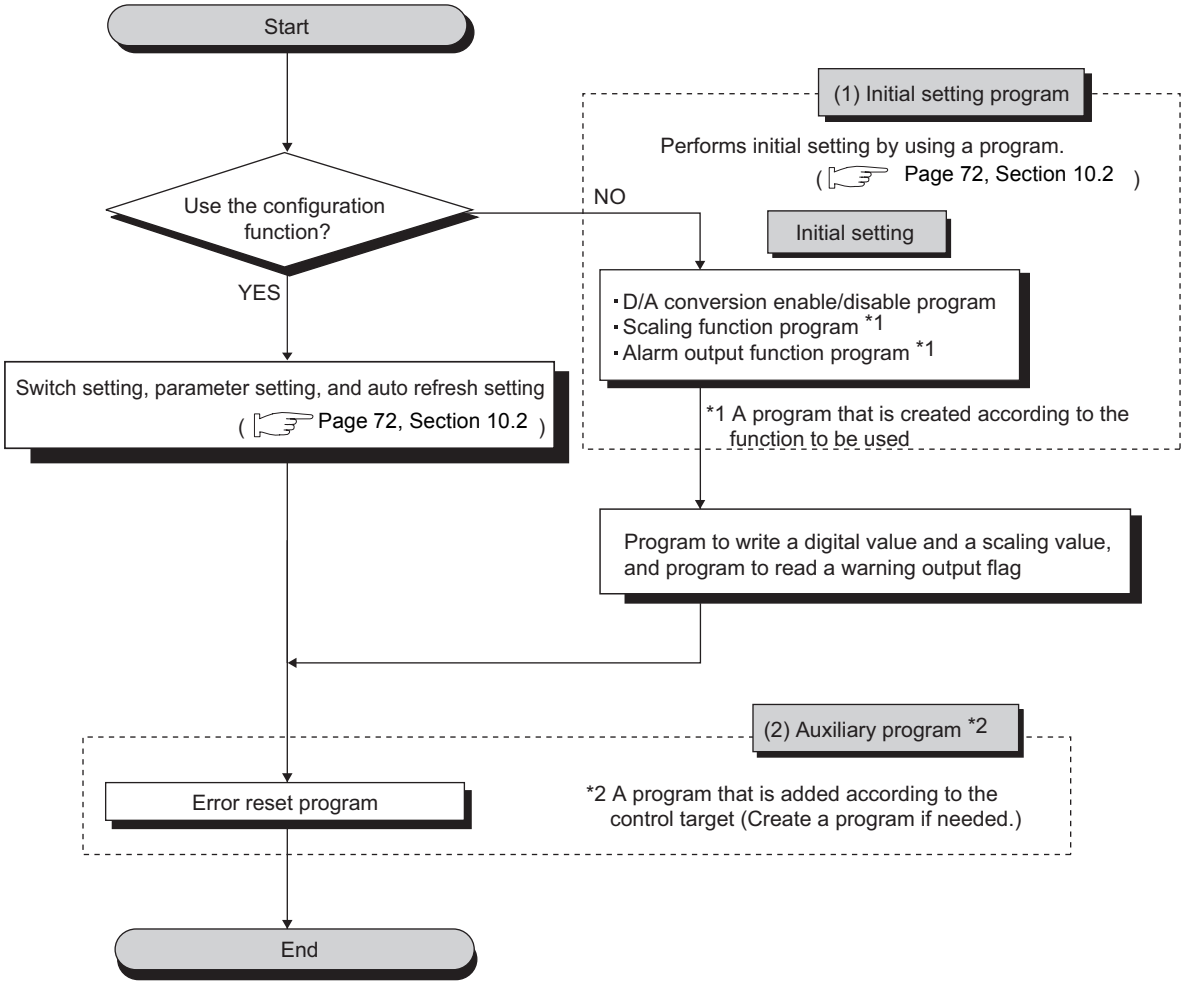
4. **Use the ▲ and ▼ buttons to switch ON/OFF. Press the OK button to set the value at the device test setting.**

CHAPTER 10 PROGRAMMING

This chapter describes the procedure for programming and the basic program of the D/A converter module.

10.1 Procedure for Programming

Create a program executed by D/A converter module according to the following procedure.

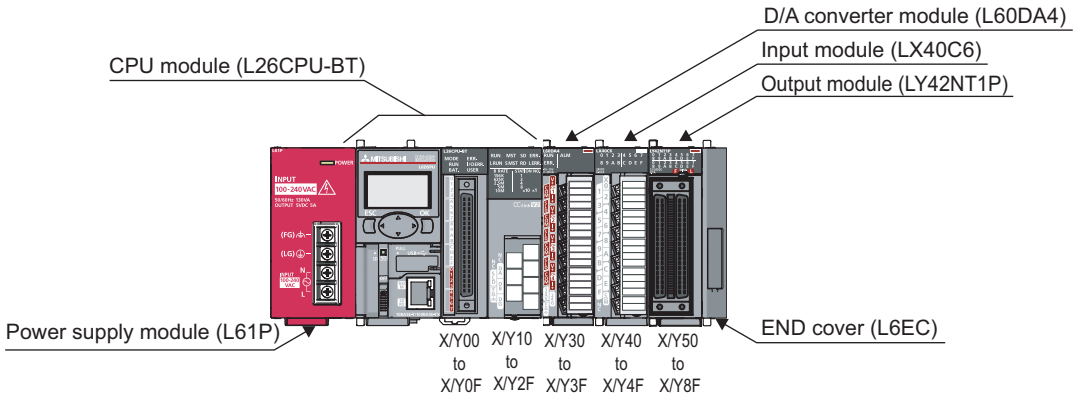


10.2 When Using a Standard System Configuration

The following shows program examples for the system configuration and usage conditions of the D/A converter module.

(1) System configuration

The following shows an example of the system configuration when using the module in a standard system configuration.



Point

For configuring the same I/O assignment as the system above, when using the L02CPU, set I/O Assignment of the D/A converter module within X/Y30 to F. Also, set the I/O assignment of the LX40C6 within X/Y40 to 4F, and the same of the LY42NT1P, within X/Y50 to 8F.

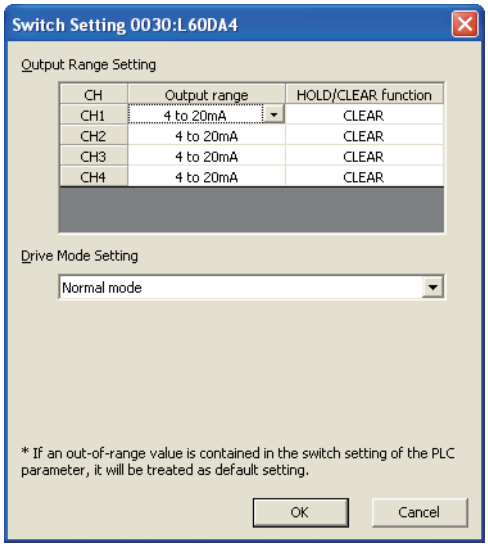
(2) Programming condition

Set CH1 and CH2 of the D/A converter module to D/A conversion enabled, and then write the digital values.
If a digital value write error occurs, an error code is displayed in BCD.
Configure the scaling setting in CH1 only, and configure the warning output function in CH2 only.

(3) Switch Setting

Set the output range, HOLD/CLEAR function and operation mode.

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Switch Setting"



(4) Initial setting description

(a) Channel setting

Setting item	CH1	CH2	CH3	CH4
D/A conversion enable/disable setting	Enable	Enable	Disable	Disable
Warning output setting	Disable	Enable	Disable	Disable
Warning output lower limit value	–	3000	–	–
Warning output upper limit value	–	10000	–	–
Scaling enable/disable setting	Enable	Disable	Disable	Disable
Scaling upper limit value	32000	–	–	–
Scaling lower limit value	0	–	–	–

(b) Devices for users

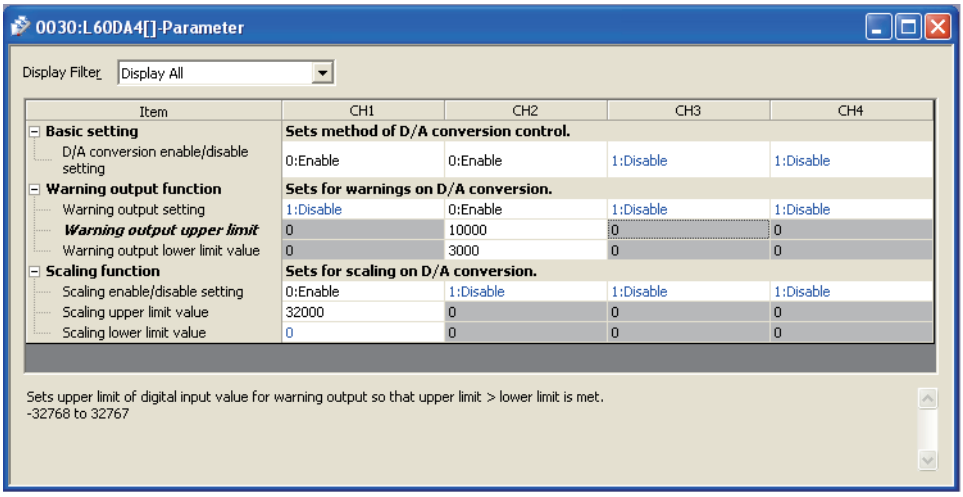
Device	Description	
D1	CH1 digital value	
D2	CH2 digital value	
D8	Warning output flag	
D10	Error code	
D11	CH1 Scaling value	
M20 to 27	Warning output flag	
M100	Module READY checking flag	
X41	Batch output enable signal	LX40C6 (X40 to 4F)
X42	Digital value write command input signal	
X44	Alarm output reset signal	
X45	Error reset signal	
Y50 to 5F	Error code notation (BCD 3 digits)	LY42NT1P (Y50 to 5F)

(5) Program example when using the parameter of intelligent function module

(a) Parameter setting

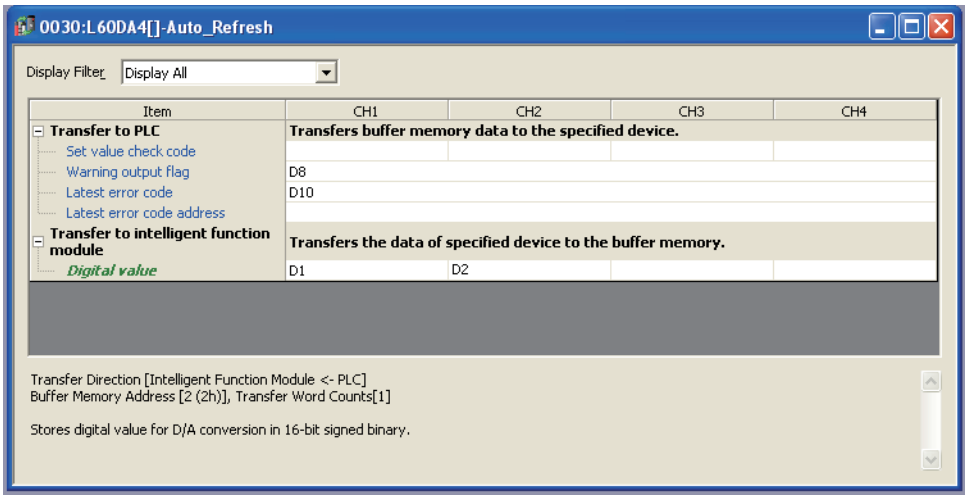
Set the contents of initial settings in the parameter.

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Parameter"



(b) Auto refresh setting

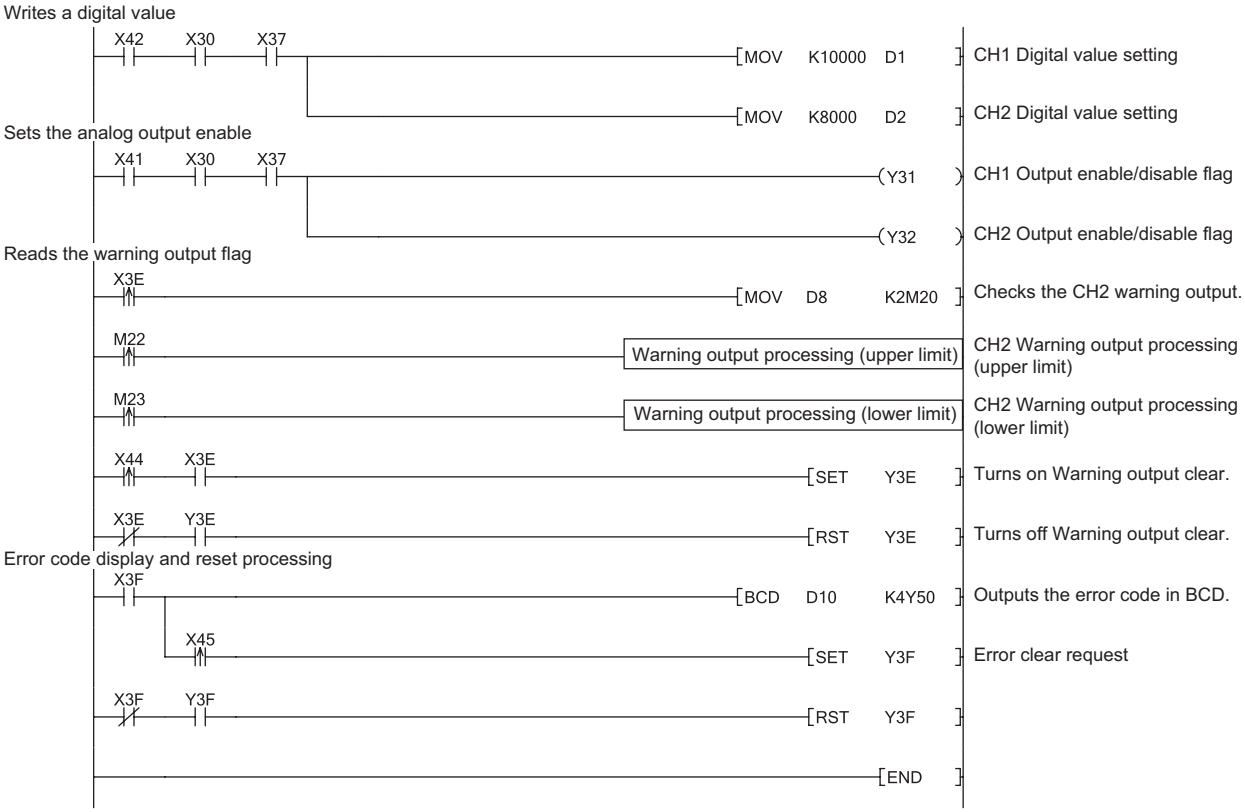
Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Auto_Refresh]



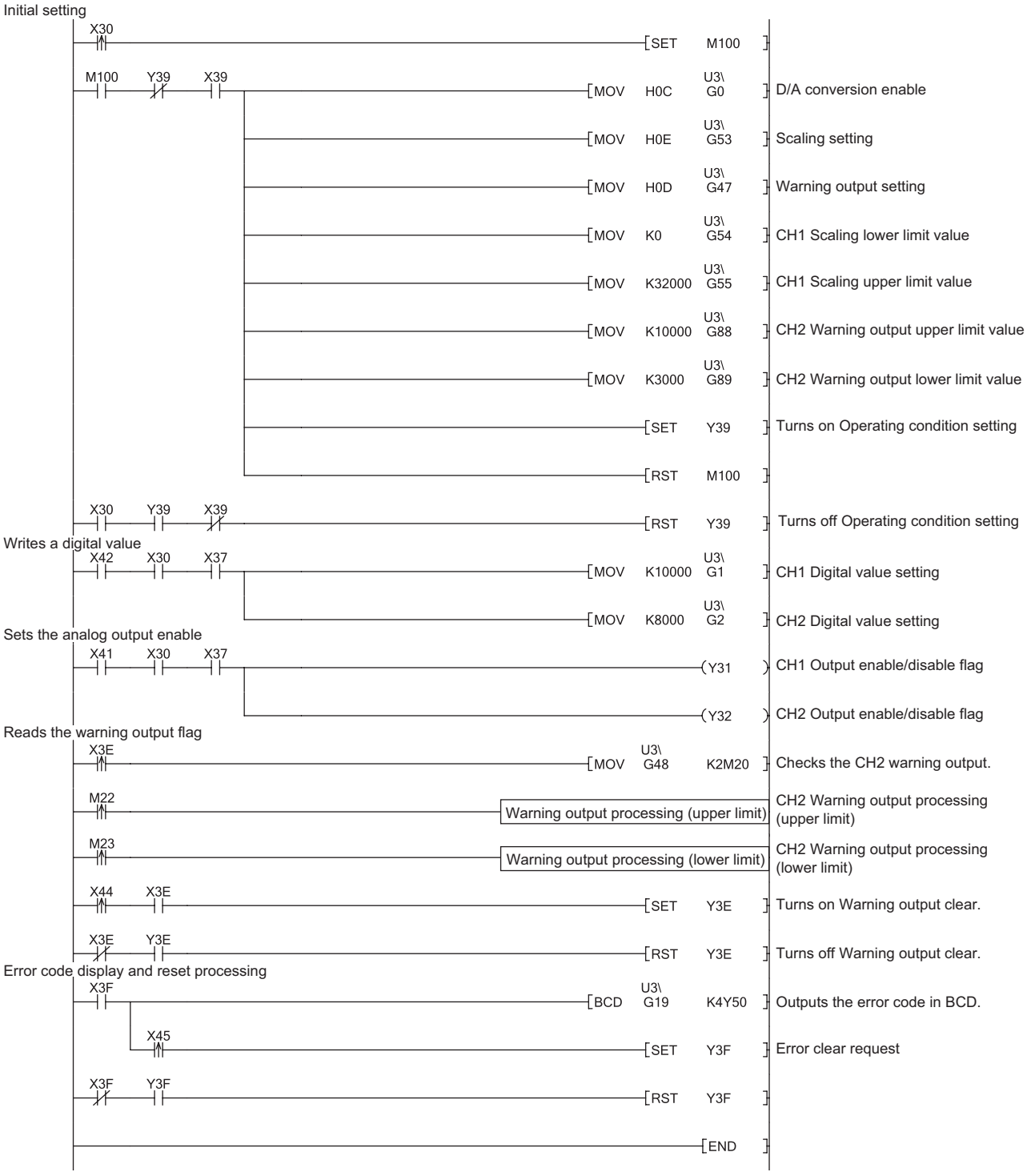
(c) Writing the parameter of intelligent function module

Write the parameter of the intelligent function module to the CPU module.

(d) Program example



(6) Program example when not using the parameter of intelligent function module



CHAPTER 11 TROUBLESHOOTING

This chapter describes errors that may occur while using the D/A converter module, and those troubleshooting.

(1) Checking the error codes and the alarm codes

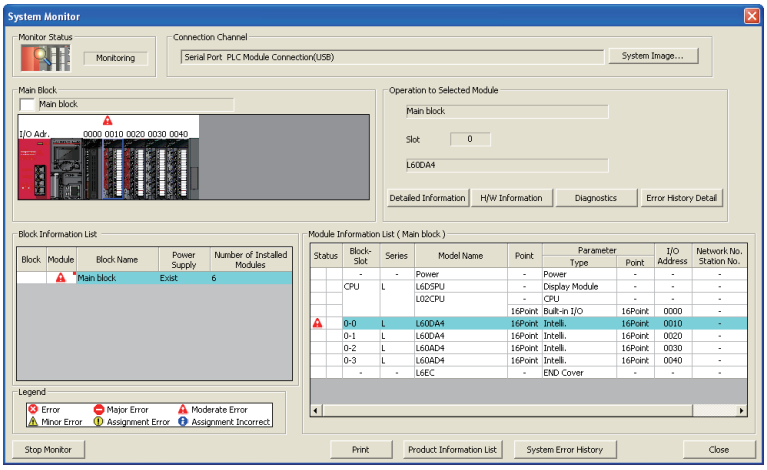
Errors and alarms occurred in the D/A converter module can be checked with the following methods. Check according to the purpose and application.

- Checking on the Module Detailed Information
- Checking by Latest error code (Un\G19) of the buffer memory address
- Checking on the module error collection function

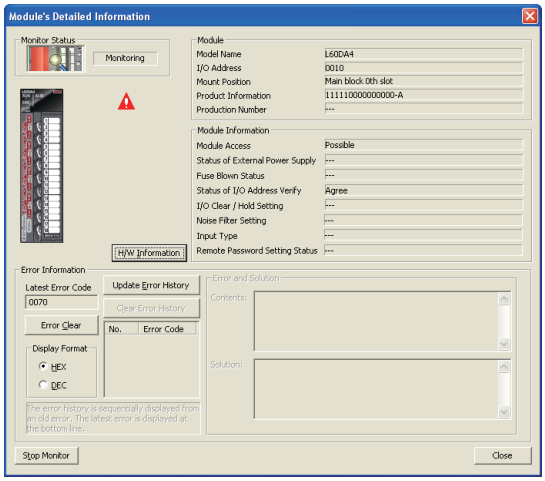
11.1 Checking on the Module Detailed Information

The following describes how to check the errors on the module detailed information.

[Diagnostics] ⇨ [System Monitor…]



↓



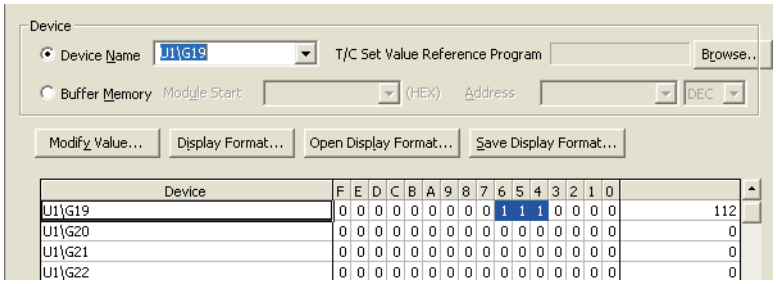
1. **Select the D/A converter module in "Main Block" and click the Detailed Information button.**

2. **"Module Detailed Information" of the D/A converter module is displayed.**

11.2 Checking by Latest Error Code (Un\G19)

The following describes how to check the error codes and alarm codes in Latest error code (Un\G19).

[Online] ⇨ [Monitor] ⇨ [Device/Buffer Memory Batch]



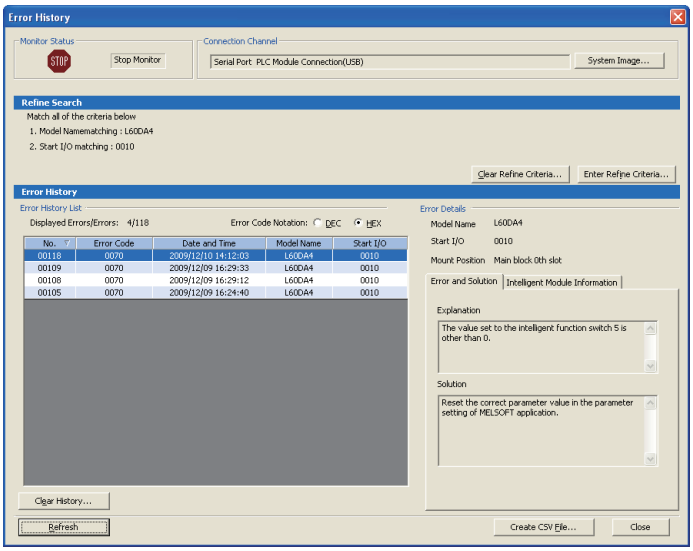
11.3 Checking on the Module Error Collection Function

Using the module error collection function stores the errors occurred in the D/A converter module to the CPU module. Once being stored, the errors remain even after power-off or reset of the CPU module.

(1) How to check the errors by the module error collection function

To check the errors of the D/A converter module collected by the CPU module, open the "Error History" dialog box.

[Diagnostics] ⇨ [System Monitor…] ⇨ click the Error History Detail button.



(2) Errors to be collected

The D/A converter module reports the following information to the CPU module:

- Error code list (Page 79, Section 11.4)
- Alarm code list (Page 80, Section 11.5)

11.4 Error Code List

When errors in the D/A converter module occur while writing data to or reading data from the CPU module, the following error codes are stored in Latest error code (Un\G19).
At the same time, the D/A converter module reports the errors to the CPU module.

Error code (decimal)	Description and cause of error	Action
10□	A value outside the range is set to Switch 1 (output range) in the Switch Setting for I/O and Intelligent Function Module screen of GX Works2. □ indicates the number of a channel where an invalid value is set.	Correct the value in the parameter setting of GX Works2.
111	A hardware failure occurs in the module.	Power off and then on the module. If the same error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi service center or representative, explaining a detailed description of the problem.
112	Other than "0" is set to the intelligent function module switch 5.	Set "0" for Switch 5 in the Switch Setting for I/O and Intelligent Function Module screen of GX Works2.
113	The flash memory data is an error.	Check the analog output value. If the same error occurs again, please consult your local Mitsubishi service center or representative, explaining a detailed description of the problem.
120[*1*2]	An invalid value is set to the offset/gain setting. The number of an error channel cannot be identified.	Perform offset/gain setting again for all channels where the user range setting has been configured. If the same error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi service center or representative, explaining a detailed description of the problem.
12□[*1*3]	An invalid value is set to the offset/gain setting. □ indicates the number of a channel where an error occurs.	Perform offset/gain setting again for the error channel. If the same error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi service center or representative, explaining a detailed description of the problem.
161[*1*4]	The G(P).OGSTOR instruction was executed in the offset/gain setting mode.	Do not execute the G(P).OGSTOR instruction in the offset/gain setting mode.
162[*1]	• The G(P).OGSTOR instruction has been consecutively executed. • In offset/gain setting, a setting value has been consecutively written to the flash memory more than 25 times.	• Execute the G(P).OGSTOR instruction once per module. • Do not write a setting value consecutively.
163[*1]	The G(P).OGSTOR instruction was executed for the module different from the one to which the G(P).OGLOAD instruction had been executed.	Execute the G(P).OGLOAD and G(P).OGSTOR instructions to the same module.
170[*1]	The offset/gain setting is configured exceeding the maximum number of times.	The offset/gain setting will not be performed according to the setting.
40□[*1]	When the user range setting is performed or restored, the offset value is greater than or equal to the gain value. □ indicates the number of a channel where an error occurs.	Correct the value so that the offset value may be smaller than the gain value.

Error code (decimal)	Description and cause of error	Action
500*1	• When the offset/gain setting is performed, several channels have been set. • In offset/gain setting, channel numbers or "0" is set for both Offset/gain setting mode Offset specification (Un\G22) and Offset/gain setting mode Gain specification (Un\G23).	Correct the Offset/gain setting mode Offset specification (Un\G22) value and/or the Offset/gain setting mode Gain specification (Un\G23) value.
60□*1	A value set to CH□ Digital value (Un\G1 to Un\G4) is outside the range. □ indicates the number of a channel where an error occurs.	Set the value within the range.
62□*1	Among CH1 Warning output upper limit value (Un\G86) to CH4 Warning output lower limit value (Un\G93), any of the lower limit value is greater than or equal to the corresponding upper limit value. □ indicates the number of a channel where an error occurs.	Correct the value so that the upper limit value may be greater than the lower limit value.
700*1	In offset/gain setting mode, a value set to Offset/gain adjustment value specification (Un\G24) is outside the range.	Correct the value within the range of -3000 to 3000.
90□*1	A value outside -32000 to 32000 is set to any of CH1 Scaling lower limit value (Un\G54) to CH4 Scaling upper limit value (Un\G61). □ indicates the number of a channel where an error occurs.	Correct the value within the range of -32000 to 32000.
91□*1	Among CH1 Scaling lower limit value (Un\G54) to CH4 Scaling upper limit value (Un\G61), any of the lower limit value is greater than or equal to the corresponding upper limit value. □ indicates the number of a channel where an error occurs.	Correct the value so that the upper limit value may be greater than the lower limit value.

*1 This error code can be cleared by turning off, on, and then off Error clear request (YF).
*2 If an error occurs, D/A conversion performed in all channels will stop.
Therefore, after performing the offset/gain setting again, reconfigure initial settings.
*3 If an error occurs, D/A conversion performed in the error channel will stop.
Therefore, after performing the offset/gain setting again, reconfigure initial settings.
*4 An error code is not stored in Latest error code (Un\G19) but in the completion status of the G(P). OGSTOR instruction (Ⓢ +1).

11.5 Alarm Code List

The following shows the alarm code list.

Alarm code (decimal)	Description and cause of alarm	Action
15△□	A warning occurred. □ indicates the number of a channel where a warning occurred. △ indicates a value representing the following status: 0: Upper limit of a warning 1: Lower limit of a warning	Reset the digital value within the setting range and then turn off, on, and off Warning output clear request (YE).

11.6 Troubleshooting

(1) When the RUN LED flashes or turns off

(a) When flashing

Check item	Action
Is the operation mode setting in the offset/gain setting mode?	Switch the operation mode in the intelligent function module switch setting of GX Works2 to the normal mode. Or reconfigure the Switch 4 in the intelligent function module switch setting and set the normal mode.

(b) When turning off

Check item	Action
Is the power supplied?	Check that the supply voltage of power supply module is within the rated range.
Is the capacity of power supply module enough?	Make sure that the power capacity is enough by calculating the current consumption of such as the connected CPU module, I/O modules, and intelligent function modules.
Is there any watchdog timer error?	Reset the CPU module, and check if the RUN LED turns on. If the RUN LED remains off, the module may be failed. Please consult your local Mitsubishi service center or representative, explaining the detailed description of the problem.
Is the module installed properly?	Check the module connection.

(2) When the ERR. LED turns on or flashes

(a) When turning on

Check item	Action
Does any error occur?	Check Latest error code (Un\G19), and take actions described in the error code list. (☞ Page 79, Section 11.4)

(b) When flashing

Check item	Action
Is the value other than 0 set for Switch 5 of the intelligent function module switch setting?	With the parameter setting of GX Works2, set 0 for Switch 5 in the intelligent function module switch setting.

(3) When the ALM LED flashes

Check item	Action
Is there any alarm output?	Check Warning output flag (Un\G48).

(4) When analog output value does not come out

Check item	Action
Is the external power supply 24VDC supplied?	Check External power supply READY flag (X7), and if the flag is turned OFF, provide a 24VDC power supply to the external power supply terminal (pin number 16, 17).
Is there any problem with wiring, such as off or disconnection of analog signal lines?	Check the faulty area by checking the signal line visually or conductively.
Is the CPU module in the STOP status?	Change the status of the CPU module to RUN.
Is the offset/gain setting correct?	Check whether the offset/gain is set properly. When using the user range setting, shift it to the factory default setting, and check the D/A conversion. If the D/A conversion is performed properly, reconfigure the offset/gain setting.
Is the output range setting correct?	Check Setting range (Un\G20) through the monitoring screen of GX Works2. When the output range setting is wrong, reconfigure the intelligent function module switch setting.
Is D/A conversion enable/disable setting (Un\G0) of the channel to output set to D/A conversion disabled?	Check D/A conversion enable/disable setting (Un\G0) through the monitoring screen of GX Works2. Then, set D/A conversion enable for Un\G0 with the sequence program or the parameter of the intelligent function module.
Is the D/A output enable/disable flag of the channel to output set to disabled?	Check whether CH□ Output enable/disable flag (Y1 to Y4) is OFF or ON through the monitoring screen of GX Works2. If CH□ Output enable/disable flag (Y1 to Y4) is OFF, review the sequence program.
Is any digital value written to the channel to output?	Check CH□ Digital value (Un\G1 to Un\G4) through the monitoring screen of GX Works2.
Is Operating condition setting request (Y9) being executed?	Check if the analog output is performed properly after turning Operating condition setting request (Y9) OFF → ON → OFF with GX Works2. If the output is performed properly, review the sequence program.

Point

If the analog output value does not come out even after taking the above actions, the module may be failed. Please consult your local Mitsubishi service center or representative, explaining the detailed description of the problem.

(5) When HOLD of analog output value is not available

Check item	Action
Is the HOLD/CLEAR function setting correct?	Set HOLD for the HOLD/CLEAR function in the intelligent function module switch setting of GX Works2. Also, check the setting value of switches in the intelligent function module switch setting.

11.7 Checking the Status of D/A Converter Module by the System Monitor

To check the LED status or the setting status of the intelligent function module switch setting, select "H/W Information" in the D/A converter module on the system monitor of GX Works2.

(1) Hardware LED information

LED status is displayed.

No.	LED name	On status
1)	RUN LED	0000_H : Indicates the LED off. 0001_H : Indicates the LED on. Alternating indication between 0000_H and 0001_H : Indicates the LED flashing. (GX Works2 displays the communication status with the D/A converter module, so that the displaying intervals of 0000_H and 0001_H are not always even.)
2)	ERR. LED	
3)	ALM LED	

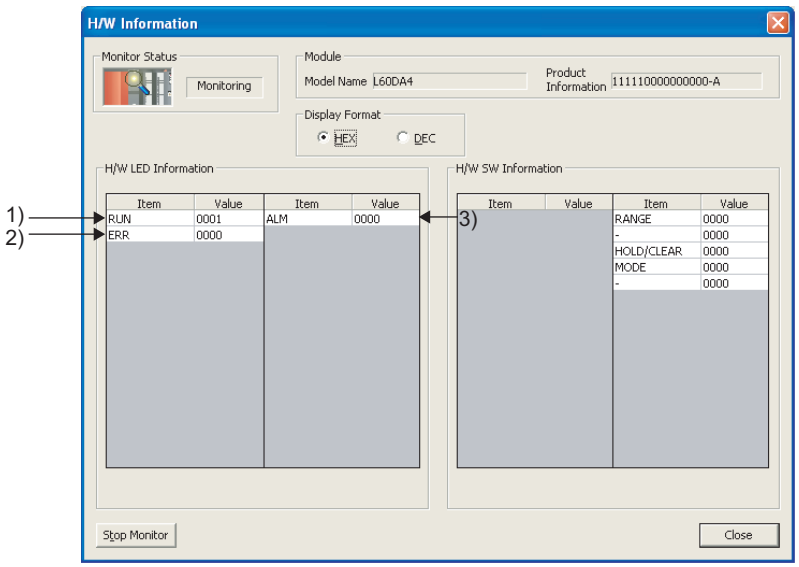
(2) Hardware switch information

The setting status of the intelligent function module switch setting is displayed.

For details on the setting status, refer to the following.

- Intelligent function module switch setting (Page 112, Appendix 8.1(2))

Item	Intelligent function module switch
RANGE	Switch 1
—	Switch 2
HOLD/CLEAR	Switch 3
MODE	Switch 4
—	Switch 5



APPENDICES

Appendix 1 Details of I/O Signals

This section describes the details of I/O signals of D/A converter module for the CPU module.
The I/O number described in Appendix 1 shows the case that the start I/O number of the D/A converter module is set to "0".

Appendix 1.1 Input Signal

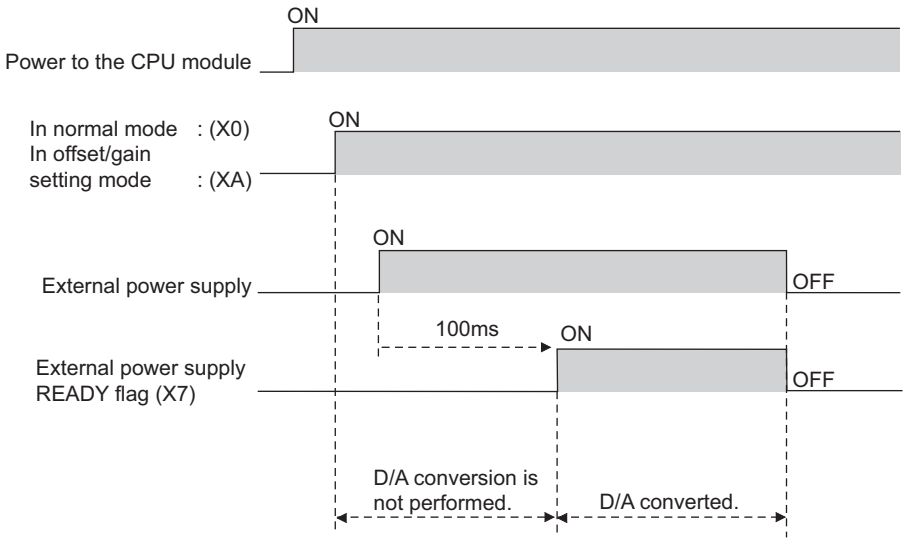
(1) Module READY (X0)

Module READY (X0) turns ON to indicate that the preparation for the D/A conversion is completed after the power-on or after the reset operation of the CPU module.
In the following cases, Module READY (X0) turns off.

- In the offset/gain setting mode (In this case, the D/A conversion processing is executed).
- When a watch dog timer error occurs to the D/A converter module (In this case, the D/A conversion processing is not executed).

(2) External power supply READY flag (X7)

100ms after the external power supply is supplied, External power supply READY flag (X7) turns on, and the D/A conversion processing is executed.
The following shows the time chart when the external power supply is turned to ON after the power-on of the CPU module.



(a) Normal mode

When the module is started with the external power supply input status, External power supply READY flag (X7) turns from OFF to ON, at the same time as Module READY (X0) turns from OFF to ON.
Also, if Module READY (X0) is ON and the external power supply is input later, External power supply READY flag (X7) turns from OFF to ON after 100ms.

(b) Offset/gain setting mode

When the module is started with the external power supply input status, External power supply READY flag (X7) turns from OFF to ON at the same time as Offset/gain setting mode flag (XA) turns from OFF to ON. Also, if Offset/gain setting mode flag (XA) is ON and the external power supply is input later, External power supply READY flag (X7) turns from OFF to ON after 100ms.

(c) When the external power supply is not supplied, or when the time after the supply is less than 100ms.

The following occurs.

- External power supply READY flag (X7) turns OFF, and the D/A conversion processing is not executed.
- The analog output value becomes 0V/0mA.
- Out-of-range digital value error detection and alarm output are not executed.

Point

- For the external power supply, supply the voltage and current indicated in the performance specifications.
- When executing D/A conversion, make sure that Module READY (X0) and External power supply READY flag (X7) are ON.

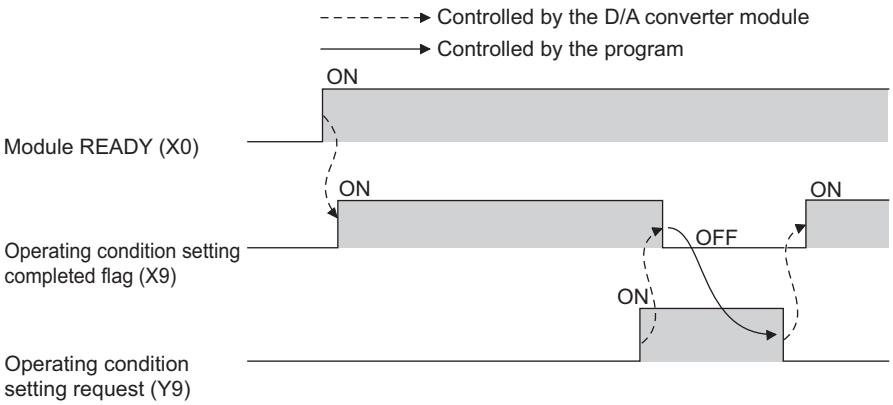
(3) Operating condition setting completed flag (X9)

When changing the following settings, use Operating condition setting completed flag (X9) as an interlock condition to turn Operating condition setting request (Y9) OFF → ON → OFF.

- D/A conversion enable/disable setting (Un\G0)
- Warning output setting (Un\G47)
- CH☐ Warning output upper limit value (Un\G86, Un\G88, Un\G90, Un\G92)
- CH☐ Warning output lower limit value (Un\G87, Un\G89, Un\G91, Un\G93)
- Scaling enable/disable setting (Un\G53)
- CH☐ Scaling lower limit value (Un\G54, Un\G56, Un\G58, Un\G60)
- CH☐ Scaling upper limit value (Un\G55, Un\G57, Un\G59, Un\G61)

In the case of the following status, Operating condition setting completed flag (X9) turns OFF.

- When Operating condition setting request (Y9) is ON

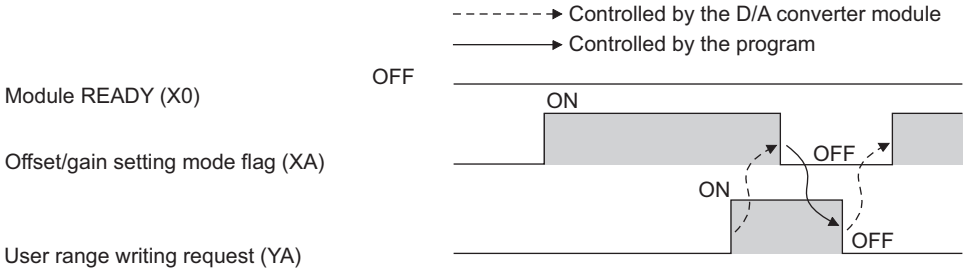


(4) Offset/gain setting mode flag (XA)

(a) Offset/gain setting mode

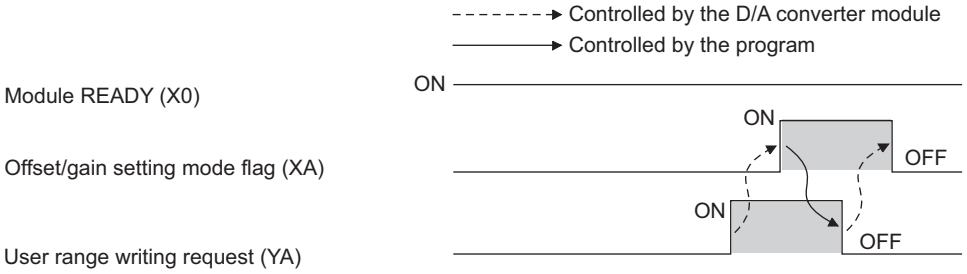
When registering the offset or gain value, which was adjusted with the offset/gain setting, Offset/gain setting mode flag (XA) is used as an interlock condition to turn User range writing request (YA) OFF → ON → OFF.
For the offset/gain setting, refer to the following.

- Offset/gain setting (☞ Page 111, Appendix 8.1)



(b) Normal mode

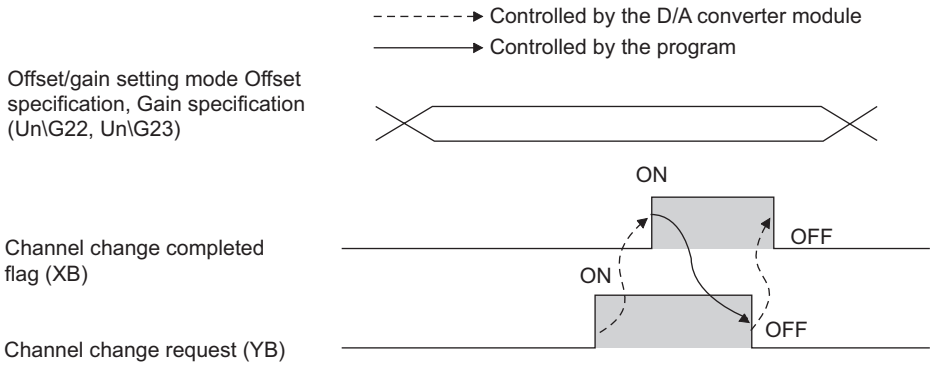
In the user range restoration, use Offset/gain setting mode flag (XA) as an interlock condition to turn User range writing request (YA) OFF → ON → OFF.



(5) Channel change completed flag (XB)

When changing a channel to perform the offset/gain setting, use Channel change completed flag (XB) as an interlock condition to turn Channel change request (YB) OFF → ON → OFF.
For the offset/gain setting, refer to the following.

- Offset/gain setting (☞ Page 111, Appendix 8.1)

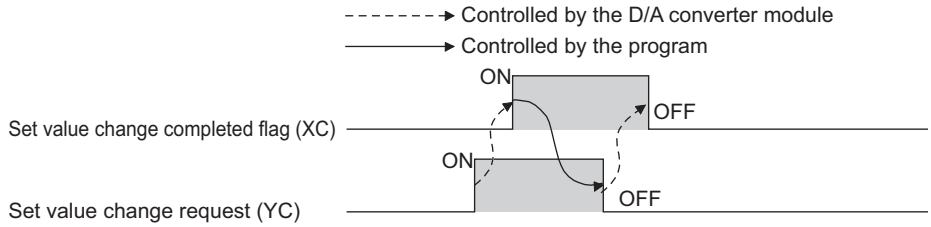


(6) Set value change completed flag (XC)

When adjusting the offset/gain setting, Set value change completed flag (XC) is used as an interlock condition to turn Set value change request (YC) OFF → ON → OFF.

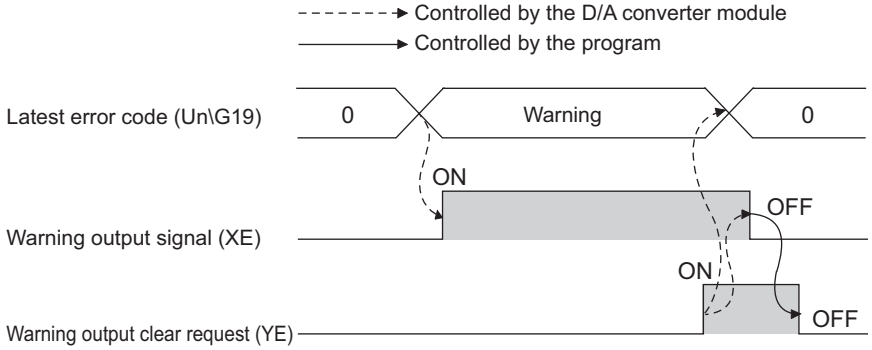
For the offset/gain setting, refer to the following.

- Offset/gain setting (☞ Page 111, Appendix 8.1)



(7) Warning output signal (XE)

In D/A conversion enabled channels, if any digital value exceeds the alarm output upper limit value or is below than the alarm output lower limit value, Warning output signal (XE) turns ON.



(a) Turning OFF Warning output signal (XE)

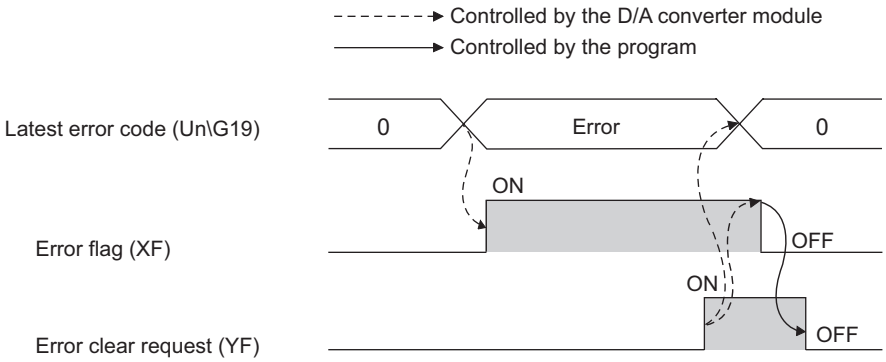
Turn OFF by the following two methods.

- Turning OFF → ON → OFF Warning output clear request (YE)
- Turning OFF → ON → OFF Operating condition setting request (Y9)

When alarm code is stored in Latest error code (Un\G19), Warning output signal (XE) is cleared to 0.

(8) Error flag (XF)

Error flag (XF) turns ON if an error occurs.



(a) Turning OFF Error flag (XF)

Eliminate the error cause, and turn OFF → ON → OFF Error clear request (YF).

(At the timing of turning Error clear request (YF) from OFF to ON, Error flag (XF) and Latest error code (Un\G19) are cleared.)

Appendix 1.2 Output Signal

(1) CH□ Output enable/disable flag (Y1 to Y4)

This function sets whether to output the D/A-converted value or the offset value, for each channel.

ON : D/A conversion value

OFF : offset value

(a) D/A conversion speed

The D/A conversion speed is calculated by 20μs x number of conversion enabled channels, regardless of the turning of CH□ Output enable/disable flag (Y1 to Y4) from OFF to ON.

(2) Operating condition setting request (Y9)

To validate the following settings, turn Operating condition setting request (Y9) OFF → ON → OFF.

- D/A conversion enable/disable setting (Un\G0)
- Warning output setting (Un\G47)
- CH□ Warning output upper limit value (Un\G86, Un\G88, Un\G90, Un\G92)
- CH□ Warning output lower limit value (Un\G87, Un\G89, Un\G91, Un\G93)
- Scaling enable/disable setting (Un\G53)
- CH□ Scaling lower limit value (Un\G54, Un\G56, Un\G58, Un\G60)
- CH□ Scaling upper limit value (Un\G55, Un\G57, Un\G59, Un\G61)

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Operating condition setting completed flag (X9) (☞ Page 84, Appendix 1.1)

(3) User range writing request (YA)

(a) Offset/gain setting mode

Turn User range writing request (YA) OFF → ON → OFF to register the adjusted offset/gain setting values in the D/A converter module.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Offset/gain setting mode flag (XA) (☞ Page 84, Appendix 1.1)

(b) Normal mode

Turn User range writing request (YA) OFF → ON → OFF to perform the user range restoration.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Offset/gain setting mode flag (XA) (☞ Page 84, Appendix 1.1)

For user range restoration, refer to the following.

- Saving and restoring offset/gain values (☞ Page 59, Section 8.10)

(4) Channel change request (YB)

Turn Channel change request (YB) OFF → ON → OFF to change a channel to perform the offset/gain setting.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Channel change completed flag (XB) (☞ Page 84, Appendix 1.1)

(5) Set value change request (YC)

- Turn Set value change request (YC) OFF → ON → OFF to change the analog output value during the adjustment of offset/gain setting.

  The analog output is changed according to the value set in Offset/gain adjustment value specification (Un\G24).

(6) Warning output clear request (YE)

Turn Warning output clear request (YE) OFF → ON → OFF to clear the alarm output.
For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Warning output signal (XE) (☞ Page 84, Appendix 1.1)

(7) Error clear request (YF)

Turn Error clear request (YF) OFF → ON → OFF to clear errors.
For the timing of turning the signal OFF → ON → OFF, refer to the following.

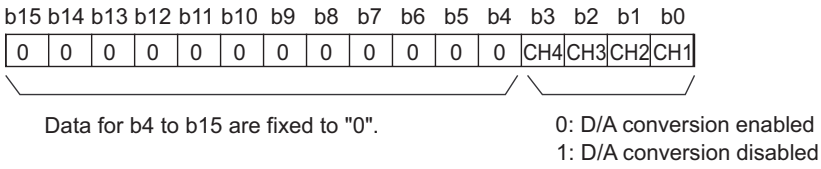
- Error flag (XF) (☞ Page 84, Appendix 1.1)

Appendix 2 Details of Buffer Memory Addresses

The following describes the details of buffer memory.

(1) D/A conversion enable/disable setting (Un\G0)

Sets whether to enable or disable D/A conversion for each channel.



(a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(b) Default value

All channels are set to D/A conversion disable (1) as the default value.

(2) CH☐ Digital value (Un\G1 to Un\G4)

This is the area where the digital value in signed 16-bit binary for performing the D/A conversion is written from the CPU module.

When the value out of the setting range is written, the D/A conversion is performed with the upper and lower limit value of the settable range. In addition, a check code is stored in CH☐ Set value check code (Un\G11 to Un\G14) and an error code is stored in Latest error code (Un\G19).

Output range setting	If the scaling function is disabled		If the scaling function is enabled *1
	Settable range (practical range)	A written digital value out of the settable range is treated as	Settable range
0: 4 to 20mA	0 to 20479 (practical range: 0 to 20000)	20480 or more: 20479 -1 or less: 0	-32000 to 32000
1: 0 to 20 mA			
2: 1 to 5V			
3: 0 to 5V			
4: -10 to10V	-20480 to 20479 (practical range: -20000 to 20000)	20480 or more: 20479 -20481 or less: -20480	
F: User range setting			

*1 When the scaling function is enabled, the settable range and practical range depend on the settings for scaling upper and lower limit values.

(3) CH☐ Set value check code (Un\G11 to Un\G14)

Check code is stored in this area if the digital value out of the settable range is written to CH☐ Digital value (Un\G1 to Un\G4).

The following shows the check codes to be stored when the digital value out of the setting range is written.

Check code	Description
$000F_H$	A digital value exceeding the settable range is written.
$00F0_H$	A digital value falling short of the settable range is written.
$00FF_H$	A digital value falling short of the setting range and digital value exceeding the setting range are written. The check code of $00FF_H$ is stored in the following case, for example. • Write the digital value exceeding the settable range, first. • Then, write the digital value falling short of the settable range before resetting the check code.

Once the check code is stored, the code remains even the digital value is within the settable range.

While the scaling function is enabled, the check is performed to the scale-converted value of CH☐ Digital value (Un\G1 to Un\G4).

Note that some errors may be observed in the digital value to which a check code is stored due to the calculation error of scale conversion when a scale-converted value is out of the settable range.

(a) Resetting the setting value check codes

Rewrite the digital value to the value within the settable range and turn Error clear request (YF) OFF → ON → OFF.

(4) Latest error code (Un\G19)

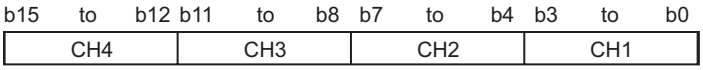
Error codes or alarm codes detected in the D/A converter module are stored.

For details on error codes or alarm codes, refer to the following.

- Error code list (☞ Page 79, Section 11.4)
- Alarm code list (☞ Page 80, Section 11.5)

(5) Setting range (Un\G20)

The setting for output range can be checked.



Setting range of D/A converter module

Output range	Setting value
4 to 20mA	0_H
0 to 20mA	1_H
1 to 5V	2_H
0 to 5V	3_H
-10 to 10V	4_H
User range setting	F_H

Point

The setting cannot be changed with Setting range (Un\G20).
For changing the setting, refer to the following.

- Switch Setting (☞ Page 39, Section 7.2)

(6) Offset/gain setting mode Offset specification (Un\G22), Offset/gain setting mode Gain specification (Un\G23)

Specify the channel to perform the offset/gain setting adjustment.

For details on offset/gain setting, refer to the following.

- Offset/Gain Setting (☞ Page 42, Section 7.5)

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Offset/gain setting mode Offset specification (Un\G22)	0	0	0	0	0	0	0	0	0	0	0	0	CH4	CH3	CH2	CH1
Offset/gain setting mode Gain specification (Un\G23)	0	0	0	0	0	0	0	0	0	0	0	0	CH4	CH3	CH2	CH1

Data for b4 to b15 are fixed to "0".

1: Setting-target channel
0: Invalid

(a) Enabling the setting

Turn OFF → ON → OFF Channel change request (YB) to enable the setting.

Point

Only one channel can be specified at a time. When multiple channels are set at a time, the offset/gain setting mode error occurs and the error code is stored in Latest error code (Un\G19).

(7) Offset/gain adjustment value specification (Un\G24)

This is the area to set the adjustment value of analog output value in the offset/gain setting mode.

Ex. The setting value of 1000 corresponds to:
the analog adjustment value of approx. 0.33V (in voltage output) or approx. 0.69mA (in current output).

(a) Setting range

The setting range is as follows;

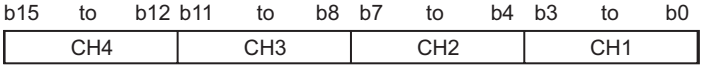
- Setting range: -3000 to 3000

(b) Enabling the setting

Turn OFF → ON → OFF Set value change request (YC) to enable the setting.

(8) HOLD/CLEAR function setting (Un\G26)

The HOLD/CLEAR function setting status of the D/A converter module can be checked.



The setting value is as follows;

HOLD/CLEAR function setting	Setting value
CLEAR	0_H
HOLD	1 to F_H (value other than 0)

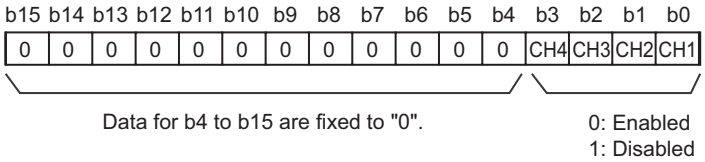
Point

The setting cannot be changed with HOLD/CLEAR function setting (Un\G26).
For changing the setting, refer to the following.

- Switch Setting (☞ Page 39, Section 7.2)

(9) Warning output setting (Un\G47)

Sets whether to enable or disable the alarm output for each channel.



(a) Enabling the setting

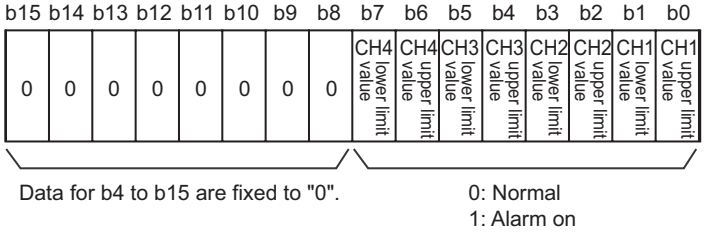
Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(b) Default value

All channels are set to disable (1) as the default value.

(10)Warning output flag (Un\G48)

Alarms can be checked if the alarm is the upper limit warning or lower limit warning, for each channel.



(a) Warning output flag (Un\G48) status

- When a digital value is out of the range set in CH1 Warning output upper limit value (Un\G86) to CH4 Warning output lower limit value (Un\G93), Warning output flag corresponding to each channel turns to alarm output (1).
- When an error is detected in any D/A conversion enable or Warning output enable channels, Warning output signal (XE) is also turned to ON.

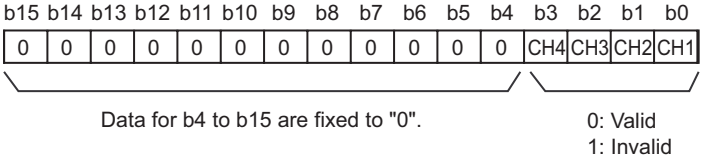
(b) Clearing the Warning output flag

There are two methods for clearing Warning output flag (Un\G48).

- Turning OFF → ON → OFF Operating condition setting request (Y9)
- Turning OFF → ON → OFF Warning output clear request (YE)

(11)Scaling enable/disable setting (Un\G53)

Sets whether to enable or disable the scaling for each channel.



(a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(b) Default value

All channels are set to disable (1) as the default value.

(12)CH□ Scaling lower limit value (Un\G54, Un\G56, Un\G58, Un\G60), CH□ Scaling upper limit value (Un\G55, Un\G57, Un\G59, Un\G61)

Set the input range of digital value when using the scaling function.

(a) Setting range

The setting range is as follows;

- Setting range: -32000 to 32000 (scaling upper limit value > scaling lower limit value)

(b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(c) Default value

All channels are set to 0.

Point

- When a value out of the setting range is set, an error occurs and an error code is stored in Latest error code (Un\G19).
- This setting is not reflected in the D/A converter module if Scaling enable/disable setting (Un\G53) is set to disable.

(13)CH□ Warning output upper limit value (Un\G86, Un\G88, Un\G90, Un\G92), CH□ Warning output lower limit value (Un\G87, Un\G89, Un\G91, Un\G93)

Set the upper and lower limit values of the digital value to output an alarm.
When the settings meet "alarm output upper limit value ≥ alarm output lower limit value", an error code is stored in Latest error code (Un\G19).

(a) Setting range

The setting range is as follows;

- Setting range: -32768 to 32767 (alarm output upper limit value > alarm output lower limit value)

(b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(c) Default value

All channels are set to 0.

Point

- If Scaling enable/disable setting (Un\G53) is set to "enable", make sure to specify values that reflect scale conversion.
- In channels whose Warning output setting (Un\G47) are set to "disable", the values set for the disabled channels of CH□ Warning output upper limit value (Un\G86, Un\G88, Un\G90, Un\G92) and CH□ Warning output lower limit value (Un\G87, Un\G89, Un\G91, Un\G93) are ignored.

(14)Mode switching setting (Un\G158, Un\G159)

Set the setting value for the mode to be switched to.

Mode switching to	Setting value	
	Un\G158	Un\G159
Normal mode	0964_H	4144_H
Offset/gain setting mode	4144_H	0964_H

(a) Setting procedure

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

(b) After the mode switching

When the mode is switched, this area is cleared to zero and Operating condition setting completed flag (X9) is turned to OFF.

After checking that Operating condition setting completed flag (X9) is OFF, turn Operating condition setting request (Y9) to OFF.

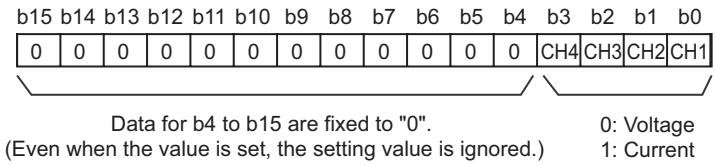
Point

When a value out of the setting range is written, the mode is not switched and only the operating condition is changed.

(15)Pass data classification setting (Un\G200)

This is the area for saving and restoring the offset/gain setting value in user range setting.

Specify the offset/gain setting value to be saved and restored as either voltage or current.



(16)CH1 Industrial shipment settings offset value (Un\G202) to CH4 User range settings gain value (Un\G217)

This is the area for restoring the offset/gain setting value in user range setting.

The data to be used when restoring the offset/gain setting value in user range setting is stored.

The data is stored when;

- Writing the initial setting by utility
- Turning OFF → ON Operating condition setting request (Y9) *1
- Turning OFF → ON User range writing request (YA) (in offset/gain setting mode)

*1 The data is not saved when the setting value is written to Mode switching setting (Un\G158, Un\G159).

When restoring the offset/gain setting value in user range setting, set the data saved in this area to the same area in the D/A converter module where the data is restored.

(a) Procedure for saving offset/gain values in the buffer memory and recording the saved values

1. **Configure Pass data classification setting (Un\G200)**
2. **Turn OFF → ON Operating condition setting request (Y9)**
3. **Compare the values in CH1 Industrial shipment settings offset value (Un\G202) to CH4 User range settings gain value (Un\G217) with the values in the range reference tables.**
4. **When the value is appropriate, record the values in Pass data classification setting (Un\G200) and CH1 Industrial shipment settings offset value (Un\G202) to CH4 User range settings gain value (Un\G217).**

For details on the offset/gain value setting, refer to the following.

- Offset/gain Setting (☞ Page 42, Section 7.5)

(17)Latest error code address (Un\G1800)

The latest address of error log is stored.

(18)Error history No. □ (Un\G1810 to Un\G1969)

Up to 16 errors occurred in the module are recorded.

	b15 to b8	b7 to b0
Un\G1810	Error code	
Un\G1811	First two digits of the year	Last two digits of the year
Un\G1812	Month	Day
Un\G1813	Hour	Minute
Un\G1814	Second	Day of the week
Un\G1815 to Un\G1819	System area	

Appendix 3 I/O Conversion Characteristic of D/A Conversion

I/O conversion characteristic of D/A conversion means the slope of the line connected between the offset value and gain value when converting the digital value written from the CPU module to analog output value (voltage or current output).

(1) Offset value

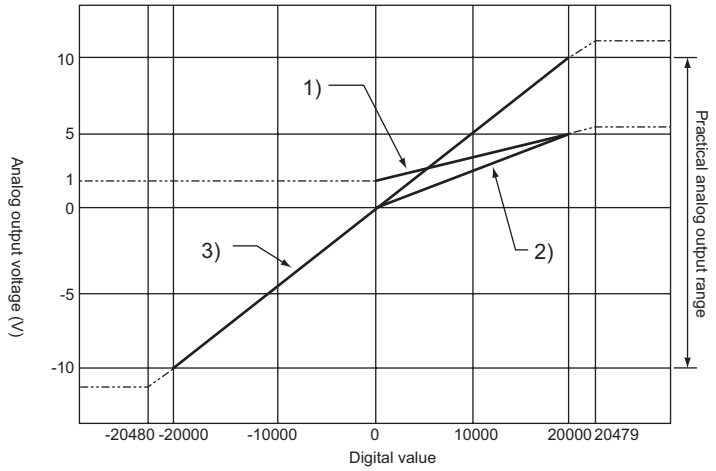
This is the analog output value (voltage or current) when the digital value set from the CPU module is 0.

(2) Gain value

This is the analog output value (voltage or current) when the digital value set from the CPU module is 20000.

(3) Voltage output characteristic

The following graph shows the voltage output characteristic.



No.	Output range setting	Offset value	Gain value	Digital value	Resolution
1)	1 to 5V	1V	5V	0 to 20000	200μV
2)	0 to 5V	0V	5V		250μV
3)	-10 to 10V	0V	10V	-20000 to 20000	500μV
—	User range setting	*1	*1		333μV*2

*1 Set the offset value and gain value in user range setting within the range satisfying the following two conditions.
- Setting range: -10 to 10V
- ((Gain value) - (offset value)) ≥ 6.6V

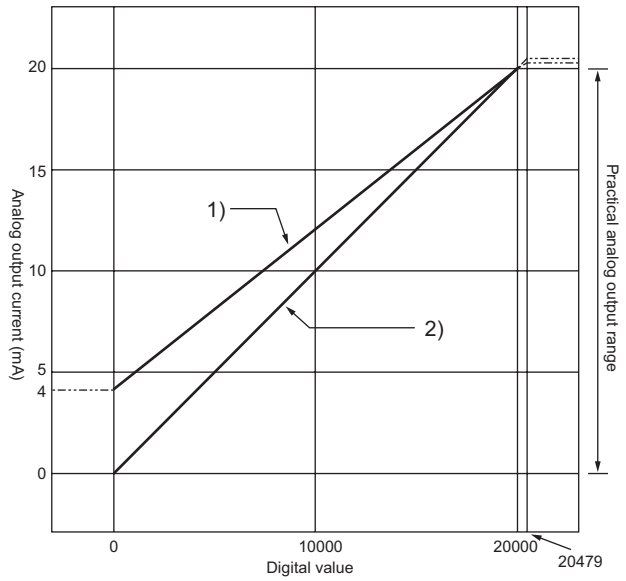
*2 This is the maximum resolution in user range setting.

Point

Use the value within the practical digital input range and practical analog output range of each output range. If a value out of the range is used, the accuracy may not fall within the range of performance specifications. (Do not use the value in the dotted line in the graph above.)

(4) Current output characteristic

The following graph shows the current output characteristic.



No.	Output range setting	Offset value	Gain value	Digital value	Resolution
1)	4 to 20mA	4mA	20mA	0 to 20000	800nA
2)	0 to 20mA	0mA	20mA		1000nA
—	User range setting	*1	*1	-20000 to 20000	700nA*2

*1 Set the offset value and gain value in user range setting within the range satisfying the following two conditions.
- Setting range: 0 to 20mA
- ((Gain value) - (offset value)) ≥ 13.8mA

*2 This is the maximum resolution in user range setting.

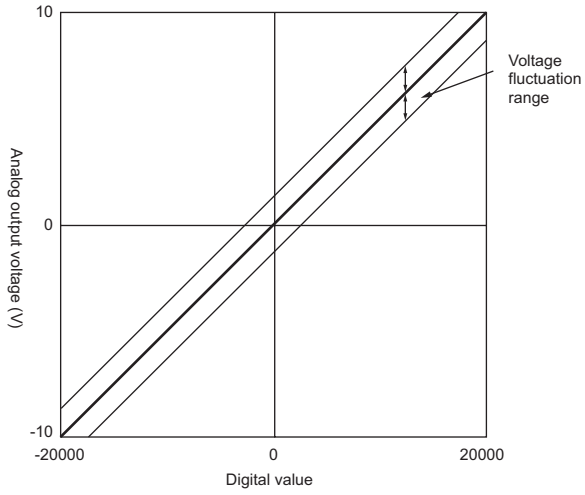
Point

Use the value within the practical digital input range and practical analog output range of each output range. If a value out of the range is used, the accuracy may not fall within the range of performance specifications. (Do not use the value in the dotted line in the graph above.)

Appendix 4 D/A Conversion Accuracy

This is the accuracy for the maximum value of analog output value.
Even when changing the offset/gain setting and output range to change the output characteristics, the accuracy does not change and is kept within the range of described performance specifications.

The following graph shows the fluctuation range of accuracy when the range of -10 to 10V is selected.
The analog output accuracy is within ±0.1% (±10mV) when the ambient temperature is 25±5°C and within ±0.3% (±30mV) when the ambient temperature is 0 to 55°C. (Excluding the case under noise effect.)



Appendix 5 Dedicated Instruction

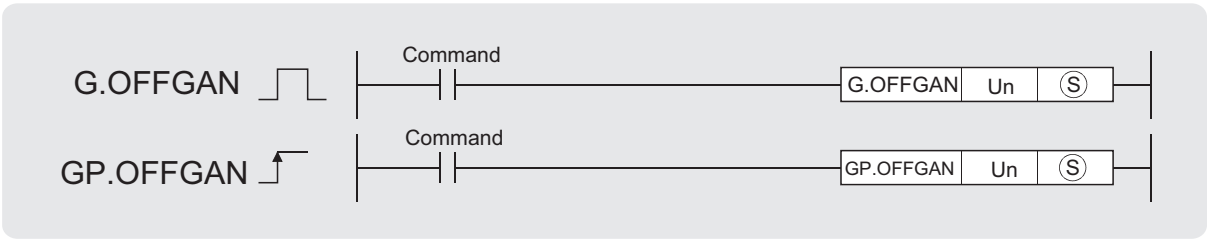
This chapter describes the dedicated instructions that can be used in D/A converter module.

Appendix 5.1 Instruction List

The following shows the dedicated instructions that can be used in D/A converter module.

Instruction	Description
G(P).OFFGAN	The operation mode is changed from the normal mode to the offset/gain setting mode. The operation mode is changed from the offset/gain setting mode to the normal mode.
G(P).OGLOAD	The offset/gain set value in the user range setting is read out to the CPU module.
G(P).OGSTOR	The offset/gain set value in the user range setting stored in the CPU module is restored to the D/A converter module.

Appendix 5.2 G(P).OFFGAN



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant	Others
	Bit	Word		Bit	Word				
Ⓢ	—	○		—					

(1) Setting data

Device	Description	Setting range	Data type
Un	Start I/O number of module	0 to FE_H	BIN 16-bit
Ⓢ	Switching the operation mode 0: switch to the normal mode 1: switch to the offset/gain setting mode When a value other than above is set, the mode switches to the offset/gain setting mode.	0, 1	BIN 16-bit

(2) Functions

This instruction switches the operation mode of the D/A converter module.

- Normal mode → offset/gain setting mode (Offset/gain setting mode flag (XA) is ON)
- Offset/gain setting mode → normal mode (Offset/gain setting mode flag (XA) is OFF)

Point

- When the mode is switched from the offset/gain setting mode to the normal mode, Module READY (X0) turns from OFF to ON.
  Note that if a program includes the initial settings to be executed at ON of Module READY (X0), this instruction performs the initial setting process.
- When the mode switching (normal mode → offset/gain setting mode, or offset/gain setting mode → normal mode) is performed, the D/A conversion stops.
- When the mode is switched from the offset/gain setting mode to the normal mode, all-channel D/A conversion disable ($000F_H$) is stored in D/A conversion enable/disable setting (Un\G0).
  To resume the D/A conversion, set D/A conversion enable (0) for the corresponding channels and turn Operating condition setting request (Y9) OFF → ON → OFF.

(3) Errors

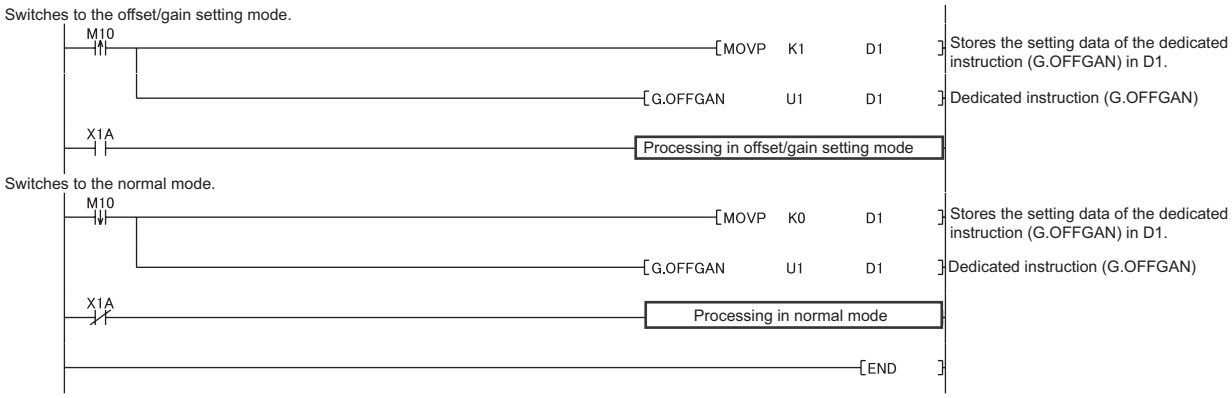
The instruction has no errors.

(4) Program example

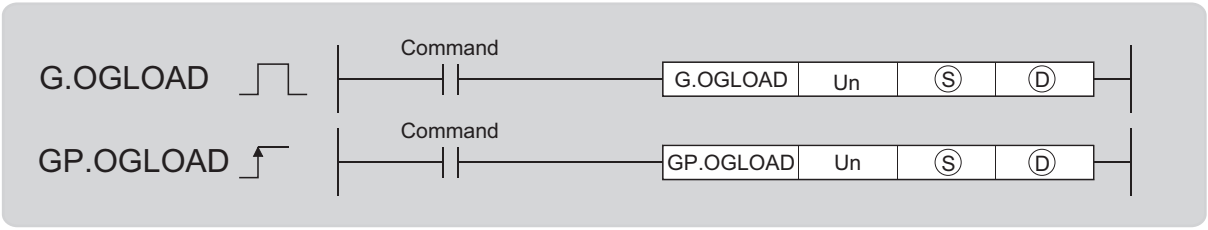
The following shows the program of the D/A converter module, installed in I/O number X/Y10 to X/Y1F, with the following conditions:

• turning ON M10 switches the operation mode to the offset/gain setting mode, and

• turning OFF M10 restores the operation mode to the normal mode.



Appendix 5.3 G(P).OGLOAD

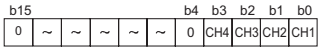


Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant	Others
	Bit	Word		Bit	Word				
Ⓢ	—	○		—					
Ⓓ		○		—					

(1) Setting data

Device	Description	Setting range	Data type
Un	Start I/O number of module	0 to FE_H	BIN 16-bit
Ⓢ	Start number of device where the control data is stored	Within the range of specified device	Device name
Ⓓ	Device to turn ON for one scan after the processing completion of the dedicated instruction. In error completion, Ⓓ+1 also turns ON.	Within the range of specified device	Bit

(2) Control data *1

Device	Item	Setting data	Setting range	Set by
Ⓢ	System area	—	—	—
Ⓢ+1	Completion status	The status on instruction completion is stored. 0 : normal completion Other than 0: error completion (error code)	—	System
Ⓢ+2	Pass data classification setting	Specify the type of offset/gain setting value to read out. 0: voltage 1: current 	0000_H to $000F_H$	User
Ⓢ+3	System area	—	—	—
Ⓢ+4	CH1 Industrial shipment settings offset value	—	—	System
Ⓢ+5	CH1 Industrial shipment settings gain value	—	—	System
Ⓢ+6	CH2 Industrial shipment settings offset value	—	—	System
Ⓢ+7	CH2 Industrial shipment settings gain value	—	—	System
Ⓢ+8	CH3 Industrial shipment settings offset value	—	—	System
Ⓢ+9	CH3 Industrial shipment settings gain value	—	—	System
Ⓢ+10	CH4 Industrial shipment settings offset value	—	—	System
Ⓢ+11	CH4 Industrial shipment settings gain value	—	—	System
Ⓢ+12	CH1 User range settings offset value	—	—	System
Ⓢ+13	CH1 User range settings gain value	—	—	System
Ⓢ+14	CH2 User range settings offset value	—	—	System
Ⓢ+15	CH2 User range settings gain value	—	—	System
Ⓢ+16	CH3 User range settings offset value	—	—	System
Ⓢ+17	CH3 User range settings gain value	—	—	System
Ⓢ+18	CH4 User range settings offset value	—	—	System
Ⓢ+19	CH4 User range settings gain value	—	—	System

*1 Configure the setting only for the Pass data classification setting Ⓢ +2.
When the data is written to the area to be set by system, offset/gain setting value is not correctly read out.

(3) Functions

This instruction reads out the offset/gain setting value in the user range setting of the relevant module to CPU module.

The interlock signal of G(P).OGLOAD includes a completion device Ⓓ and a completion status device Ⓓ +1.

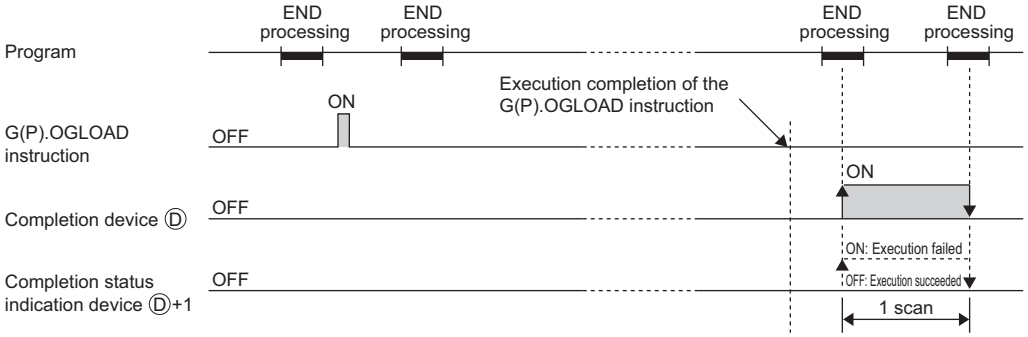
(a) Completion device

The device turns ON at the END processing for the scan where the G(P).OGLOAD instruction is completed, and turns OFF at the next END processing.

(b) Completion status indication device

This device turns OFF → ON → OFF depending on the status of the G(P).OGLOAD instruction completion.

- Normal completion: the device is kept to be OFF.
- Error completion: the device turns ON at the END processing for the scan where the G(P).OGLOAD instruction is completed, and turns OFF at the next END processing.

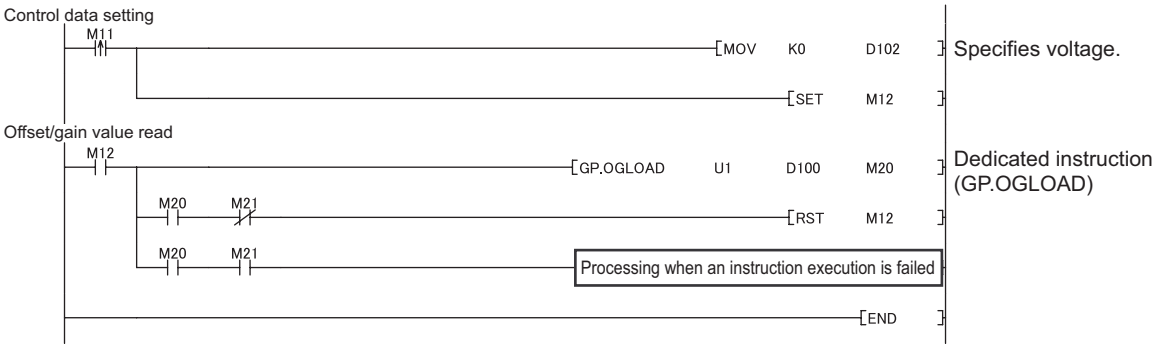


(4) Errors

The instruction has no errors.

(5) Program example

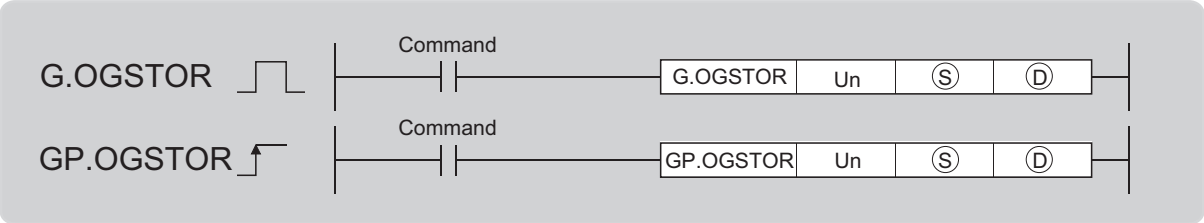
The following shows the program to read out the offset/gain setting value of the D/A converter module, installed in I/O number X/Y10 to X/Y1F, by turning ON M11.



Point

When performing the dedicated instruction G(P).OGSTOR, the D/A conversion is stopped.
Turn OFF → ON → OFF Operating condition setting request (Y9) to restart the D/A conversion.

Appendix 5.4 G(P).OGSTOR



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H, $	Others
	Bit	Word		Bit	Word				
Ⓢ	—	○		—					
Ⓓ		○		—					

(1) Setting data

Device	Description	Setting range	Data type
Un	Start I/O number of module	0 to FE_H	BIN 16-bit
Ⓢ*1	Start number of device where the control data is stored	Within the range of specified device	Device name
Ⓓ	Device to turn ON for one scan after the processing completion of the dedicated instruction. It also makes Ⓓ+1 ON in error completion.	Within the range of specified device	Bit

*1 Specify the device specified to Ⓢ on execution of the G(P).OGLOAD instruction.
Do not change the data which is read out by the G(P).OGLOAD instruction. If the data is changed, the normal operation may not be ensured.

(2) Control data

Device	Item	Setting data	Setting range	Set by
Ⓢ	System area	—	—	—
Ⓢ+1	Completion status	The status on instruction completion is stored. 0 : normal completion Other than 0: error completion (error code)	—	System
Ⓢ+2	Pass data classification setting	The value which is set for Pass data classification setting Ⓢ +2 by G(P).OGLOAD instruction is stored. 0: voltage 1: current 	0000_H to $000F_H$	System
Ⓢ+3	System area	—	—	—
Ⓢ+4	CH1 Industrial shipment settings offset value	—	—	System
Ⓢ+5	CH1 Industrial shipment settings value	—	—	System
Ⓢ+6	CH2 Industrial shipment settings offset value	—	—	System
Ⓢ+7	CH2 Industrial shipment settings gain value	—	—	System
Ⓢ+8	CH3 Industrial shipment settings offset value	—	—	System
Ⓢ+9	CH3 Industrial shipment settings gain value	—	—	System
Ⓢ+10	CH4 Industrial shipment settings offset value	—	—	System
Ⓢ+11	CH4 Industrial shipment settings gain value	—	—	System
Ⓢ+12	CH1 User range settings offset value	—	—	System
Ⓢ+13	CH1 User range settings gain value	—	—	System
Ⓢ+14	CH2 User range settings offset value	—	—	System
Ⓢ+15	CH2 User range settings gain value	—	—	System
Ⓢ+16	CH3 User range settings offset value	—	—	System
Ⓢ+17	CH3 User range settings gain value	—	—	System
Ⓢ+18	CH4 User range settings offset value	—	—	System
Ⓢ+19	CH4 User range settings gain value	—	—	System

(3) Functions

- The offset/gain setting value in the user range setting stored in the CPU module is restored to the D/A converter module.
- There are two interlock signals of G(P).OGSTOR: a completion device Ⓓ and a completion status indication device Ⓓ+1.
- The reference accuracy on restoration of offset/gain setting value is lowered three times or less of that of before the restoration.

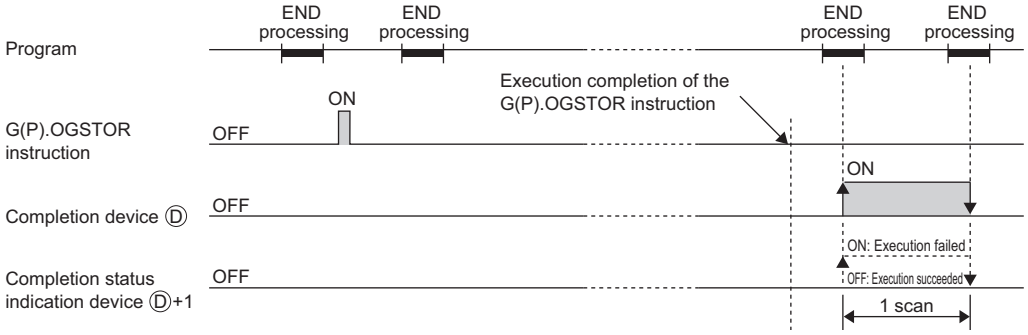
(a) Completion device

The device turns ON at the END processing for the scan where the G(P).OGSTOR instruction is completed, and turns OFF at the next END processing.

(b) Completion status indication device

This device turns OFF → ON → OFF depending on the status of the G(P).OGSTOR instruction completion.

- Normal completion: the device is kept to be OFF.
- Error completion: the device turns ON at the END processing for the scan where the G(P).OGSTOR instruction is completed, and turns OFF at the next END processing.



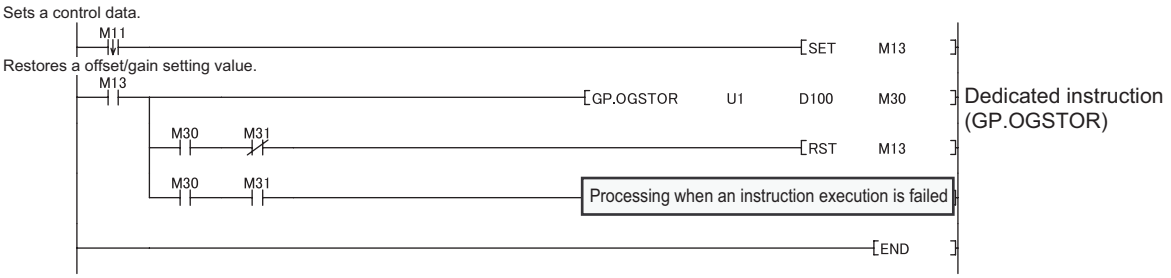
(4) Errors

In the following cases, an error occurs and error code is stored in completion status area Ⓢ +1.

Error code	Description of operation error
161	G(P).OGSTOR instruction is executed in offset/gain setting mode.
162	G(P).OGSTOR instruction is continuously executed.
163	• G(P).OGSTOR instruction is executed to the different model from the one to which G(P).OGLOAD instruction is executed. • G(P).OGSTOR instruction has been executed before the execution of G(P).OGLOAD instruction.

(5) Program example

The following shows the programs to write the offset/gain setting value to the D/A converter module, installed in I/O number X/Y10 to X/Y1F, by turning OFF M11.



Appendix 6 Checking Serial Number and Function Version

For details on how to check the serial number and function version, refer to the following.

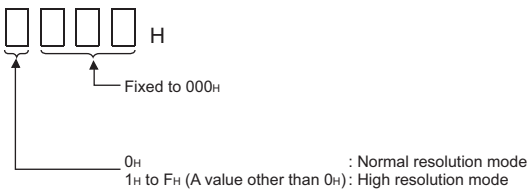
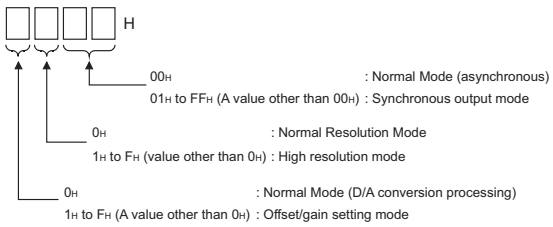
MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

Appendix 7 Differences with Q Series

The following table shows a comparison of the specifications between the L60DA4 and the Q64DAN.

For the function comparison between LCPU and QCPU, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

Difference	L60DA4	Q64DAN
Resolution switching function	1 type; 1/20000 (resolution switching function is not installed)	2 types; normal resolution (1/4000) and high resolution (1/12000 or 1/16000)
Synchronous output function	Not available	Available
Switch 4 in switch setting		

Appendix 8 When Using GX Developer or GX Configurator-DA

Appendix 8 describes the operating procedure when using GX Developer and GX Configurator-DA.

(1) Compatible software version

For compatible software version, refer to the following.

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

Appendix 8.1 Operation of GX Developer

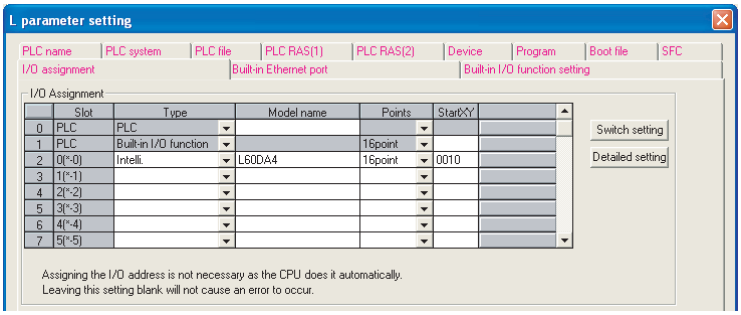
Configure the setting on the following screen when using GX Developer.

Screen name	Application	Reference
I/O assignment	Set the type of module to be installed and the range of I/O signal.	Page 111, Appendix 8.1(1)
Switch setting	Configure the switch setting for an intelligent function module.	Page 112, Appendix 8.1(2)
Offset/gain setting	Configure the setting when using the user range setting for output range.	Page 113, Appendix 8.1(3)

(1) I/O assignment

Configure the setting from "I/O assignment" in "PLC parameter".

Parameter ⇨ [PLC parameter] ⇨ [I/O assignment]

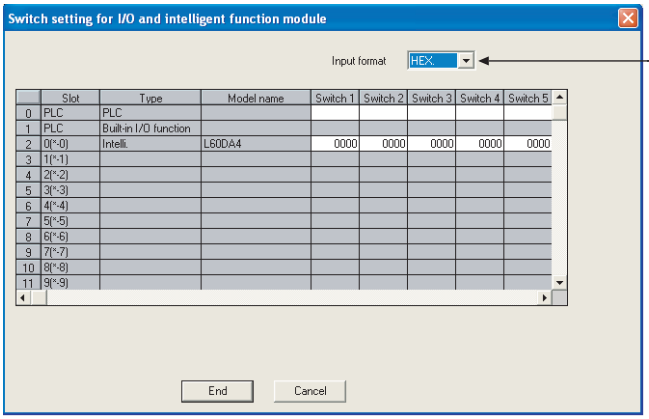


Item	Description
Type	Select "Intelli".
Model name	Enter the model name of the D/A converter module.
Points	Select "16 point".
Start XY	Enter a desired start I/O number of D/A converter module.

(2) Intelligent function module switch setting

Configure the setting from "Switch setting" in "PLC parameter".

Parameter ⇨ [PLC parameter] ⇨ [I/O assignment] ⇨Click the Switch setting button.



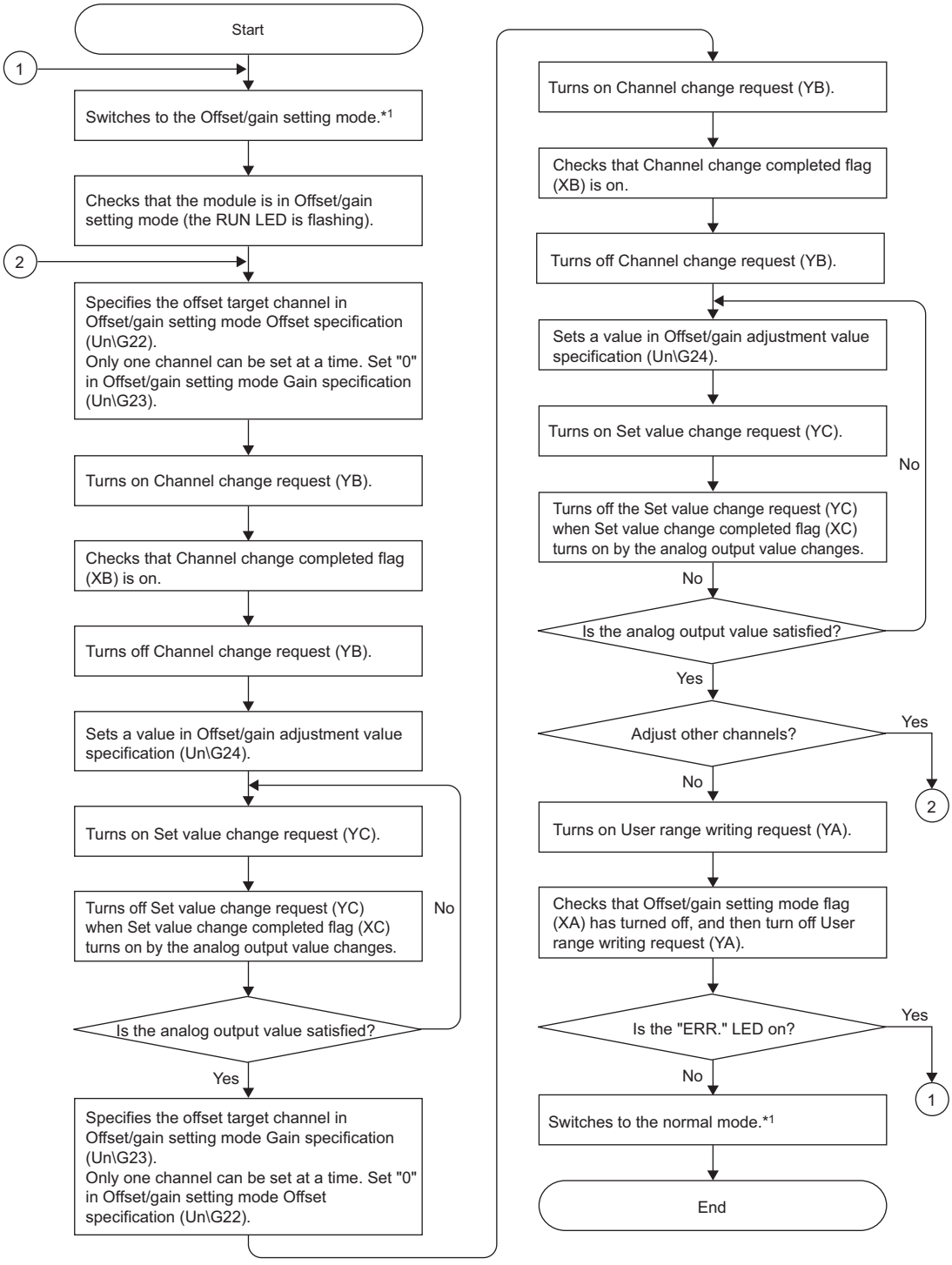
Item	Setting item		
Switch 1	Output range setting (CH1 to CH4) □□□□ H CH4 CH3 CH2 CH1	**Analog output range**	**Output range setting**
		4 to 20mA	0_H
		0 to 20mA	1_H
		1 to 5V	2_H
		0 to 5V	3_H
		-10 to 10V	4_H
		User range setting	F_H
Switch 2	0: Fixed (blank)		
Switch 3	HOLD/CLEAR function setting (CH1 to CH4) □□□□ H CH4 CH3 CH2 CH1	**Setting value**	**HOLD/CLEAR**
		0	CLEAR
		1 to F_H*1	HOLD
Switch 4	□□□□ H 000H: Fixed 0H : Normal mode 1H to FH (A value other than 0H)*1 : Offset-gain setting mode		
Switch 5	0: Fixed (blank) *2		

*1 The operation is the same when any value within the setting range is set.

*2 If a value other than 0 is written, error: 112 occurs.

(3) Offset/gain setting

When using the user range setting, configure the offset/gain setting with the following operations.
When using the factory default setting, the offset/gain setting is not necessary.



*1 The following shows the procedure for switching the mode (normal mode offset/gain setting mode normal mode).
Dedicated instruction (G(P).OFFGAN) (☞ Page 102, Appendix 5.2)
- Changing for Mode switching setting (Un\G158, Un\G159) and OFF → ON → OFF of Operating condition setting request (Y9) (☞ Page 96, Appendix 2(14))
- Intelligent function module switch setting (☞ Page 39, Section 7.2 (1))

Point

- Configure the offset/gain setting in accordance with the actual use situation.
- Offset and gain values are recorded in the flash memory in the D/A converter module by turning OFF → ON → OFF User range writing request (YA). Once recorded, the values are not deleted even after turning the power off.
  When the values are written 26 times in succession, an error occurs and the error code is stored in Latest error code (Un\G19) to prevent an improper write to flash memory.
- Configure the offset/gain setting in the range satisfying the following condition.
  When the setting value out of the range is configured, the resolution and accuracy of the module may not fall within the range shown in the following performance specifications.
  - I/O conversion characteristic of D/A conversion (☞ Page 98, Appendix 3)
- Configure the offset/gain setting for each channel.
  When configuring the setting for offset and gain channels at the same time, an error occurs and ERR. LED turns on.
- When error occurs even in one channel, offset/gain value is not written to the module.
  Check the value in Latest error code (Un\G19) and perform the following procedures to reconfigure the offset/gain setting from the beginning.
  - Error code list (☞ Page 79, Section 11.4)
- When the mode is switched from the offset/gain setting mode to the normal mode by the setting of the dedicated instruction (G(P).OFFGAN) or Mode switching setting (Un\G158, Un\G159), Module READY (X0) turns from OFF to ON. Note the initial setting process is executed at the switching of the mode if the sequence program executes the initial setting at Module READY (X0) ON.
- To validate the intelligent function module switch setting after writing the setting to the CPU module, reset the CPU module or turn the power supply from OFF to ON.

(4) Program example

(a) Device

Ex. I/O number of D/A converter module is X/Y30 to 3F (when L26CPU-BT is used)

The following shows the devices used in the program example.

Device	Function
M0	Channel selection
M2	Gain setting
M3	Channel change command
M4	Offset/gain setting value channel change command
M5	Mode switching
M6	Analog output value adjustment command
M7	Command to write offset/gain setting values to the module
M8	Adjustment amount setting
M50	Signal for checking the offset/gain setting mode
M51	Signal for checking the normal mode
D0	Channel-specified storage device
D1	Adjustment amount setting storage device
D2	Storage device for the setting value of the dedicated instruction (G(P).OFFGAN)
M100	Module READY checking flag

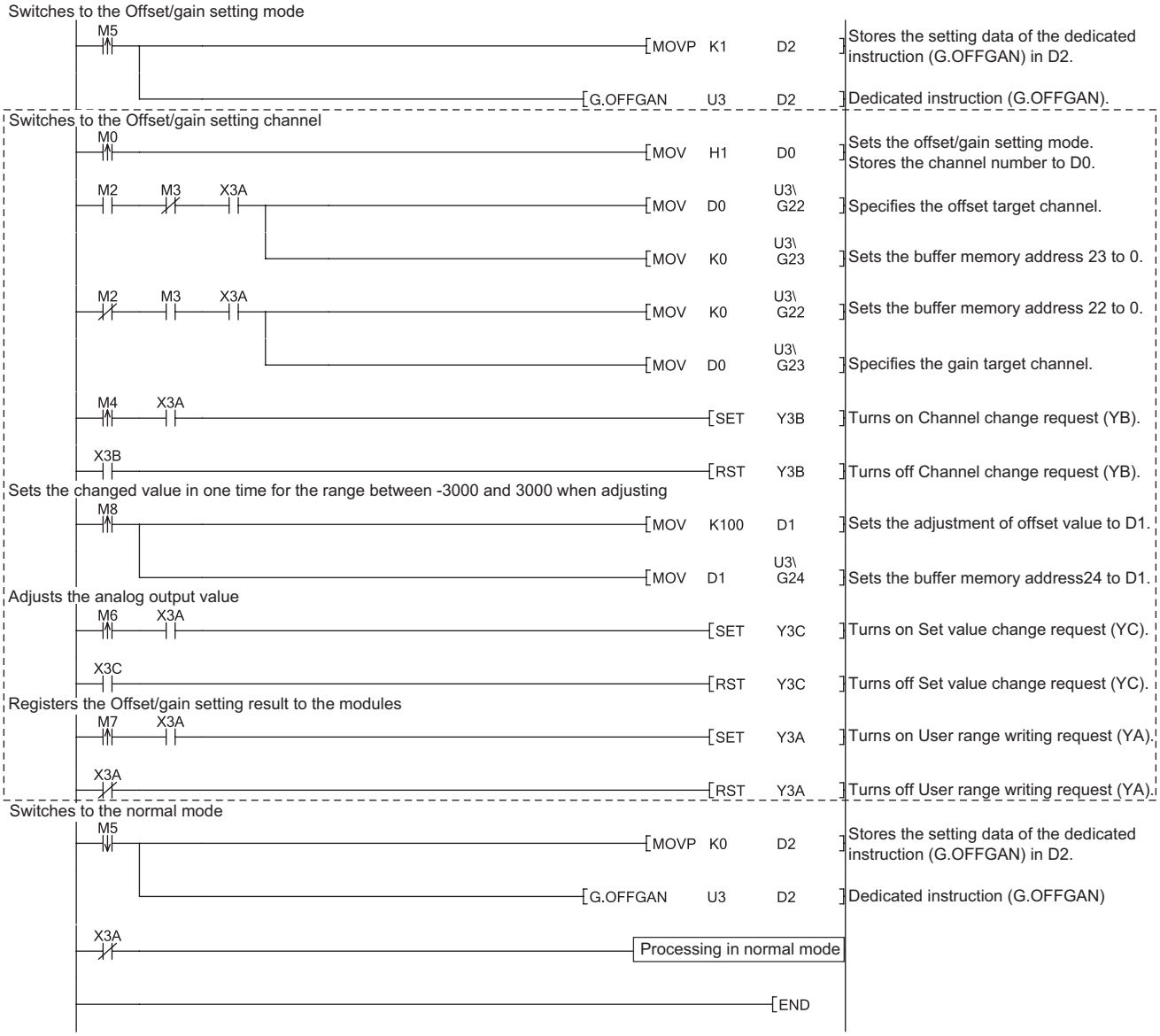
Point

For configuring the same I/O assignment as the system above, when using L02CPU, set the I/O assignment of the D/A converter module within X/Y30 to 3F.

(b) Switching the mode by the dedicated instruction (G.OFFGAN)

This program performs the followings:

- first, switches the mode to the offset/gain setting mode by the dedicated instruction (G.OFFGAN),
- second, switches the channels for which the offset/gain settings are configured,
- third, writes the offset/gain value to the D/A converter module,
- finally, switches the mode back to the normal mode.

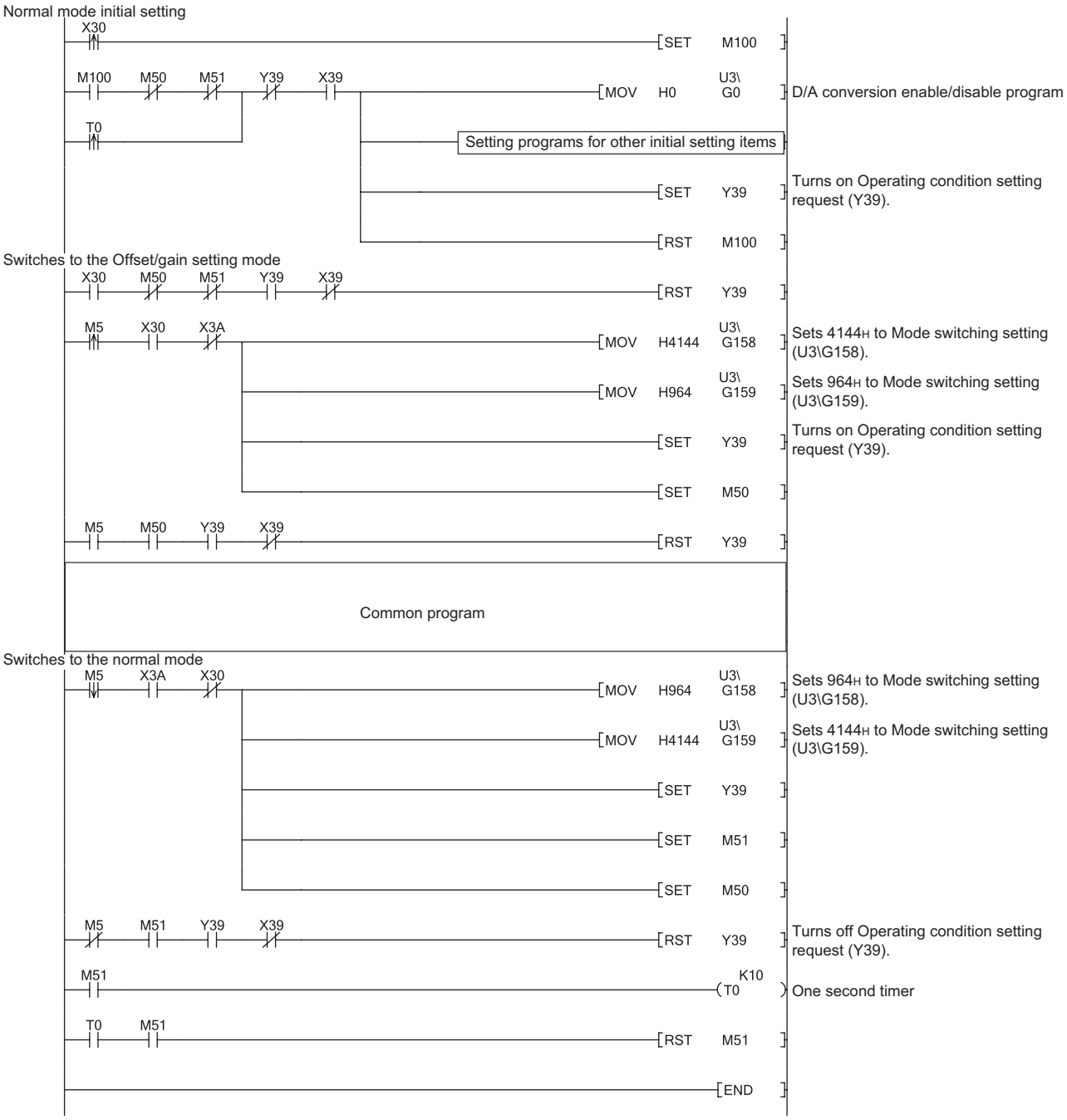


Point

The program in the dot-line box is common with the following three programs.

- Switching the mode by the dedicated instruction (G(P).OFFGAN)
- Switching the mode by Mode switching setting (U3\G158, U3\G159) and Operating condition setting request (Y39)
- Switching the mode by the intelligent function module switch setting

(c) Switching the mode by Mode switching setting (Un\G158, Un\G159) and Operating condition setting request (Y9)



(d) Switching the mode by the intelligent function module switch setting

The program other than the common program is not required.

Appendix 8.2 Operation of GX Configurator-DA

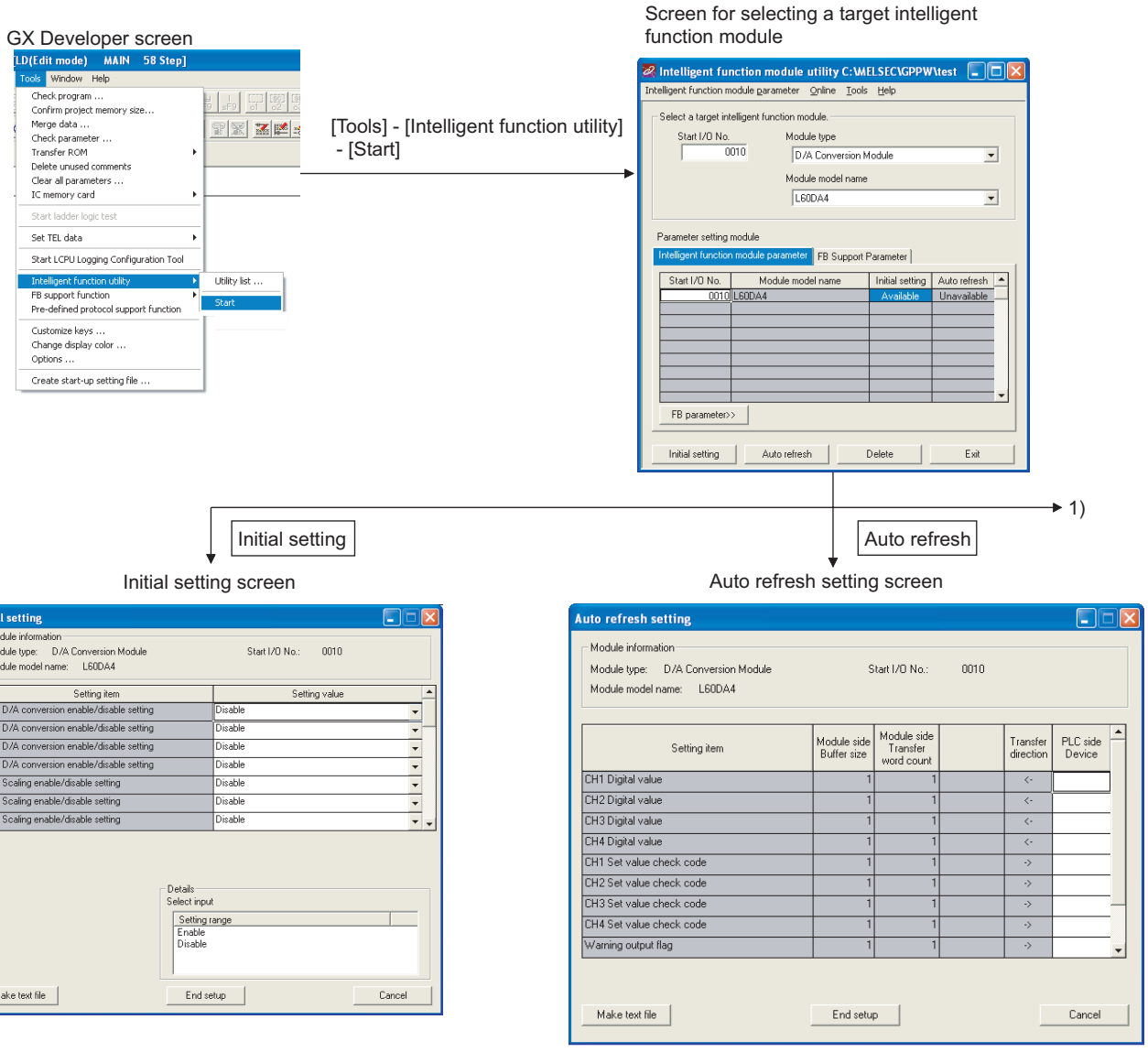
When setting the D/A converter module parameter using GX Configurator-DA, the display method such as a setting screen differs from that of GX Works2.

This section describes the screen display method of GX Configurator-DA.

The setting contents are the same as GX Works2. (☞ Page 38, CHAPTER 7)

When using GX Configurator-DA, configure the settings on the following screens.

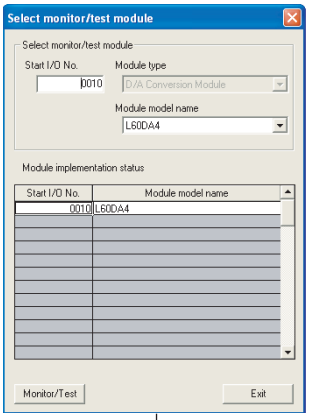
Screen name	Application
Initial setting	This setting configures the settings such as D/A conversion enable/disable setting.
Auto refresh setting	This setting transfers data in the buffer memory to specified devices.
Monitor/test	This function enables the user to monitor/test the buffer memory and I/O signals, and configure the operating condition setting and offset/gain setting.
FB conversion	This function generates FB automatically from the intelligent function module parameter (initial setting/ auto refresh).



1)

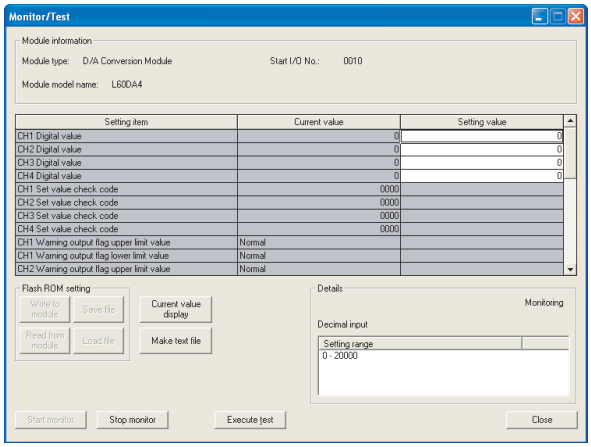
[Online] - [Monitor/Test]

Select monitor/test module screen



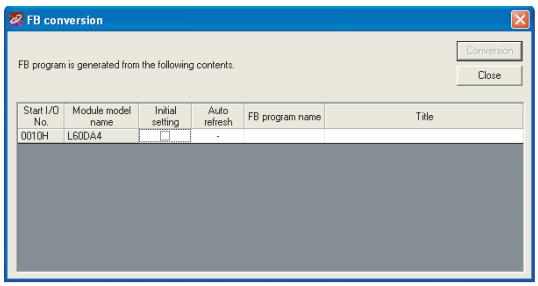
Select a module to be monitored/tested.

Monitor/Test screen



<<FB Support Parameter>>tab - FB conversion

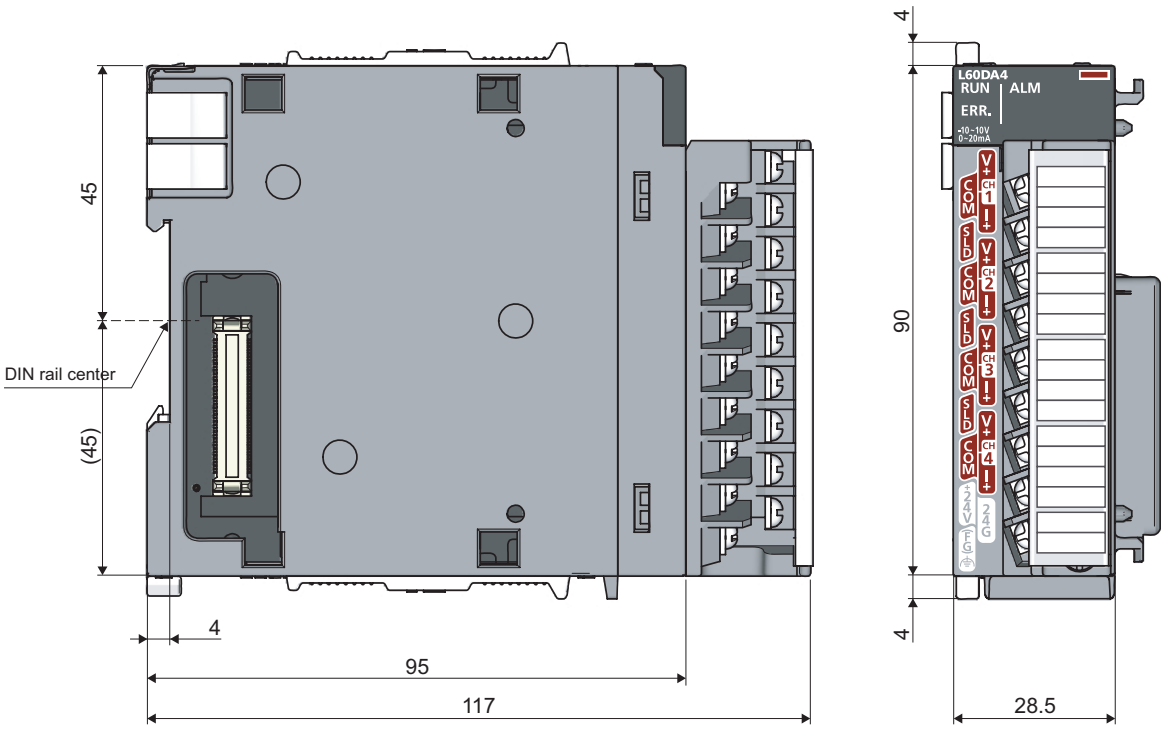
FB conversion screen



Appendix 9 External Dimensions

The following shows the external dimensions of D/A converter module.

(1) L60DA4



(Unit: mm)

Memo

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INSTRUCTION INDEX

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Print date	*Manual number	Revision
January 2010	SH(NA)-080900ENG-A	First edition

Japanese manual version SH-080878-B

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However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.
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The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.
[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
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    2. Failure caused by unapproved modifications, etc., to the product by the user.
    3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
    4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
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MELSEC-L Digital-Analog Converter Module User's Manual

MODEL	L-D/A-U-E
MODEL CODE	13JZ43
SH(NA)-080900ENG-A(1001)MEE	

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