

PLC Intelligent Function Module

This course is for those who have mastered the basics of MELSEC-Q Series and are using intelligent function modules for the first time or have only recently started using intelligent function modules.

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The course teaches how to use the intelligent function modules by using a relatively easy digital-analog converter module and engineering software called "GX Works2."

The contents of this course are as follows.
We recommend that you start from Chapter 1.

Chapter 1 The basics of intelligent function modules





Learn the basic functions and usages of the intelligent function modules and GX Works 2.

Chapter 2 How to use the D/A converter module

Learn the specifications and connection method of the D/A converter module (Q62DAN), how to set the module with GX Works2 and how to check the module's workings at the time of start-up.

Final Test

Passing grade: 60% or higher.

Go to the next page		Go to the next page.
Back to the previous page		Back to the previous page.
Move to the desired page		"Table of Contents" will be displayed, enabling you to navigate to the desired page.
Exit the learning		Exit the learning. Window such as "Contents" screen and the learning will be closed.

Safety cautions

When you learn by using actual products, please fully read the safety precautions in the corresponding manuals.

Learning precautions

- The displayed screens of the software version that you use may differ from those in this course.

This course uses the following software version:

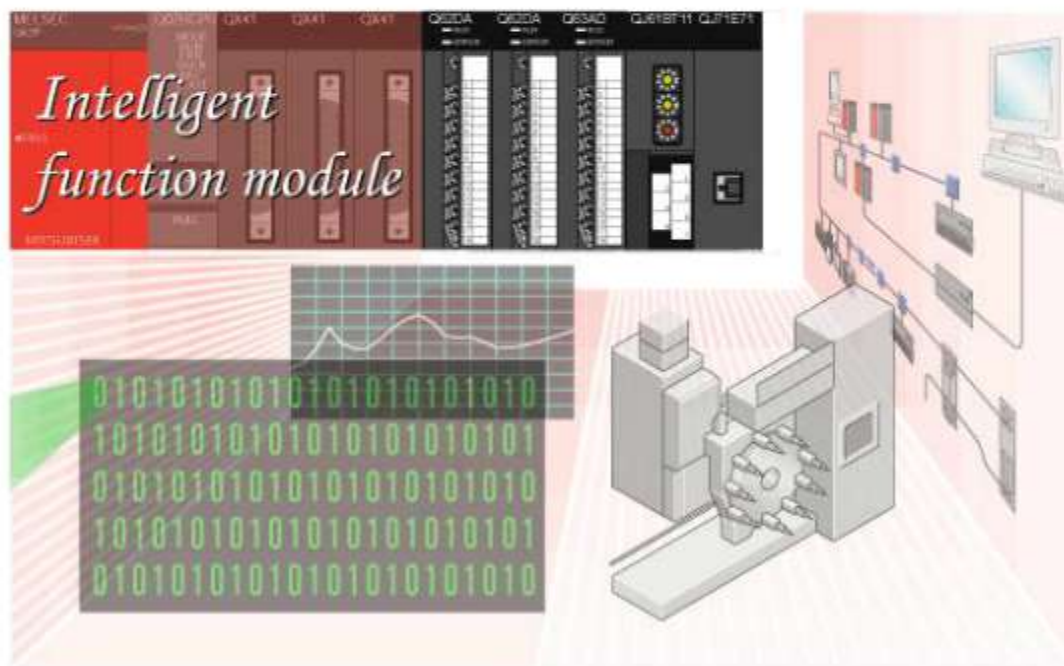
- GX Works2 Version 1.77F

Chapter 1 The Basics of Intelligent Function Modules

In this chapter, you will learn about the basic functions and control methods that are common to the intelligent function modules of the MELSEC-Q Series.

Let's study the control methods of intelligent function modules and how they relate to the GX Works2.

- 1.1 Overview of intelligent function modules
- 1.2 Control of intelligent function modules
- 1.3 Programs to control intelligent function modules
- 1.4 Operation setting by using parameters



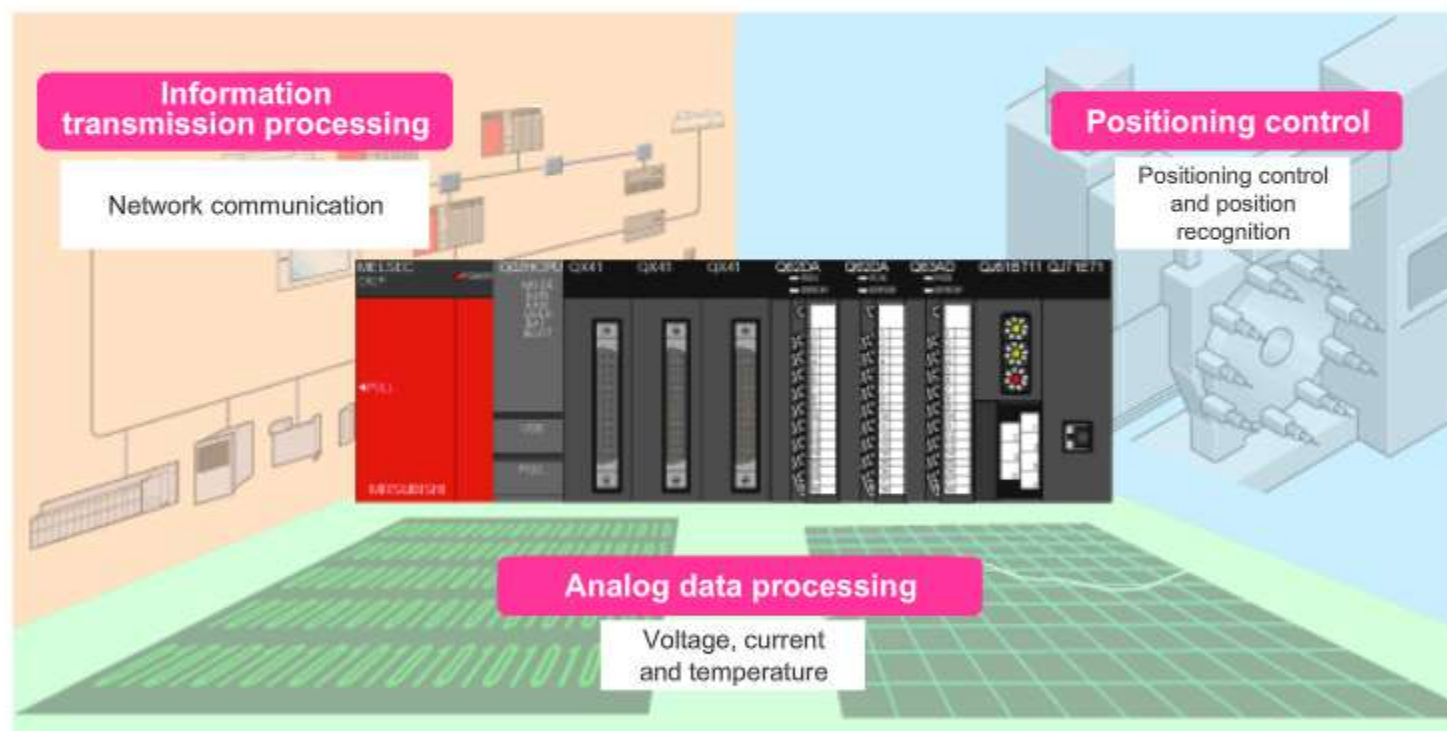
1.1

Overview of Intelligent Function Modules

Among the various modules that are mounted on the base unit of the MELSEC-Q Series programmable controller, those modules other than the CPU module, power supply module and digital I/O module are called "intelligent function modules."

The intelligent function modules are important for expanding the scope of application of the programmable controller at the interface where the programmable controller is connected to various sensors and actuators.

There are modules that control the input/output of analog signals, that communicate with devices connected with each other by a network, and that control positioning, and others.



Now let's learn the types of modules by function classification.

1.1.1 Types of Intelligent Function Modules

The intelligent function modules of the Q Series programmable controllers are as follows.

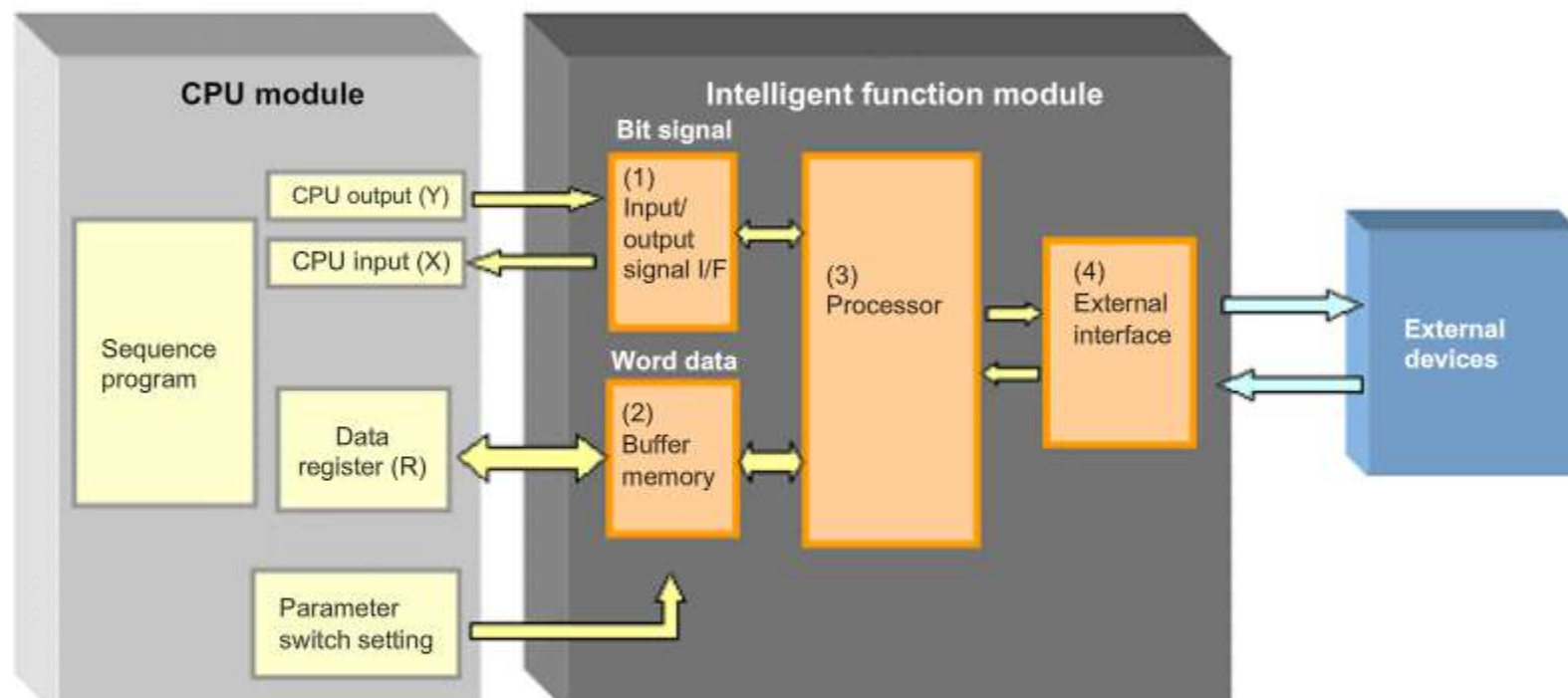
By type	Name of module	Overview of function
Analog system modules	A/D converter module	The A/D converter module converts analog quantities such as voltage and current externally inputted into digital data that are then captured into the CPU module.
	D/A converter module	The D/A converter module converts digital data set by the CPU module into analog quantities such as voltage and current, and then outputs them.
	Temperature regulating module	Based on temperature sensor measurements (analog data) and programmable controller's target temperature, the temperature regulating module computes the necessary control inputs to external devices. These external devices then adjust the specimen temperatures to meet the target.
	Temperature input module	The temperature input module converts temperature measurements (analog data) from external sensors into digital data, which can be handled by the CPU module.
Positioning/counter system modules	High-speed counter module	The high-speed counter module receives high-speed pulse train signals from encoders that are mounted to machines, and counts the number of pulses. Based on the results, the speeds and positions of machines can be confirmed.
	Positioning module	The positioning module outputs positioning information that is computed by programmable controllers to external devices (such as servo amplifiers) as positioning commands (positions and speeds).
Network system modules	Serial communication module	The serial communication module transfers data to and from external devices through serial interfaces such as RS-232.
	Ethernet module	The Ethernet module is connected to Ethernet for passing data between devices in a network.

*Of the above modules, this course covers the D/A converter module.

1.1.2

Interfaces and Internal Configurations of Intelligent Function Modules

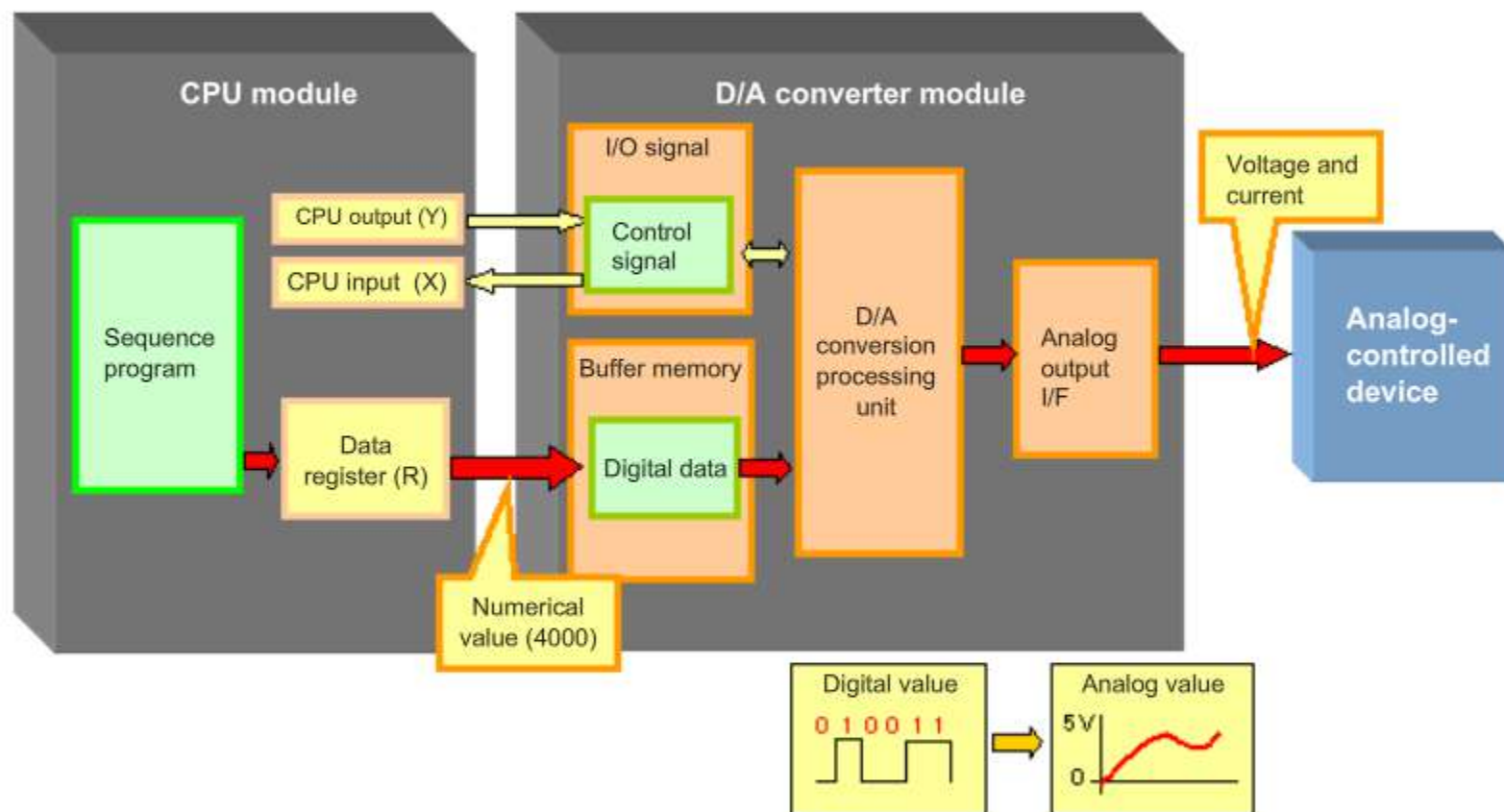
I/O modules have input/output signals only. The distinctive feature of intelligent function modules is that they have buffer memories.



(1) I/O signal I/F	This is an interface for passing bit signals (ON/OFF signals) to and from the CPU module. The number of occupied points is decided for each intelligent function module, and the I/O number is decided by the slot to be mounted.
(2) Buffer memory	This is an interface for passing Word data (16 bits) to and from the CPU module. For each intelligent function module, necessary information is allocated to the address of buffer memory.
(3) Processor	This is configured with dedicated circuits that process the main functions of the intelligent function module.
(4) External interface	This is an interface to connect intelligent function modules to external devices.

1.1.3 Functions of Analog System Modules

Analog system modules handle analog quantities such as voltage, current and temperature for the devices to be controlled. The following block diagram shows the case of the D/A converter module.



The D/A converter module converts digital data set by a sequence program into analog data (voltage or current), and then outputs them to external devices. The details are explained in Chapter 2.

1.2

Control of Intelligent Function Modules

1.2.1

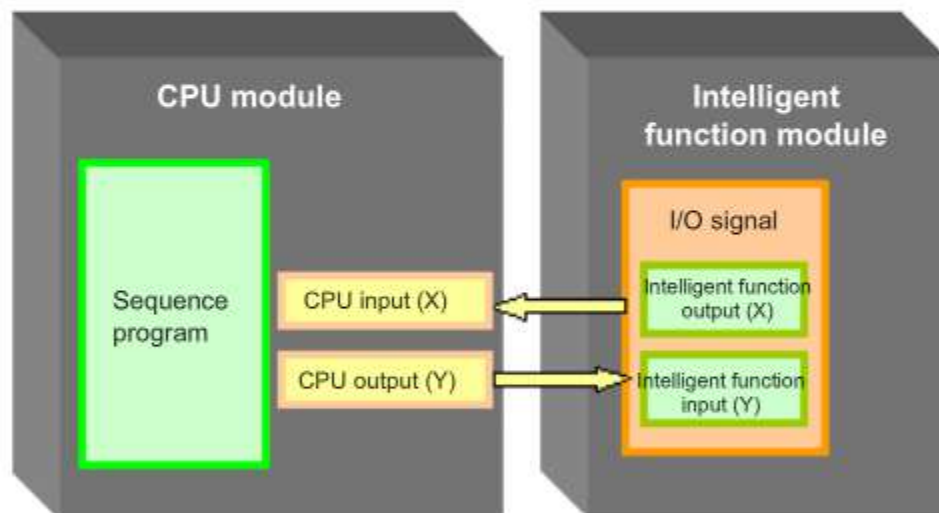
Roles of I/O Signal / Buffer Memory

I/O signal

Conventionally, signals inputted to the CPU module is expressed as X, and signals outputted from the CPU module is expressed as Y.

The number of I/O points occupied by each intelligent function module is fixed.

If the module has 16 I/O points, there will be 16 input and 16 output points allocated.



X signals inform the CPU module about the status of intelligent function modules with ON/OFF signals.

Examples of X signals (in the case of D/A converter module)

- Module READY signal
- High resolution mode status flag
- Operating condition setting complete flag
- Offset/gain setting mode flag

Y signals give instructions to intelligent function modules from the CPU module with ON/OFF signals.

Examples of Y signals (in the case of D/A converter module)

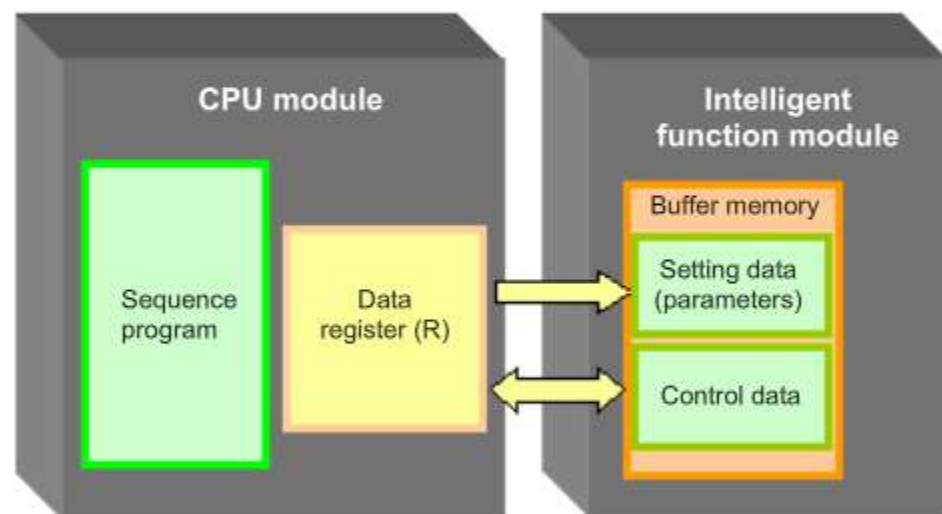
- CH1 output enable/disable flag
- CH2 output enable/disable flag
- Operating condition setting request
- User range write request

1.2.1

Roles of I/O Signal / Buffer Memory

Buffer memory

The buffer memory contains setting data, used to transmit the initial information of intelligent function modules; and control data, used to continuously update the latest information during operation.



Example of setting data (in the case of D/A converter module)
- D/A conversion enabled/disabled

Example of control data (in the case of D/A converter module)
- CH1 digital value
- CH2 digital value
- CH1 set value check code
- CH2 set value check code
- Error code

1.2.2

Information to Control Intelligent Function Modules

As an example, the flow of information to control intelligent function modules is explained below.

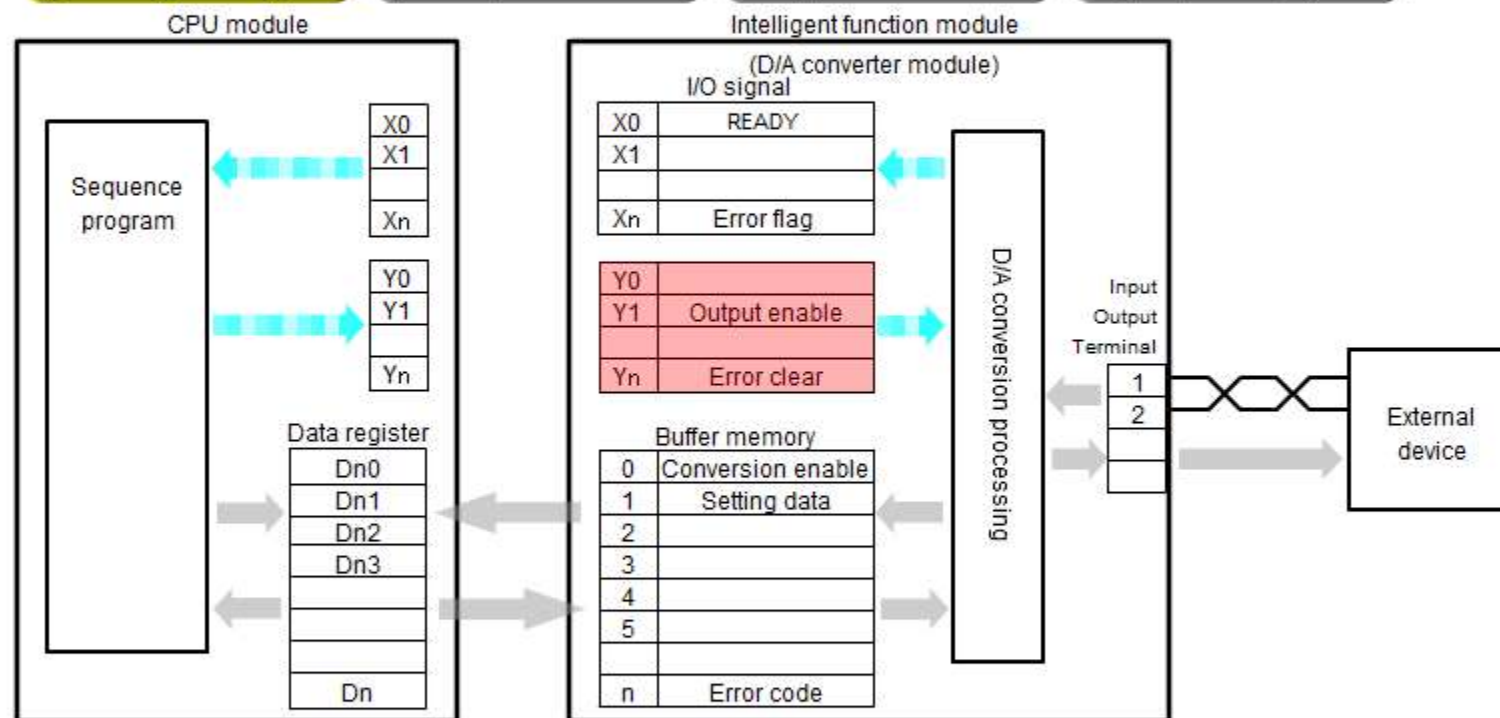
Click the button to run through the explanations.

(1) Passing of I/O signals

(2) Passing of buffer memory

(3) External data

(4) Sequence program



(1) Passing of I/O signals

ON/OFF signals to control intelligent function modules are passed by I/O signals.

"X" is a signal received by the CPU module side and "Y" is a signal transmitted by the CPU module side as a command.

The passing of I/O signals is controlled by a sequence program.

1.3

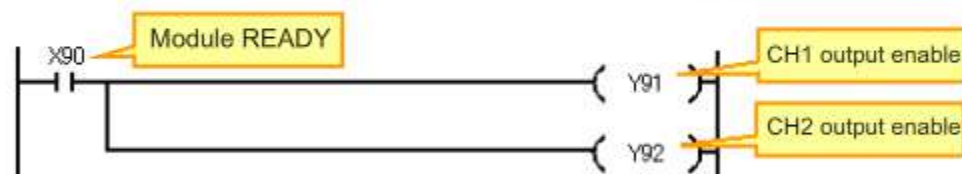
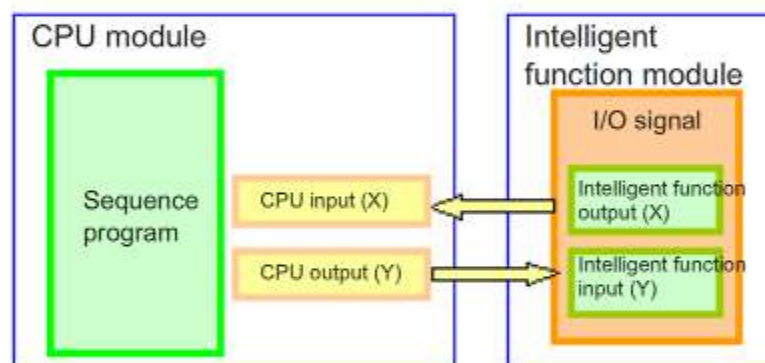
Programs to Control Intelligent Function Modules

Let's learn about sequence programs used to access I/O signals and buffer memories.

- Accessing I/O signals

Programming equivalent to the usual control of I/O modules is conducted by using I/O numbers (X and Y devices) assigned to intelligent function module.

- Programming example for accessing I/O signals



- Accessing buffer memory

In the pass, data transfer between the intelligent function module and the CPU module is done using a sequence program. (Further details are given on the following pages.)

If GX Works2 is used, data are automatically communicated between the CPU module and buffer memory (see Section 1.4).

1.3.1 Programming by Intelligent Function Module Devices

Intelligent function module devices can read data from and write data into its own buffer memories using transfer instructions such as MOV, as is the case with the device memories in CPU modules.

Expressing
buffer memory
as a device

U□\G□

U□ : The first two digits of the three-digit start I/O number (hexadecimal digit) of the intelligent function module are specified. For example, if the start I/O number is X/Y090, the device is specified as "U09" or "U9."

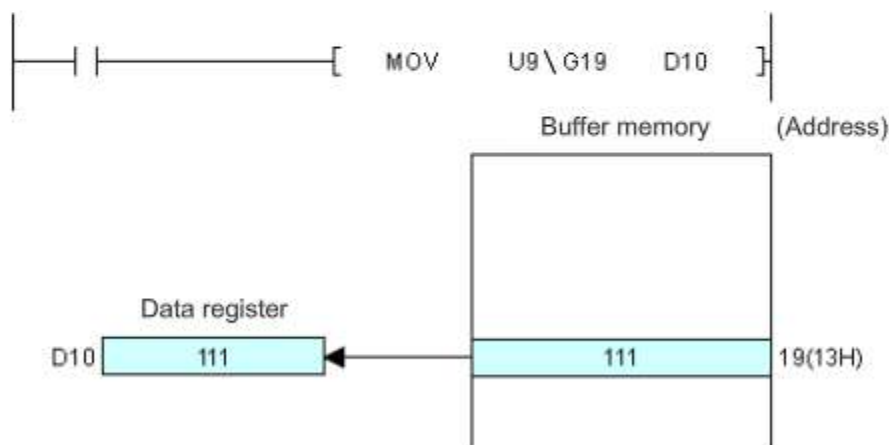
G□ : The address of buffer memory of the intelligent function module is specified by a decimal digit. For example, when accessing the area of Address 19, the device is specified as "G19."

Example of expression: I/O number of "X/Y09" and buffer memory address of "19" are expressed as "U9\G19."

Program example

- Program example to read data from buffer memory

A program to read data from buffer memory address "19" of the intelligent function module (start I/O number is "X/Y090") and write the data into data register "D10" is shown below.

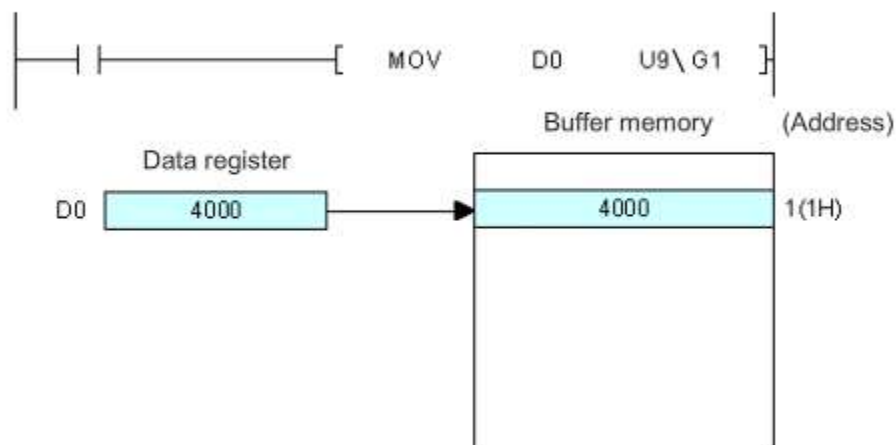


1.3.1

Programming by Intelligent Function Module Devices

- Program example to write data into buffer memory

A program to write the data of data register "D0" into buffer memory address "1" of the intelligent function module (start I/O number is "X/Y090") is shown below.



1.4

Operation Setting by Using Parameters

Sequence programs define operation methods and setting values. In contract, parameters only describe setting values. The setting values set by parameters (using GX Works2) can be also defined by sequence programs, as explained in Section 1.3.

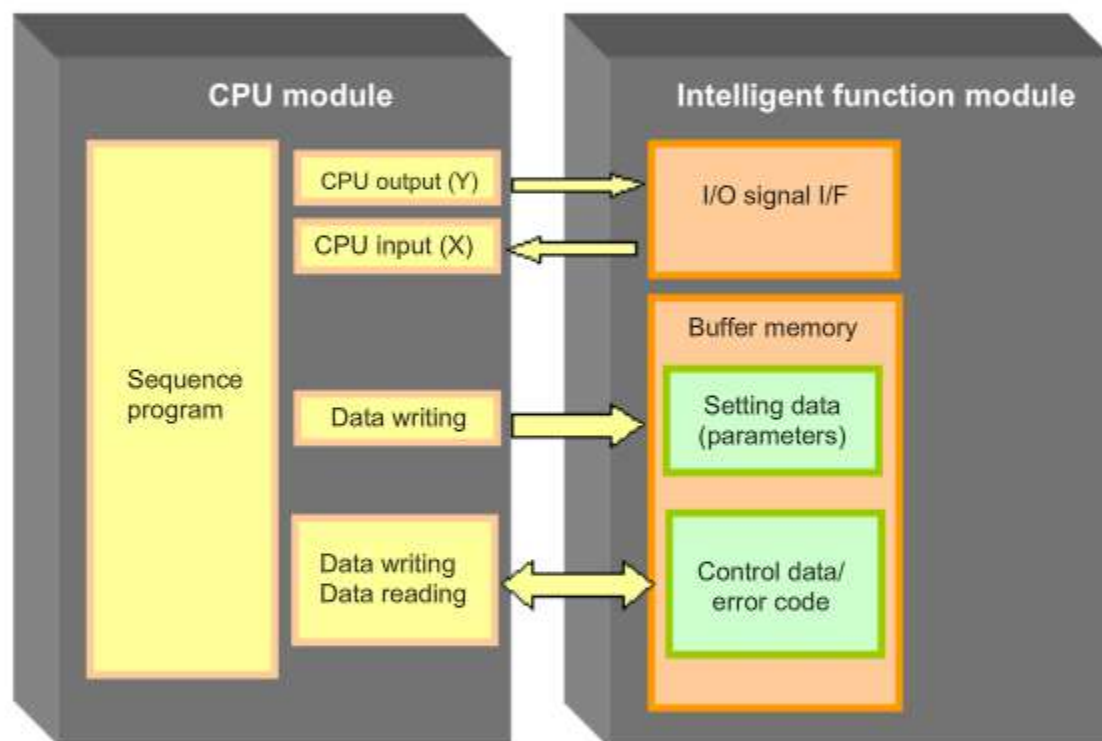
However, the best way to write a program is to use both sequence programs and parameters; Use sequence programs to define operation methods, and parameters to set values.

Method	Characteristic
Sequence programs only	Complex operation patterns, which are determined depending on the condition, can be programmed. Ideal for programming a mass production operation.
Sequence programs + parameters	It is easy to differentiate between operation method and setting values. If operation quantities are changed, it is easy to find the places to be changed.

1.4.1 Setting by Sequence Program

The method of passing data by sequence programs only is shown below.

- Concept of passing data by sequence program

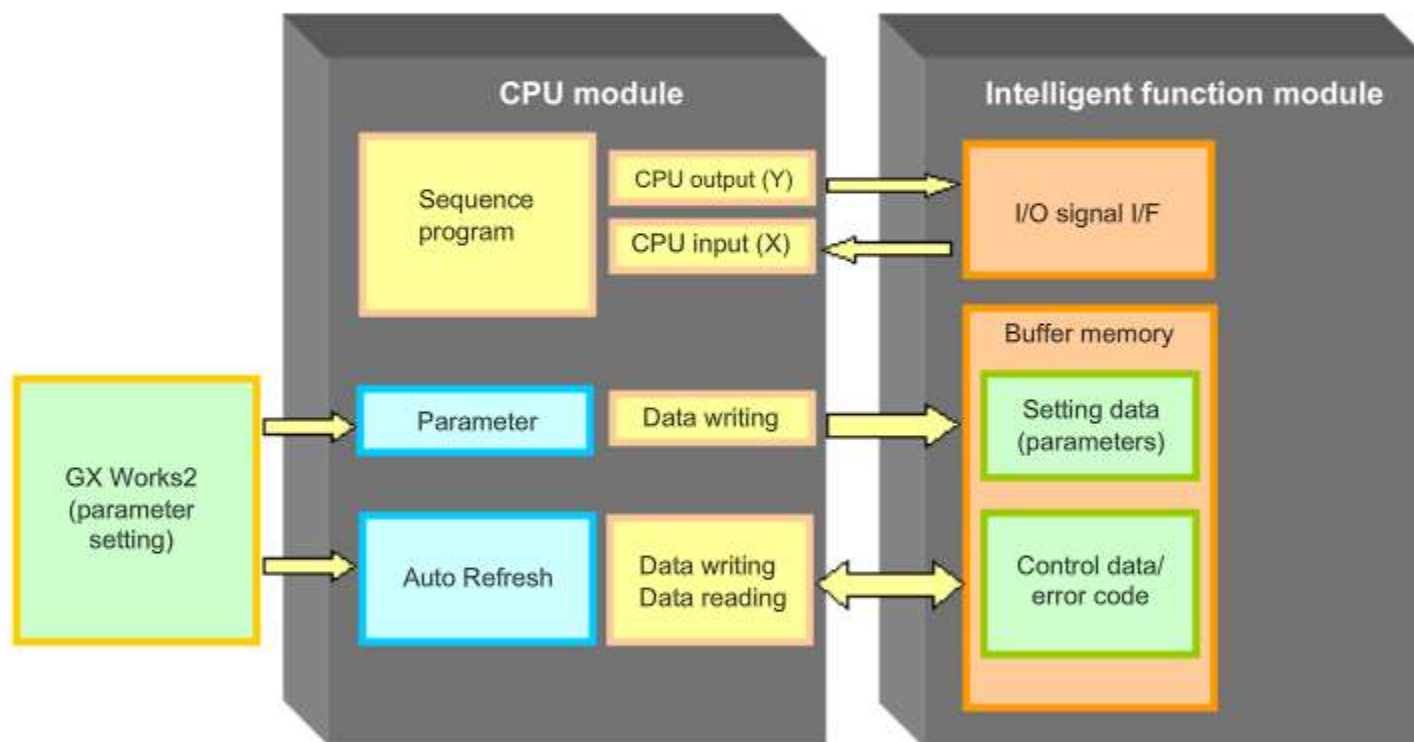


The data of the buffer memory are passed by a sequence program.

1.4.2 Setting by Parameters

The method of passing data by sequence program + parameters is shown below.

- Concept of passing data by sequence program + parameters



Data of the buffer memory are passed by parameter settings and Auto Refresh.

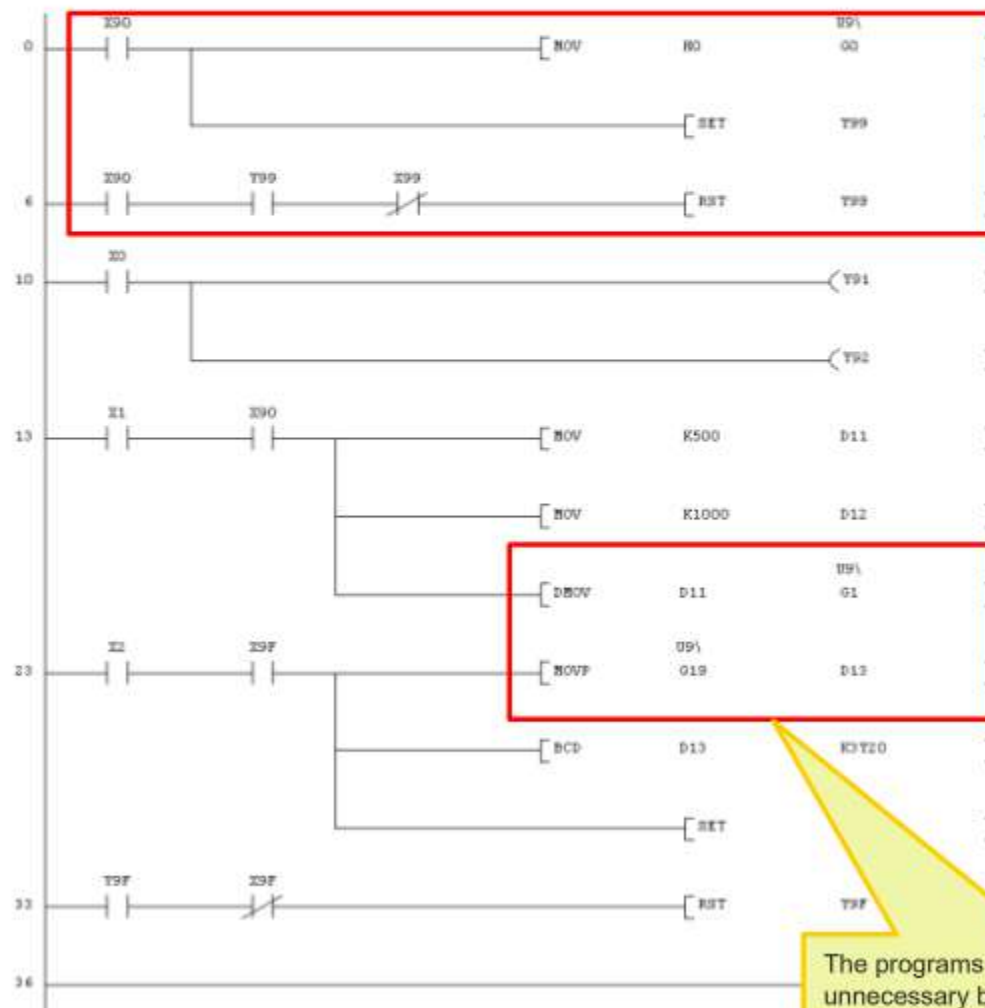
Auto Refresh allows the CPU module to automatically update the buffer memory of the intelligent function module only by setting the head of the device and the amount of data to be transferred.

1.4.3 Advantages of Using Parameters

Let's compare the data-passing operation written by sequence programs with the data-passing operation written by sequence programs and parameters (for the Q62DAN D/A converter module).

-Example of data-passing operation written by sequence programs
The start I/O number of Q62DAN is specified as "X/Y90."

The programs in this part are unnecessary by using parameters.



The initial setting value of Q62DAN is written into the buffer memory.

Operating condition setting request is set.

Operating condition setting request is reset by setting completion.

CH1 output enable ON.

CH2 output enable ON.

Digital value of CH1 is transferred to D11.

Digital value of CH2 is transferred to D12.

Digital values of CH1 and CH2 are written into the buffer memory of Q62DAN.

The error code of Q62DAN is read from the buffer memory to D13.

The error code is converted into BCD and outputted to Y20 to Y2B.

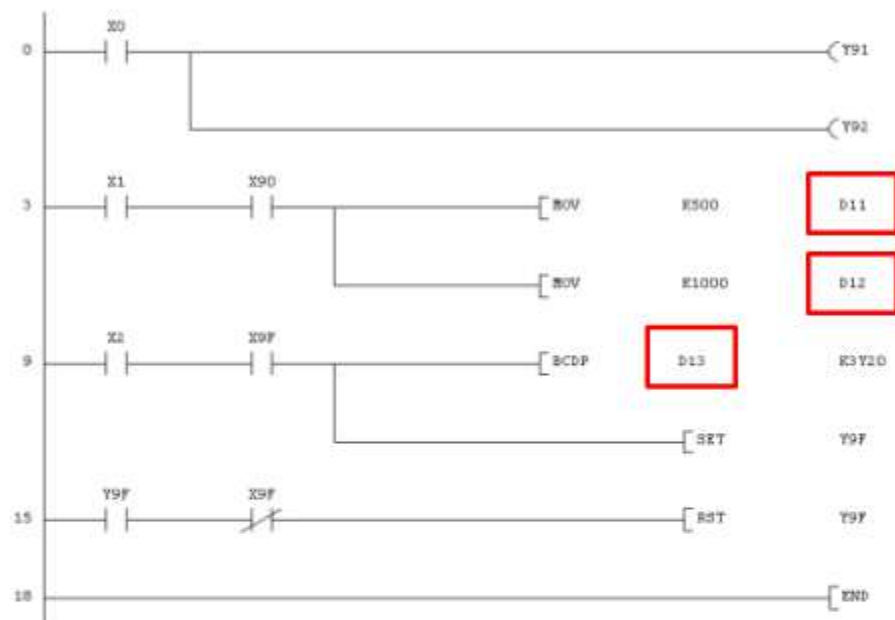
Error clear request (Y9F) is set.

Error clear request (Y9F) is reset.

The programs in this part are made unnecessary by using parameters.

1.4.3 Advantages of Using Parameters

- Example of data-passing operation written by sequence programs + parameters



CH1 output enable ON.

CH2 output enable ON.

Digital value of CH1 is transferred to D11.

Digital value of CH2 is transferred to D12.

The error code (D13) of Q62DAN is converted into BCD and outputted to Y20 to Y2B.

Error clear request (Y9F) is set.

Error clear request (Y9F) is reset.

The digital value is written into the buffer memory.

The error code is read from the buffer memory.

If parameters are used, the program to communicate with the buffer memory is made unnecessary by the following settings.

- Parameters

Parameter item	Setting
CH1 D/A conversion enable/disable	Enable
CH2 D/A conversion enable/disable	Enable

- Auto Refresh

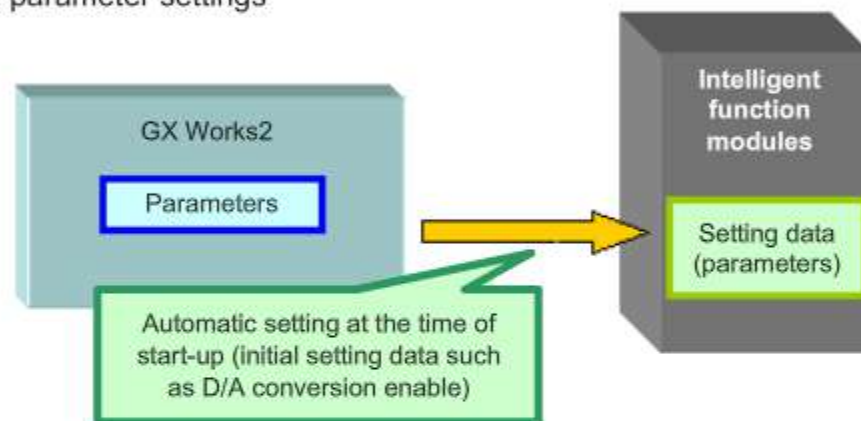
Auto Refresh item	Storage device
CH1 digital value	D11
CH2 digital value	D12
Error code	D13

1.4.4 Overview of Functions of GX Works2

Parameters:

Parameters for the buffer memories of the intelligent function module can be set using GX Works2. The information set in the parameter screen is written into intelligent function modules at the time of start-up. The program to write parameter values is made unnecessary.

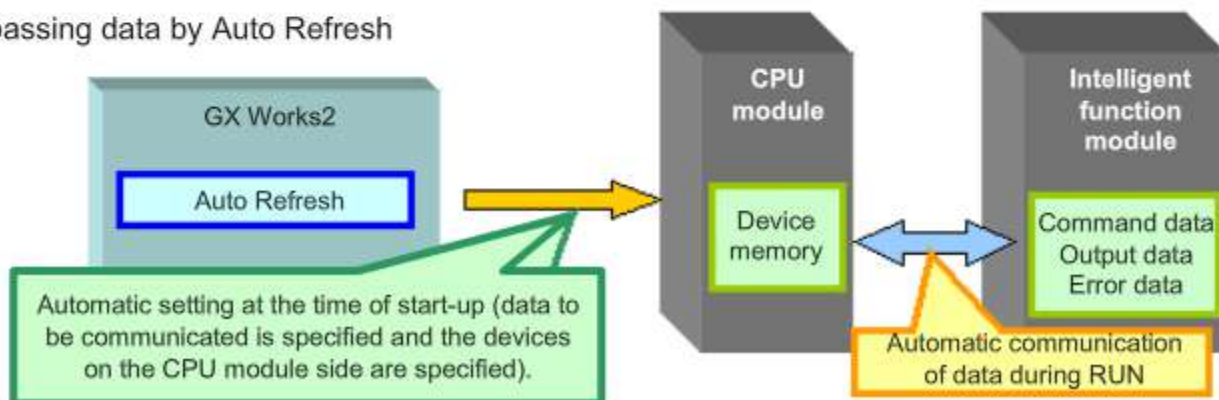
- Concept of passing data by parameter settings



Auto Refresh:

This function automatically passes data between the CPU module and intelligent function module. Specified data are automatically communicated between the devices on the set CPU module and the buffer memories of intelligent function modules. The program to pass data between the CPU module and buffer memories is unnecessary.

- Concept of passing data by Auto Refresh



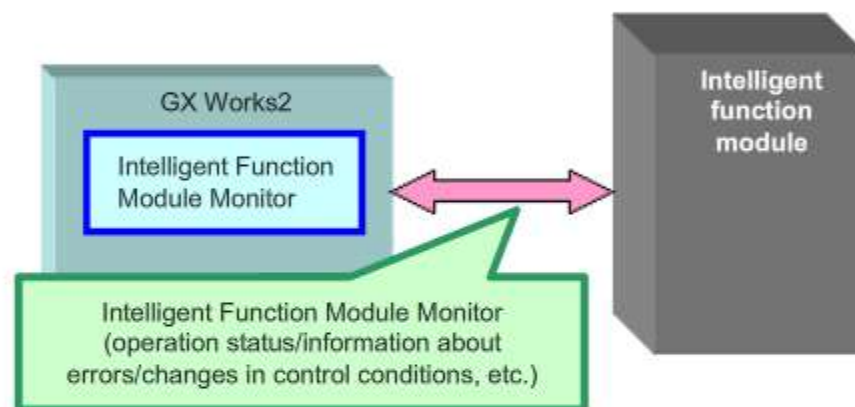
1.4.4

Overview of Functions of GX Works2

Intelligent Function Module Monitor

This function diagnoses the operation status of intelligent function modules, details of errors and others. The status within intelligent function modules can be monitored, and settings can be changed by the screen of GX Works2.

- Concept of functions of Intelligent Function Module Monitor



In this chapter, you have learned:

- Overview of intelligent function modules
- Control of intelligent function modules
- Programs to control intelligent function modules
- Operation settings by using parameters

Please review the following important points:

Interfaces of intelligent function modules	There are I/O signals that support bit signals and buffer memories that support Word data. There are also external interfaces to pass signals from and to external devices.
Methods of passing information	There are two methods of passing information to and from intelligent function modules. One is to use sequence programs and the other is to use the parameters.
Functions of GX Works2	After adding new modules, GX Works2 can set parameters and Auto Refresh and use the functions of Intelligent Function Module Monitor. GX Works2 makes it easier to create the sequence program to control intelligent function modules. Moreover, the workings at the time of start-up can be checked by the functions of Intelligent Function Module Monitor.
Sequence program	If parameters and Auto Refresh are set by using GX Works2, the sequence program that controls Q62DAN processes the I/O signals of Q62DAN, and reads and writes data to and from the device memories specified by Auto Refresh.

At the end, please take the test to check your understanding.

Chapter 2 How to Use the D/A Converter Module

Let's learn about the operation of the D/A converter module. In this chapter, we will use a conveyor speed control system that uses analog outputs of Q62DAN, as an example.

2.1 Configuration of D/A converter module

2.2 GX Works2

2.3 Settings to use Q62DAN

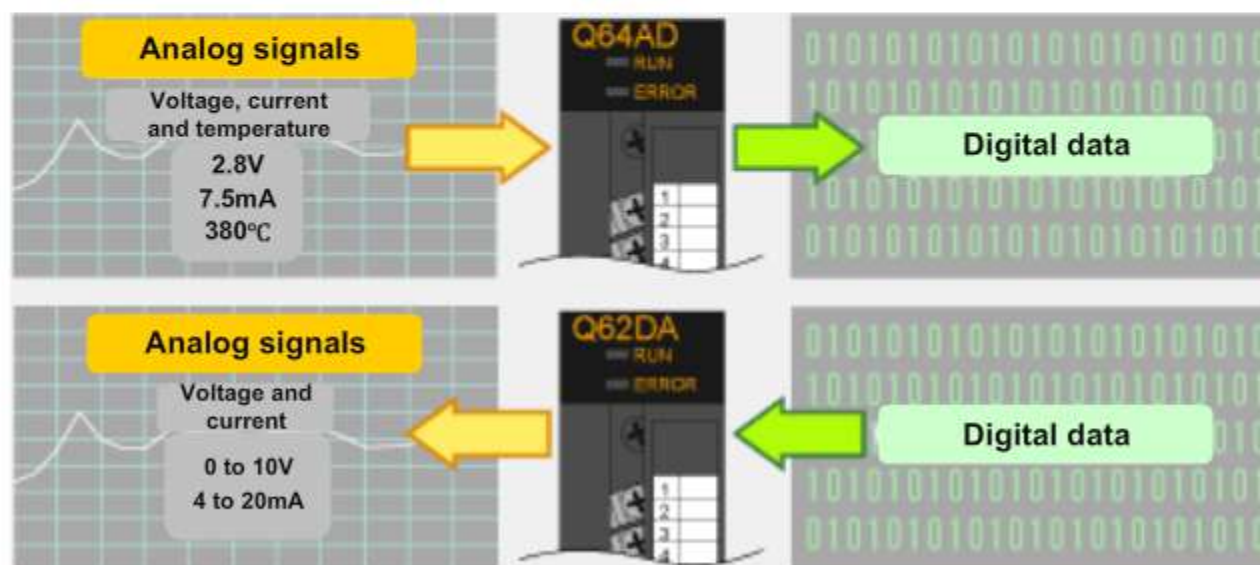
2.4 Sequence program

2.5 Checking the operation of Q62DAN

(External device side)

Analog I/O Intelligent Function Modules

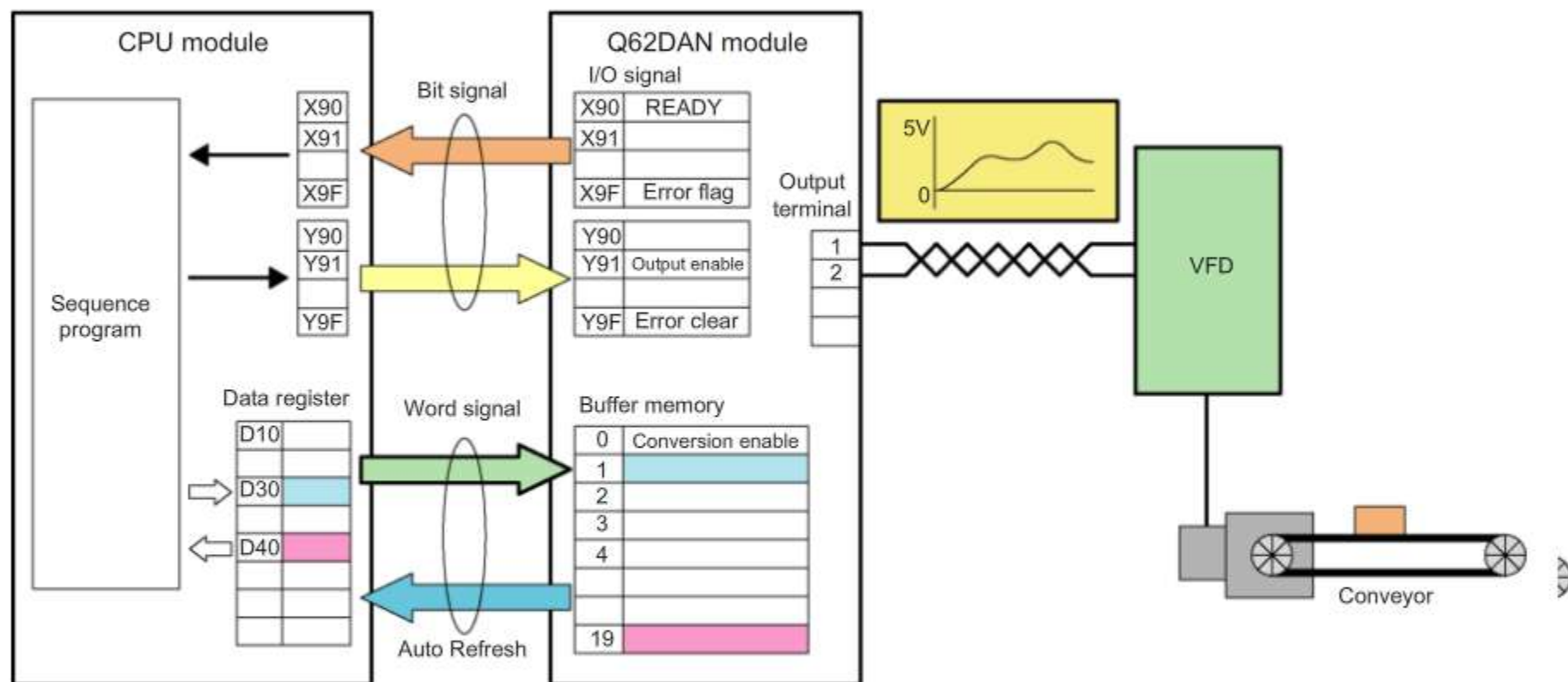
(CPU module side)



2.1

Configuration of D/A Converter Module

Let's configure the parameters for the system shown below.



2.1.1 Procedures to Use Q62DAN

(1) Installation and wiring.

Install Q62DAN in the specified slot of the base unit.

Connect Q62DAN by wires to external devices. (Wiring connection is explained in Section 2.1.7.)



(2) Setting in GX Works2

Start up GX Works2. Add Q62DAN as a new module. Then, set the switches, parameters and Auto Refresh. (Details are given in Section 2.2.1.)



(3) Creating the sequence program and writing into the CPU module

Create the sequence programs to control Q62DAN.

Write the sequence programs, PLC parameters and Intelligent Function Module parameters to the CPU module.



(4) Debugging

Use Intelligent Function Module Monitor of GX Works2 to check the operation status of Q62DAN.

2.1.2

Performance and Specifications of Q62DAN

Check that the system specifications are satisfied.

The specifications of Q62DAN are listed below.

Item	Specifications					
Number of analog outputs	2 points (2 channels)					
Digital input	16-bit signed binary					
	Normal resolution mode: -4096 to 4095, high resolution mode: -12288 to 12287, -16384 to 16383					
Analog output voltage	-10 to 10VDC (external load resistance: 1k Ω to 1M Ω)					
Analog output current	0 to 20mADC (external load resistance: 0 to 600 Ω)					
I/O characteristics Maximum resolution	Voltage	Output range	Normal resolution	Maximum resolution	High resolution	Maximum resolution
		0 to 5V	0 to 4000	1.25mV	0 to 12000	0.416mV
		1 to 5V		1.0mV		0.333mV
		-10 to 10V	-4000 to 4000	2.5mV	-16000 to 16000	0.625mV
		User range		0.75mV	-12000 to 12000	0.333mV
	Current	0 to 20mA	0 to 4000	5 μ A	0 to 12000	1.66 μ A
		4 to 20mA		4 μ A		1.33 μ A
		User range	-4000 to 4000	1.5 μ A	-12000 to 12000	0.83 μ A
Accuracy	Ambient temperature 25 \pm 5°C: \pm 0.1% or less					
	Ambient temperature 0°C to 55°C: \pm 0.3% or less					
Conversion speed	80 μ s/channel					
Number of occupied I/O points	16 points (I/O assignment: intelligent 16 points)					

Resolution modes and output ranges are selected by switch setting in GX Works2 (see Section 2.3.1).

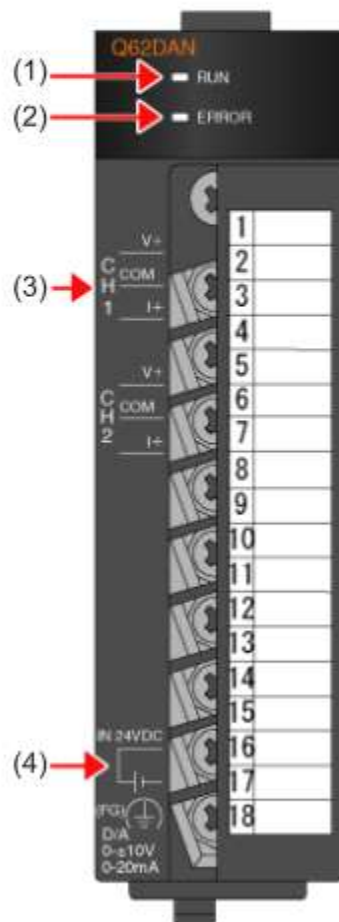
2.1.3

Appearance of Q62DAN and Terminal Assignment

Check the appearance and wire run lengths.

- Names of parts of Q62DAN module

Q62DAN



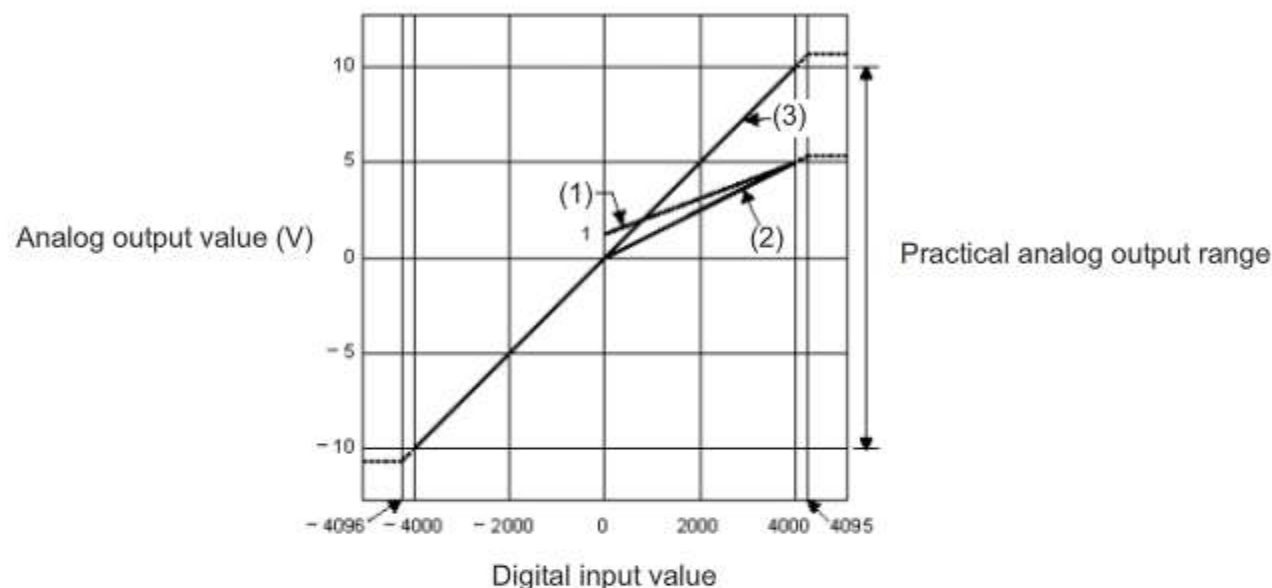
Number	Name	Description
(1)	RUN LED	Indicates the operation status of Q62DAN. On: operating normally Flashing: offset/gain setting mode Off: 5V power off, watchdog timer error, on-line module replacement enabled.
(2)	ERROR LED	Indicates the operation status of Q62DAN. On: error Off: operating normally Flashing: switch setting at the time of error Those other than 0 are set to Switch 5 by switch setting of Intelligent Function Module.
(3)	Analog output terminal	Outputs D/A converted analog values.
(4)	External supply power terminal	Connects 24VDC external supply power.

2.1.4

D/A Conversion Characteristics of Q62DAN

The D/A conversion characteristics (voltage output) of Q62DAN in normal resolution mode are shown below.

The D/A conversion characteristics (voltage output) of Q62DAN of the example use 0V to 5V.



Number	Output range setting	Offset	Gain	Digital input	Maximum resolution
(1)	1 to 5V	1V	5V	0 to 4000	1.0mV
(2)	0 to 5V	0V	5V		1.25mV
(3)	-10 to 10V	0V	10V	-4000 to 4000	2.5mV
-	User range setting	*1	*1	-4000 to 4000	0.75mV

*1 Please check the offset and gain values of user range setting by referring to the product manual.

Offset: Shows the value of analog output when the digital input value is 0.

(Example: When the output range is 1V to 5V, the offset is 1V.)

Gain: Shows the value of analog output when the digital input value is the maximum value (4000).

(Example: When the output range is 1V to 5V, the gain is 5V.)

2.1.5 I/O Signals of Q62DAN

Input signal (X): This is turned ON/OFF by Q62DAN.

Output signal (Y): This is turned ON/OFF by the CPU module side.

Q62DAN is controlled by the sequence programs using I/O signals.

* The numerical range of I/O signals of Q62DAN is decided by the position of mounted slot when Q62DAN is mounted to the base module.

Also, it can be used by forcibly assigning it to any numerical range by setting the I/O assignment of PC parameters.

The I/O numbers of Q62DAN of the example system for training are X90 to X9F and Y90 to Y9F.

Assignment of I/O signals of Q62DAN:

Input signal (Q62DAN → CPU module)		Output signal (CPU module → Q62DAN)	
X90	Module READY	Y90	Use prohibited
X91	Use prohibited	Y91	CH1 output enable/disable flag
X92		Y92	CH2 output enable/disable flag
X93		Y93	Use prohibited
X94		Y94	
X95		Y95	
X96		Y96	
X97		Y97	
X98	High resolution mode status flag	Y98	
X99	Operating condition setting complete flag	Y99	Operating condition setting request
X9A	Offset/gain setting mode status flag	Y9A	User range write request
X9B	Channel change complete flag	Y9B	Channel change request
X9C	Set value change complete flag	Y9C	Set value change request
X9D	Synchronous output mode status flag	Y9D	Synchronous output request
X9E	Use prohibited	Y9E	Use prohibited
X9F	Error occurrence flag	Y9F	Error clear request

For further details of I/O signals,
please see here.

2.1.6 Buffer Memory of Q62DAN

Q62DAN contains buffer memory.

The locations where data are stored in buffer memory depend on the specifications of Q62DAN: there is an area where data from the CPU module are written and an area where data are written by the operating system of Q62DAN.

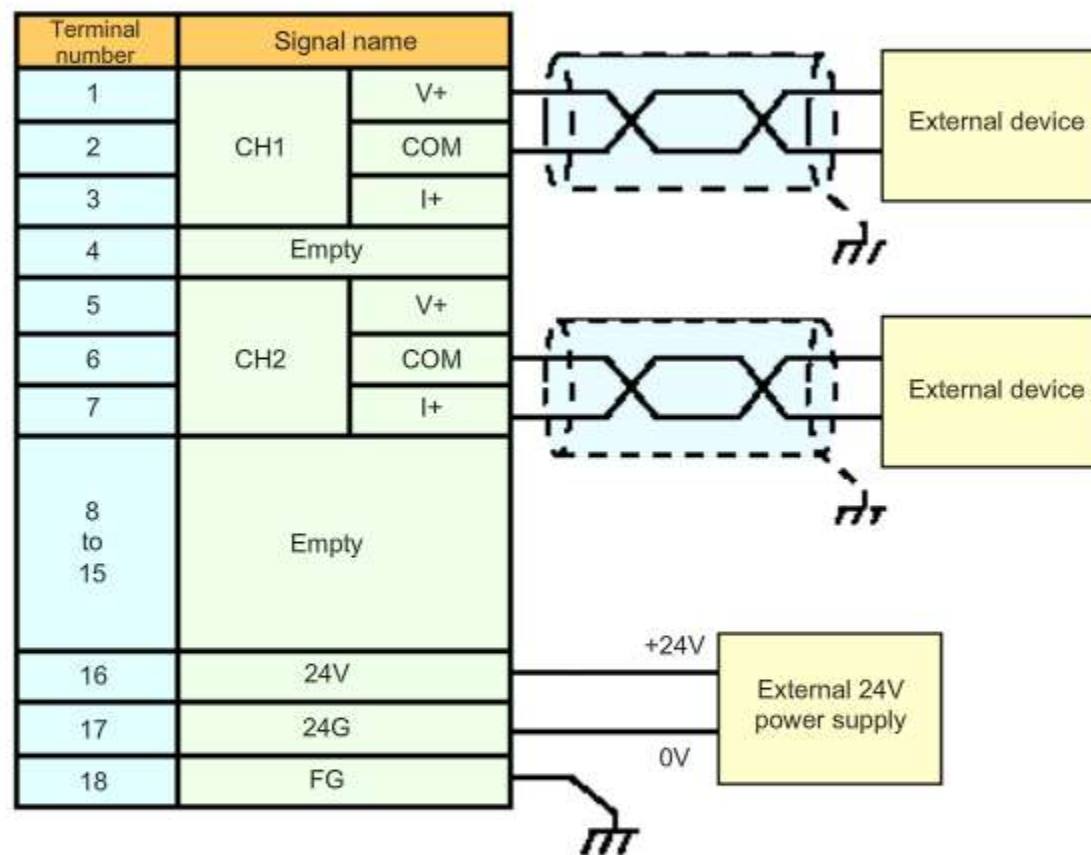
(See the "Read/Write" column of the table below.)

Buffer memory assignment of Q62DAN (Only frequently-used data setting items are presented):

Address		Name	Default	Read/Write (*1)	Initial setting	Auto Refresh
Hexadecimal	Decimal					
0H	0	D/A conversion enable/disable	3H	R/W	○	-
1H	1	CH1 digital value	0	R/W	-	○
2H	2	CH2 digital value	0	R/W	-	○
3H AH	3 to 10	System area	-	Use prohibited	-	-
BH	11	CH1 setting value check code	0	R	-	○
CH	12	CH2 setting value check code	0	R	-	○
DH 12H	13 to 18	System area	-	Use prohibited	-	-
13H	19	Error code	0	R	-	○
14H	20	Setting range (CH1 to CH2)	0H	R	-	-
15H	21	System area	-	Use prohibited	-	-
16H	22	Offset/gain setting mode offset specification	0	R/W	-	-
17H	23	Offset/gain setting mode gain specification	0	R/W	-	-
18H	24	Offset/gain adjustment value specification	0	R/W	-	-
D1H	209	CH2 User range setting gain value	0	R/W	-	-

2.1.7 Example of Q62DAN Connection

Typical connection diagram of Q62DAN



- Connection to Terminal "V+" and Terminal "COM" for analog voltage output
- Connection to Terminal "I+" and Terminal "COM" for analog current output
- Connection of +24V of external 24VDC power supply to Terminal "24V", and 0V to Terminal "24G"
- For connection of external devices, use twisted-pair shielding wires.

2.2

GX Works2

The GX Works2 can also support start-up of the D/A converter module.

This section uses the Q62DAN D/A converter module as an example to explain the screens and details of settings.

2.2.1 Setting Screens of GX Works2

New Module screen for Q62DAN

Make the following settings to add a module.

- Set the Module Type (from a pull-down menu)
- Set the Module Name (from a pull-down menu)
- Set the Mounted Slot No. (Slot No. of Intelligent Function Module)
- Set the Start XY address (XY address of Intelligent Function Module)

New Module

Module Selection

Module Type: Analog Module

Module Name: Q62DAN

Mount Position

Base No.: Mounted Slot No.: 3 Acknowledge I/O Assignment

☒ Specify start XY address: 0090 (H) 1 Slot Occupy [16 points]

Title Setting

Title:

OK Cancel

Mounted Slot No. and Start XY address can be changed after being set.

2.2.1 Setting Screens of GX Works2

Switch Setting screen for Q62DAN

Depending on the usage of Q62DAN, select the output range (the output range of the channel to be used for D/A conversion).

In the screen below, the output range of CH1 is set to 0 to 5V (Default: 4 to 20 mA).

Switch Setting 0090:Q62DAN

Output Range Setting

CH	Output range	HOLD/CLEAR function
CH1	0 to 5V	CLEAR
CH2	4 to 20mA	CLEAR

Synchronous Output Mode
Normal (Asynchronous) Mode

Resolution Mode Setting
Normal Resolution Mode

Drive Mode Setting
Normal (D/A Converter Processing) Mode

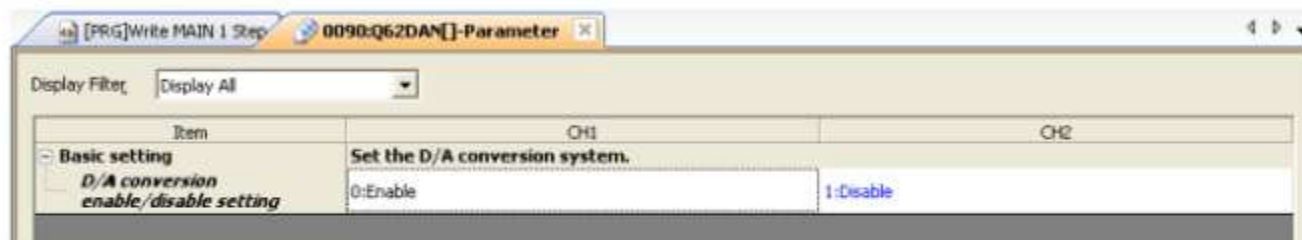
* This dialog setting is linked to the Switch Setting of the PLC parameter.
Default value will be shown in the dialog
if the Switch Setting of the PLC parameter contains an out-of-range value.

OK Cancel

2.2.1 Setting Screens of GX Works2

Parameter setting for Q62DAN

- Enable the D/A conversion function of each channel before using.



Auto Refresh setting for Q62DAN

- Digital value: Set the CPU device that stores the digital data to be transferred to Q62DAN.
- Set value check code: Set the CPU device where a warning of Q62DAN is transmitted to.
- Error code: Set the CPU device where an error of Q62DAN is transmitted to.



2.2.2

Intelligent Function Module Monitor Screen of GX Works2

Intelligent Function Module Monitor

This screen is used to monitor the values currently stored in buffer memories, ON/OFF status of X/Y signals, and others.

Intelligent Function Module Monitor 1(0090:Q62DAN)			
Item	Current Value	Device	Data Type
<input type="checkbox"/> I/O Signal Monitor			
<input type="checkbox"/> Input Signal(X):			
Module READY	--	X90	Bit
High resolution mode status flag	--	X98	Bit
Operating condition setting completed flag	--	X99	Bit
Offset/gain setting mode flag	--	X9A	Bit
Channel change completed flag	--	X9B	Bit
Set value change completed flag	--	X9C	Bit
Synchronous output mode flag	--	X9D	Bit
Error flag	--	X9F	Bit
<input type="checkbox"/> Output Signal(Y):			
CH1 Output enable/disable flag	--	Y91	Bit
CH2 Output enable/disable flag	--	Y92	Bit
Operating condition setting request	--	Y99	Bit
User range writing request	--	Y9A	Bit
Channel change request	--	Y9B	Bit
Set value change request	--	Y9C	Bit
Synchronous output request	--	Y9D	Bit
Error clear request	--	Y9F	Bit

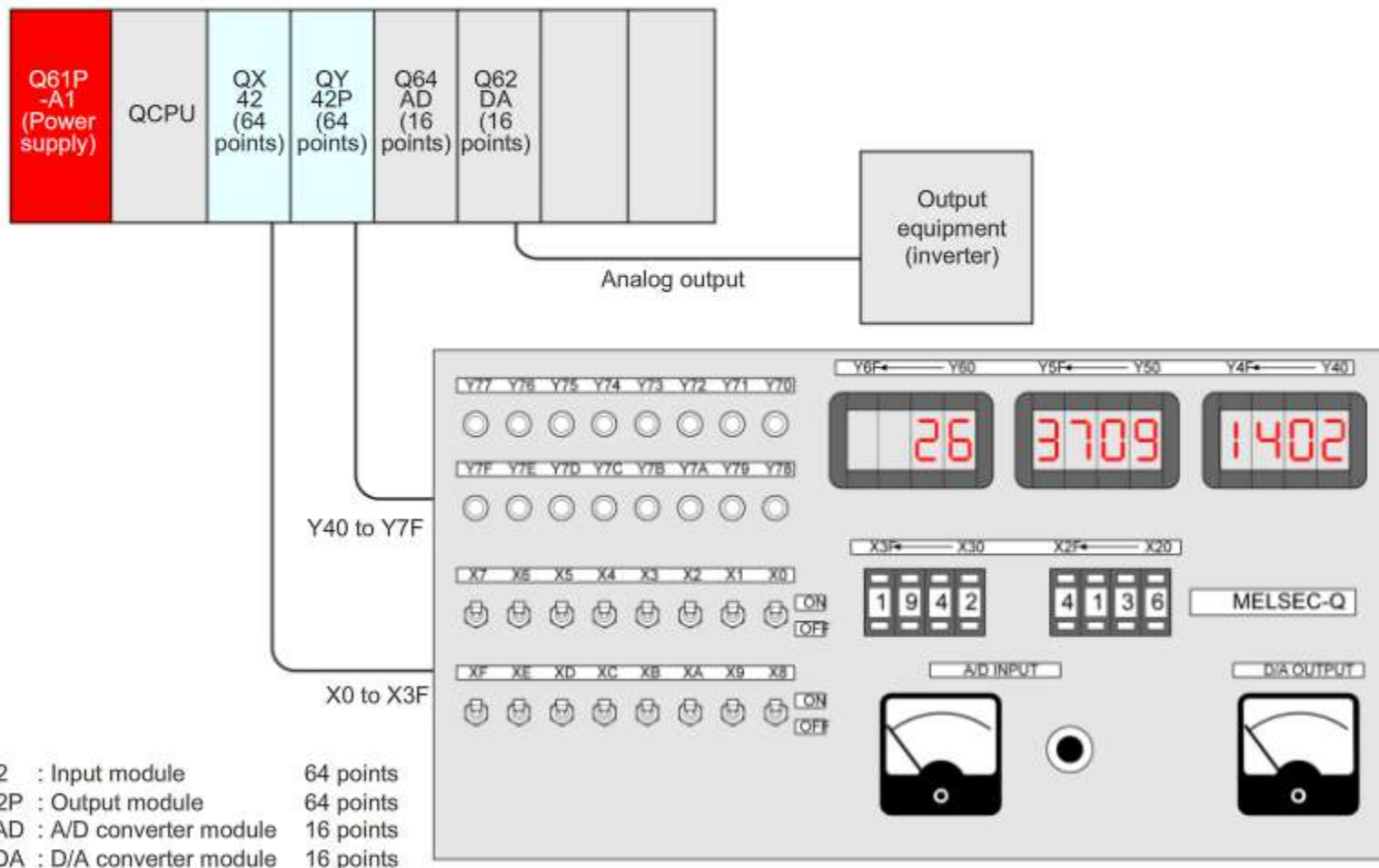
2.3

Settings to Use Q62DAN

The settings by a personal computer to use Q62DAN are simulated.

- Configuration of the program example

Settings are made based on the following system configuration.

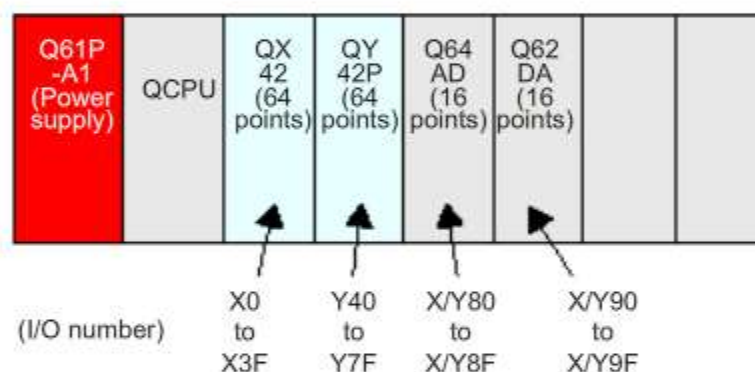


2.4 Sequence Program

2.4.1 Sequence Program Example

(1) Module configuration and I/O numbers

The module configuration and I/O numbers of the program example are as follows.



(2) Auto Refresh

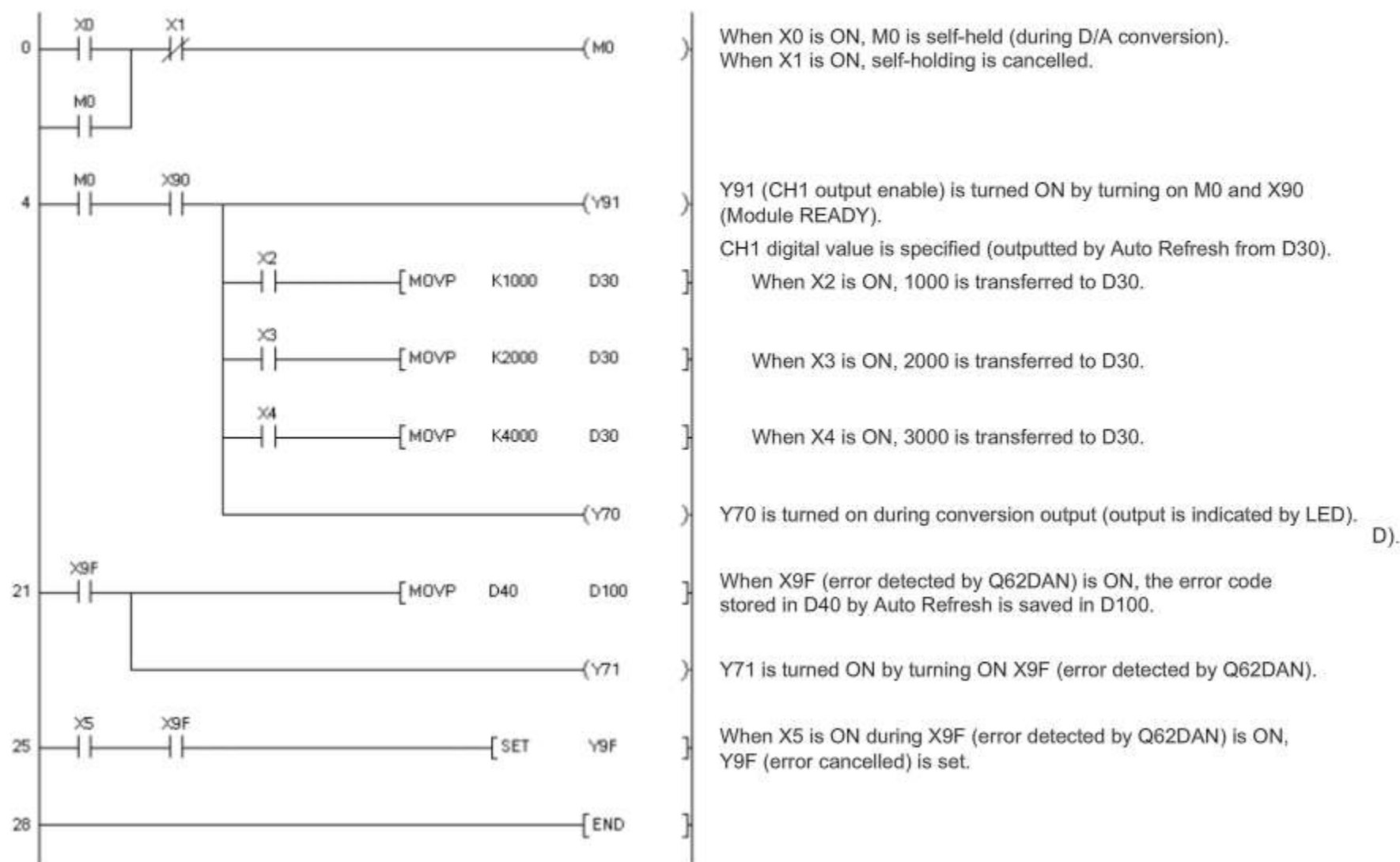
The Auto Refresh settings are as follows.



2.4.1 Sequence Program Example

The sequence programs used for this example are shown below.

The digital values to be used in Q62DAN are transferred to "D30" specified by Auto Refresh setting.



Project Edit Find/Replace Compile View Online Debug Diagnostics Tool Window Help



Navigation

Project

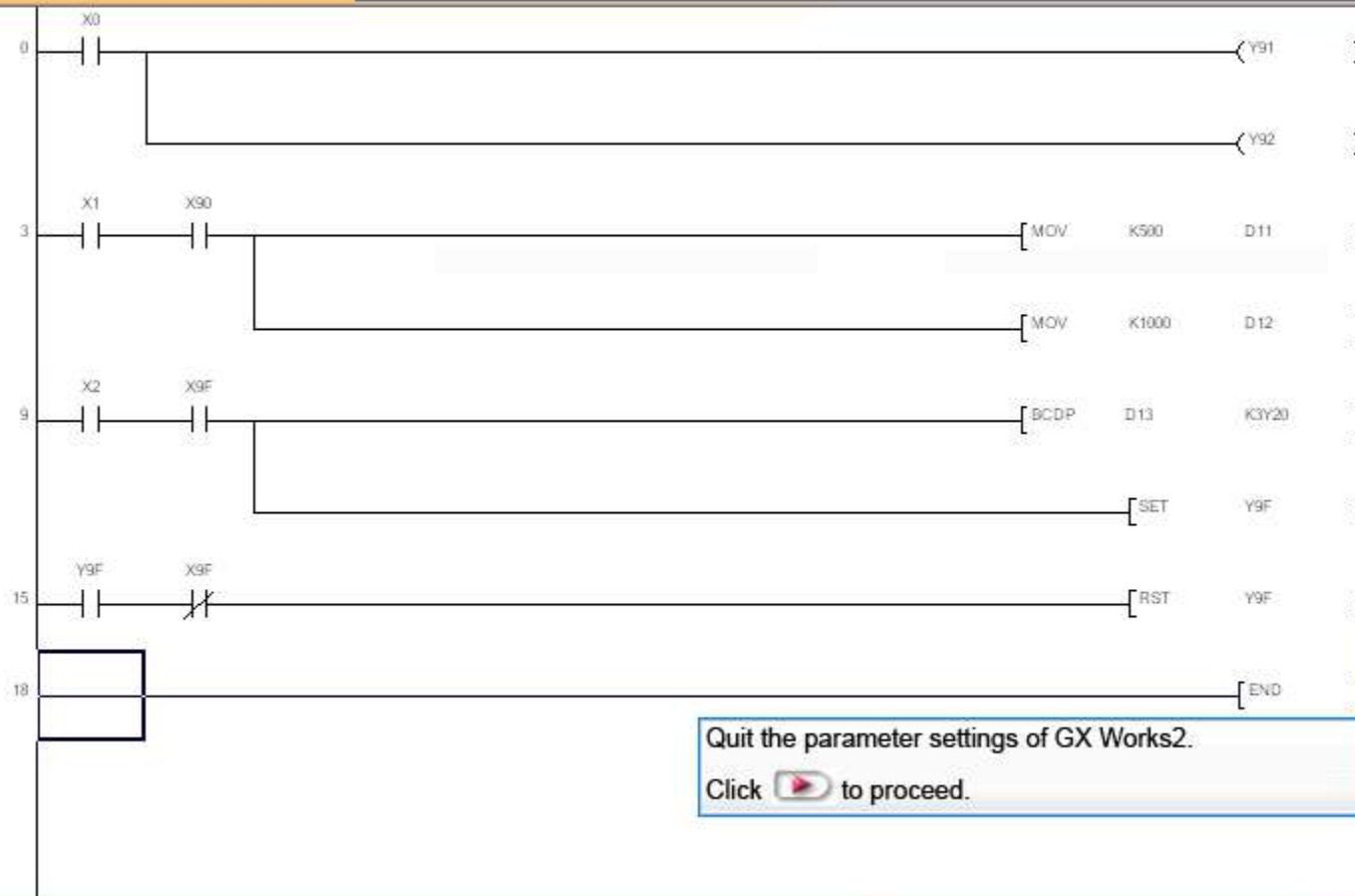
- Parameter
- Intelligent Function Module
 - 0090:Q62DAN
 - Switch Setting
 - Parameter
 - Auto_Refresh
- Global Device Comment
- Program Setting
- POU
 - Program
 - MAIN
 - Local Device Comment
- Device Memory
- Device Initial Value

Project

User Library

Connection Destination

[PRG]Write MAIN 19 Step



Quit the parameter settings of GX Works2.

Click  to proceed.

English

Unlabeled

Q06UDH

Host Station

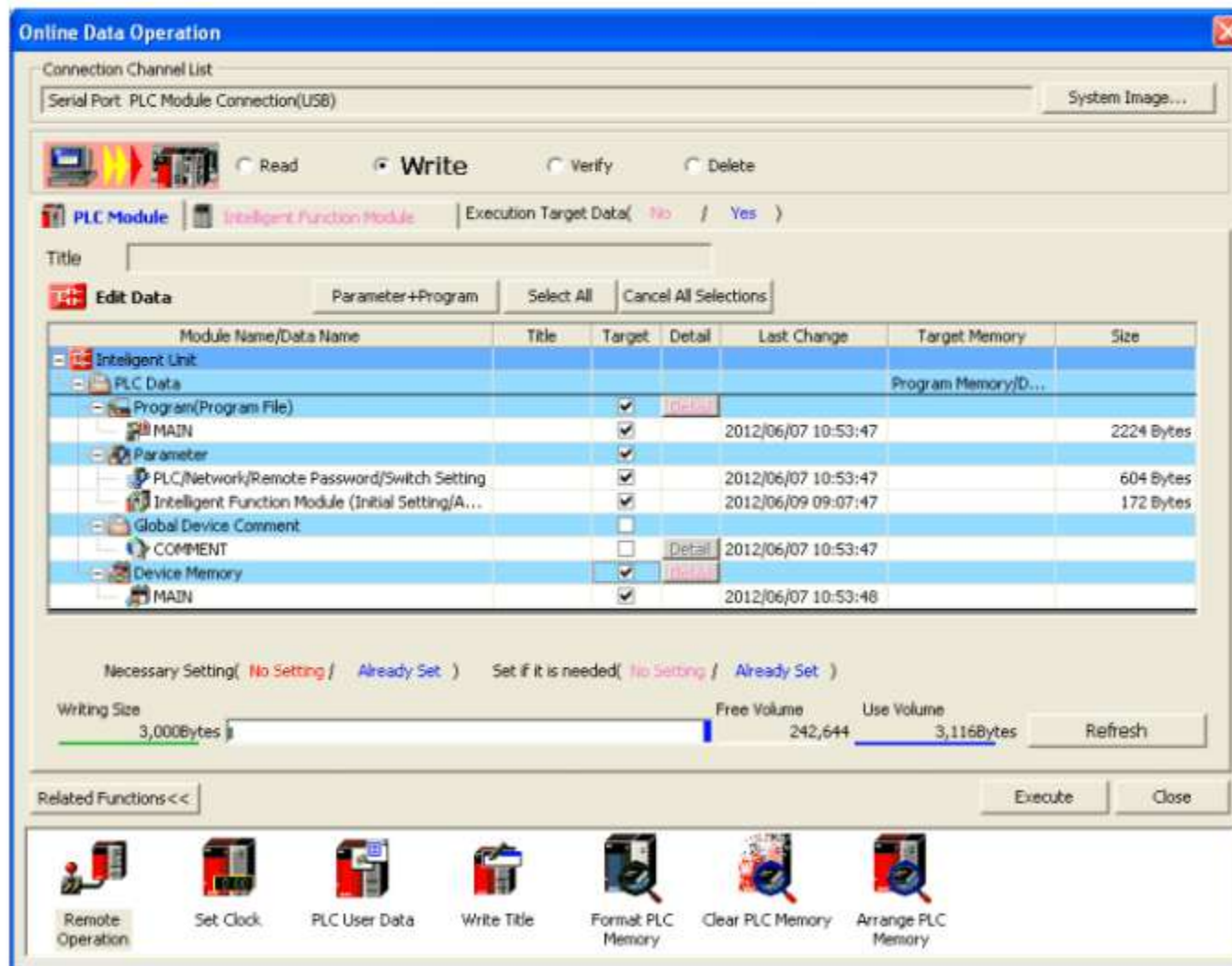
18/195

2.4.2

Writing Sequence Programs and Parameters

Together with the created sequence programs and set parameters, the "parameter settings" data set by GX Works2 are written into the CPU module as Intelligent Function Module parameters.

Intelligent Function Module parameters selected in the "PLC Write" screen of GX Works2 are shown below.



2.5

Checking the Operation of Q62DAN

Let's learn how to operate Q62DAN using the parameters and sequence program written into the CPU module and how to check the operation of Q62DAN.

2.5.1

Checking by Intelligent Function Module Monitor of GX Works2

Connect a personal computer and check Q62DAN's operation status using Intelligent Function Module Monitor of GX Works2.

- Functions of Intelligent Function Module Monitor of GX Works2

Intelligent Function Module Monitor can monitor the error status of Q62DAN and status of buffer memory and I/O signals.

Let's learn how to monitor Q62DAN.

Intelligent Function Module Monitor 1(0090:Q62DAN)			
Item	Current Value	Device	Data Type
<input checked="" type="checkbox"/> I/O Signal Monitor			
<input checked="" type="checkbox"/> Input Signal(X):			
Module READY	--	X90	Bit
High resolution mode status flag	--	X98	Bit
Operating condition setting completed flag	--	X99	Bit
Offset/gain setting mode flag	--	X9A	Bit
Channel change completed flag	--	X9B	Bit
Set value change completed flag	--	X9C	Bit
Synchronous output mode flag	--	X9D	Bit
Error flag	--	X9F	Bit
<input checked="" type="checkbox"/> Output Signal(Y):			
CH1 Output enable/disable flag	--	Y91	Bit
CH2 Output enable/disable flag	--	Y92	Bit
Operating condition setting request	--	Y99	Bit
User range writing request	--	Y9A	Bit
Channel change request	--	Y9B	Bit
Set value change request	--	Y9C	Bit
Synchronous output request	--	Y9D	Bit
Error clear request	--	Y9F	Bit

Project Edit Find/Replace Compile View Online Debug Diagnostics Tool Window Help

File Edit View PLC I/O Monitor Run Stop Reset Search Help

PLC I/O Monitor Run Stop Reset Search Help

Navigation

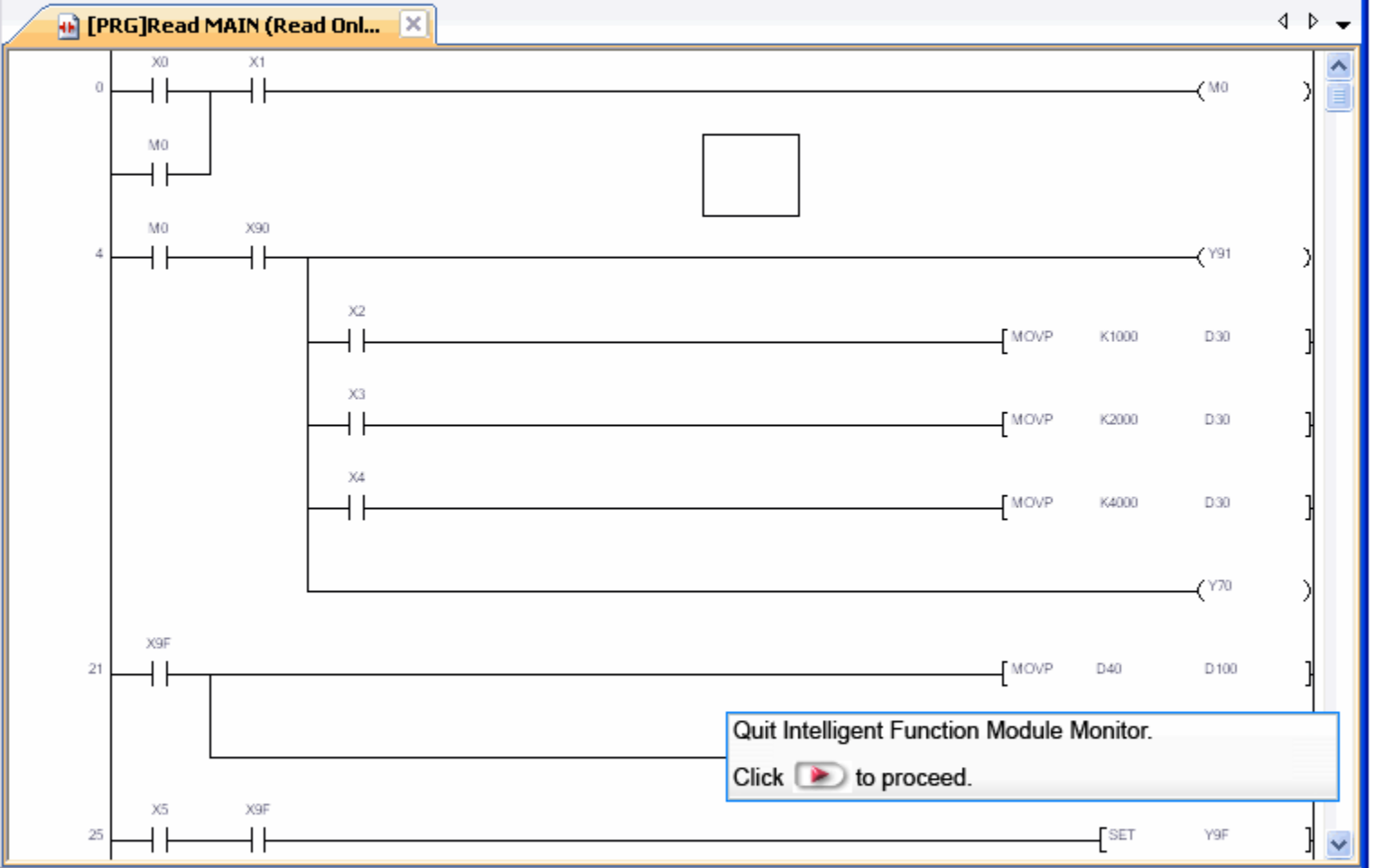
Project

- Parameter
- Intelligent Function Module
- Global Device Comment
- Program Setting
- POU
- Device Memory
- Device Initial Value

Project

User Library

Connection Destination



Quit Intelligent Function Module Monitor.
Click to proceed.

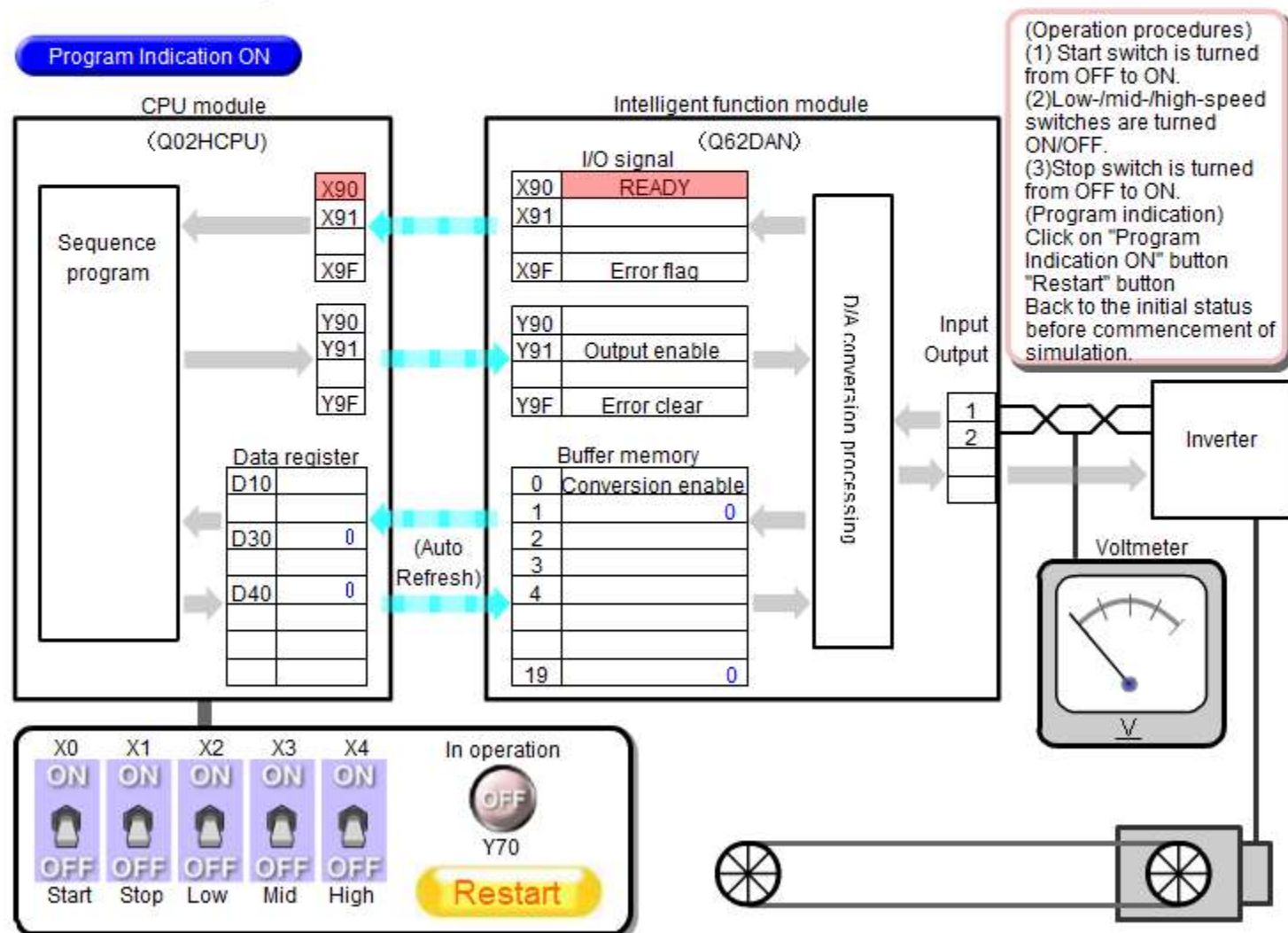
2.5.2

Checking the Operation of the Program Example

The operation of the CPU module and Q62DAN, which are programmed in this example, can be simulated. Check how the data and analog outputs of Q62DAN change upon changing the start/stop switches and ON/OFF of low-, mid- and high-speed switches.

* Use the monitoring function of GX Works2 to monitor.

Program Indication ON



2.5.3

What to Check When Q62DAN Does Not Work

Check errors of Q62DAN

Check the error codes caused in Q62DAN as described Section 2.5.1.

- Check using Intelligent Function Module Monitor of GX Works2.

* Check the error codes and their details, then deal with them as described in the product manual.

Procedures for checking errors

Referring to the product manual, check the details of errors and normal/abnormal status of buffer memory and I/O signals, and deal with the errors.

(1) Check for the error codes using Intelligent Function Module Monitor.

(2) Check the commands for outputs

Check the following in the buffer memory and I/O signals of Q62DAN using Intelligent Function Module Monitor.

Data to be checked		Details
Buffer memory	Digital values of CHn	Digital values from the CPU module should be stored. If digital values are not stored, the sequence program and device specifications should be corrected.
I/O signals	CHn output enable/disable flag	The output enable/disable flag should be ON. If it is OFF, the device specifications of the sequence program should be corrected.

(3) Check the parameters for outputs

Check the settings of conversion enable/disable by using the method you learned in Section 2.2 concerning the parameters of Q62DAN.

("Enable" should be set.)

Checking the status Q62DAN after error removal

Check that Q62DAN is working normally using the intelligent function module monitor.

2.5.3

What to Check When Q62DAN Does Not Work

Screen of Intelligent Function Module Monitor

This is an example screen of Intelligent Function Module Monitor of GX Works2.

Intelligent Function Module Monitor 1(0090:Q62DAN)			
Item	Current Value	Device	Data Type
I/O Signal Monitor			
Input Signal(X):			
Module READY	--	X90	Bit
High resolution mode status flag	--	X98	Bit
Operating condition setting completed flag	--	X99	Bit
Offset/gain setting mode flag	--	X9A	Bit
Channel change completed flag	--	X9B	Bit
Set value change completed flag	--	X9C	Bit
Synchronous output mode flag	--	X9D	Bit
Error flag	--	X9F	Bit
Output Signal(Y):			
CH1 Output enable/disable flag	--	Y91	Bit
CH2 Output enable/disable flag	--	Y92	Bit
Operating condition setting request	--	Y99	Bit
User range writing request	--	Y9A	Bit
Channel change request	--	Y9B	Bit
Set value change request	--	Y9C	Bit
Synchronous output request	--	Y9D	Bit
Error clear request	--	Y9F	Bit

Details in the screen

(1) Item	The name of module information is indicated. If the data type is detailed dialog/error code and warning code, an icon is indicated at the head of each item.
(2) Present value	The present value of module information is indicated. Character strings such as ON/OFF and values are indicated.
(3) Device	The devices assigned to module information are indicated.
(4) Data type	The data type of module information is indicated. In the case of detailed dialog/error code/warning code, their details can be checked.

In this chapter, you have learned:

- Specifications of digital/analog converter module (Q62DAN), control signals and functions of control data
- Setting screens of GX Works2 and screens of Intelligent Function Module Monitor
- Settings required to start up Q62DAN
- Sequence program to control the program example
- How to troubleshoot an error with Q62DAN

Please review the following important points.

Performance specifications and usage of Q62DAN	Q62DAN is a module that makes analog outputs (2 channels). The output range can be selected from 0 to 5V, -10 to +10V, 0 to 20mA and 4 to 20mA. For the external output terminal, voltage (V) and current (I) are independent.
Settings by GX Works2	New modules can be added. When new modules are added, the I/O assignment must be set at the same time.
	The switches of Q62DAN, parameters and Auto Refresh are set. Switch settings such as the output range of Q62DAN (0 to 5V and 4 to 20mA) are important. High resolution mode and others can be set as necessary. In parameters, D/A conversion enable/disable of CH1 and CH2 is set. The default is "disable". In Auto Refresh, devices on the CPU module side where digital values of CH1 and CH2 and error codes are stored are set.
Sequence program	If parameters and Auto Refresh are set by using GX Works2, the sequence program that controls Q62DAN processes the I/O signals of Q62DAN, and reads and writes data to and from the device memories specified by Auto Refresh.
Checking operation of Q62DAN	The operation of Q62DAN is checked by Intelligent Function Module Monitor of GX Works2. The status of buffer memory of Q62DAN can also be checked by GX Works2. If Q62DAN does not work, the above functions are used to check error information.

Finally, please do the test to check your understanding.

Test**Final Test**

Now that you have completed all of the lessons of the **PLC Intelligent Function Module** Course, you are ready to take the final test. If you are unclear on any of the topics covered, please take this opportunity to review those topics.

There are a total of 9 questions (28 items) in this Final Test.

You can take the final test as many times as you like.

How to score the test

After selecting the answer, make sure to click the **Answer** button. Your answer will be lost if you proceed without clicking the Answer button. (Regarded as unanswered question.)

Score results

The number of correct answers, the number of questions, the percentage of correct answers, and the pass/fail result will appear on the score page.

Correct Answers : **2**

Total Questions : **9**

Percentage : **22%**

To pass the test, you have to answer **60%** of the questions correct.

Proceed

Review

Retry

- Click the **Proceed** button to exit the test.
- Click the **Review** button to review the test. (Correct answer check)
- Click the **Retry** button to retake the test again.

Test**Final Test 1**

Place a check () mark against the type(s) that can be called an intelligent function module among the following module types. (multiple selections allowed)

- ☐ CPU module
- ☐ Analog-digital (A/D) converter module
- ☐ Input module, output module
- ☐ Positioning module
- ☐ Serial communication module
- ☐ Power supply module

[Answer](#)[Back](#)

Test

Final Test 2

The following sentences describe the intelligent function module. Select the appropriate option in each box to complete the sentence.

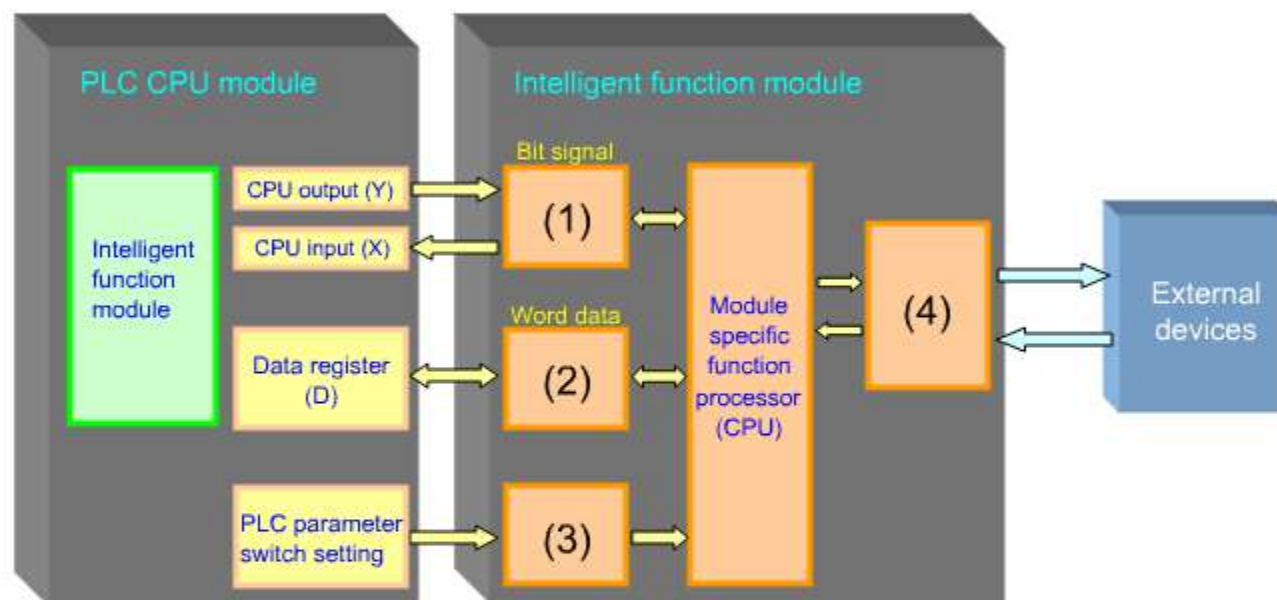
- 1) Intelligent function modules that process sequential values such as voltage, current and temperature are called ().
- 2) The () acquires voltage and current (analog data) from external devices and converts them into digital data.
- 3) Intelligent function modules that perform data communication between multiple PLC CPU modules or between PLC CPU module and upper level computer on the network are called ().
- 4) The intelligent function module that monitors the machine's operation and controls complicated movement of the machine is called ().
- 5) The movement of the machine is detected by encoders, and the () acquires pulse signals from the encoders and counts the number of pulses.

[Answer](#)[Back](#)

Test

Final Test 3

Select the appropriate option in boxes (1) to (4).



(1) --Select-- ▼

(2) --Select-- ▼

(3) --Select-- ▼

(4) --Select-- ▼

Answer

Back

Test**Final Test 4**

The following sentences describe the data transfer performed at intelligent function modules. Select the appropriate option in each box to complete the sentence.

The () for controlling the intelligent function module are transferred by using buffer memory.

Data transferred via the buffer memory come from either the () as commands,

or are output from () to the CPU as a result of the process.

Data are communicated by () as set with GX Works2 or by

programming using ().

[Answer](#)[Back](#)

Test**Final Test 5**

Select the appropriate sentence that explains the I/O signals of intelligent function modules from the following. (multiple selections allowed)

- ☐ The I/O signals of intelligent function modules are transferred by Auto Refresh.
- ☐ The I/O signals of intelligent function modules are transferred by sending and receiving bit (ON/OFF) signals to/from the CPU module.
- ☐ Among the I/O signals of intelligent function modules, the module receives "X" signals.
- ☐ Among the I/O signals of intelligent function modules, the module receives "Y" signals.

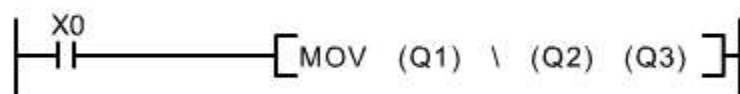
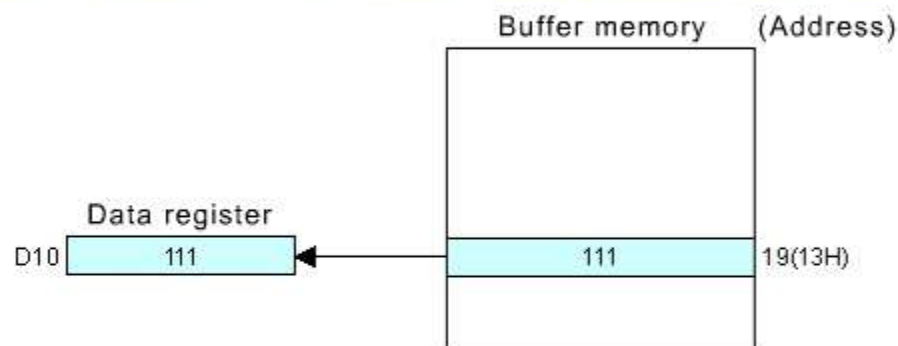
[Answer](#)[Back](#)

Test

Final Test 6

Intelligent function module devices enable programming of the intelligent function module buffer memory in the same way as the device memory in the CPU module.

Complete a program to read data from buffer memory address "19" of the intelligent function module (head I/O number: "X/Y090") and write the data into register "D10".

Q1 Q2 Q3

Answer

Back

Test**Final Test 7**

The following sentences describe the D/A conversion characteristics (in normal resolution mode) of Q62DAN. Select the appropriate option in each box to complete the sentence.

When the output range setting of "1 to 5V" is selected, the output voltage will be ()V for the input digital value "0", and ()V for the input digital value "4000".

In this case, the output voltage for the input digital value "0" is called the (), and the output voltage for the input digital value "4000" is called the ().

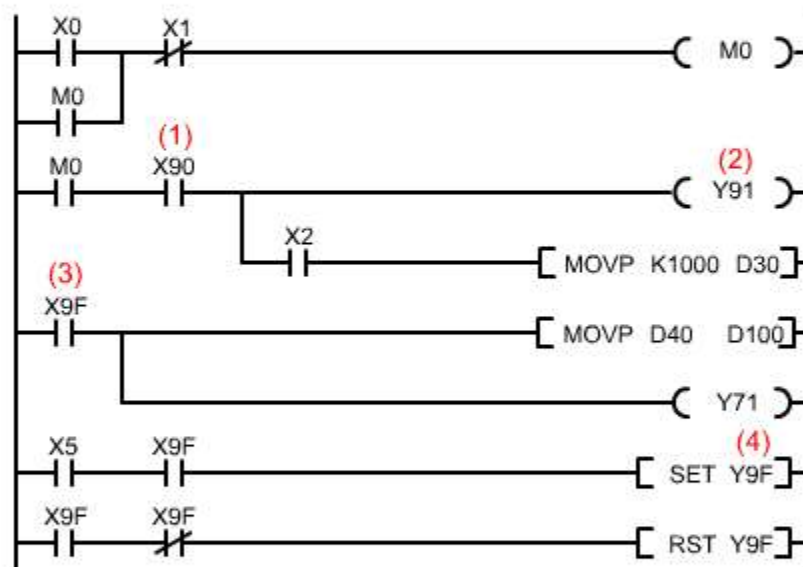
Test

Final Test 8

The following is a sequence program to control Q62DAN. Select the appropriate option in boxes (1) to (4).

Process defined with the program

- When X0 is ON, M0 is ON. When Module READY is turned ON, the CH1 output enable flag is turned ON.
- When the error occurrence flag is ON, the error code (data stored in D40) is transferred to D100.
- When X5 is ON while an error is detected, the error clear request turns ON.



Precondition

- Q62DAN is mounted in the slot of the main base unit whose head I/O address is specified as "X/Y90".

(1)

(2)

(3)

(4)

Answer

Back

Test**Final Test 9**

Select the correct method to check error codes caused in Q62DAN.

- ☐ Use the PLC diagnosis screen of GX Works2.
- ☐ Use the ladder monitor screen of GX Works2.
- ☐ Use the Function Module Monitor of GX Works2.
- ☐ Use the PLC parameters screen of GX Works2.

[Answer](#)[Back](#)

Test**Test Score**

You have completed the Final Test. Your results are as follows.
To end the Final Test, proceed to the next page.

Correct Answers : 0

Total Questions : 9

Percentage : 0%

[Proceed](#)[Review](#)[Retry](#)

You failed the test.

You have completed the **PLC Intelligent Function Module** Course.

Thank you for taking this course.

We hope you enjoyed the lessons and the information you acquired in
this course will be useful in the future.

You can review the course as many times as you want.

Review

Close