MELSEC QnA3C Provider

Mitsubishi Q series C24 QnA-compatible 3C frame

Version 1.1.1

User’s guide

January 30, 2023

[Remarks]

[Revision History]

Version	Date	Content
1.0.0	2014-06-16	First edition
1.1.0	2016-02-03	Added VT, Elem, and Array for the option of CaoController::AddVariable method. Added the following devices as available device. SM, CS, CC, SB, S, DX, DY, SD, CN, SW, Z, R, ZR Added the following character strings for the entry of VT option and Type option. Bool, I1, UI1, I2, UI2, I4, UI4, R4, R8, BSTR, Float, Double, String
	2020-02-13	Fixed typos.
1.1.1	2020-04-20	Corrected version information acquisition process.
	2023-01-30	Fixed typos.

[Hardware]

Model	Version	Notes

Contents

1. Introduction

This is a user's guide for MELSEC QnA3C provider that is one of the CAO provider. MELSEC QnA3C provider is designed for MELSEC Q-series QnA-compatible 3C frames (formats 1 to 4) manufactured by Mitsubishi Electric Corporation.

MELSEC QnA3C provider establishes communication with a serial communication unit of Mitsubishi’s sequencer MELSEC Q-series through MC protocol. For details on the MC protocol, refer to Mitsubishi Electric's "MELSEC Communication Protocol Reference Manual" (hereinafter MELSEC Manual).

2. Overview of provider

2.1. Overview

MELSEC QnA3C provider is a CAO provider that absorbs dependence on a serial communication unit, which is designed to communicate with Mitsubishi's sequencer. This provider also provides functions specified by CAO provider interface specification. The file format is DLL (Dynamic Link Library) and it is dynamically uploaded from the CAO engine. To use MELSEC QnA3C provider, you need to install ORiN2SDK, or, complete registration manually based on the following information.

Table 2-1 MELSEC QnA3C provider

File name	CaoProvMELSECQnA3C.dll
ProgID	CaoProv.MELSEC.QnA3C
Registry registration[1]	Regsvr32 CaoProvMELSECQnA3C.dll
Remove registry registration	Regsvr32 /u CaoProvMELSECQnA3C.dll

2.2. Precautions on Use

2.2.1. Connection with a Serial communication unit

For the way of connection between a PC and a serial communication unit, refer to the serial communication unit user's manual from Mitsubishi Electric Corporation.

[1] If the registry is installed by ORiN SDK, you do not need to register/delete it manually

2.3. Method and Property

2.3.1. CaoWorkspace::AddController method

In MELSEC QnA3C provider, initial processing for serial communication will be executed once a Controller object is created. When establishing connection, specify a device with option character strings.

Syntax AddController(<bstrCtrlName:BSTR>, <bstrProvName:BSTR>,
<bstrPcName:BSTR > [, <bstrOption:BSTR>])

bstrCtrlName : [in] Controller name
bstrProvName : [in] Provider name. Fixed value =" CaoProv.MELSEC.QnA3C".
bstrPcName : [in] Machine name where provider operates
bstrOption : [in] Option character string

Table 2-2 Option character string of CaoWorkspace::AddController

Option	Description
Conn=<connection parameter>	This option is not omittable. Set a communication format and its connection parameters.
Format=<format number>	Set the format used for communication. (Default: 1)
SumCheck=<enabled/disabled>	Enable/Disable the Sum check (Default: Enabled)

2.3.1.1. Conn option

The following shows connection parameter strings for Conn option. Parameters enclosed with square brackets ("[]") are omittable. Underlined items in the following description show the default values that are automatically chosen when options are not specified.

"Conn=com:<ComPort>[:<BaudRate>[:<Parity>:<DataBits>:<StopBits>]]"

<COM Port> : COM port number.'1'-COM1, '2'-COM2, …
<BaudRate> : Communication speed.
1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200, 230400
<Parity> : Parity. 'N'-NONE, 'E'-EVEN, 'O'-ODD
<DataBits> : Number of data bit. '7'-7bit '8'-8bit
<StopBits> : Number of stop bit. '1'-1bit , '2'-2bit

2.3.1.2. Format option

Specify the format of the control procedure when communicating with the MC protocol. Specify the format that matches the communication protocol setting of the target interface of the PLC CPU.

The difference between each format is as follows based on Format 1. See the MELSEC manual for details.

Format number	Description
2	A block number will be added to each message.
3	Each message will be enclosed with STX and ETX.
4	CR and LF will be added to each message.

2.3.2. CaoController::AddVariable method

Create a variable object that is used to obtain/set a serial communication unit information.

Syntax AddVariable(<bstrName:BSTR > [, <bstrOption:BSTR>])

bstrName : [in] Variable name

bstrOption : [in] Option character string

Table 2-3 Option character string of CaoController::AddVariable

Option	Description
Param=<variable parameter>	Set parameters of variables
VT=<Variable type>	Specify the data type to input/output device memory.
Type=<Variable type>	Specify the data type to input/output device memory. Note) If both VT option and Type option are specified, the entry of VT option is prioritized.
Elem=<Element count>	Specify the element count. To specify with hexadecimal, use the following format. 0x[0-9, A-F]+, &H[0-9, A-F]+, [0-9, A-F]+H
Elements=<Element count >	Specify the element count with hexadecimal. Note) If both Elem option and Elements option are specified, the entry of Elem option is prioritized.
Array=< True or False >	Specify whether value is obtained as array type even if only one element is retrieved.

In this method, setting a device code at the top of the variable name will enable to access MELSEC (Q-series) through a serial communication unit.[2]

<Device> :

Bit device : SM, X, Y, M, L, F, V, B, TS, TC, SS, SC, CS, CC, SB, S, DX, DY

Word device : SD, D, W, TN, SN, CN, SW, Z, R, ZR

<Address> := Variable's address where a device points to. To specify an address, use decimal value or hexadecimal value.

Table 2-4 Device list

Device		Device code	Type	Address specification
Special relay		SM	Bit	Decimal
Special register		SD	Word	Decimal
Input		X	Bit	Hexadecimal
Output		Y		Hexadecimal
Internal relay		M		Decimal
Latching relay		L		Decimal
Annunciator		F		Decimal
Edge relay		V		Decimal
Link relay		B		Hexadecimal
Data register		D	Word	Decimal
Link register		W		Hexadecimal
Timer	Contact	TS	Bit	Decimal
	Coil	TC		
	Current value	TN	Word	
Retentive timer	Contact	SS	Bit	Decimal
	Coil	SC		
	Current value	SN	Word	
Counter	Contact	CS	Bit	Decimal
	Coil	CC		
	Current value	CN	Word	
Link special relay		SB	Bit	Hexadecimal
Link special register		SW	Word	Hexadecimal
Step relay		S	Bit	Decimal
Direct input		DX	Bit	Hexadecimal

[2] For details, refer to Mitsubishi's serial communication protocol reference.

Direct output	DY		Hexadecimal
Index register	Z	Word	Decimal
File register	R	Word	Decimal
	ZR		Decimal

[Example] "X0" , " Y1F", "D50" , "M350"

2.3.2.1. Param option

The following shows connection parameter strings of Param option. Parameters enclosed with square brackets ("[]") are omittable.

"Param=[<StationNo>:<NetworkNo>:<PCNo>:<SelfStationNo>[:<BlockNo >]]"

< StationNo > : Station number. Default: 00(30H, 30H)

< NetworkNo > : Network number. Default: 00(30H, 30H)

< PCNo > : PC number. Default: FF(46H, 46H)

< SelfStationNo > : Self station number. Default: 00(30H, 30H)

< BlockNo > : Block number. Default: 00(30H, 30H)

[Example] "X0", "Param = 01:00:FF:00:00" Obtain the value of X0 in Station number 1

2.3.2.2. VT option

This option specifies the point count for one element of respective I/O types (1 point = 1 bit). If this option is not specified, data types specified by Type option are set automatically. If both VT option and Type option are not specified, the default data type of a variable is applied. For example, if Bit device is specified for a variable, "Bit" will be the default value. If Word device is specified a variable, "Word" will be the default value.

Table 2-5 VT option list

Type	Data type	points/element	Description
Bit	VT_I2	1 point	Read/Write data for every one bit (one point) of data. Note) Available to bit device (X, Y, M, etc.) only.
Bool	VT_BOOL	1 point	Read/Write data for every one bit (one point) of data. Note) Available to bit device (X, Y, M, etc.) only.
I1	VT_I1	8 points	Read/Write data for every eight points. Note) In Elements option, if you specify odd number for the element count, it is converted to an even number by adding eight points filled with 0.
UI1	VT_UI1	8 points	Read/Write data for every eight points. Note) In Elements option, if you specify odd number for the element count, it is converted to an even number by adding eight points filled with 0.
I2 Word	VT_I2	16 points	Read/Write data for every word unit (16 points) of data.
UI2	VT_UI2	16 points	Read/Write data for every 16 points.
I4	VT_I4	32 points	Read/Write data for every 32 points.
UI4	VT_UI4	32 points	Read/Write data for every 32 points.
R4 Float	VT_R4	32 points	Read/Write data for every 32 points.
R8 Double	VT_R8	64 points	Read/Write data for every 64 points.
BSTR String	VT_BSTR	8 points	Read/Write character strings of ASCII (one letter : 8-bit). Note) If the length of character strings you entered is shorter than that of elements specified by Elements option, the remaining points are filled with 0.

"[VT=[<VT option character string>]]"

[Example] "X0", "VT = VT_I2" Obtain values from X0 to X15 as Word values (2 bytes).

2.3.2.3. Type option

Just like VT option, this option specifies data types (not recommended). If both Type option and VT option are specified, VT option is prioritized.

2.3.2.4. Elem option

Specify the element count with Decimal or Hexadecimal type. To specify with Decimal, enter the desired element count as-is. To specify with Hexadecimal, enter the element count with the format of "0x[0-9, A-F]+, &H[0-9, A-F]+, " or with the format of "[0-9, A-F]+H". If this option is not specified, the element counts specified by Elements option will be set. If both Elem option and Elements option are not specified, the element count should be "1".

Table 2-6 Available range

VT option	Device type	Available range		
		Access station-1[3]	Access station-2[4]	Access station-3[5]
Bit, Bool	Bit device	1 ≦ Element count ≦ 7904	1 ≦ Element count ≦ 3952	1 ≦ Element count ≦ 160
I1, UI1, BSTR, String	Bit device	1 ≦ Element count ≦ 1920	1 ≦ Element count ≦ 960	1 ≦ Element count ≦ 20
	Word device	1 ≦ Element count ≦ 1920	1 ≦ Element count ≦ 960	1 ≦ Element count ≦ 128
I2, UI2, Word	Bit device	1 ≦ Element count ≦ 960	1 ≦ Element count ≦ 480	1 ≦ Element count ≦ 10
	Word device	1 ≦ Element count ≦ 960	1 ≦ Element count ≦ 480	1 ≦ Element count ≦ 64
I4, UI4, R4, Float	Bit device	1 ≦ Element count ≦ 480	1 ≦ Element count ≦ 240	1 ≦ Element count ≦ 5
	Word device	1 ≦ Element count ≦ 480	1 ≦ Element count ≦ 240	1 ≦ Element count ≦ 32
R8, Double	Bit device	1 ≦ Element count ≦ 240	1 ≦ Element count ≦ 120	1 ≦ Element count ≦ 2
	Word device	1 ≦ Element count ≦ 240	1 ≦ Element count ≦ 120	1 ≦ Element count ≦ 16

[3] "Access station-1" describes the access to one of the following stations.
① C24/E71-mounted station (own station)
② Q/LCPU station (other station) via Q/L series-compatible network system (CC-Link IE controller network, MELSECNET/H, MELSECNET/10, Ethernet) / Intelligent device station with CC-Link IE field network/MELSECNET/H remote I/O station
③ C24 of above ① and ②, and Q/LCPU station with multidrop connection

[4] "Access station-2" describes the access to one of the following stations.
① Q/QnACPU station (other station) via QnA series-compatible network system (MELSECNET/10,Ethernet)/MELSECNET/10 remote I/O station
② C24 mounted on above ① and Q/QnACPU station with multidrop connection (other station)
③ QnACPU and Q/QnACPU station (other station) via network system (MELSECNET/H, MELSECNET/10, Ethernet)/ MELSECNET/H, MELSECNET/10 remote I/O station

[5] "Access station-3" describes the access to the station other than *7 or *8.
[Example] Sequencer CPU other than Q/L/QnACPU stations (other station)

"[Elem =[<Element count>]]"

(Example) "X0", "Elem = 5" Retrieve the values of X0 to X4 as Bit value
(Example) "D10", "Elem = 0x10" Retrieve the values of D10 to D25 as Word value
(Example) "D10", "Elem = &H10" Retrieve the values of D10 to D25 as Word value
(Example) "D10", "Elem = 10H" Retrieve the values of D10 to D25 as Word value
(Example) "X100", "Type = Word, Elem = 2" Retrieve the values of X100 to X131 by Word-unit

2.3.2.5. Elements option

Just like Elem option, this option specifies the element count (not recommended). In Elements option, specify the element count with Hexadecimal. If both Elements option and Elem option are specified, Elem option is prioritized.

2.3.2.6. Array option

This option specifies whether the read value is retrieved as array type, when all of the following conditions are satisfied:

1) The entry of Enum option is 1.
2) The entry of VT option is other than BSTR, or the entry of Type option is other than String.

If this option is True, the read value is retrieved as array type. If this option is False, the read value is retrieved as the specified data type. This will be False if there is no entry.

"[Array=[< True or False >]]"

(Example) "X0", "VT=BOOL , Elem = 1, Array=True" Retrieve the value of X0 as a BOOL type array.
(Example) "X0", "VT=BOOL , Elem = 1, Array=False" Retrieve the value of X0 as BOOL type.

2.4. Error code

In MELSEC QnA3C provider, specific error codes shown below are defined. For about ORiN2 common errors, refer to the chapter of the error code on "ORiN2 programming guide".

Table 2-7 Specific error code list

Error name	Error number	Description
Sum check error	0x80100100	Sum check error is detected.
Serial communication unit error	0x8010xxxx	If an error occurs in the serial communication unit, an original error code of the serial communication unit will be set to the "xxxx" area and returned. For details about error codes, refer to the manual of the serial communication unit.