MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Channel Isolated Digital-Analog Converter Module SIL2 Diagnostic Function Block Library Reference

CONTENTS

1 OVERVIEW

This manual describes the FB library to input or output data from or to a system with the R60DA8-G.

1.1 FB Library List

The following table lists the FB library in this manual. The FB library consists of the SIL2 safety program FB and the Standard program FB. The SIL2 safety program FB is used for safety programs, and the Standard program FB is used with the SIL2 safety program FB.
M+SIL2DAG_DAConv_R has obtained the safety approval and can be used for building safety applications up to IEC61508 Ed2.0 SIL2.

Name	Used by	Description
M+SIL2DAG_DAConv_R	Safety program	They output data from a system with the R60DA8-G.
M+SIL2DAG-IEF_ReadADVal_R	Standard program	

For the FB library, please consult your local Mitsubishi representative.
For how to register the FB library, refer to the GX Works3 Operating Manual.

Point

M+SIL2DAG_DAConv_R and M+SIL2DAG-IEF_ReadADVal_R, which are the FB library used in the system configured with the R60DA8-G, must be used together. The maximum number of this FB library that can be arranged on one network is 32. The maximum number of the R60DA8-G that can be arranged on one network is also 32.

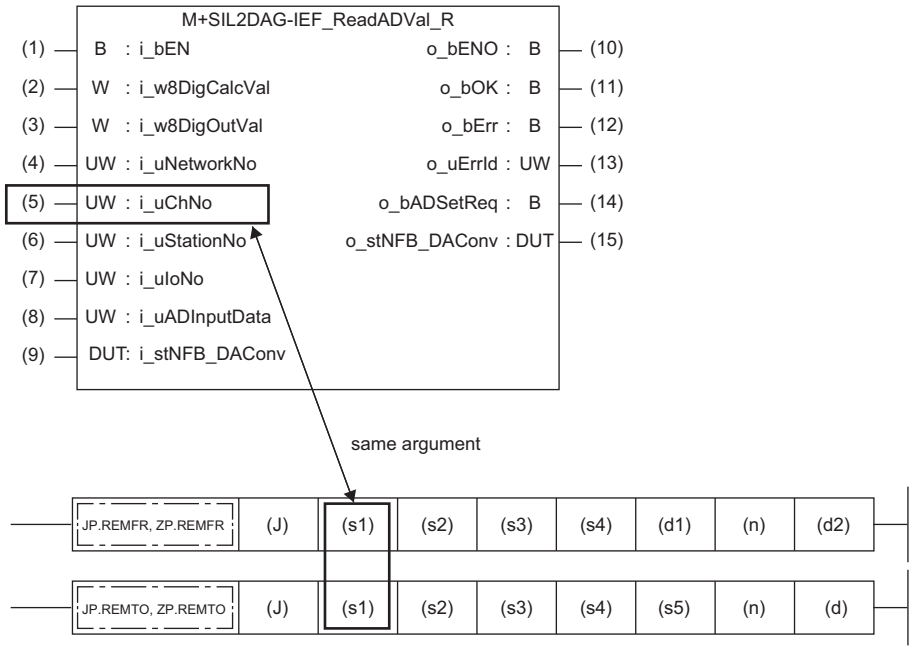
When this FB library is used together with any of the following dedicated instructions, however, the number of the FB library that can be arranged reduces.

- REMFR instruction
- REMTO instruction
- REMFRD instruction
- REMTOD instruction

M+SIL2DAG-IEF_ReadADVal_R incorporates the above-mentioned instructions.

These instructions use the argument called "Channel of the own station, which is used for the instruction", and this argument can be set within the range of 1 to 32. When M+SIL2DAG-IEF_ReadADVal_R and one of these instructions are used together, attentions are required because a same number cannot be set for the multiple arguments. For instance, when the FB library and the REMFR/REMTO instruction are used together in the same network, if 1 is set for the argument of the REMFR/REMTO instruction, a value other than 1 must be set for the argument of the FB library.

For the reason stated above, when you want to execute the REMFR, REMTO, REMFRD, or REMTOD instruction to a node on the network where this FB library is used, the number of the FB library that can be arranged reduces because in such a case, separate channel numbers must be set for the arguments.



1.2 System Configuration

To use the FB library in this manual, configure a SIL2 analog output system. For the configuration of the SIL2 analog output system, refer to the following.

MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

2 DETAILS OF THE FB LIBRARY

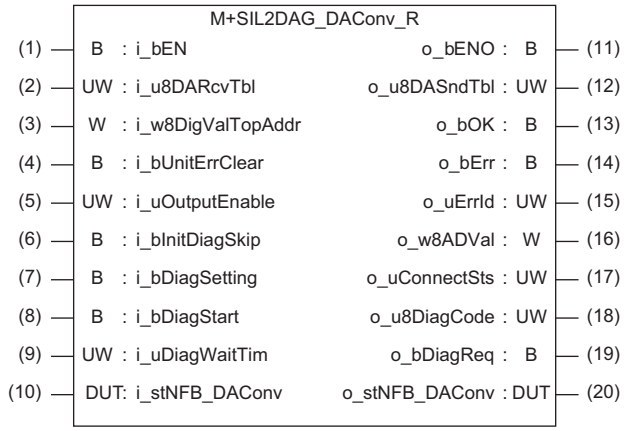
This chapter describes the details of the FB library.

2.1 M+SIL2DAG_DAConv_R

Name

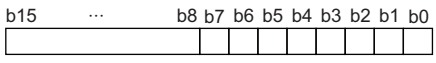
M+SIL2DAG_DAConv_R

Overview

Item	Description
Functional overview	Inputs digital values to the R60DA8-G in SIL2 mode.
Symbol	

Labels to use

■Input labels

No.	Variable name	Name	Data type	Scope	Description
(1)	i_bEN	Execution command	Bit	On or off	On: The FB is activated. Off: The FB is not activated. For a setting example of this input label, refer to the following. 📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)
(2)	i_u8DARcvTbl	Safety communications receive area	Word [unsigned]	Valid device range	The label sets the start device of the receive data storage device (8 words) for the safety communication setting.
(3)	i_w8DigValTopAddr	Digital value	Word [signed]	Valid device range	The label sets digital values to be output to the R60DA8-G. Areas of 8 words are required regardless of the number of D/A conversion enabled channels.
(4)	i_bUnitErrClear	Module error clear	Bit	On or off	Turn on this label to clear an occurring error. Turn off this label after the error is cleared.
(5)	i_uOutputEnable	Output enable request	Word [unsigned]	—	The label specifies the channels for which an analog output from the R60DA8-G is enabled. b0 to b7 correspond to CH1 to CH8. b8 to b15 are not used.  • On: Output is enabled • Off: Output is disabled

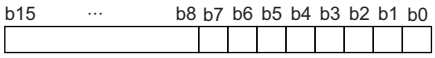
No.	Variable name	Name	Data type	Scope	Description
(6)	i_bInitDiagSkip	Start-up diagnostics skip request	Bit	On or off	The label selects whether start-up diagnostics is to be performed or not. This option is available only if the safety operation mode of the SIL2 Process CPU is in TEST MODE. If the mode is not in TEST MODE, the diagnostics is performed regardless of this setting. • On: No start-up diagnostics is performed. • Off: Start-up diagnostics is performed.
(7)	i_bDiagSetting	Circuit diagnostics execution setting	Bit	On or off	The label sets whether to execute D/A conversion circuit diagnostics automatically or manually. • Off: Auto • On: Manual
(8)	i_bDiagStart	Circuit diagnostics start request	Bit	On or off	When i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on) and o_bDiagReq (D/A conversion circuit diagnostics waiting flag) is on, D/A conversion circuit diagnostics starts by turning on this flag. After o_bDiagReq (D/A conversion circuit diagnostics waiting flag) turns off, turn off this flag.
(9)	i_uDiagWaitTim	Circuit diagnostics request WAIT time	Word [unsigned]	1 to 120 (min)	When i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on) and o_bDiagReq (D/A conversion circuit diagnostics waiting flag) is on, a value set with this label determines how long to wait before i_bDiagStart (circuit diagnostics start request) is turned on. A value smaller than "D/A converter circuit Diagnostic cycle setting" must be set.
(10)	i_stNFB_DAConv	Standard/safety shared input data	Structure	—	Data from a SIL2 safety program FB to a SIL2 standard program FB is stored. For details, refer to the following. 📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

Restriction

Do not change the following input labels during operation of the SIL2 diagnostic FB library (while i_bEN is on). Doing so may cause abnormal operation of the SIL2 diagnostic FB library due to the following reasons.

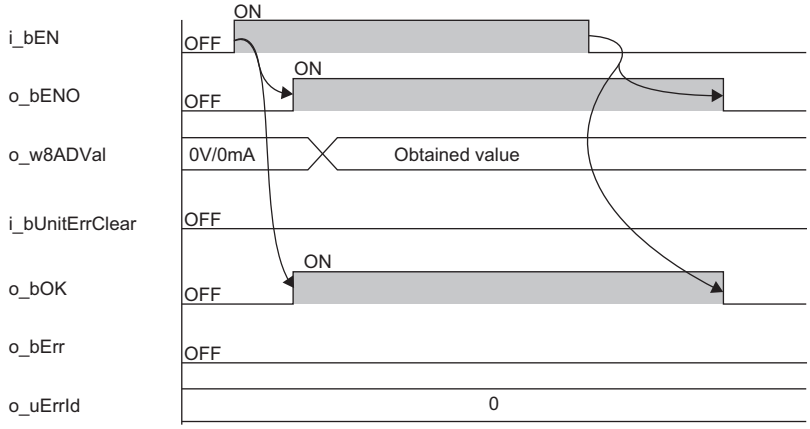
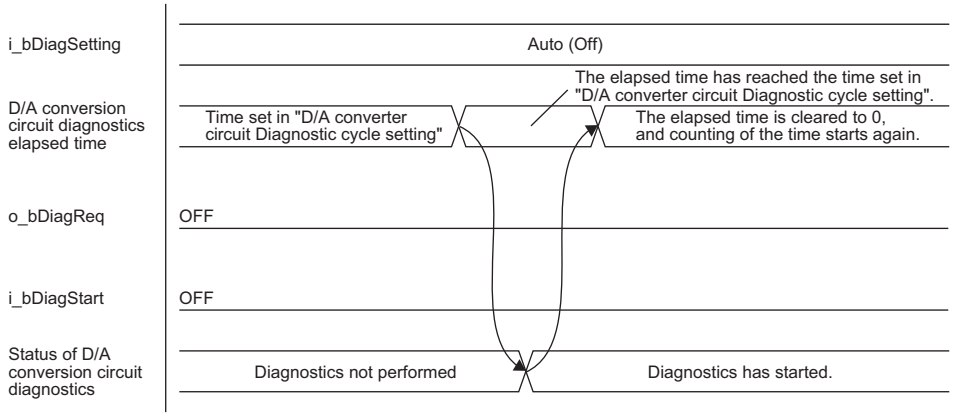
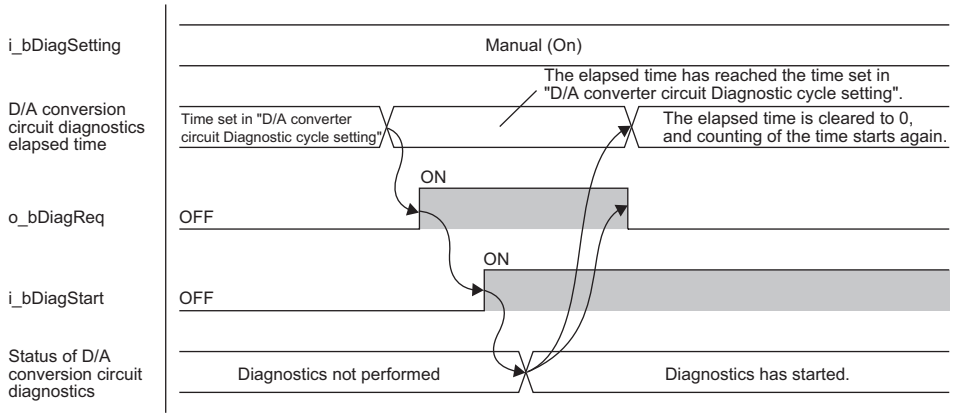
- i_u8DARcvTbl: Because this area is used by the SIL2 diagnostic FB library
- i_bInitDiagSkip: Because this label may function improperly
- i_bDiagSetting: Because this label may function improperly
- i_uDiagWaitTim: Because this label may function improperly
- i_stNFB_DAConv: Because this area is used by the SIL2 diagnostic FB library

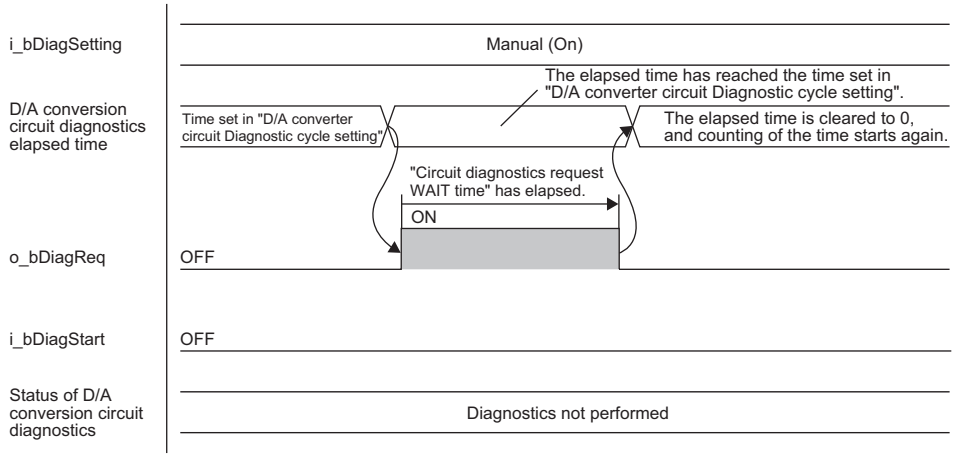
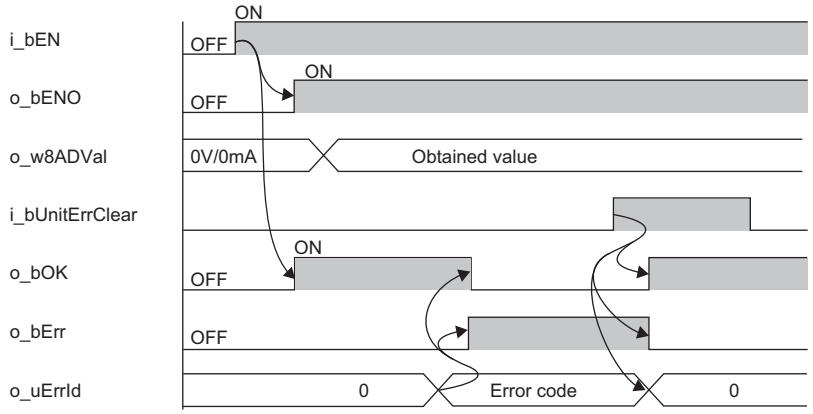
■Output labels

No.	Variable name	Name	Data type	Default value	Description
(11)	o_bENO	Execution status	Bit	Off	On: The execution command is on. Off: The execution command is off.
(12)	o_u8DASndTbl	Safety communications send area	Word [unsigned]	0	The label sets the start device of the send data storage device (8 words) for the safety communication setting.
(13)	o_bOK	Normal completion	Bit	Off	The on state indicates that the FB processing has been completed successfully.
(14)	o_bErr	Error completion	Bit	Off	The on state indicates that the FB processing has been completed with an error.
(15)	o_uErrId	Error code	Word [unsigned]	0	The error code is stored at error completion.
(16)	o_w8ADVal	Digital obtained value	Word [signed]	0	Digital values obtained from the SIL2 standard program FB are output. This label specifies a safety device area for the CH1 storage location. For CH2 and subsequent channels, safety device areas are assigned and numbered sequentially starting from the next area of that specified for CH1. Areas of 8 words are required regardless of the number of D/A conversion enabled channels.
(17)	o_uConnectSts	External device connection status	Word [unsigned]	0	The label indicates the connection status between the R60DA8-G and an actuator. b0 to b7 correspond to CH1 to CH8. b8 to b15 are not used.  • On: Connected • Off: Disconnected
(18)	o_u8DiagCode	Status code	Word [unsigned]	0	A status code for each channel is stored. This label specifies a safety device area for the CH1 storage location. For CH2 and subsequent channels, safety device areas are assigned and numbered sequentially starting from the next area of that specified for CH1. Areas of 8 words are required regardless of the number of D/A conversion enabled channels.
(19)	o_bDiagReq	D/A conversion circuit diagnostics waiting flag	Bit	Off	When i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on) and the D/A conversion circuit diagnostic cycle has elapsed, the label outputs ON. When i_bDiagStart (circuit diagnostics start request) turns on or when i_uDiagWaitTim (circuit diagnostics request WAIT time) has elapsed, the label outputs OFF.
(20)	o_stNFB_DAConv	Standard/safety shared output data	Structure	—	Output data from a SIL2 safety program FB to a SIL2 standard program FB is set. For details, refer to the following. 📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

FB details

Item	Description	
Relevant devices	Channel isolated digital-analog converter module	R60DA8-G (SIL2 mode)
	CPU module	MELSEC iQ-R series SIL2 Process CPU (redundant mode)
	Engineering tool	GX Works3 Version 1.045X or later
Language to use	Ladder diagram	
Number of steps	9520 steps The number of steps of the FB embedded in a program depends on the CPU module used, the input/output definitions, and the options setting of GX Works3. For the options setting of GX Works3, refer to the GX Works3 Operating Manual.	
FB dependence	M+SIL2DAG-IEF_ReadADVal_R	
Functional description	• Turning on i_bEN (execution command) causes o_bENO (execution status) to be turned on to output digital values to the R60DA8-G. The following conditions are required for the target channels. · The R60DA8-G module parameters are set to D/A conversion enabled. · The relevant bits of i_uOutputEnable (output enable request) are set to ON. • The FB stores the status code in o_u8DiagCode (status code) depending on the status of each channel. • The FB gets the module parameters from the R60DA8-G on the first start-up. If it cannot get correct parameters within 2 seconds, it turns off o_bOK (normal completion) and turns on o_bErr (error completion), stores an error code in o_uErrId (error code), and does not perform the subsequent operations. • After getting the module parameters correctly, the FB performs start-up diagnostics. During the start-up diagnostics, a digital output value obtained from the channel isolated A/D converter module for diagnostics is stored in o_w8ADVal (digital obtained value). In addition, in o_uConnectSts (external device connection status), the FB turns off bits of all channels. If a system error is detected at the start-up diagnostics, it turns off o_bOK (normal completion) and turns on o_bErr (error completion), stores an error code in o_uErrId (error code), and does not perform subsequent operations. Also, if an error for each channel is detected, it stores a status code in o_u8DiagCode (status code) of the relevant channel. Note that if the safety operation mode of the SIL2 Process CPU is in TEST MODE and i_bInitDiagSkip (start-up diagnostics skip request) is on, subsequent operations are started without the start-up diagnostics. • After the operations up to the start-up diagnostics are completed, analog output read-back is performed at every SIL2 D/A conversion cycle. During analog output read-back, o_uConnectSts (external device connection status) of the relevant channel is turned on. Also, a digital operation value obtained from the channel isolated A/D converter module for diagnostics is stored in o_w8ADVal (digital obtained value). • When i_bDiagSetting (circuit diagnostics execution setting) is set to Auto (off), D/A conversion circuit diagnostics is started at every D/A conversion circuit diagnostic cycle. During the D/A conversion circuit diagnostics, the FB turns off o_uConnectSts (external device connection status) of the relevant channel and stores a digital output value obtained from the R60AD8-G for diagnostics in o_w8ADVal (digital obtained value). • By turning on i_bUnitErrClear (module error clear), the FB clears an occurring error (except a D/A conversion circuit diagnostic error). Note that if the status code (o_u8DiagCode) is set to 0000H (Idle), 8001H (Start-up), or □1□□H (Processing interrupted), the error clear is not performed. If i_bUnitErrClear (module error clear) remains on after the status code (o_u8DiagCode) changes, the error clear is performed. • For the channel where i_uOutputEnable (output enable request) is turned off (output is disabled), outputs to the module are stopped, and a digital operation value obtained from the channel isolated A/D converter module for diagnostics is stored in o_w8ADVal (digital obtained value). In addition, in o_uConnectSts (external device connection status), a bit of the relevant channel is turned off. Note that this function applies to normal channels where D/A conversion is enabled. • When i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on) and the D/A conversion circuit diagnostic cycle has elapsed, the o_bDiagReq (D/A conversion circuit diagnostics waiting flag) turns on. After that, when i_bDiagStart (circuit diagnostics start request) is turned on before i_uDiagWaitTim (circuit diagnostics request WAIT time) elapses, D/A conversion circuit diagnostics starts, and o_bDiagReq (D/A conversion circuit diagnostics waiting flag) turns off. If i_bDiagStart (circuit diagnostics start request) is not turned on before i_uDiagWaitTim (circuit diagnostics request WAIT time) elapses, o_bDiagReq (D/A conversion circuit diagnostics waiting flag) turns off without the execution of D/A conversion circuit diagnostics. • A safety I/O HOLD time exceeded error that occurred in the R60DA8-G is regarded as a channel isolated D/A converter module error (error code: FFFFH). To perform this FB again after the safety I/O HOLD time exceeded error is eliminated, perform the error clear operation.	
FB compilation method	Subroutine type	
FB operation	Arbitrary execution type	
Application example	📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)	

Item	Description
Timing chart of I/O signals	■When the operation is completed successfully (common operation)  ■When the operation is completed successfully (the operation when i_bDiagSetting (circuit diagnostics execution setting) is set to Auto (off))  ■When the operation is completed successfully (the operation when i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on)) 

Item	Description
Timing chart of I/O signals	■When the operation is completed successfully (the case where i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on) and the circuit diagnostics does not start)  ■When the operation is completed with an error 
Restrictions and precautions	• To use this FB, configure the master station and the intelligent device station. (MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)) • The FB requires the configuration of the ladder for every input label.

List of error codes

Error code	Description
200H	Indicates a module parameter error.
201H	Indicates the state in which diagnostics is not possible.
202H	Indicates a SIL2 standard program FB error.
FFFFH	Indicates a module error in the R60DA8-G.

For handling errors corresponding to these error codes, refer to the following.

MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

List of status codes

Status code	Status name	Description
0000H	Idle	The FB is disabled (initial status).
8001H	Start-up	The FB is in the start-up status.
8002H	D/A conversion disabled	D/A conversion is disabled.
8003H	Analog output read-back in progress	Analog output read-back is being performed.
8004H	Analog output read-back completed	The analog output read-back is completed.
8005H	D/A conversion circuit diagnostics in progress	D/A conversion circuit diagnostics is being performed.
8006H	D/A conversion circuit diagnostics completed successfully	The result of D/A conversion circuit diagnostics is valid.
8010H	Output stopped	Output operation is stopped.
C001H	Analog output read-back error	The verification of analog output read-back is inconsistent.
C002H	D/A conversion circuit diagnostic error	The verification of D/A conversion circuit diagnostics is inconsistent.
C010H	SIL2 D/A conversion cycle set value error	The value set for "SIL2 D/A conversion cycle setting" of the module parameter is out of range.
C011H	D/A conversion circuit diagnostic cycle set value error	The value set for "D/A conversion circuit diagnostic cycle setting" of the module parameter is out of range.
C012H	Circuit diagnostics request WAIT time error	The value set for i_uDiagWaitTim (circuit diagnostics request WAIT time) of the input label is out of range.
C013H	Invalid circuit diagnostics request WAIT time error	The value set for i_uDiagWaitTim (circuit diagnostics request WAIT time) of the input label exceeds the value set for "D/A conversion circuit diagnostic cycle setting".
C021H	D/A range setting error	The value set for "Output range setting" of the module parameter is out of range.
C030H	Target module error	The destination module of safety communications is not the R60DA8-G.
C031H	Safety communication error	Safety communications with the destination module cannot be performed properly.
C040H	Target network number set value error	The value set for the target network number of the SIL2 standard program FB input label is out of range.
C041H	Own station channel set value error	The value set for the own station channel of the SIL2 standard program FB input label is out of range.
C042H	Target station number set value error	The value set for the target station number of the SIL2 standard program FB input label is out of range.
C043H	Target station start I/O number set value error	The value set for the target station start I/O number of the SIL2 standard program FB input label is out of range.
C044H	Module information read error	Module information could not be read from the R60AD8-G for diagnostics.
C045H	Module information write error	Module information could not be written to the R60AD8-G for diagnostics.
C046H	FB communication error	Communications with the SIL2 standard program FB cannot be performed properly.
□1□□H	Processing interrupted	The processing is interrupted. □ stores a status code when it is interrupted. (If the processing is interrupted when the code is analog output read-back completed (8004H), the status code is set to 8104H.) All statuses except 'Idle' (status code: 0000H) shift to 'Processing interrupted' when i_bEN is turned off. At this time, the 8th bit of the status code turns on (the status code becomes □1□□H). When i_bEN is turned on, the 8th bit of the status code turns off (the status code becomes □0□□H), and the status returns to a previous one, which is indicated by the status code (□0□□H).

For handling statuses corresponding to these status codes, refer to the following.

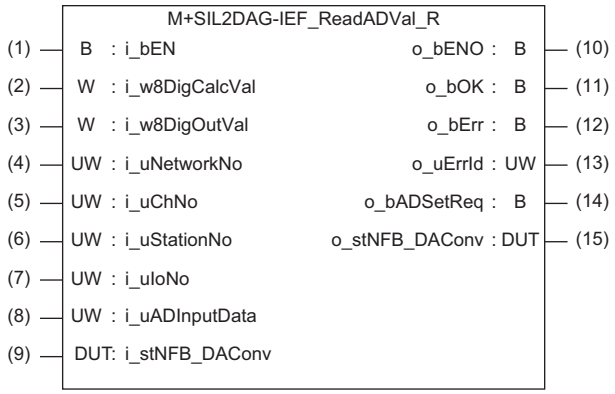
MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

2.2 M+SIL2DAG-IEF_ReadADVal_R

Name

M+SIL2DAG-IEF_ReadADVal_R

Overview

Item	Description
Functional overview	Obtains digital operation values from the R60AD8-G (normal mode).
Symbol	

Labels to use

■Input labels

No.	Variable name	Name	Data type	Scope	Description
(1)	i_bEN	Execution command	Bit	On or off	On: The FB is activated. Off: The FB is not activated.
(2)	i_w8DigCalcVal	Digital operation value	Word [signed]	Valid device range	The label sets the device assigned to the CH☐ digital operation value obtained from the R60AD8-G for diagnostics.
(3)	i_w8DigOutVal	Digital output value	Word [signed]	Valid device range	The label sets the device assigned to the CH☐ digital output value obtained from the R60AD8-G for diagnostics.
(4)	i_uNetworkNo	Target network number	Word [unsigned]	1 to 239	The label sets the network number that was set in the network required setting of the remote head module.
(5)	i_uChNo	Own station channel	Word [unsigned]	1 to 32	The label sets the channel used for the network between the remote head module and the CPU module.
(6)	i_uStationNo	Target station number	Word [unsigned]	1 to 120	The label sets the station number that was set in the network required setting of the remote head module.
(7)	i_uIoNo	Target station start I/O number	Word [unsigned]	00H to FEH	The label sets the first three digits of the four-digit hexadecimal number that represents the start I/O number of the intelligent function module.
(8)	i_uADInputData	A/D module input information	Word [unsigned]	—	The label sets the device assigned to from 'Module READY' (X0) to 'Error flag' (XF) of the R60AD8-G for diagnostics.
(9)	i_stNFB_DAConv	Standard/safety shared input data	Structure	—	The label sets input data from the SIL2 safety program FB to the SIL2 standard program FB. For details, refer to the following. 📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

Restriction

Do not change the following input labels during operation of the SIL2 diagnostic FB library (while i_bEN is on). Doing so may cause abnormal operation of the SIL2 diagnostic FB library due to the following reasons.

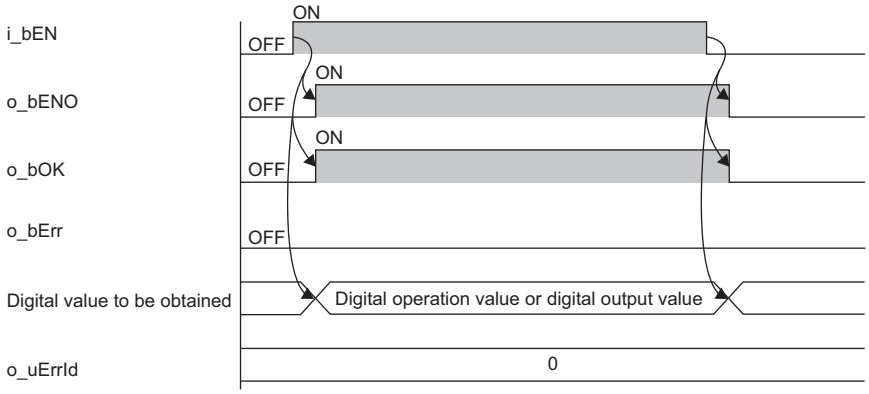
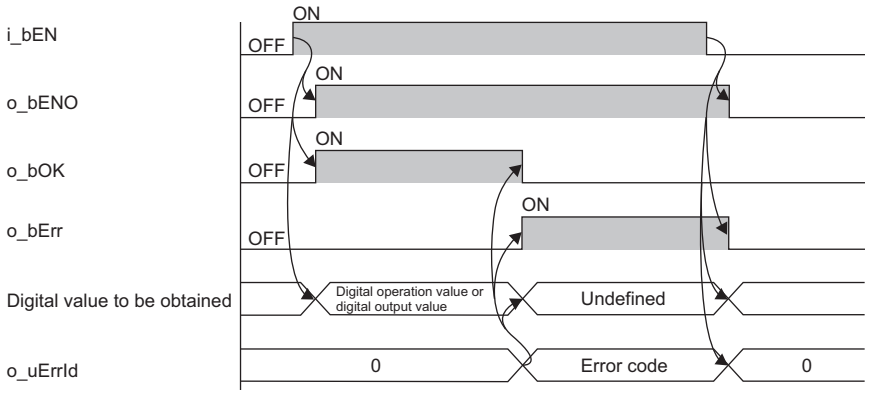
- i_w8DigCalcVal: Because this area is used by the SIL2 diagnostic FB library
- i_w8DigOutVal: Because this area is used by the SIL2 diagnostic FB library
- i_uNetworkNo: Because this label may function improperly
- i_uChNo: Because this label may function improperly
- i_uStationNo: Because this label may function improperly
- i_uIoNo: Because this label may function improperly
- i_uADInputData: Because this label may function improperly
- i_stNFB_DAConv: Because this area is used by the SIL2 diagnostic FB library

i_uChNo is a parameter required to access buffer memory areas of the intelligent device station or the remote device station on CC-Link IE Field Network. For i_uChNo, set a value different from channel numbers of this FB library and the dedicated instructions used (the REMFR, REMTO, REMFRD, and REMTOD instructions).

■Output labels

No.	Variable name	Name	Data type	Default value	Description
(10)	o_bENO	Execution status	Bit	Off	The label outputs the execution status of the FB. On: Executing Off: Not executing
(11)	o_bOK	Normal completion	Bit	Off	The on state indicates that the FB processing has been completed successfully.
(12)	o_bErr	Error completion	Bit	Off	The on state indicates that the FB processing has been completed with an error.
(13)	o_uErrId	Error code	Word [unsigned]	0	The error code is stored at error completion.
(14)	o_bADSetReq	Operating condition setting request	Bit	Off	The label sets the device assigned to 'Operating condition setting request' (Y9) of the R60AD8-G for diagnostics.
(15)	o_stNFB_DAConv	Standard/safety shared output data	Structure	—	The label sets output data from the SIL2 standard program FB to the SIL2 safety program FB. For details, refer to the following. 📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

FB details

Item	Description	
Relevant devices	Channel isolated analog-digital converter module	R60AD8-G (normal mode)
	CPU module	MELSEC iQ-R series SIL2 Process CPU (redundant mode)
	Engineering tool	GX Works3 Version 1.045X or later
Language to use	Ladder diagram	
Number of steps	1445 steps The number of steps of the FB embedded in a program depends on the CPU module used, the input/output definitions, and the options setting of GX Works3. For the options setting of GX Works3, refer to the GX Works3 Operating Manual.	
FB dependence	M+SIL2DAG_DAConv_R	
Functional description	• When i_bEN (execution command) is turned on, the FB follows instructions from the SIL2 safety program FB to obtain either i_w8DigCalcVal (digital operation value) or i_w8DigOutVal (digital output value). • When an error occurs in the FB, o_bErr (error completion) is turned on, and an error code is stored in o_uErrId (error code).	
FB compilation method	Subroutine type	
FB operation	Arbitrary execution type	
Application example	📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)	
Timing chart of I/O signals	■When the operation is completed successfully  ■When the operation is completed with an error  	
Restrictions and precautions	• To use this FB, configure the master station and the intelligent device station. (📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)) • The FB requires the configuration of the ladder for every input label.	

List of error codes

Error code	Description
100H	Indicates a parameter error.
FFFFH	Indicates a module error in the R60AD8-G.

For handling errors corresponding to these error codes, refer to the following.

📖 MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application)

APPENDIX

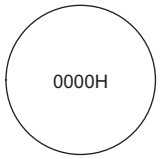
Appendix 1 State Transition Diagram

This section shows a state transition diagram on o_u8DiagCode (status code) of M+SIL2DAG_DAConv_R.

How to read the state transition diagram

■Large circle

Large circles on the state transition diagram indicate the status codes of M+SIL2DAG_DAConv_R.



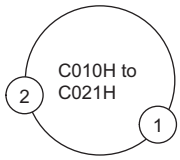
For instance, the figure above represents a status code of 0000H (Idle).

For status codes, refer to the following.

☞ Page 10 List of status codes

■Arrow connecting large circles, small circle

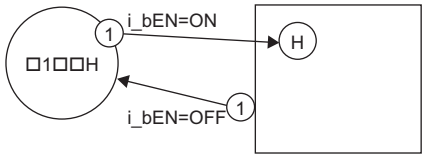
- An arrow connecting two large circles indicates a direction of status transition. Transition conditions are described near the arrow.
- A number in a small circle indicates the priority of transition, for cases when a status has multiple transition directions and multiple transition conditions are satisfied simultaneously. (A smaller number has a higher priority.)



■'Processing interrupted'

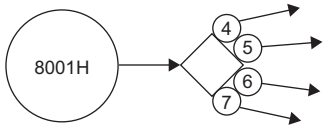
All statuses except 'Idle' (status code: 0000H) shift to 'Processing interrupted' when i_bEN is turned off. At this time, the 8th bit of the status code turns on (the status code becomes □1□□H).

When i_bEN is turned on while the status is 'Processing interrupted' (status code: □1□□H), the 8th bit of the status code turns off and the status returns to the previous one (represented by 'H' in the figure below).



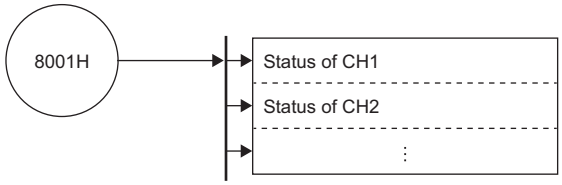
■Selection point

The status transitions from 'Status common to all channels' (Start-up (status code: 8001H)) to the selection point. A condition of each channel determines to which direction the status shifts from this selection point.

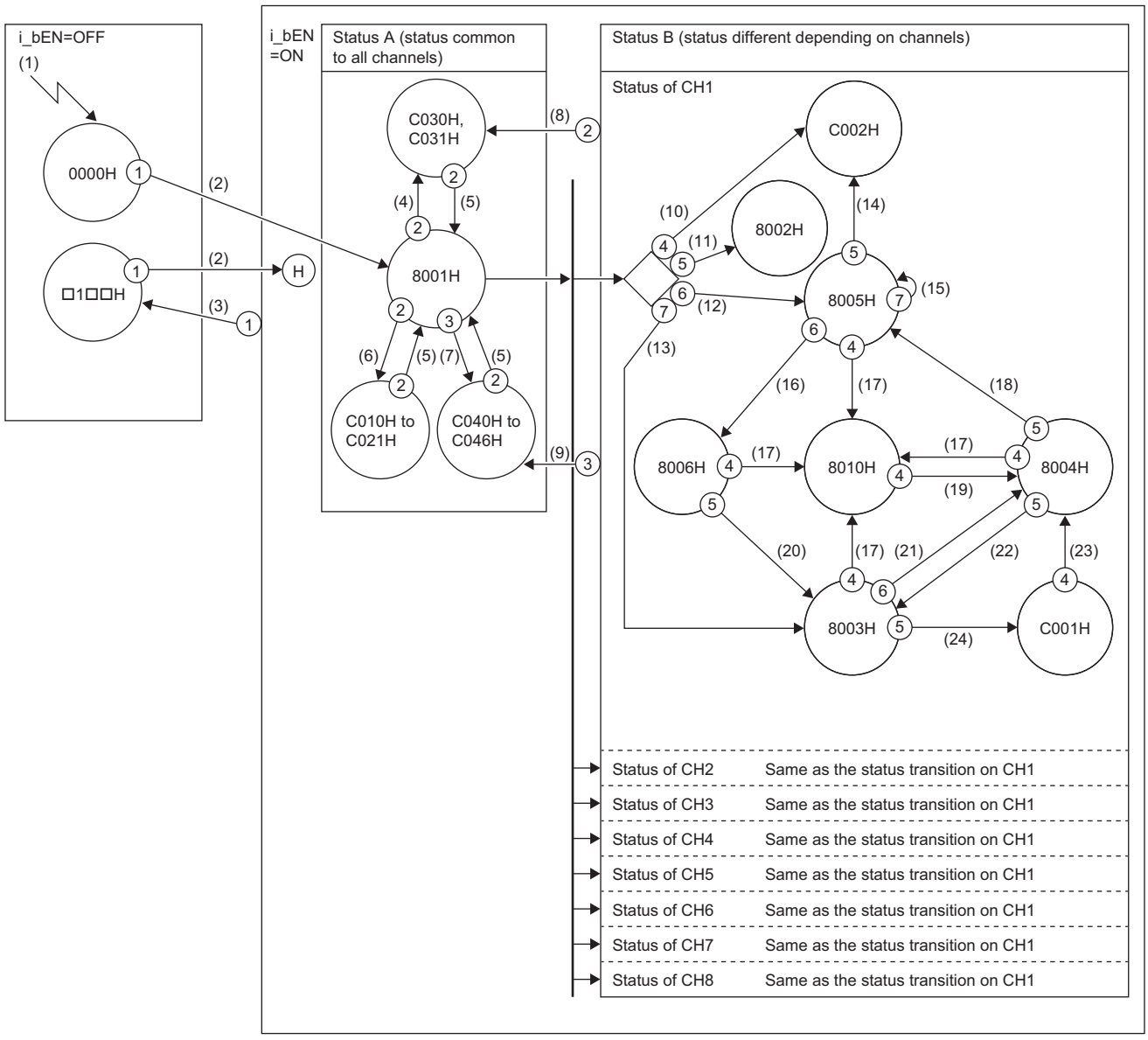


■Parallel

The status transitions from 'Status common to all channels' (Status A) to 'Status different depending on channels' (Status B).



State transition diagram



No.	Description
(1)	Power ON
(2)	i_bEN = ON
(3)	i_bEN = OFF
(4)	Safety communication error or module type inconsistent
(5)	Error clear
(6)	Module parameter value out of the range
(7)	SIL2 standard program FB error detected
(8)	Safety communication error
(9)	Module information read error or module information write error

No.	Description
(10)	Start-up completed and an error was detected in the previous circuit diagnostics.
(11)	Start-up completed and D/A conversion disabled
(12)	Start-up completed, D/A conversion enabled, and start-up diagnostics enabled
(13)	Start-up completed, D/A conversion enabled, and start-up diagnostics disabled
(14)	SIL2 D/A conversion cycle has elapsed and an error is detected in the circuit diagnostics.
(15)	Start-up completed, D/A conversion enabled, and start-up diagnostics enabled
(16)	No error is detected in the circuit diagnostics.
(17)	Output disabled
(18)	SIL2 D/A conversion cycle has elapsed as well as either of the following conditions is satisfied when D/A conversion circuit diagnostic cycle has elapsed. • i_bDiagSetting (circuit diagnostics execution setting) is set to Auto (off). • i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on), and circuit diagnostics start is requested within the time specified in i_uDiagWaitTim (circuit diagnostics request WAIT time).
(19)	Output enabled
(20)	SIL2 D/A conversion cycle has elapsed.
(21)	No error is detected in the analog output read-back.
(22)	Either of the following conditions is satisfied when SIL2 D/A conversion cycle has elapsed. • D/A conversion circuit diagnostic cycle has not elapsed. • D/A conversion circuit diagnostic cycle has elapsed, i_bDiagSetting (circuit diagnostics execution setting) is set to Manual (on), and circuit diagnostics start is not requested within the time specified in i_uDiagWaitTim (circuit diagnostics request WAIT time).
(23)	Error clear
(24)	SIL2 D/A conversion cycle has elapsed and an error is detected in the analog output read-back.

INSTRUCTION INDEX

M

MEMO

REVISIONS

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

Revision date	*Manual number	Description
June 2018	BCN-P5999-0894-A	First edition
December 2018	BCN-P5999-0894-B	■Added or modified parts Section 1.1, 2.2
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