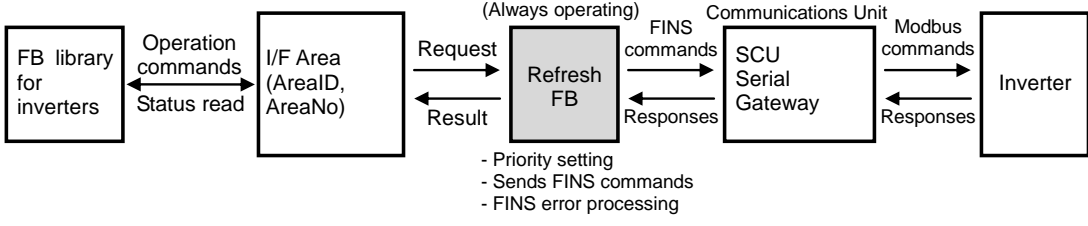
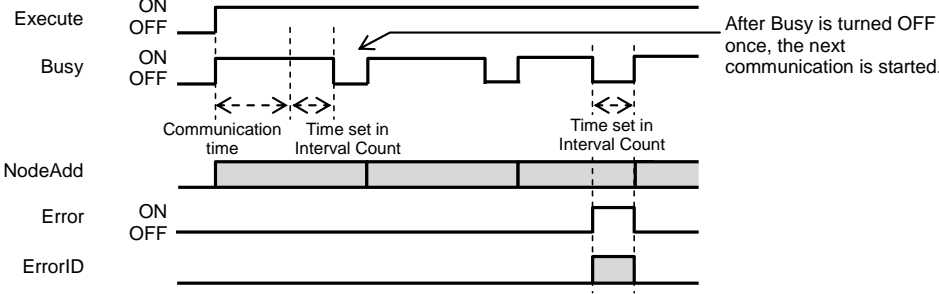
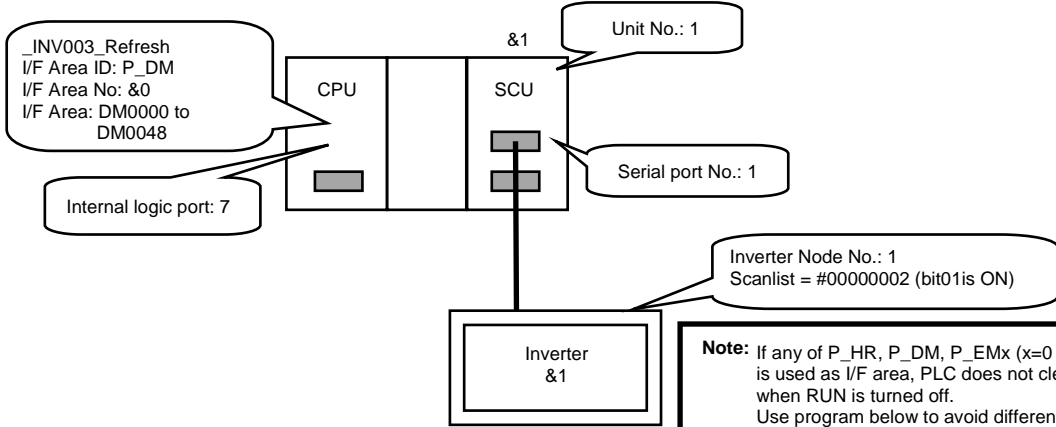


<b>INV 003</b>	<b>Status Refresh: _INV003_Refresh</b>
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<b>Basic function</b>	Refreshes the Inverter status.	
<b>Symbol</b>		
<b>File name</b>	Lib\FBL\omronlib\Inverter\INVRT(MX2_RX)\Serial\_INV003_Refresh.cxf	
<b>Applicable models</b>	Inverters	3G3MX2-****-V1 3G3RX-****-V1
	CPU Unit	CJ2H-CPU** Unit version 1.4 or later CJ2M-CPU** Unit version 2.0 or later CP1H Unit version 1.2 or later CP1L (except 10 points CPU) Unit version 1.0 or later
	Serial Communications Unit	CJ1W-SCU41-V1 Unit version 1.3 or later CJ1W-SCU42 Unit version 2.0 or later CJ1W-SCU31-V1 Unit version 1.3 or later CJ1W-SCU32 Unit version 2.0 or later
	RS-422A/485 Option Board	CP1W-CIF11 CP1W-CIF12
	CX-Programmer	Version 9.0 or higher
<b>Language</b>	Ladder programming language	
<b>Conditions for usage</b>	<p>This FB can be used with the system connected by the serial ports which support Modbus communication protocols with the Serial Gateway function.</p> <ul style="list-style-type: none"> <li>· Serial Communications Unit (SCU)</li> <li>· CP1H Series CPU Unit's serial port</li> <li>· CP1L Series CPU Unit's serial port</li> </ul> <p>■ Settings</p> <p>PLC Settings "Comms Instructions Settings in FB"</p> <ul style="list-style-type: none"> <li>· Response timeout (default: 2 s)</li> <li>· Retry counts (default: 0)</li> </ul> <p>■ Shared Resources</p> <ul style="list-style-type: none"> <li>· Communications port (internal logic port)</li> <li>· PLC Area specified as I/F Area ID (AreaID) and I/F Area No (AreaNo)</li> </ul> <p>■ Parameter Settings</p> <p>Configure communications settings in an appropriate Serial Communications Unit. These settings must be the same as inverter parameter settings. Use the serial gateway mode as a communication mode.</p> <p>■ Inverter Settings</p> <p>For wiring method, refer to the manual of the applicable inverter. Set inverter parameters according to Modbus communication specifications to be used. Especially for 1:n connection, set all inverters to the same communications settings. Set 1 to 31 as the inverter node address without overlaps. For inverter parameter setting method, refer to the user's manual of each inverter.</p>	

<p><b>Function description</b></p>	<p>This FB communicates with the inverter.</p> <p>When commands in the FB library for inverters are executed, this FB converts those commands into Modbus commands to communicate with the inverter and returns a result to the FB library for inverters. Also, the inverter status is periodically read. It is necessary to always activate this FB in order to use the FB library for inverters.</p>  <p style="margin-left: 40px;">- Priority setting - Sends FINS commands - FINS error processing</p> <p>■ <b>Output Variables Behavior</b> Processing (Busy) is turned ON when communication is started, and turned OFF after the elapse of the time set in Interval Count since the communication has been completed. When a communication error has occurred, Error (Error) is turned ON and Processing (Busy) is turned OFF. The next communication is automatically started after the elapse of the time set in Interval Count since the communication has been completed.</p> 
<p><b>FB definition</b></p>	<p>Always ON connection type Connect the EN input to the Always ON flag (P_ON). It is impossible to use the same Instance in several areas.</p>
<p><b>FB precautions</b></p>	<ul style="list-style-type: none"> <li>• To use this FB, create one instance for each serial port to be used.</li> <li>• Design the safety system in consideration of a long response time so that no danger can occur even if communications are interrupted.</li> <li>• This FB uses FINS communications commands. When this FB is executed with other FINS communications performed, test sufficiently before the operation to check that there is no effect.</li> <li>• Take safety measures separately, such as wiring directly to an external sensor input of the inverter, to prevent from entering the operation prohibited area. The inverter continues to operate even if communications are interrupted.</li> <li>• Set the Interval Count in consideration of the communication time. Commands, such as stopping, are not sent until the elapse of that waiting time.</li> </ul>
<p><b>EN input condition</b></p>	<ul style="list-style-type: none"> <li>• Connect the EN input to the Always ON flag (P_ON). If the EN is connected to a contact, this FB output is held by turning OFF the contact.</li> </ul>
<p><b>Restrictions Others</b></p>	<ul style="list-style-type: none"> <li>• Allocate this FB to the cyclic task. This FB does not operate with the interrupt task.</li> <li>• Basically, always turn ON the EN input.</li> <li>• When the input variable value is out of range, this FB does not execute the command. Especially in I/F Area, it is impossible to specify a position that is out of the I/O memory range or EM bank limit. Note that it is determined as out of the input range.</li> <li>• Do not specify "Function block/SFC memory" or "File memory" to I/F Area.</li> <li>• If I/F Area uses EM or DM, clear the applicable area when the program starts. (Refer to Application example below.) A previous RUN command may remain in the memory, which can cause an unexpected start.</li> <li>• Do not change relays in I/F Area during this FB operation because this FB uses them.</li> </ul>

<b>Application example</b>	<p>Refreshes data written in the specified area. (Communications with the inverter are established via the Serial Communications Unit (SCU), No. 1.)</p>  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Note:</b> If any of P_HR, P_DM, P_EMx (x=0 through C) is used as I/F area, PLC does not clear the bits when RUN is turned off. Use program below to avoid different action from P_IOM or P_WM, and clear bits by BSET command as shown below.</p> </div> <div style="margin-top: 20px;"> <p>P_First_Cycle → BSET(071)   #0000   D0   D48 → Clear I/F Area when the operation starts.</p> <p style="text-align: center;">Refresh</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th style="width: 30%; text-align: center;">_INV003_Refresh</th> <th style="width: 10%;"></th> <th style="width: 40%;"></th> </tr> </thead> <tbody> <tr> <td>P_On</td> <td>(BOOL) EN</td> <td>(BOOL) ENO</td> <td></td> </tr> <tr> <td>Unit selection &amp;1</td> <td>(INT) UnitSelect</td> <td>(BOOL) BUSY</td> <td>Processing</td> </tr> <tr> <td>Serial port No. &amp;1</td> <td>(INT) Physical_Port No</td> <td>(INT) NodeAddr</td> <td>Node No. in process</td> </tr> <tr> <td>Internal logic port &amp;7</td> <td>(INT) InternalLogic_PortNo</td> <td>(BOOL) Error</td> <td>Error</td> </tr> <tr> <td>Scan List #00000002</td> <td>(DWORD) Scanlist</td> <td>(WORD) ErrorID</td> <td>Error code</td> </tr> <tr> <td>Interval Count &amp;0</td> <td>(UINT) IntervalCount</td> <td></td> <td></td> </tr> <tr> <td>I/F Area ID #0082</td> <td>(WORD) AreaID</td> <td></td> <td></td> </tr> <tr> <td>I/F Area No &amp;0</td> <td>(INT) AreaNo</td> <td></td> <td></td> </tr> </tbody> </table> </div>		_INV003_Refresh			P_On	(BOOL) EN	(BOOL) ENO		Unit selection &1	(INT) UnitSelect	(BOOL) BUSY	Processing	Serial port No. &1	(INT) Physical_Port No	(INT) NodeAddr	Node No. in process	Internal logic port &7	(INT) InternalLogic_PortNo	(BOOL) Error	Error	Scan List #00000002	(DWORD) Scanlist	(WORD) ErrorID	Error code	Interval Count &0	(UINT) IntervalCount			I/F Area ID #0082	(WORD) AreaID			I/F Area No &0	(INT) AreaNo		
	_INV003_Refresh																																				
P_On	(BOOL) EN	(BOOL) ENO																																			
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<b>Related manuals</b>	<p>For the programming with variables, refer to CHAPTER 4 Reference in PART 1: CX-Programmer, CX-Programmer Operation Manual (Cat. No. W446).</p>																																				

■ Variable Table  
Input Variables

Name	Variable name	Data type	Default	Range	Description												
EN	EN	BOOL	0 (OFF)	ON/OFF	1 (ON): Starts FB 0 (OFF): Does not start FB												
Unit selection	UnitSelect	INT	&0	&0 to &15, #CCCC, #CCCD	Specifies the connected Unit and serial port. ■ For CP1H/CP1L-M series CPU Unit's serial port												
Serial port No.	Physical_PortNo	INT	&1	&1, &2	<table border="1" style="width: 100%;"> <tr> <td>Unit selection UnitSelect</td> <td>#CCCC</td> </tr> <tr> <td>Serial port No. Physical_PortNo</td> <td>&amp;1: Port 1 &amp;2: Port 2</td> </tr> </table> ■ For CP1L-L series CPU Unit's serial port <table border="1" style="width: 100%;"> <tr> <td>Unit selection UnitSelect</td> <td>#CCCD</td> </tr> <tr> <td>Serial port No. Physical_PortNo</td> <td>&amp;1: Port 1</td> </tr> </table> ■ For Serial Communications Unit (SCU) <table border="1" style="width: 100%;"> <tr> <td>Unit selection UnitSelect</td> <td>&amp;0 to &amp;15: Unit No.</td> </tr> <tr> <td>Serial port No. Physical_PortNo</td> <td>&amp;1: Port 1 &amp;2: Port 2</td> </tr> </table>	Unit selection UnitSelect	#CCCC	Serial port No. Physical_PortNo	&1: Port 1 &2: Port 2	Unit selection UnitSelect	#CCCD	Serial port No. Physical_PortNo	&1: Port 1	Unit selection UnitSelect	&0 to &15: Unit No.	Serial port No. Physical_PortNo	&1: Port 1 &2: Port 2
Unit selection UnitSelect	#CCCC																
Serial port No. Physical_PortNo	&1: Port 1 &2: Port 2																
Unit selection UnitSelect	#CCCD																
Serial port No. Physical_PortNo	&1: Port 1																
Unit selection UnitSelect	&0 to &15: Unit No.																
Serial port No. Physical_PortNo	&1: Port 1 &2: Port 2																
Internal logic port	InternalLogic_PortNo	INT	&1	&0 to &7	Specifies the internal logic port number.												
Scan List	Scanlist	DWORD	#00000002	#00000002 to #FFFFFFFF	Sets the list of inverters to communicate. Each bit represents the node number. bit1: Node 1, bit2: Node 2 to bit31: Node 31 bit0: not used 1 (ON): Communicate 0 (OFF): Not communicate Communications with the inverter node which corresponds to bit with 1 (ON) are established. For example, in the case of #00000002, only bit 1 is ON. Therefore, only Node 1 communicates.												
Interval Count	IntervalCount	UINT	&0	&0 to &65535	Sets a waiting time from completion to start of the communications. Unit: 10 ms Processing (Busy) is held at least for the specified time because the timer has a margin of error. When &0 is set, Processing (Busy) is turned OFF for one cycle.												
I/F Area ID	AreaID	WORD	#0082	Refer to the right column	Specifies the I/F Area type. P_CIO(#00B0): CIO Area P_WR(#00B1): WR Area P_HR(#00B2): HR Area P_DM(#0082): DM Area P_EM00(#0050) to P_EM18(#0068): EM Area (Bank 00 to 18)												
I/F Area No	AreaNo	INT	&0	Refer to the right column	Specifies the first address of I/F Area. The number of occupied words in I/F Area is 49 words. More than one Area cannot be set. CIO Area: &0 to &6094 WR Area: &0 to &462 HR Area: &0 to &462 DM Area/EM Area: &0 to &32718												

**Output Variables**

Name	Variable name	Data type	Range	Description
ENO	ENO	BOOL	ON/OFF	1 (ON): FB operating normally 0 (OFF): FB not operating normally
Processing	Busy	BOOL	ON/OFF	1(ON): Communications in progress 0(OFF): Communications completed (0 (OFF) at least for 1 cycle)
Node No. in process	NodeAddr	INT		Shows the Node No. in which communications are in progress or completed.
Error	Error	BOOL	ON/OFF	When this variable is 1 (ON), an inverter error has occurred.
Error code	ErrorID	WORD	#0000 to #FFFF	Returns the code for the error which occurred in the FB. For details on the error, refer to "Error/Abort Condition List". The error code is output during error. Cleared automatically when the error is reset.

**■ Error/Abort Condition List**

Name	Error code	Probable error cause	Corrective measure
Normal completion	#0000	-	-
Response error	#0001 to #7FFF	A response error of the communications command occurred.	Identify an error cause from the FINS Commands End Codes List in Communications Command Reference Manual (W342).
Modbus exception response	#8001 to #9FFF	An exception response was returned via Modbus communication.	Identify an error cause from the Exception Response in Multi-function Compact Inverter MX2 Series Type V1 User's Manual (I585) and High-function General-purpose Inverter 3G3RX Series Type V1 User's Manual (I578). The exception response and code are respectively output to upper double digits (xx) and lower double digits (yy) of an error code "#xyy".
Out of the input variable	#A000	The input variable in this FB is out of range.	Set an input variable value within the specified range.

**DATA I/F Area**

This FB and FBs for inverters use I/F Area. Do not operate this I/F Area outside FBs.

a: Address specified in I/F Area ID (AreaID) and I/F Area No (AreaNo)

Address	Data
a+00	Message communication command and status
a+01	Number of bytes of command data
a+02	Number of bytes of response data
a+03 : a+09	Command area
a+10 : a+15	Response area
a+16 a+17	Communication status of each node (bit1: Node 1, bit2: Node 2 to bit31: Node 31)
a+18	Axis command and status data for Node 1
a+19	Axis command and status data for Node 2
:	:
a+47	Axis command and status data for Node 30
a+48	Axis command and status data for Node 31

Message communication command and status  
(W: Command, R: Status)

Address	bit	Signal name	R/W
a+00	00	Access right acquisition	W
	01	Frequency reference model determination enabled	W
		Not used	-
	02	Not used	-
	03	Not used	-
	04	Not used	-
	05	Not used	-
	06	Not used	-
	07	Not used	-
	08	Waiting response	R
	09	Not used	-
	10	Not used	-
	11	Not used	-
	12	Not used	-
	13	Not used	-
	14	Not used	-
15	Not used	-	

Axis command and status data  
(W: Command, R: Status)

Address	bit	Signal name	R/W
a+18 : a+48	00	RUN command	W
	01	Rotation direction	W
		Stop command	W
	02	Stop command	W
	03	Error reset	W
	04	Operation status	R
	05	Rotation direction	R
	06	Inverter operation ready	R
	07	MoveVelocity communication in execution	-
	08	During RUN	R
	09	Speed arrival (Constant speed arrival)	R
	10	Speed arrival (Set frequency or more)	R
	11	Overload warning	R
	12	Excessive PID deviation	R
	13	During error	R
	14	Not used	-
15	Communication error	R	

■ Revision History

Version	Date	Contents
1.00	2013.4.1	Original production

■ Note

This document explains the function of the function block.  
It does not provide information of restrictions on the use of Units and Components or combination of them. For actual applications, make sure to read the operation manuals of the applicable products.

## Appendix

### ■ Hardware Configuration

3G3MX2/3G3RX-V1 Series Inverter can be connected to the following serial ports which support Modbus communication protocols with the Serial Gateway function.

- Serial ports of Serial Communications Unit (SCU)
- CP1H Series CPU Unit's serial port
- CP1L Series CPU Unit's serial port

### ■ Communications Settings

It is necessary to conform the communication specifications for all inverters, which are connected with the serial communications, to the communication settings for the serial port.

All components connected on the same communication line are set to operate with the Modbus communication protocols and their communication specifications are required to be same.

The following table shows the default settings of the inverter in the communication settings. Change the settings according to the communication specifications.

Parameter No.	Parameter name	Default setting	Setting example
A001	1st Frequency Reference Selection	02: Digital Operator	03: Modbus communication
A002	1st RUN Command Selection	02: Digital Operator	03: Modbus communication
C071	Communication Speed Selection (Baud Rate Selection)	04: 4800 bps (RX series) 05: 9600 bps (MX series)	05: 9600bps
C072	Communication Station No. Selection	1	1
C073	Communication Bit Length Selection <sup>*1</sup>	7: 7 bits	8: 8 bits
C074	Communication Parity Selection	00: No parity	00: No parity
C075	Communication Stop Bit Selection	1: 1 bit	1: 1 bit
C076	Operation Selection on Communication Error	02: Ignore	02: Ignore
C077	Communication Error Timeout Time	0.00 [s]	0.00 [s]
C078	Communication Wait Time	0 [ms]	0 [ms]
C079	Communication Method Selection <sup>*1</sup>	01: Modbus	01: Modbus

\*1 These parameters are only for RX series. They cannot be set in MX2 series.

### ■ FB List

The following table shows FBs to be used in combination with FB \_INV003\_Refresh.

FB name	Function name	Description
_INV003_Refresh	Status Refresh	Refreshes the Inverter status.
_INV034_MoveVelocity	Speed Command (frequency)	Outputs a frequency, rotation direction, and RUN command to the Inverter.
_INV035_ChangeVelocity	Frequency Change	Changes a frequency reference for the inverter.
_INV061_Stop	Deceleration Stop	Stops the Inverter with deceleration.
_INV081_Reset	Reset	Resets an Inverter error.
_INV204_ReadStatus	Status Read	Reads the Inverter status.
_INV205_ReadAxisError	Error Read	Reads Error information from the Inverter.
_INV206_ReadParameter	Parameter Read	Reads the setting value of the specified parameter.
_INV402_WriteParameter	Parameter Write	Writes the setting value of the specified parameter.

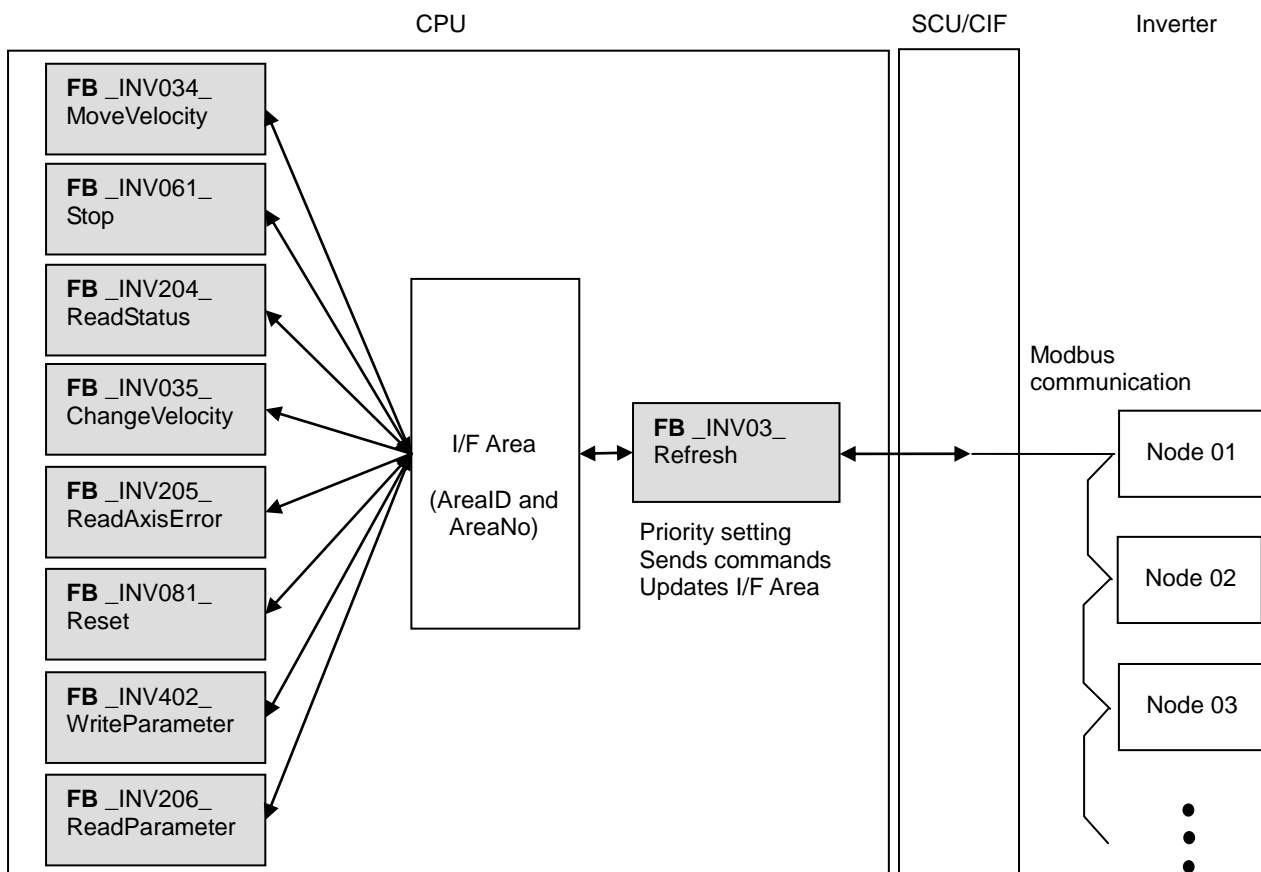
### ■ Relation with FB \_INV003\_Refresh

The following diagram shows relations between FB \_INV003\_Refresh and the other FBs.

One FB \_INV003\_Refresh for one serial port is used to communicate with the inverter. The FB \_INV003\_Refresh sends Modbus commands to the inverter according to data in I/F Area and writes received data to I/F Area.

Other FBs (\_INV034\_MoveVelocity, etc.) execute functions such as Parameter Read and commands by writing data into I/F Area via the FB \_INV003\_Refresh.

Therefore, it is necessary to always activate the FB \_INV003\_Refresh.



■ Priorities for FB

The FB \_INV003\_Refresh transmits commands in the order of priority as shown below.

Priority	FB name	Description
High	_INV061_Stop	Has the highest priority.
Low	_INV034_MoveVelocity _INV035_ChangeVelocity _INV081_Reset _INV205_ReadAxisError _INV206_ReadParameter _INV402_WriteParameter	Execution of FBs in the left column at the same time or during the execution of FB _INV061_Stop: <ul style="list-style-type: none"> <li>The FB _INV034_MoveVelocity is not executed. Start up it again after the FB _INV061_Stop has been completed.</li> <li>FBs other than the FB _INV034_MoveVelocity are executed after the FB _INV061_Stop has been completed.</li> </ul> Execution of the FB _INV061_Stop during the execution of FBs in the left column: <ul style="list-style-type: none"> <li>The FB _INV034_MoveVelocity is interrupted.</li> <li>FBs other than the FB _INV034_MoveVelocity are executed after the FB _INV061_Stop has been completed.</li> </ul> Simultaneous execution of FBs in the left column: <ul style="list-style-type: none"> <li>They are executed in the order of start-up.</li> </ul>
N/A	_INV204_ReadStatus	Executed independent of the other FBs.

■ Execution order of FB for some inverters

When some inverters are connected to the same port, the FB \_INV003\_Refresh transmits other FBs to inverters in the order of node number. For example, when the FB \_INV034\_MoveVelocity and \_INV206\_ReadParameter start up in the same cycle for the inverters, node No. 1, 2, and 3, they are transmitted in the following order.

Execution order	Target node No.	FB to be transmitted
1	Node 1	FB _INV034_MoveVelocity
2	Node 2	FB _INV034_MoveVelocity
3	Node 3	FB _INV034_MoveVelocity
4	Node 1	FB _INV206_ReadParameter
5	Node 2	FB _INV206_ReadParameter
6	Node 3	FB _INV206_ReadParameter