

Before using the product

Thank you for using our G100 RAPIEnet+ communication option board.

Manual Revision History

Revision History

No.	Date	Version	Changes
1	2025/11/28	1.00	First Issue

Safety Information

- Always follow safety instructions to prevent accidents and potentially hazardous situations.
- Safety precautions are classified into "WARNING" and "CAUTION," and their meanings are as follows:

Warning

Indicates a potentially hazardous situation, which, if not avoided, may cause death or serious injury.

Caution

Indicates a potentially hazardous situation, which, if not avoided, may cause minor injury or damage to the product.

- Symbols used in this document and on the product indicate the following.

The  symbol indicates that there is a risk of danger, so caution is advised.

The  symbol indicates that there is a risk of electric shock, so caution is advised.

- After reading this manual, store it in a location where the user can easily access it at any time.
- To safely use the functions of the G100 Series Inverter, please read this manual carefully.

Caution

- **Be careful not to damage the CMOS elements on the communication board.**
Static charge may cause malfunctioning of the product.
- **Turn off the inverter before connecting communication cables.**
Otherwise, malfunctions or communication errors may occur.
- **Ensure that the inverter body and the G100 RAPIEnet+ communication option board connectors are connected correctly.**
Otherwise, malfunctions or communication errors may occur.
- **Check the parameter units when configuring the parameter values.**
Otherwise, a communication error may occur.

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PART1 Introduction

1 Overview

The G100 RAPIEnet+ communication option board connects the LSLV-G100 inverter to the industrial communication networks depending on the user selection.

The RAPIEnet+ mode connects to RAPIEnet corresponding to IEC 61158 Type 21 and IEC 62439 RRP international standards and supports RAPIEnet, EtherNet/IP, and Modbus TCP protocols.

The PROFINET mode connects to the PROFINET network corresponding to IEC 61158 Type 10 international standards and supports connections to the LSE Cloud via Modbus TCP, HTTP, and MQTT.

By using 100 Mbps auto-negotiation, collision-free communication is ensured, securing real-time performance in data transmission. This enables the control and monitoring of the G100 inverter through a PLC sequence program or an arbitrary master module.

Simple wiring reduces installation time and facilitates easy maintenance.

(When used with XG5000, compatibility is supported from XGL-EFMxB V8.00 or later, although some functions are limited. For full functionality, XGL-EFMxB V9.10 or later is recommended.)

** You can download the user manual ("Manual_XGT_FEnet")
at <https://sol.ls-electric.com>.

Note

What is RAPIEnet+?

It is a hybrid communication solution that incorporates RAPIEnet, LS ELECTRIC's real-time industrial Ethernet based on international standards for ring control, a highly versatile Modbus TCP, and EtherNet/IP communication technologies. This highly performant and efficient industrial Ethernet by LS ELECTRIC allows for integration of IoT and various future technologies required for the automation industry.

2 G100 RAPIEnet+ Communication Option Board Technical Features

2.1 RAPIEnet+

Items	Description				
Communication Protocol	RAPIEnet, EtherNet/IP, Modbus TCP				
Communication speed	100Mbps				
Communication type	Auto Negotiation				
Communication range	100m (Twisted Pair)				
Service	Smart scaling	Maximum 16 words			
Topology	Line/Ring topology				
Recommended cable	UTP, FTP, STP				
Maximum number of connected stations (varies per PLC specifications)		LS ELECTRIC PLC (Communication Controller)		Other vendor PLC	
		Max Stations (Line)	Max Stations (Ring)	Max Stations (Line)	Max Stations (Ring)
	RAPIEnet*	64		-	
		Specific CPU: 128			
	EtherNet/IP	64		(Varies per PLC specifications)	50 (DLR)
	Modbus TCP	32		(Varies per PLC specifications)	-

* The number of stations is divided into 64 and 128 based on the performance of the combination of the Controller (XGL-EFMxB) and the CPU. Select and configure the system according to the following examples:

- XGI-CPUZ3, 5, 7, XGC-CPUX, XGI-CPUUN (V2.0 or higher): 128 stations including the controller; Other CPU series: 64 stations including the controller.

2.2 PROFINET

Items	Description
Communication Protocol	PROFINET IO CC-B
Communication speed	100Mbps
Communication type	Full Duplex
Maximum Number of Connected Stations (Varies per PLC specifications)	128 units MRP 48 units
Communication range	100m (Twisted Pair)
Service	PROFIdrive Class 1
Topology	Line, Tree, Star, RING topology

3 Package components

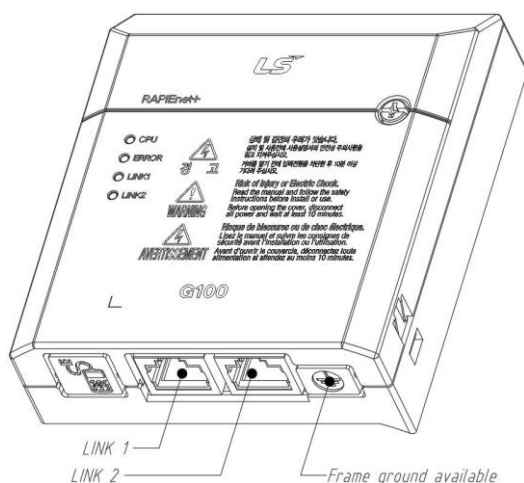
The package includes the G100 RAPIEnet+ communication option board and a quick guide.

4 Model name of the G100 RAPIEnet+ communication option board

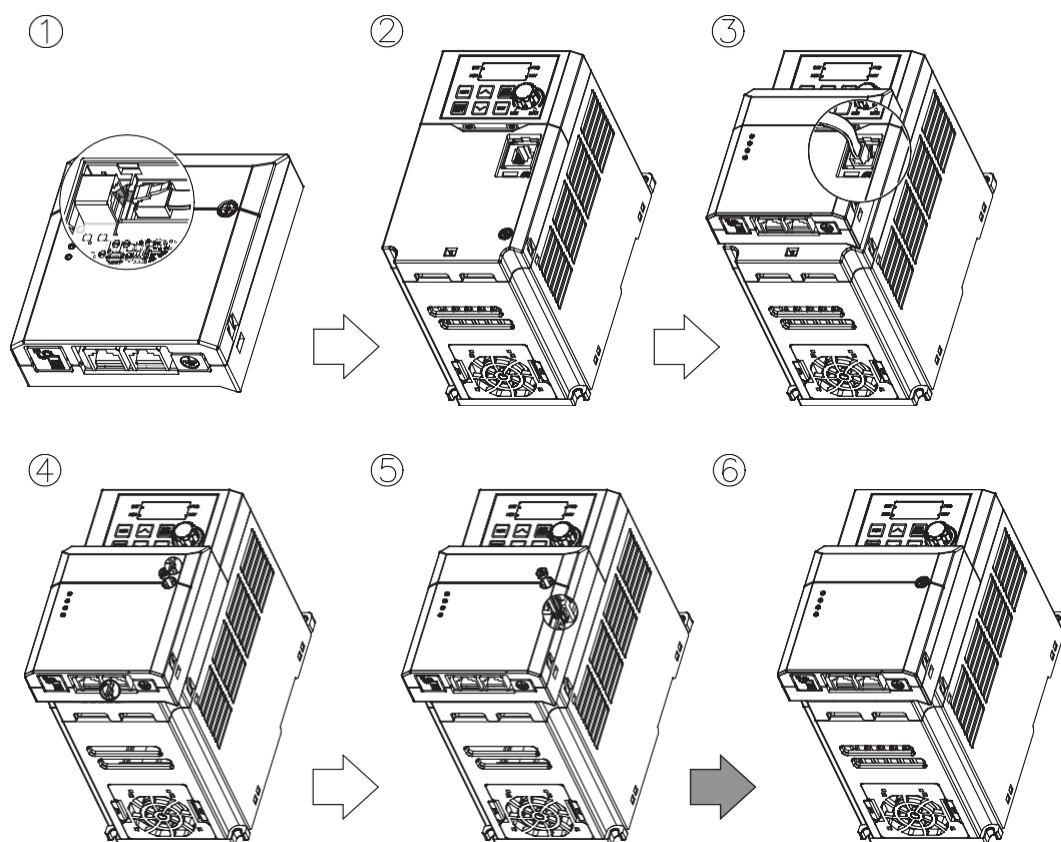
Model name: CEPW-G100

5 G100 RAPIEnet+ communication board layout and installation

5.1 G100 RAPIEnet+ Communication Option Board Appearance



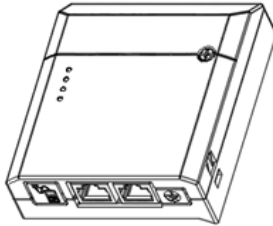
5.2 Installing the G100 RAPIEnet+ communication board



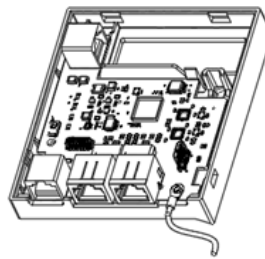
- 1 Connect the supplied RJ45 cable included with the G100 RAPIEnet+ communication option.
- 2 Remove the option cover from the G100 inverter main unit.
- 3 Connect the G100 inverter main unit and the G100 RAPIEnet+ communication option using the supplied RJ45 cable.
- 4 Hook the G100 RAPIEnet+ communication option into the slot on the inverter main unit.
- 5 Tighten the knob screw inside the G100 RAPIEnet+ communication option using a tool.
- 6 The G100 inverter and the G100 RAPIEnet+ communication option are now securely installed

5.3 G100 RAPIEnet+ Communication Option Board Grounding Connection Method and Procedure

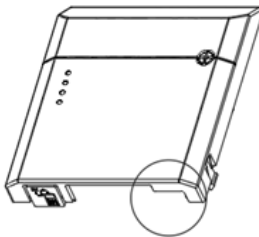
①



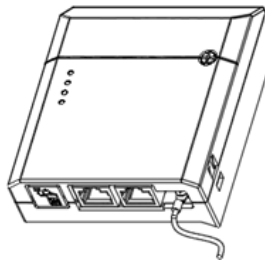
②



③



④



- 1 Remove the front cover from the communication module.
- 2 Fix the ground cable to the communication module using the bottom screw on the circuit board.
- 3 Remove the knockout panel with the grounding symbol from the front cover.
- 4 Install the front cover to the communication module.

Warning

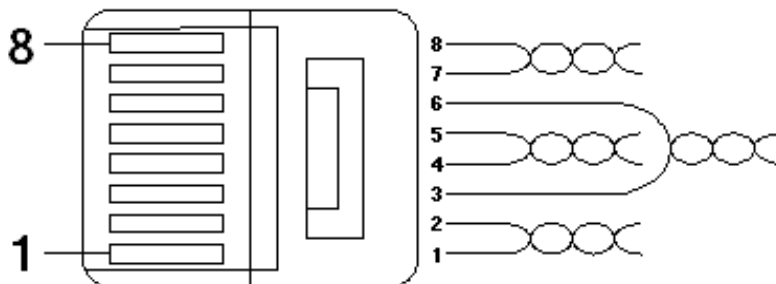
- Do not install or remove the G100 RAPIEnet+ communication option board while the power to the G100 inverter is on.
- Install or remove the G100 RAPIEnet+ communication option board only after the inverter capacitor voltage has completely discharged.
- Ensure that the RJ45 cable between the inverter body and the G100 RAPIEnet+ communication option board does not come loose.
- The G100 RAPIEnet+ communication option board supports Frame Ground (FG).

6 Network connection

6.1 Network connection cable wiring

Pin No.	Signal	Description	Cable color
1	TX+	Data transmission (+)	White/Yellow
2	TX-	Data transmission (-)	Yellow
3	RX+	Data reception (+)	White/Green
4	NONE	Not used	Blue
5	NONE	Not used	White/Blue
6	RX-	Data reception (-)	Green
7	NONE	Not used	White/Brown
8	NONE	Not used	Brown

6.2 Communication cable connector



- The cables connected to pin 1 and pin 2 must be twisted in a pair.
- The cables connected to pin 3 and pin 6 must be twisted in a pair.

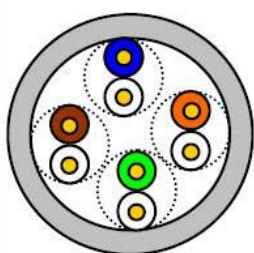
7 Network cable specifications

7.1 Frequency band

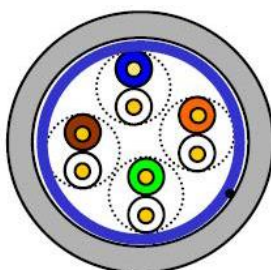
There are five types of UTP cable specifications according to different applications, from category 1 through category 5. Use category 5 for the G100 RAPIenet+ communication option board.

Category 5 network cables support a frequency band up to 100 MHz, with up to 60 MHz channel performance and up to 100 Mbps data transmission speed.

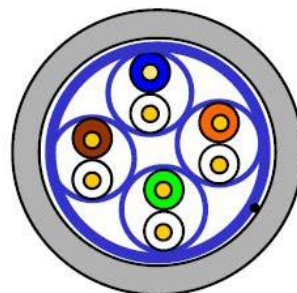
7.2 Twisted pair cable types



UTP



FTP



STP

Category	Description	Usage
UTP (U.UTP)	Unshielded twisted pair cable for high-speed signals	200 MHz max. Voice + Data + Low-quality video/signals
FTP (S.UTP)	Single insulation for the cable core Insulation material: AL/Plastic complex foil or copper braid	100 MHz max. Protection against EMI, electrically stable Voice + Data + Low-quality video signals
STP (S.STP)	Dual insulation for the cable pair and the cable core - Material for cable pair insulation: AL/Plastic complex foil - Material for core insulation: AL/Plastic complex foil or copper braid	500 MHz max. Voice + Data + Video signals Replaces 75Ω coaxial cable

8 Inverter communication address

For detailed information on inverter communication addresses, please refer to "Chapter 8: Full Function Table" in the "G100 User Manual."

** Download the document at <https://sol.ls-electric.com>.

9 Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board

The parameters below display information related to RAPIEnet, EtherNet/IP, PROFINET, and Modbus TCP. The parameters for Protocols R, E, P, and M correspond to RAPIEnet, EtherNet/IP, PROFINET, and Modbus TCP, respectively.

To operate the G100 inverter using the G100 RAPIEnet+ communication option board, set the DRV parameter Command Source of the keypad to 4 (Fieldbus).

To issue frequency reference commands using the G100 RAPIEnet+ communication option board, set DRV parameter Freq Ref Src to 8 (Fieldbus).

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
DRV	Command Source	1	0~4	4: Sets to Fieldbus.	R/E/M/P
Frq	Freq Ref Src	0	0~8	8: Sets to Fieldbus.	R/E/M/P
CM-19	Fbus Option Type	0	0~1	Selects the protocol you want to use. 0: RAPIEnet+ 1: PROFINET	R/E/M/P
CM-06	FBus S/W Ver	-	-	This displays the version of the G100 RAPIEnet+ communication option board installed in the inverter.	R/E/M/P
CM-09	FBus Led	-	-	This displays the LED ON/OFF information of the G100 RAPIEnet+ communication option board.	R/E/M/P
CM-07	FBus ID	10	0~220	This sets the node number of the G100 RAPIEnet+ option board.	R/E

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
CM-10	FBus IP Addr1	192	0~255	Sets the IP address. * To connect to the network via the RAPIEnet protocol after setting CM-25 to "2 (RAPIEnet Enable)," set CM-13 to "100 + CM-07."	R/E/ M/P
CM-11	FBus IP Addr2	168	0~255		
CM-12	FBus IP Addr3	1	0~255		
CM-13	FBus IP Addr4	101	0~255		
CM-14	FBus Subnet CIDR	24	0~32	Sets the Subnet CIDR.	R/E/ M/P
CM-15	FBus Gateway Addr1	192	0~255	Sets the Gateway address.	R/E/ M/P
CM-16	FBus Gateway Addr2	168	0~255		
CM-17	FBus Gateway Addr3	1	0~255		
CM-18	FBus Gateway Addr4	10	0~255		
CM-94	Comm Update	0	0:NO 1:YES	Update to apply the currently configured communication-related parameters.	R/EM/P

CIDR	Subnet Mask	CIDR	Subnet Mask
0	0.0.0.0		
1	128.0.0.0	17	255.255.128.0
2	192.0.0.0	18	255.255.192.0
3	224.0.0.0	19	255.255.224.0
4	240.0.0.0	20	255.255.240.0
5	248.0.0.0	21	255.255.248.0
6	252.0.0.0	22	255.255.252.0
7	254.0.0.0	23	255.255.254.0
8	255.0.0.0	24	255.255.255.0
9	255.128.0.0	25	255.255.255.128
10	255.192.0.0	26	255.255.255.192

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board

CIDR	Subnet Mask	CIDR	Subnet Mask
11	255.224.0.0	27	255.255.255.224
12	255.240.0.0	28	255.255.255.240
13	255.248.0.0	29	255.255.255.248
14	255.252.0.0	30	255.255.255.252
15	255.254.0.0	31	255.255.255.254
16	255.255.0.0	32	255.255.255.255

Note

After making changes to parameters CM-10 – 25, you must set CM-94 (Comm-Update) to "1 (Yes)" to save the changes. (If a parameter change attempt is made and Comm Update CM-94 is not executed, the Error LED will blink red at 2-second intervals to alert the user.)

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board

Code #	Parameter Name	Initial Value	Range	Description	Protocol
CM-30	Para Status Num	3	0~16	Automatically set according to the CIP Input Instance.	R/E/P
CM-31	Para Status-01	000A	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-32	Para Status-02	000E	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-33	Para Status-03	000F	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-34	Para Status-04	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-35	Para Status-05	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-36	Para Status-06	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P

Keypad Parameters Related to the G100 RAPINet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
CM-37	Para Status-07	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-38	Para Status-08	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-39	Para Status-09	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-40	Para Status-10	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-41	Para Status-11	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-42	Para Status-12	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-43	Para Status-13	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-44	Para Status-14	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-45	Para Status-15	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-46	Para Status-16	0000	0x0000 ~0xFFFF	Set the inverter data address to be read by the client. (Hex.)	R/E/P
CM-50	Para Ctrl Num	2	0~16	Automatically set according to the CIP Output Instance.	R/E/P
CM-51	Para Control-01	0005	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
CM-52	Para Control-02	0006	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-53	Para Control-03	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-54	Para Control-04	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-55	Para Control-05	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-56	Para Control-06	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-57	Para Control-07	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-58	Para Control-08	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-59	Para Control-09	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-60	Para Control-10	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-61	Para Control-11	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-62	Para Control-12	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-63	Para Control-13	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
CM-64	Para Control-14	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-65	Para Control-15	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
CM-66	Para Control-16	0000	0x0000 ~0xFFFF	Set the command inverter data address in the client. (Hex.)	R/E/P
PR-12	Lost Cmd Mode	None	00: None 01: FreeRun 02: Dec 03: Hold Input 04: Hold Output 05: Lost Preset	This sets the inverter operation when the Lost Command occurs due to communication command loss with the G100 RAPIEnet+ communication option board. ¹	R/E/ M/P

¹ Lost Cmd Mode

Set Value	Functionality
"None"	Maintains the previous status.
"FreeRun"	Lost Command Trip occurs, and a free run is made.
"Dec"	Lost Command Trip occurs, and the inverter decelerates to stop for set time for [PRT-07] Trip Dec Time.
"Hold Input"	Lost Command Warning occurs and the inverter operates with the previous speed reference.
"Hold Output"	Lost Command Warning occurs and the inverter operates with the previous running speed.
"Lost Preset"	A Lost Command Warning occurs, and the inverter operates with frequency reference set at [PR-14] Lost Preset Freq.

Keypad Parameters Related to the G100 RAPIEnet+ Communication Option Board					
Code #	Parameter Name	Initial Value	Range	Description	Protocol
PR-13	Lost Cmd Time	1.0	0.1~120.0	This sets the communication command loss determination time with the G100 RAPIEnet+ communication option board	R/E/M/P
PR-14	Lost Preset Freq	0.00	0.00 ~ 60.00	Sets the Lost Preset speed	R/E/M/P
PR-67	Lost Opt Cmd Mode	1: Free-Run	0: None 1: Free-Run 2: Dec	This function is enabled only when the run command or frequency reference is set to Fieldbus. It configures the operation of the inverter when a Lost Command occurs due to the communication option not being installed or due to loss of communication commands. ²	R/E/M/P
PR-68	Lost Opt Cmd Delay	0.0	0.0~120.0	Sets the judgment time for the mode operation configured in Pr.67	R/E/M/P

² Lost Opt Cmd Mode

Set Value	Functionality
"None"	Maintains the previous status.
"FreeRun"	An Option Lost Command occurs, and the inverter performs a free run.
"Dec"	An Option Lost Command occurs, and the inverter decelerates to a stop using the time set in [PRT-07] Trip Dec Time.

PART2 RAPIEnet+ Communication Functions

1 Description of Keypad Parameters Related to RAPIEnet+ Mode

1.1 Description of keypad parameters (simplified)

The keypad parameters are summarized in the table below. Detailed descriptions are provided in each parameter group.

Code #	Parameter Name	Description
DRV	Command Source	Command Source
Frq	Freq Ref Src	Frequency Settings
CM-06	FBus S/W Ver	G100 RAPIEnet+ Communication Option Board S/W Version
CM-09	FBus Led	G100 RAPIEnet+ Communication Option Board LED Indications
CM-07	FBus ID	G100 RAPIEnet+ Communication Option Board Station Number (G100 RAPIEnet+ Communication Option Board ID)
CM-10	FBus IP Addr1	Enter the 1st decimal number of the IP address.
CM-11	FBus IP Addr2	Enter the 2nd decimal number of the IP address.
CM-12	FBus IP Addr3	Enter the 3rd decimal number of the IP address.
CM-13	FBus IP Addr4	Enter the 4th decimal number of the IP address.
CM-14	FBus Subnet CIDR	Subnet CIDR (Decimal input)
CM-15	FBus Gateway Addr1	Enter the 1st decimal number of the gateway address.
CM-16	FBus Gateway Addr2	Enter the 2nd decimal number of the gateway address.
CM-17	FBus Gateway Addr3	Enter the 3rd decimal number of the gateway address.

Description of Keypad Parameters Related to RAPIEnet+ Mode

Code #	Parameter Name	Description
CM-18	FBus Gateway Addr4	Enter the 4th decimal number of the gateway address.
CM-22	OptParameter13	Network communication speed (0 fixed, automatically set to 100 Mbps)
CM-23	OptParameter14	RAPIEnet: Sets Input Parameter Size EtherNet/IP: Set Input Instance
CM-24	OptParameter15	RAPIEnet: Sets Output Parameter Size EtherNet/IP: Set Output Instance
CM-25	OptParameter16	Enable or disable RAPIEnet 2: RAPIEnet Enable 0: RAPIEnet Disable(Default)
CM-94	Comm Update	Reflect the network parameter changes.
CM-30	Para Status Num	Displays the number of transmitted data
CM-31	Para Status-01	Set address 1 for storing the transmitted data.
CM-32	Para Status-02	Set address 2 for storing the transmitted data.
CM-33	Para Status-03	Set address 3 for storing the transmitted data.
CM-34	Para Status-04	Set address 4 for storing the transmitted data.
CM-35	Para Status-05	Set address 5 for storing the transmitted data.
CM-36	Para Status-06	Set address 6 for storing the transmitted data.
CM-37	Para Status-07	Set address 7 for storing the transmitted data.
CM-38	Para Status-08	Set address 8 for storing the transmitted data.
CM-39	Para Status-09	Set address 9 for storing the transmitted data.
CM-40	Para Status-10	Set address 10 for storing the transmitted data.
CM-41	Para Status-11	Set address 11 for storing the transmitted data.
CM-42	Para Status-12	Set address 12 for storing the transmitted data.
CM-43	Para Status-13	Set address 13 for storing the transmitted data.
CM-44	Para Status-14	Set address 14 for storing the transmitted data.
CM-45	Para Status-15	Set address 15 for storing the transmitted data.
CM-46	Para Status-16	Set address 16 for storing the transmitted data.
CM-50	Para Ctrl Num	Displays the number of received data

Code #	Parameter Name	Description
CM-51	Para Control-01	Set address 1 for storing the received data.
CM-52	Para Control-02	Set address 2 for storing the received data.
CM-53	Para Control-03	Set address 3 for storing the received data.
CM-54	Para Control-04	Set address 4 for storing the received data.
CM-55	Para Control-05	Set address 5 for storing the received data.
CM-56	Para Control-06	Set address 6 for storing the received data.
CM-57	Para Control-07	Set address 7 for storing the received data.
CM-58	Para Control-08	Set address 8 for storing the received data.
CM-59	Para Control-09	Set address 9 for storing the received data.
CM-60	Para Control-10	Set address 10 for storing the received data.
CM-61	Para Control-11	Set address 11 for storing the received data.
CM-62	Para Control-12	Set address 12 for storing the received data.
CM-63	Para Control-13	Set address 13 for storing the received data.
CM-64	Para Control-14	Set address 14 for storing the received data.
CM-65	Para Control-15	Set address 15 for storing the received data.
CM-66	Para Control-16	Set address 16 for storing the received data.
PR-12	Lost Cmd Mode	Select operation mode for a lost command.
PR-13	Lost Cmd Time	Sets the communication command loss detection time
PR-14	Lost Preset Freq	Set the target operating frequency in case of communication command loss.
PR-67	Lost Opt Cmd Mode	Selects the communication option command loss mode
PR-68	Lost Opt Cmd Delay	Sets the communication loss detection time of the communication option

1.2 Operation Group

① **[DRV] Command Source: Command Source**

Select the command source for the G100 inverter. To input run commands via communication using the G100 RAPIEnet+ Communication Option Board, select 4 (Fieldbus).

② **[FRQ] Freq Ref Src: Frequency reference source**

Select the frequency command source for the G100 inverter. To input frequency reference commands via communication using the G100 RAPIEnet+ Communication Option Board, select 8 (Fieldbus).

1.3 CM group

① **[CM-06] FBus S/W Ver: G100 RAPIEnet+ Communication Option Board S/W Version**

This automatically displays the S/W version of the G100 RAPIEnet+ communication option board currently installed in the G100 inverter.

② **[CM-07] FBus ID: G100 RAPIEnet+ Communication Option Board Node Number (G100 RAPIEnet+ Communication Option Board ID)**

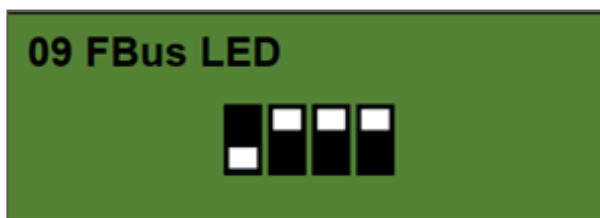
This sets the node number of the G100 RAPIEnet+ communication option board. The setting range is 0 to 220, providing a total of 221 station numbers. (Required when communication is configured using the RAPIEnet protocol.) For the maximum number of connectable stations, refer to page 2 of this document.

When setting the station ID, be careful not to use a station ID that is not already occupied by the PLC system or other network devices.

After making setting changes, you must set [CM-94] Comm Update to "1 (Yes)" before the changes can take effect.

③ **[CM-09] FBus Led: G100 RAPIEnet+ Communication Option Board LED Indications**

You can check the LED indicators of the G100 RAPIEnet+ Communication Option Board via the keypad. Refer to "PART2 Chapter 4 LED Indications and troubleshooting" of this document for operations related to the LED display.

Example of the [CM-09] FBus LED Indication

LINK1	LINK2	ERROR LED	CPU LED
LED OFF	LED ON	LED ON	LED ON

④ **[CM-22] OptParameter13: Set the network communication speed. (100Mbps Auto Negotiation)**

The communication speed is fixed to 0 and is automatically set to 100 Mbps without requiring a separate configuration.

⑤ **[CM-23] OptParameter14: Transmission data setting**

This is used for monitoring the smart extension transmission data of the G100 RAPIenet+ communication option board. Set the desired values at transmission data addresses [CM-31]-[CM-46].

You can set "OptParameter14 (smart extension transmission data index)" to between "0" and "19."

Refer to the following table for the description of the "OptParameter14" settings.

The "OptParameter14 (smart extension transmission data index)" setting cannot be written while the inverter is operating. Stop inverter operation before making changes to the setting.

This parameter setting is also required for a service via EtherNet/IP protocol. It specifies the data format of the inverter status to be transmitted to the client (originator) during an I/O communication via a CIP (Common Industrial Protocol). Refer to the Assembly Object section of the EtherNet/IP.

Set value	Input instance value (E)	Data Size(R/E)	Number of parameters (R/E)
0	70	4	X
1	71	4	X
2	110	4	X
3	111	4	X

Set value	Input instance value (E)	Data Size(R/E)	Number of parameters (R/E)
4	141	2	1
5	142	4	2
6	143	6	3
7	144	8	4
8	145	10	5
9	146	12	6
10	147	14	7
11	148	16	8
12	149	18	9
13	150	20	10
14	151	22	11
15	152	24	12
16	153	26	13
17	154	28	14
18	155	30	15
19	156	32	16

⑥ [CM-24] OptParameter15: Reception data setting

Used to monitor smart scaling receive data from the G100 RAPIenet+ Communication Option Board. Set the values to be controlled among the addresses [CM-51] to [CM-66].

You can set "OptParameter15 (smart extension reception data index)" to between "0" and "19."

The description of the "OptParameter15" settings are as follows.

The "OptParameter15 (smart extension reception data index)" setting cannot be written while the inverter is operating. Stop inverter operation before making changes to the setting.

This parameter is also required for EtherNet/IP protocol service. It configures the format of the command data transmitted to the inverter by the client (originator) during the I/O communication via the CIP (Common Industrial Protocol). Refer to the Assembly Object section of the EtherNet/IP.

Set value	Input instance value (E)	Data Size(R/E)	Number of parameters (R/E)
0	20	4	X
1	21	4	X
2	100	4	X
3	101	4	X
4	121	2	1
5	122	4	2
6	123	6	3
7	124	8	4
8	125	10	5
9	126	12	6
10	127	14	7
11	128	16	8
12	129	18	9
13	130	20	10
14	131	22	11
15	132	24	12
16	133	26	13
17	134	28	14
18	135	30	15
19	136	32	16

⑦ [CM-25] OptParameter16: Enable or disable RAPIenet

The G100 RAPIenet+ communication option board is initially in the RAPIenet Disable state and is compatible with our products (XGL-EFMxB V9.10 or higher) and RAPIenet v2 smart extension services. (2: RAPIenet v2 Enable / 0: RAPIenet v2 Disable)

** You can download the user manual ("Manual_XGT_FEnet") at <https://sol.ls-electric.com>.

When connecting the G100 RAPIenet+ communication option board with third-party products, it is recommended to set the parameter to "0," execute Comm Update (CM-94), and use it in RAPIenet Disable state.

⑧ **[CM-30] Para Status Num: Number of transmission data**

You can set [CM-23] OptParameter14 to change the amount of transmission data to between "0" and "16." The G100 RAPIEnet+ communication option board can receive up to 16 data items. The data addresses to be transmitted are set via [CM-31] to [CM-46].

⑨ **[CM-31] Para Status-01 ~ [CM-46] Para Status-16: Transmission data address settings**

After setting the number of transmission data with CM-23, enter the matching number of data addresses for the data to transmit to the client (originator) with parameters CM-31 through CM-46.

⑩ **[CM-50] Para Ctrl Num: Number of reception data**

You can set [CM-24] OptParameter15 to change the amount of transmission data to between "0" and "16."

The G100 RAPIEnet+ communication option board can receive up to 16 data items. You can configure the address for the received data with parameters CM-51 through CM-66.

⑪ **[CM-51] Para Control-01 ~ [CM-66] Para Control-16: Reception data address settings**

After setting the number of receive data through [CM-50] Receive Data Address Setting, enter the inverter data addresses to be used for the Client (Originator)

⑫ **[CM-94] Comm Update: Applying the Changed Settings to the G100 RAPIEnet+ Option Board**

The CM group parameters display the settings stored on the inverter connected to the G100 RAPIEnet+ communication board and the changes made on the keypad are not directly reflected on the G100 RAPIEnet+ communication board.

When Comm Update is set to "1 (Yes)," the changed setting values are applied to the G100 RAPIEnet+ Communication Option Board, and it operates accordingly. (Parameters that require Comm Update are [CM-07], [CM-10] to [CM-25].)

1.4 PRT group (Lost Command)

① [PR-12] Lost Cmd Mode: Operation mode for a command loss

You can select the operation mode for when a network failure or connection failure between the inverter and the communication occurs while the inverter is operated via network communication.

② [PR-13] Lost Cmd Time: Decision time for a command loss

Set the time duration until the operation mode set with PR-12 will be reflected following a command loss. You can set a value between "0.1" and "120" seconds.

③ [PR-14] Lost Preset Freq: Operation frequency for a command loss

When a lost command occurs, a protective function is activated and the inverter will continue to operate using the frequency set with [PR-14]. The setting value is from the start frequency to the max frequency [Hz].

④ [PR-67] Lost Opt Cmd Mode: Selects the communication option command loss mode

This function is enabled only when the run command or frequency reference is set to Fieldbus. It configures the operation of the inverter when a Lost Command occurs due to the communication option not being installed or due to loss of communication commands.

⑤ [PR-68] Lost Opt Cmd Delay: Sets the communication loss detection time of the communication option

Sets the decision time for mode operation configured in Pr.67 code.

⑥ Lost command conditions by protocol - RAPIEnet

If data is not received from the RAPIEnet master (XGL-EFMxB V9.10 or higher) within the watchdog setting time, the G100 RAPIEnet+ communication option board enters Lost Command state, and after the time set in [PR-13] passes, the inverter operates according to the settings in [PR-12].

Refer to "PART2 Section 2 2.2.2 Configuring the master module" for how to set the watchdog timer for the master module.

- EtherNet/IP

If the Implicit Message Connection (Class1 Connection) between the Originator (PLC or Client) and the Target (Inverter) is not established for 1 second, the G100 RAPIEnet+ communication option board will enter the Lost Command state, and after the time set in [PR-13] passes, the inverter will operate according to the settings in [PR-12].

- Modbus TCP

If no data is received from the Client for 5 seconds in Modbus TCP, the G100 RAPIEnet+ communication option board will enter the Lost Command state, and after the time set in [PR-13] passes, the inverter will operate according to the settings in [PR-12].

2 Services with LS ELECTRIC products

2.1 Overview

This chapter explains about services utilizing the RAPIEnet protocol when the communication board is connected with LS ELECTRIC products. You can choose one of the smart extension (PART2 2Section 2.2) and smart extension interoperability (PART2 2Section 2.3) functions to use the service depending on the versions of the LS ELECTRIC master module XGL-EFMxB, XG5000, and G100 inverter. The G100 RAPIEnet+ communication option board provides somewhat limited functions when using the smart extension feature, so it is recommended to use the smart extension interoperability feature. The available functions for each version are shown in the table below.

Version	Smart extension	Smart extension interoperability
XGL-EFMxB V8.00 or earlier	X	X
XGL-EFMxB V9.10 or later, XG5000 V4.82 or later	O	O

To use the RAPIEnet service, keypad settings must be configured as shown in the table below.

The default value is RAPIEnet Disable.

G100 RAPIEnet+ Communication Option Board [CM-25] OptParameter16	RAPIEnet v2 Availability	EtherNet/IP Availability	Modbus TCP Availability
Setting: '2' RAPIEnet v2 Enable	O	O	O
Setting: '0' RAPIEnet v2 Disable	X	O	O

2.2 Smart extension (LS ELECTRIC master module: XGL-EFMxB V9.10 or later)

The smart extension service is a communication service between automation products that allows for the extension of multiple PLCs and inverters utilizing simple configurations, without the need for complicated parameter settings or programming. The smart extension service also has the EtherNet/IP service integrated within.

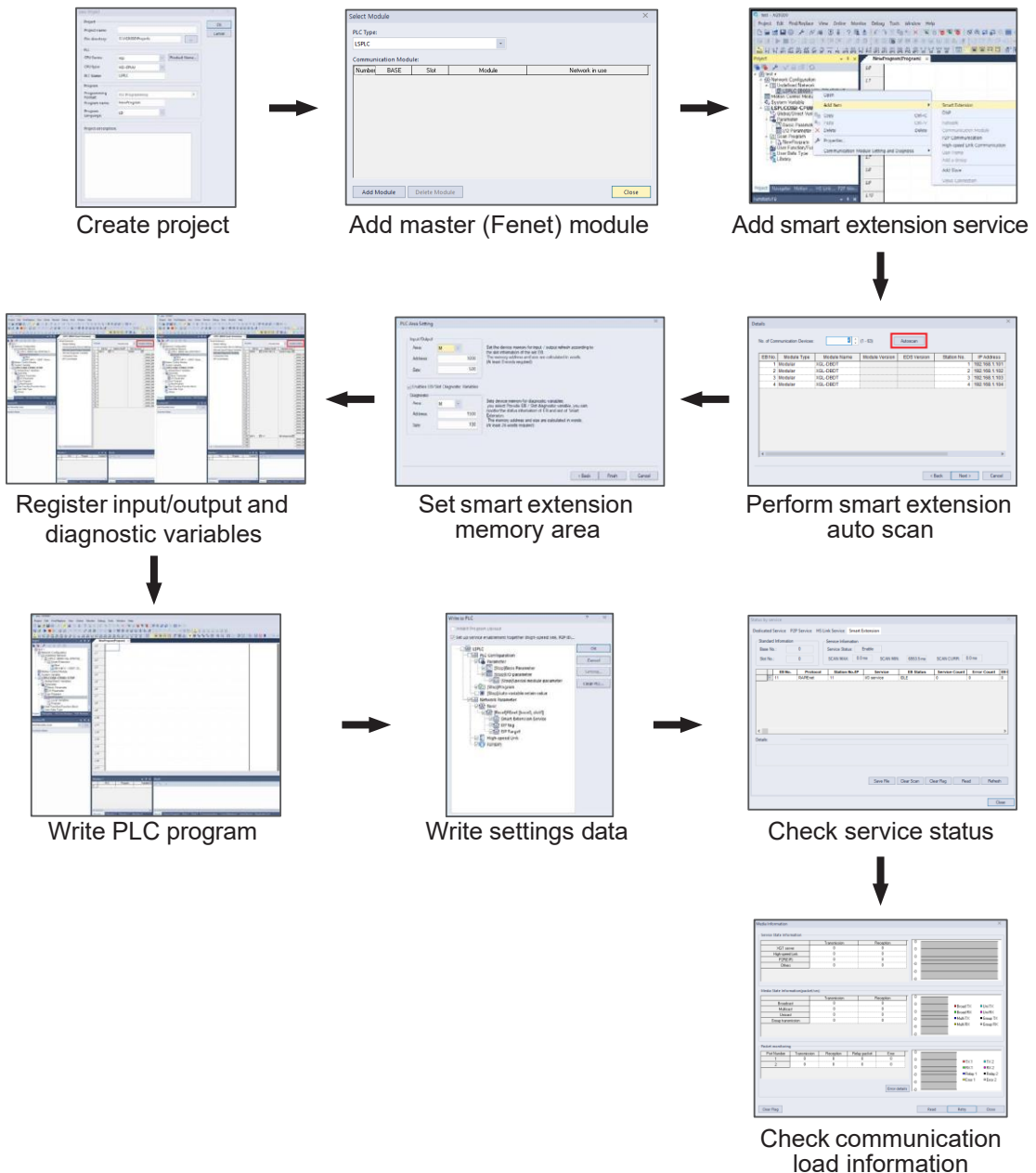
The G100 RAPIEnet+ Communication Option Board allows simple 8-word I/O data transmission and reception via our master by setting the number of transmit data [CM-30], number of receive data [CM-50], transmit data addresses [CM-31] to [CM-38], and receive data addresses [CM-51] to [CM-58]. Besides, it provides various features, such as monitoring of diagnostic parameters, RAPIEnet auto scan, and system diagnosis.

** You can download the user manual ("Manual_XGT_FEnet_V3.00") at <https://sol.ls-electric.com>.

** RAPIEnet protocol is only compatible with LS ELECTRIC's MRS (Multi-port RAPIEnet Switch) and may not provide communication when used with other universal switches (switching hub).

- XOL-ES4T (Electrical 4-port)
- XOL-ES4H (Electrical 2-port, Optical 2-port)

The following figure shows an example of the XG5000 settings screen for an LS ELECTRIC network master module (XGL-EFMxB 9.10 or later).



Note

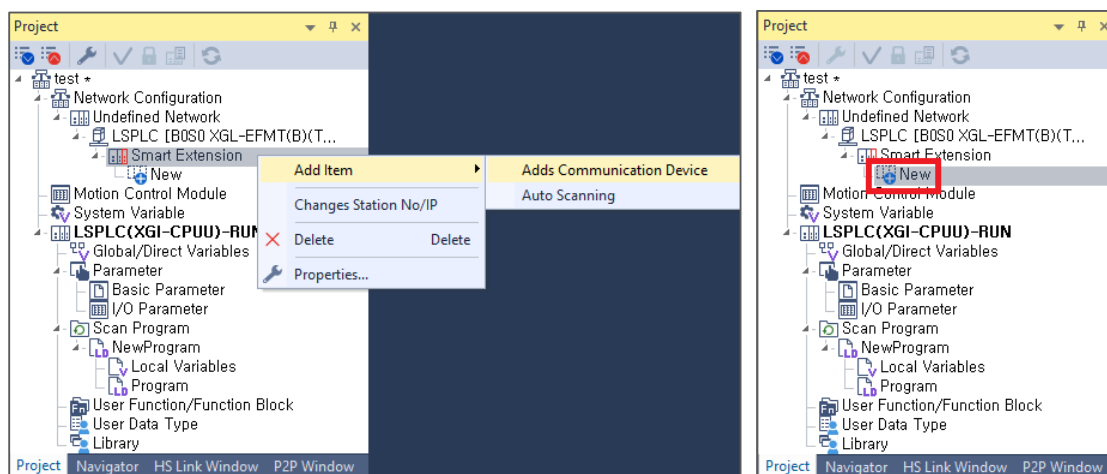
"Smart Extension Memory Area Setting": The G100 RAPIenet+ communication option board has a fixed allocation of 64-byte (32 word) areas. When configuring the addresses, be careful not to use addresses already occupied by other programs to avoid collisions. Separate warnings are not provided, nor are duplicated addresses prohibited because users may configure a certain area of the addresses to be superimposed for special purposes.

2.2.1 Configuring the XG5000 program for the PLC

To communicate with a PLC System using the G100 RAPIEnet+ communication option board, use XGL-EFMxB (RAPIEnet I/F module). For a smart extension service, the station ID (EB) and the IP address of the smart extension device must be specified first: (e.g., [CM-07] FBus ID: '05', [CM-13] FBus IP Addr4: "100 + FB US ID [05]" = "105") (This prevents IP address collisions between the communication boards installed to the inverters.) Refer to the user manual provided with the XGL-EFMxB product for detailed instructions.

Also, to configure a network communication utilizing a PLC system, installation of the XG5000 program is required. You can download XG5000 program from the LS ELECTRIC website.

** Download the document at <https://sol.ls-electric.com>.

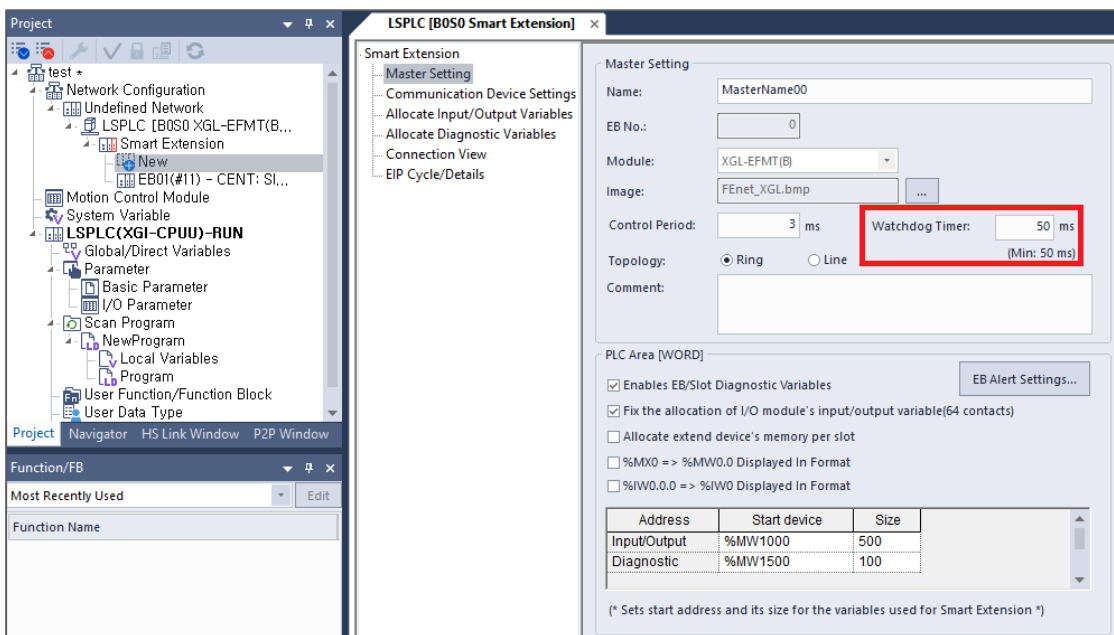


After specifying the connection information in the connection tab of the communication device addition window, select "OK" to add the communication device [CENT] (G100 RAPIEnet+ communication option board) of the smart extension service.

2.2.2 Configuring the master module

You can configure the "Watchdog timer" for a master module (XGL-EFMxB V9.10 or later). When enabling the inverter keypad parameter [PR-12] Lost Cmd Mode, and setting the Lost Cmd Time in parameter [PR-13], the master's watchdog timer setting is added. Therefore, consider this matter when setting the inverter parameter [PR-13] Lost Cmd Time.

Watchdog timer: The time for maintaining the connection between the communication device (G100 RAPIEnet+ communication option board) and the master.



2.2.3 Network device settings

Select the hot swap feature. If the hot swap feature is not selected, losing one station ID (EB) on the network will cause the entire network to stop communicating.

Smart Extension

- Master Setting
- Communication Device Settings
- Allocate Input/Output Variables
- Allocate Diagnostic Variables
- Connection View
- EIP Cycle/Details

Communication Device Settings

Sets All I/O parameters

Standard Input Filter: 3 ms

Settings	Setting	Detailed description
Run CPU->Continue output when stopped	☐	Set: Continue output when stopped Unset: Clear output when stopped
Keep output when a CPU or communication device error occurs	☐	Set: Keep output Unset: Clear output
Exchange EB or modules while running(hot swap)	☒	Set: Continue running when breakdown occurred, resolved return to normal operation Unset: Error when breakdown
Use redundant power	☐	Sets when use redundant power
Keep input when a communication device error occurs	☐	Set: Keep input Unset: Clear input

* Supports all EB hot swap, module hot swap supports only Extension driver device
** Supports Extension driver device only

2.2.4 Input/Output parameter settings

The following settings enable an automatic 8 word/8 word communication of input/output parameters.

Smart Extension

- Master Setting
- Communication Device Settings
- Allocate Input/Output Variables
- Allocate Diagnostic Variables
- Connection View
- EIP Cycle/Details

Format: Hexadecimal Variable Setting Synchronize

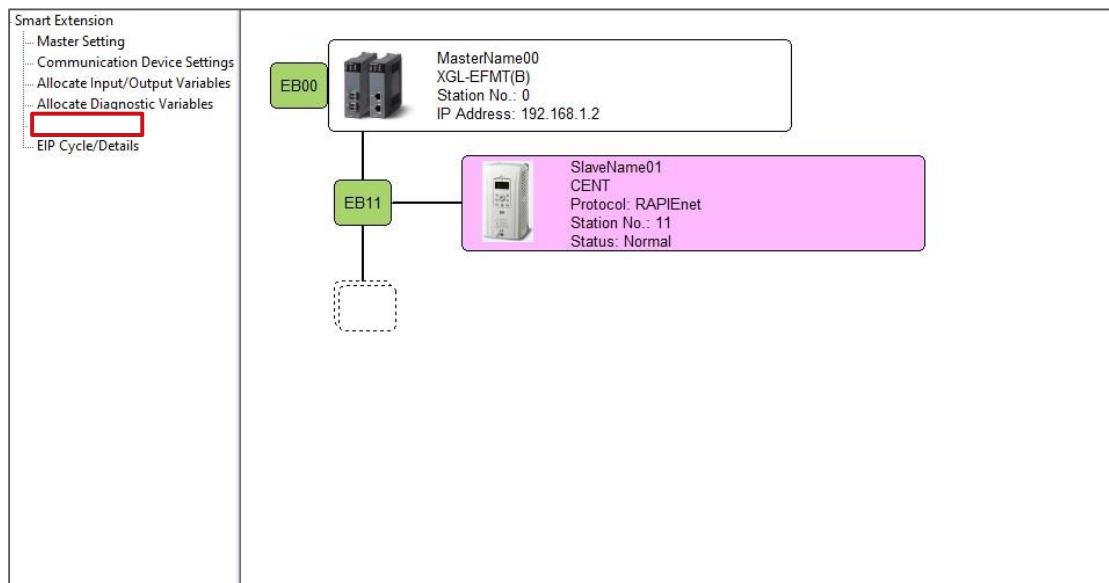
	EB No.	Station No/IP	Slot number	Variable name	Type	Device	Monitor value	Comment
1	EB11	11	Slot00					
2				_0000_EB11_StatusInputNum	WORD	%MW1000	0x0010	STATUS input
3				_0000_EB11_ControlOutputNum	WORD	%MW1001	0x0010	Control Output Count
4				_0000_EB11_StatusInput1	WORD	%MW1002	0x0000	Device Status Input 1
5				_0000_EB11_StatusInput2	WORD	%MW1003	0x0001	Device Status Input 2
6				_0000_EB11_StatusInput3	WORD	%MW1004	0x0000	Device Status Input 3
7				_0000_EB11_StatusInput4	WORD	%MW1005	0x0011	Device Status Input 4
8				_0000_EB11_StatusInput5	WORD	%MW1006	0x0011	Device Status Input 5
9				_0000_EB11_StatusInput6	WORD	%MW1007	0x0011	Device Status Input 6
10				_0000_EB11_StatusInput7	WORD	%MW1008	0x0011	Device Status Input 7
11				_0000_EB11_StatusInput8	WORD	%MW1009	0x0011	Device Status Input 8
12				_0000_EB11_ControlOutput1	WORD	%MW1010	0x0000	Device Control Output 1
13				_0000_EB11_ControlOutput2	WORD	%MW1011	0x0000	Device Control Output 2
14				_0000_EB11_ControlOutput3	WORD	%MW1012	0x0000	Device Control Output 3
15				_0000_EB11_ControlOutput4	WORD	%MW1013	0x0000	Device Control Output 4
16				_0000_EB11_ControlOutput5	WORD	%MW1014	0x0000	Device Control Output 5
17				_0000_EB11_ControlOutput6	WORD	%MW1015	0x0000	Device Control Output 6
18				_0000_EB11_ControlOutput7	WORD	%MW1016	0x0000	Device Control Output 7
19				_0000_EB11_ControlOutput8	WORD	%MW1017	0x0000	Device Control Output 8

2.2.5 Diagnostic parameter settings

Smart Extension				Format: Hexadecimal Variable Setting Synchronize			
Master Setting							
Communication Device Settings							
Allocate Input/Output Variables							
Allocate Diagnostic Variables							
Connection View							
EIP Cycle/Details							
EB No	Station No/IP	Variable Kind	Variable name	Type	Device	Monitor value	Comment
1	EB00	0/192.168.1.2	System diag				
2			_0000_STATUS_CHG_CNT	UINT	%MW1500	0x0004	Number of changed smart extension
3			_0000_SCAN_MAX	UINT	%MW1501	0x001E	Smart extension max scan cycle (1
4			_0000_SCAN_MIN	UINT	%MW1502	0x0003	Smart extension min scan cycle (10
5			_0000_SCAN_CUR	UINT	%MW1503	0x0004	Smart extension current scan cycle
6			_0000_SYSTEM_ER	BOOL	%MX24064	0	Smart extension all EB error
7			_0000_SYSTEM_WAR	BOOL	%MX24065	0	Smart extension partial EB error
8			_0000_EB_DEER	BOOL	%MX24066	0	EB dropped out while running smar
9			_0000_EB_BASE_INFO_ER	BOOL	%MX24067	0	Smart extension base information
10			_0000_IO_TYER	BOOL	%MX24068	0	Smart extension IO type error
11			_0000_IO_DEER	BOOL	%MX24069	0	Smart extension IO drop error
12			_0000_FUSE_ER	BOOL	%MX24070	0	Smart extension IO FUSE error
13			_0000_REF_TIME_OUT	BOOL	%MX24071	1	Smart extension refresh timeout
14			_0000_EB_CRC_ER	BOOL	%MX24072	0	Receive smart extension EB CRC e
15			_0000_TAG_ER	BOOL	%MX24073	0	Smart extension tag mismatch erro
16			_0000_EB_CFG_ER	BOOL	%MX24074	0	Smart extension EB configuration e
17			_0000_EB_DETACH_WAR	BOOL	%MX24075	0	EB failure warning while running s
18			_0000_IO_DETACH_WAR	BOOL	%MX24076	0	IO failure warning while running sm
19			_0000_FUSE_WAR	BOOL	%MX24077	0	FUSE warning while running smart
20			_0000_EIP_BLOCK_SVC_ER	BOOL	%MX24078	0	All EtherNet/IP block services are er
21			_0000_EIP_BLOCK_SVC_WAR	BOOL	%MX24079	0	Some of EtherNet/IP blocks is(are)
22			_0000_STATUS_CHG_CNT_CLR	BOOL	%MX24091	0	Reset the number of status change
23			_0000_REF_TIME_OUT_CLR	BOOL	%MX24092	0	Reset timeout when refreshing sm
24			_0000_EB_CRC_ER_CLR	BOOL	%MX24093	0	Reset smart extension EB CRC er
25			_0000_SCAN_CLR	BOOL	%MX24094	0	Reset smart extension scan inform
26			_0000_FLAG_CLR	BOOL	%MX24095	0	Reset smart extension flag informa
27			_0000_EB_ER	ARRAY[0..63] OF BOOL	%MX24096	0	Smart extension EB error
92			_0000_EB_WAR	ARRAY[0..63] OF BOOL	%MX24224	0	Smart extension EB warning
157	EB11	11	EB diagnosis				
158			_0000_EB11_CFG_ER	BOOL	%MX24352	0	EB configuration error
159			_0000_EB11_DEER	BOOL	%MX24353	0	Drop while running EB
160			_0000_EB11_REF_TIME_OUT	BOOL	%MX24354	1	EB refresh response timeout
161			_0000_EB11_P1_CRC_ER	BOOL	%MX24355	0	Receive CRC error frame from EB
162			_0000_EB11_P2_CRC_ER	BOOL	%MX24356	0	Receive CRC error frame from EB

System
diagnosticsDiagnose
each EB

2.2.6 Network device connections

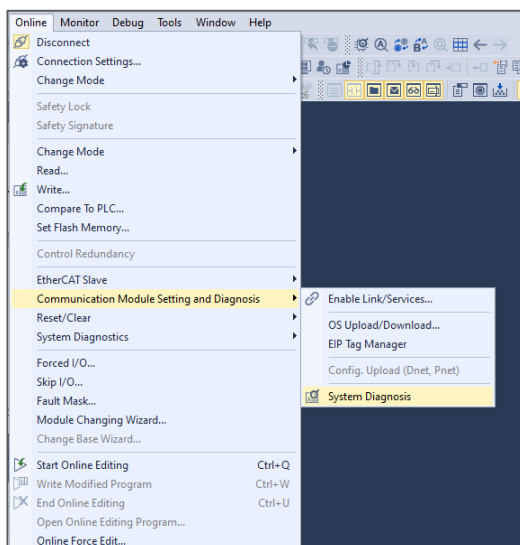


The image above is a reference for connecting the communication device.

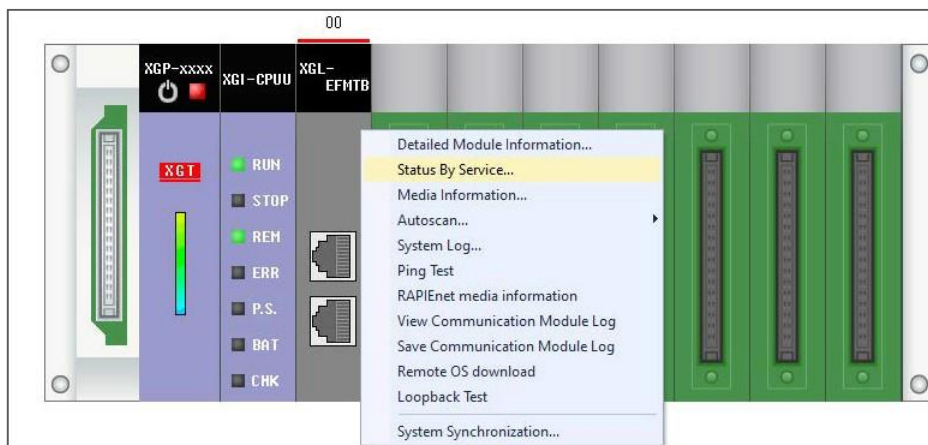
2.2.7 Service status

Service status shows the service operation status of the smart extension service, service counts, and error counts. (Service status can be provided only when the system is online.)

- ① Click **[Online]** → **[Network module settings and diagnosis]** → **[System diagnosis]**.



- ② In the **[System diagnosis]** window, right-click the master module (XGL-EFMxB) on the figure, then click **Service status**.



- ③ Click [Service status] → [Smart extension] tap to view the smart extension service status.

Status by service

Dedicated Service P2P Service HS Link Service

Standard Information

Base No.:

Slot No.:

Service Information

Service Status:

SCAN MAX: SCAN MIN:

	EB No.	Protocol	Station No./IP	Service	EB Status	Service Count	Error Count	EB I
☒	11	RAPIEnet	11	VO service	IDLE	0	0	0

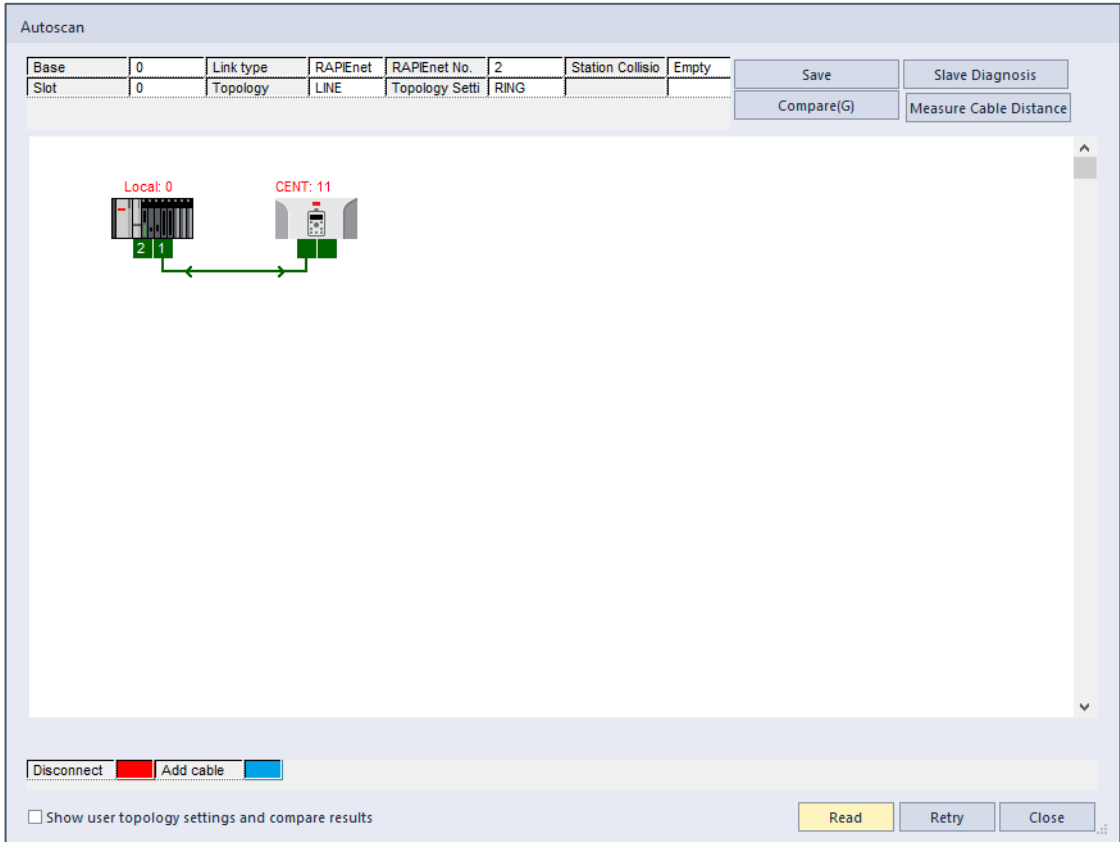
Details:

Save File Clear Scan Clear Flag Refresh

Continuously updates communication status

Close

④ In step ②, you can click the [Auto scan] tap to view the RAPIenet connection status.



2.3 Smart extension interoperability (master module XGL-EFMxB v9.10 or later/XG5000 v4.82 or later)

Configuring LS ELECTRIC modules to a certain version or later enables a more user-friendly features in smart extension services in a certain version combination. The smart extension service is a communication service between automation products that allows for a more intuitive extension of multiple PLCs and inverters than the existing smart extension services by utilizing simple configurations, without the need for complicated parameter settings or programming. The smart extension service also has the previous EtherNet/IP service integrated within. The station ID (EB) and the IP address of the smart extension device must be specified first: (e.g.: [CM-07] FBus ID: '05', [CM-13] FBus IP Addr4: "100 + FB US ID [05]" = "105") (This prevents IP address collisions between the communication boards installed to the inverters.) Refer to the user manual provided with the XGL-EFMxB product for detailed instructions.

Also, to configure a network communication utilizing a PLC system, installation of the XG5000 program is required. You can download XG5000 program from the LS ELECTRIC website.

The major improvements for XG5000 smart extension are as follows:

- 1 Drive Model Information Display**
- 2 Input/Output Parameter Settings and Batch Application**
- 3 Setting up parameters related to Fail safe (related to Lost Command)**
- 4 Drive Diagnosis Information**
- 5 Expansion of maximum input/output parameters size
(Users can set up to 16 words and was previously fixed to 8 words)**

The G100 RAPIEnet+ communication option board can simply transmit and receive 16-word I/O data through the LS ELECTRIC master by setting the transmission data addresses [CM-31]-[CM-46] and the reception data addresses [CM-51]-[CM-66]. Other functions include drive model information, drive diagnosis monitoring, fail-safe parameter settings, intuitive in/out parameter settings, batch parameter application for the same type of drive, etc.

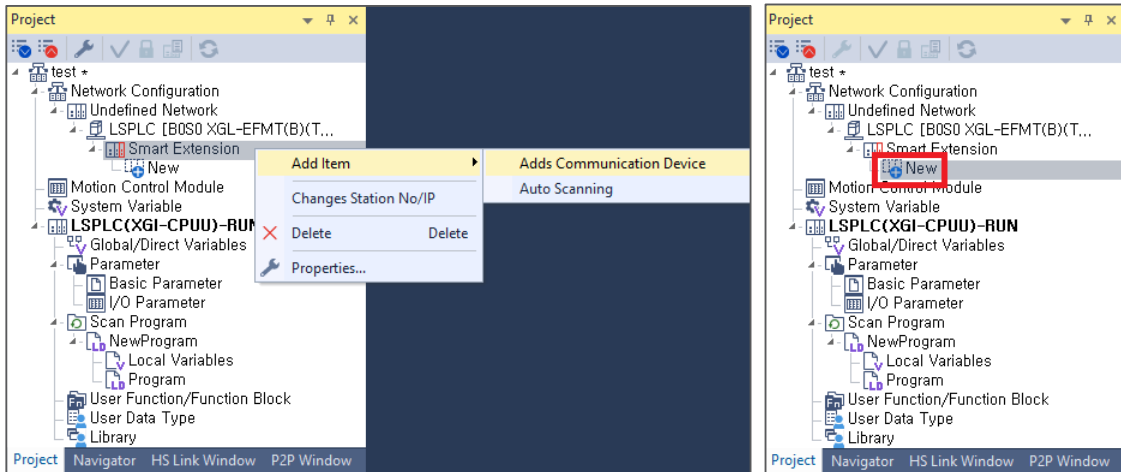
However, the conditions under which parameter settings configured via XG5000 are applied are as follows:

- 1** Writing attempts after changing inverter parameters in XG5000
- 2** Reboot the LS ELECTRIC PLC
- 3** Reset the LS ELECTRIC PLC
- 4** Resetting the power of the inverter main unit

The above four cases can reflect the G100 RAPIEnet+ communication option board parameter values through our XG5000.

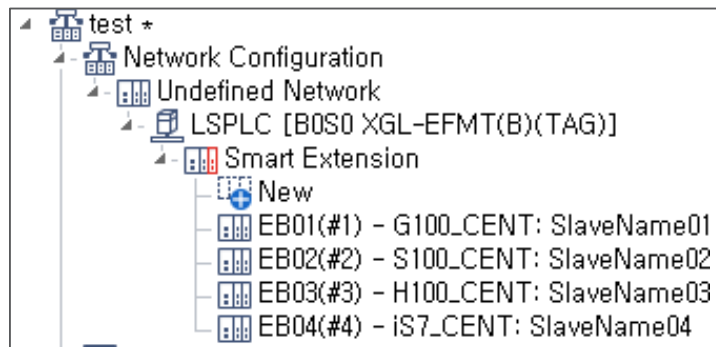
2.3.1 Drive Model Information Display

** Download the document at <https://sol.ls-electric.com>.



After specifying the connection information in the connection tab of the communication device addition window, select "OK" to add the communication device "G100_CEPW" (G100 RAPIEnet+ communication option board) of the smart extension service.

For systems with the interoperability feature, the inverter (drive) model is shown in the "Drive model_CENT" format like below.



2.3.2 Input/Output Parameter Settings and Batch Application

A UI screen for the configuration of a communication device and information

Sets Communication Device	
Basic Parameter	
Drive Parameters	
Communication device Informat	
Connect	
Smart Extension Variables	

Fail Safe	
Lost Cmd Mode	☐ None
Lost Cmd Time	☐ 1.0 sec
Lost Preset F	☐ 0.00 Hz

Provides Basic Input Parameters	
Inverter_Model	☐ ☐
Inverter_Capacity	☒ ☒
Inverter_Input_Voltage	☐ ☐
Inverter_SW_Version	☒ ☒

Input Parameter	
Para Status-1	☒
Para Status-2	☒
Para Status-3	☒
Para Status-4	☒
Para Status-5	☒
Para Status-6	☒
Para Status-7	☒
Para Status-8	☒
Para Status-9	☒
Para Status-10	☒
Para Status-11	☒
Para Status-12	☒
Para Status-13	☒
Para Status-14	☒
Para Status-15	☒
Para Status-16	☒

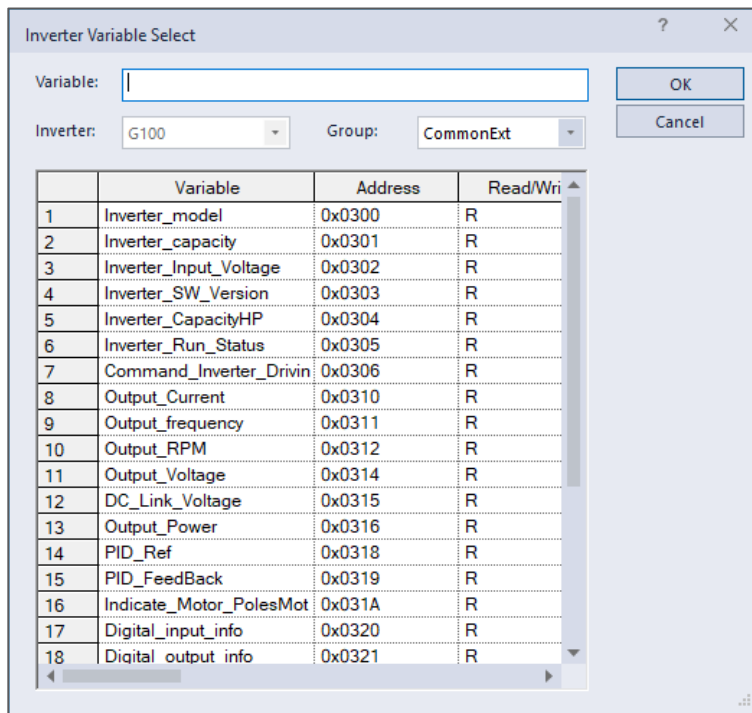
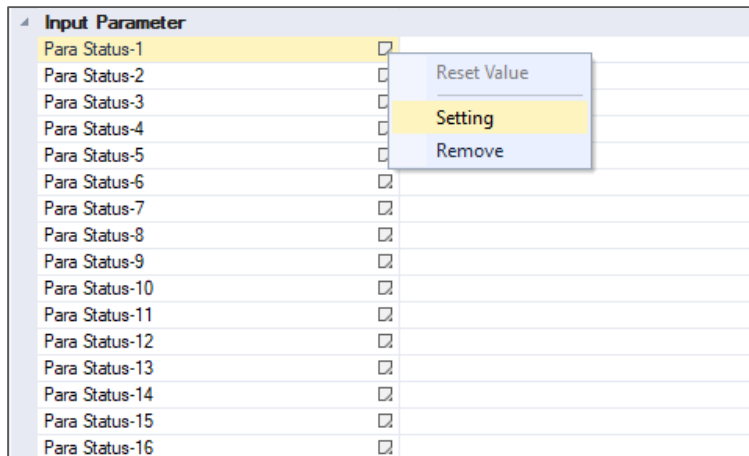
Output Parameter	
Para Control-1	☒
Para Control-2	☒
Para Control-3	☒
Para Control-4	☒
Para Control-5	☒
Para Control-6	☒
Para Control-7	☒
Para Control-8	☒
Para Control-9	☒

From Communication Device Settings → Drive Parameter Settings, input/output parameters can be set intuitively in XG5000, rather than via the keypad or loader.

The inverter capacity and inverter SW version are checked by default, and up to four additional basic drive information items can be selected and used as input parameters.

Provides Basic Input Parameters	
Inverter_Model	☒ ☐
Inverter_Capacity	☒ ☒
Inverter_Input_Voltage	☒ ☐
Inverter_SW_Version	☒ ☒

Set the desired input/output parameters through the pop-up window displayed when clicking  in the XG5000 UIs. However, you must set at least one input/output parameter, respectively, click "Save project" and write before changes are reflected. If the Drive Parameter Settings screen is open multiple times, close the duplicate windows before saving the project. Please note that copying and pasting parameters directly does not apply the settings.



Parameters can be selected by group, and both input and output parameters can be selected intuitively in the same manner on the XG5000 UI.

Inverter Variable Select

Variable:

Inverter: G100 Group: CommonExt

	Variable	Address	Read/Write
1	Inverter_model	0x0300	DRV
2	Inverter_capacity	0x0301	BAS
3	Inverter_Input_Voltage	0x0302	ADV
4	Inverter_SW_Version	0x0303	CON
5	Inverter_CapacityHP	0x0304	IN
6	Inverter_Run_Status	0x0305	OUT
7	Command_Inverter_Drvin	0x0306	COM
8	Output_Current	0x0310	APP
9	Output_frequency	0x0311	PRT
10	Output_RPM	0x0312	M2
11	Output_Voltage	0x0314	SPS
12	DC_Link_Voltage	0x0315	R
13	Output_Power	0x0316	R
14	PID_Ref	0x0318	R
15	PID_FeedBack	0x0319	R
16	Indicate_Motor_PolesMot	0x031A	R
17	Digital_input_info	0x0320	R
18	Digital_output_info	0x0321	R

OK Cancel

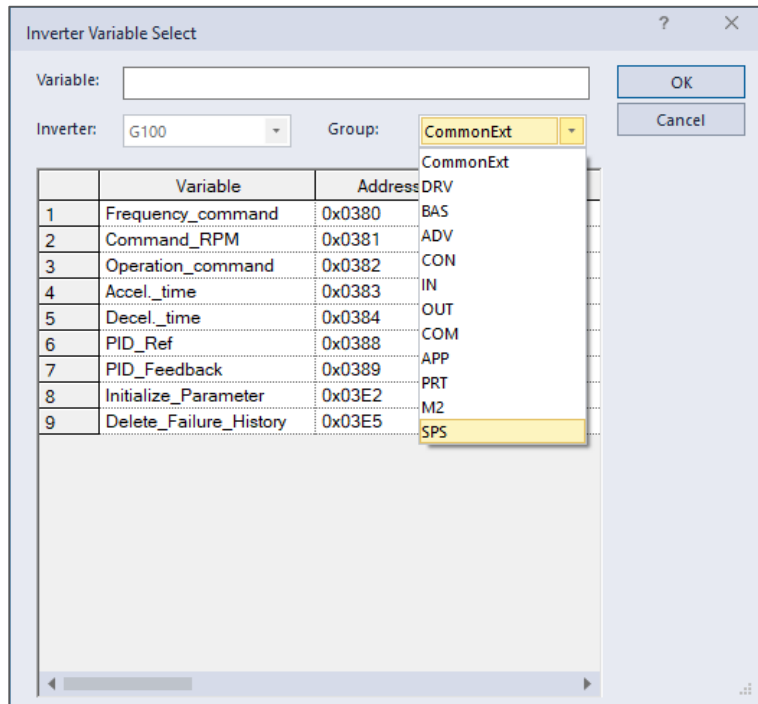
Inverter Variable Select

Variable:

Inverter: G100 Group: CommonExt

	Variable	Address	Read/Write
1	Frequency_command	0x0380	R/W
2	Command_RPM	0x0381	R/W
3	Operation_command	0x0382	R/W
4	Accel_time	0x0383	R/W
5	Decel_time	0x0384	R/W
6	PID_Ref	0x0388	R/W
7	PID_Feedback	0x0389	R/W
8	Initialize_Parameter	0x03E2	R/W
9	Delete_Failure_History	0x03E5	R/W

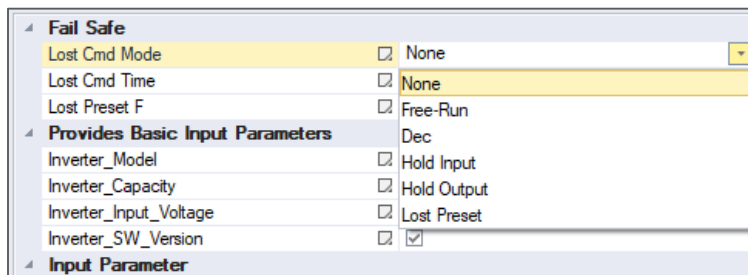
OK Cancel



2.3.3 Setting up parameters related to Fail safe (related to Lost Command)

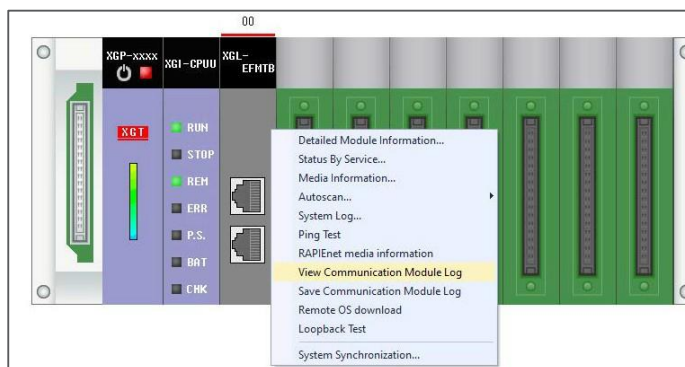
Fail Safe parameters can be configured in XG5000 instead of via the keypad.

Click  in the XG5000 UI to set.



2.3.4 Drive Diagnosis Information

You can check the diagnostic information of the XG5000 smart extension service and the event history under the communication module history view.



2.3.5 Expansion of maximum input/output parameters size (Users can set up to 16 words and was previously fixed to 8 words)

Available through XG5000's diagnosis about (inverter) drives. Available through the communication master module's communication module history function.

As with "Input/Output Parameter Settings and Batch Application," the XG5000 UI allows you to intuitively configure communication for up to 16-word/16-word of input/output, as shown below:

	Input Variables					Output variables				
	Variable name	Type	Offset	Address	Comment	Variable name	Type	Offset	Address	Comment
1	Inverter_Capacity	WORD	IB0	0x0301	Inverter capacity	Frequency_command	WORD	QB36	0x0380	Frequency command
2	Inverter_SW_Version	WORD	IB2	0x0303	Inverter SW Version	Command_RPM	WORD	QB38	0x0381	Command RPM
3	Inverter_model	WORD	IB4	0x0300	Inverter model	Operation_command	WORD	QB40	0x0382	Operation command
4	Inverter_Input_Voltage	WORD	IB6	0x0302	Inverter Input Voltage	Accel_time	WORD	QB42	0x0383	Accel. time
5	Inverter_Run_Status	WORD	IB8	0x0305	Inverter Run Status	Decel_time	WORD	QB44	0x0384	Decel. time
6	Command_Inverter_Driving	WORD	IB10	0x0306	Command Inverter Driving	Control_Virtual_Digital_In	WORD	QB46	0x0385	Control Virtual Digital Input
7	Keypad_SW_Version	WORD	IB12	0x0307	Keypad SW Version	Control_Digital_Output	WORD	QB48	0x0386	Control Digital Output
8	Keypad_Title_Version	WORD	IB14	0x0308	Keypad Title Version	Torque_Ref	WORD	QB50	0x0390	Torque Ref
9	Output_Current	WORD	IB16	0x0310	Output Current	Fwd_Pos_Torque_Limit	WORD	QB52	0x0391	Fwd Pos Torque Limit
10	Output_frequency	WORD	IB18	0x0311	Output frequency	Fwd_Neg_Torque_Limit	WORD	QB54	0x0392	Fwd Neg Torque Limit
11	Output_RPM	WORD	IB20	0x0312	Output RPM	Rev_Pos_Torque_Limit	WORD	QB56	0x0393	Rev Pos Torque Limit
12	Motor_Feedback_Speed	WORD	IB22	0x0313	Motor Feedback Speed	Rev_Neg_Torque_Limit	WORD	QB58	0x0394	Rev Neg Torque Limit
13	Output_Voltage	WORD	IB24	0x0314	Output Voltage	Torque_Bias	WORD	QB60	0x0395	Torque Bias
14	DC_Link_Voltage	WORD	IB26	0x0315	DC Link Voltage	Anytime_Para	WORD	QB62	0x039A	Anytime Para
15	Output_Power	WORD	IB28	0x0316	Output Power	Monitor_Line_1	WORD	QB64	0x039B	Monitor Line-1
16	Output_Torque	WORD	IB30	0x0317	Output Torque	Monitor_Line_2	WORD	QB66	0x039C	Monitor Line-2
17	PID_Ref	WORD	IB32	0x0388	PID Ref					
18	PID_Feedback	WORD	IB34	0x0389	PID Feedback					

Example screen of input/output parameter settings configured to 16-word/16-word

Smart Extension Master Setting Communication Device Settings Allocate Input/Output Variables Allocate Diagnostic Variables Connection View EIP Cycle/Details		Format: Hexadecimal Variable Setting Synchronize						
	EB No.	Station No/IP	Slot number	Variable name	Type	Device	Monitor value	Comment
1	EB01	1	Slot00	__0000_EB01_Inverter_Capacity	WORD	%MW1000	0x0000	IS7_CENT
2				__0000_EB01_Inverter_SW_Version	WORD	%MW1001	0x0000	Inverter capacity
3				__0000_EB01_Inverter_model	WORD	%MW1002	0x0000	Inverter SW Version
4				__0000_EB01_Inverter_input_Voltage	WORD	%MW1003	0x0000	Inverter model
5				__0000_EB01_Inverter_Run_Status	WORD	%MW1004	0x0000	Inverter input Voltage
6				__0000_EB01_Command_Inverter	WORD	%MW1005	0x0000	Inverter Run Status
7				__0000_EB01_Keypad_SW_Version	WORD	%MW1006	0x0000	Command Inverter Driving Frequen
8				__0000_EB01_Keypad_Title_Versio	WORD	%MW1007	0x0000	Keypad SW Version
9				__0000_EB01_Output_Current	WORD	%MW1008	0x0000	Keypad Title Version
10				__0000_EB01_Output_frequency	WORD	%MW1009	0x0000	Output Current
11				__0000_EB01_Output_RPM	WORD	%MW1010	0x0000	Output frequency
12				__0000_EB01_Motor_Feedback_Sp	WORD	%MW1011	0x0000	Output RPM
13				__0000_EB01_Output_Voltage	WORD	%MW1012	0x0000	Motor Feedback Speed
14				__0000_EB01_DC_Link_Voltage	WORD	%MW1013	0x0000	Output Voltage
15				__0000_EB01_Output_Power	WORD	%MW1014	0x0000	DC Link Voltage
16				__0000_EB01_Output_Torque	WORD	%MW1015	0x0000	Output Power
17				__0000_EB01_PID_Ref	WORD	%MW1016	0x0000	Output Torque
18				__0000_EB01_PID_Feedback	WORD	%MW1017	0x0000	PID Ref
19				__0000_EB01_Frequency_comman	WORD	%MW1018	0x0000	PID Feedback
20				__0000_EB01_Command_RPM	WORD	%MW1019	0x0000	Frequency command
21				__0000_EB01_Operation_command	WORD	%MW1020	0x0000	Command RPM
22				__0000_EB01_Accel_time	WORD	%MW1021	0x0000	Operation command
23				__0000_EB01_Decel_time	WORD	%MW1022	0x0000	Accel. time
24				__0000_EB01_Control_Virtual_Digit	WORD	%MW1023	0x0000	Decel. time
25				__0000_EB01_Control_Digital_Outp	WORD	%MW1024	0x0000	Control Virtual Digital Input
26				__0000_EB01_Torque_Ref	WORD	%MW1025	0x0000	Control Digital Output
27				__0000_EB01_Fwd_Pos_Torque_Li	WORD	%MW1026	0x0000	Torque Ref
28				__0000_EB01_Fwd_Neg_Torque_Li	WORD	%MW1027	0x0000	Fwd Pos Torque Limit
29				__0000_EB01_Rev_Pos_Torque_Li	WORD	%MW1028	0x0000	Fwd Neg Torque Limit
30				__0000_EB01_Rev_Neg_Torque_Li	WORD	%MW1029	0x0000	Rev Pos Torque Limit
31				__0000_EB01_Torque_Bias	WORD	%MW1030	0x0000	Rev Neg Torque Limit
32				__0000_EB01_Anytime_Para	WORD	%MW1031	0x0000	Torque Bias
33				__0000_EB01_Monitor_Line_1	WORD	%MW1032	0x0000	Anytime Para
34				__0000_EB01_Monitor_Line_2	WORD	%MW1033	0x0000	Monitor Line-1
35								Monitor Line-2

Example screen with all four basic input parameters checked and up to 16 input/output parameters selected

3 Services with LS ELECTRIC products or other manufacturer's products

3.1 Overview

This chapter explains the services utilizing EtherNet/IP and Modbus/TCP protocols when the communication board is connected with LS ELECTRIC products or another manufacturer's products.

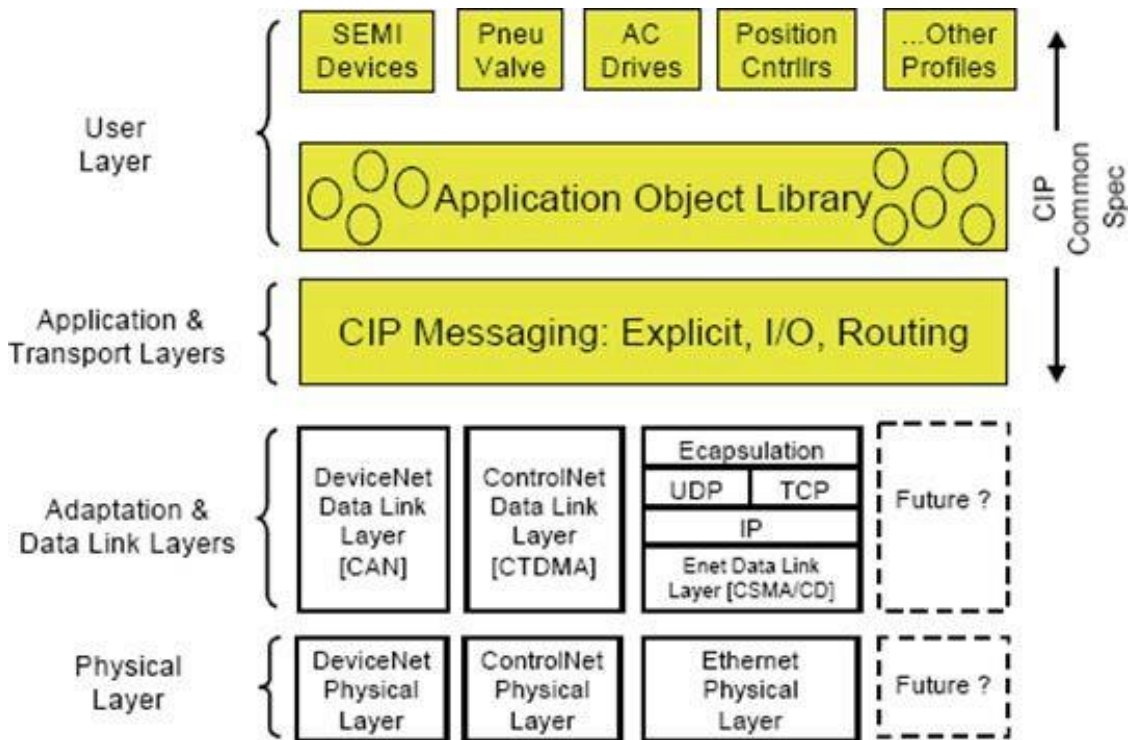
If the RAPIEnet service is not used, keypad settings must be configured as shown in the table below.

The default value is RAPIEnet Disable.

G100 RAPIEnet+ Communication Option Board CM-25 [OptParameter16]	RAPIEnet v2 Availability	EtherNet/IP Availability	Modbus TCP Availability
Setting: '2' RAPIEnet v2 Enable	O	O	O
Setting: '0' RAPIEnet v2 Disable	X	O	O

3.2 EtherNet/IP

3.2.1 Basic protocol structure



The EtherNet/IP is a protocol which implements the CIP (Common Industrial Protocol, specified by the ODVA) using the TCP and UDP protocols.

- Originator: Devices that make connection requests, which are also called clients.
- PLCs or scanners are examples of originators.
- Target: Devices that respond to connection requests, which are also called servers.
- Inverters are examples of targets.

3.2.2 Implicit Message

Implicit messages are also called I/O messages. It refers to the data communicated between the client (originator) and the server (target) at predefined intervals, via input and output instances.

The class 1 connection is used for implicit messages.

① Scope of support

Transport Type

Originator→Target: Point to Point

Target→Originator: Multicast

Transport Trigger: Cyclic

Configuration Connection: 1

Connection Tag: Not available

Priority

Originator→Target: Scheduled

Target→Originator: Scheduled

Configuration Data: Not supported

② Input Instance

Input instances refer to the status data periodically sent from the inverter to PLC or other client devices.

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
70	0						Running1 (Fwd)		Faulted
	1								
	2	Speed Actual (Low Byte) – RPM unit							
	3	Speed Actual (High Byte) – RPM unit							
71	0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
	1	Drive State							
	2	Speed Actual (Low Byte) – RPM unit							
	3	Speed Actual (High Byte) – RPM unit							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
110	0						Running1 (Fwd)		Faulted
	1								
	2	Speed Actual (Low Byte) – Hz unit							
	3	Speed Actual (High Byte) – Hz unit							
111	0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
	1	Drive State							
	2	Speed Actual (Low Byte) – Hz unit							
	3	Speed Actual (High Byte) – Hz unit							
141	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
142	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
143	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
144	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
145	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
146	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
147	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
148	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
149	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
150	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
151	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
152	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							
	22	Para Status-12 data (Low Byte)							
	23	Para Status-12 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
153	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							
	22	Para Status-12 data (Low Byte)							
	23	Para Status-12 data (High Byte)							
	24	Para Status-13 data (Low Byte)							
	25	Para Status-13 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
154	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							
	22	Para Status-12 data (Low Byte)							
	23	Para Status-12 data (High Byte)							
	24	Para Status-13 data (Low Byte)							
	25	Para Status-13 data (High Byte)							
	26	Para Status-14 data (Low Byte)							
	27	Para Status-14 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
155	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							
	22	Para Status-12 data (Low Byte)							
	23	Para Status-12 data (High Byte)							
	24	Para Status-13 data (Low Byte)							
	25	Para Status-13 data (High Byte)							
	26	Para Status-14 data (Low Byte)							
	27	Para Status-14 data (High Byte)							
	28	Para Status-15 data (Low Byte)							
	29	Para Status-15 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
156	0	Para Status-01 data (Low Byte)							
	1	Para Status-01 data (High Byte)							
	2	Para Status-02 data (Low Byte)							
	3	Para Status-02 data (High Byte)							
	4	Para Status-03 data (Low Byte)							
	5	Para Status-03 data (High Byte)							
	6	Para Status-04 data (Low Byte)							
	7	Para Status-04 data (High Byte)							
	8	Para Status-05 data (Low Byte)							
	9	Para Status-05 data (High Byte)							
	10	Para Status-06 data (Low Byte)							
	11	Para Status-06 data (High Byte)							
	12	Para Status-07 data (Low Byte)							
	13	Para Status-07 data (High Byte)							
	14	Para Status-08 data (Low Byte)							
	15	Para Status-08 data (High Byte)							
	16	Para Status-09 data (Low Byte)							
	17	Para Status-09 data (High Byte)							
	18	Para Status-10 data (Low Byte)							
	19	Para Status-10 data (High Byte)							
	20	Para Status-11 data (Low Byte)							
	21	Para Status-11 data (High Byte)							
	22	Para Status-12 data (Low Byte)							
	23	Para Status-12 data (High Byte)							
	24	Para Status-13 data (Low Byte)							
	25	Para Status-13 data (High Byte)							
	26	Para Status-14 data (Low Byte)							
	27	Para Status-14 data (High Byte)							
	28	Para Status-15 data (Low Byte)							
	29	Para Status-15 data (High Byte)							
	30	Para Status-16 data (Low Byte)							
	31	Para Status-16 data (High Byte)							

The following table explains the data (bytes 0 and 1) for instances 70, 71, 110, and 111.

Name	Description	Related Attribute	
		Class	Attr. ID
Faulted	Inverter Error	0x29	10
Warning	Not Supported	0x29	11
Running1	Motor is running Forward	0x29	7
Running2	Motor is running Reverse	0x29	8
Ready	Motor is ready to running	0x29	9
Ctrl From Net	Run/Stop control	0x29	15
Ref From Net	Speed control	0x2A	29
At Reference	Reach at reference Speed	0x2A	3
Drive State	Current Motor State	0x29	6
Speed Actual	Speed Command	0x2A	7

③ Output Instance

Out instance refers to the status data periodically sent from the PLC or other client devices to the inverter.

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20	0						Fault Reset		Run Fwd
	1								
	2	Speed Reference (Low Byte) – RPM unit							
	3	Speed Reference (High Byte) – RPM unit							
21	0		NetRef	NetCtrl			Fault Reset	Run Rev	Run Fwd
	1								
	2	Speed Reference (Low Byte) – RPM unit							
	3	Speed Reference (High Byte) – RPM unit							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	0						Fault Reset		Run Fwd
	1								
	2	Speed Reference (Low Byte) – Hz unit							
	3	Speed Reference (High Byte) – Hz unit							
101	0		NetRef	NetCtrl			Fault Reset	Run Rev	Run Fwd
	1								
	2	Speed Reference (Low Byte) – Hz unit							
	3	Speed Reference (High Byte) – Hz unit							
121	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
122	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
123	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
124	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
125	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
126	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
127	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
128	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
129	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
130	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
131	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
132	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							
	22	Para Control-12 data (Low Byte)							
	23	Para Control-12 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
133	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							
	22	Para Control-12 data (Low Byte)							
	23	Para Control-12 data (High Byte)							
	24	Para Control-13 data (Low Byte)							
	25	Para Control-13 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
134	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							
	22	Para Control-12 data (Low Byte)							
	23	Para Control-12 data (High Byte)							
	24	Para Control-13 data (Low Byte)							
	25	Para Control-13 data (High Byte)							
	26	Para Control-14 data (Low Byte)							
	27	Para Control-14 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
135	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							
	22	Para Control-12 data (Low Byte)							
	23	Para Control-12 data (High Byte)							
	24	Para Control-13 data (Low Byte)							
	25	Para Control-13 data (High Byte)							
	26	Para Control-14 data (Low Byte)							
	27	Para Control-14 data (High Byte)							
	28	Para Control-15 data (Low Byte)							
	29	Para Control-15 data (High Byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
136	0	Para Control-01 data (Low Byte)							
	1	Para Control-01 data (High Byte)							
	2	Para Control-02 data (Low Byte)							
	3	Para Control-02 data (High Byte)							
	4	Para Control-03 data (Low Byte)							
	5	Para Control-03 data (High Byte)							
	6	Para Control-04 data (Low Byte)							
	7	Para Control-04 data (High Byte)							
	8	Para Control-05 data (Low Byte)							
	9	Para Control-05 data (High Byte)							
	10	Para Control-06 data (Low Byte)							
	11	Para Control-06 data (High Byte)							
	12	Para Control-07 data (Low Byte)							
	13	Para Control-07 data (High Byte)							
	14	Para Control-08 data (Low Byte)							
	15	Para Control-08 data (High Byte)							
	16	Para Control-09 data (Low Byte)							
	17	Para Control-09 data (High Byte)							
	18	Para Control-10 data (Low Byte)							
	19	Para Control-10 data (High Byte)							
	20	Para Control-11 data (Low Byte)							
	21	Para Control-11 data (High Byte)							
	22	Para Control-12 data (Low Byte)							
	23	Para Control-12 data (High Byte)							
	24	Para Control-13 data (Low Byte)							
	25	Para Control-13 data (High Byte)							
	26	Para Control-14 data (Low Byte)							
	27	Para Control-14 data (High Byte)							
	28	Para Control-15 data (Low Byte)							
	29	Para Control-15 data (High Byte)							
	30	Para Control-16 data (Low Byte)							
	31	Para Control-16 data (High Byte)							

The following table explains the data (bits for byte 0) for instances 20, 21, 100, and 101.

Name	Description	Related Attribute	
		Class	Attr. ID
Run Fwd ¹	Forward Run Command	0x29	3
Run Rev ¹	Reverse Run Command	0x29	4
Fault reset ¹	Fault Reset Command	0x29	12
NetRef ²	Not used	0x2A	4
NetCtrl ²	Not used	0x29	5
Speed Reference	Speed Command	0x2A	8

3.2.3 Explicit Message

Explicit messages refer to non-periodic data communications used for reading or writing attribute values of an inverter or an EtherNet/IP.

Using the UCMM communication, data exchange is made without connecting the originator and the target, and periodic data exchange is available as well using the Class 3 connection.

3.2.4 Supported objects

① Identity Object (Class 0x01, Instance 1)

Attribute

Attribute ID	Access	Attribute Name	Data Length	Attribute Value
1	Get	Vendor ID	Word	259
2	Get	Device Type (AC Drive)	Word	2
3	Get	Product Code	Word	7201 ³

¹ Refer to the Drive Run and Fault sections in the "Control Supervisor Object (Class 0x29)."

² Reference speed and Run/Stop control can be set only on the LCD control panel. Network control instances 21 and 101 (NetRef, NetCtrl) are not available.

³ Product Code 7201 indicates the LS ELECTRIC G100 inverter communication option product.

Attribute ID	Access	Attribute Name	Data Length	Attribute Value
4	Get	Revision High Byte - Major Revision Low Byte - Minor Revision	Word	0x0101 ⁴
5	Get	Status	Word	⁵
6	Get	Serial Number	Double Words	⁶
7	Get	Product Name	9 Bytes	G100_CEPW

⁴ The high byte stands for a major revision number, and the low byte stands for a minor revision number. For example, "0x012" stands for "version 1.02."

This revision version is independent of the Keypad [CM-06] FBus S/W Ver.

⁵ Definition of each Status Bit

Bit	Description
0	0: Device is not connected to the master 1: Device is connected to the master
1	Reserved
2	Configured (fixed as "1" because LS ELECTRIC EtherNet/IP is supported)
3	Reserved
4	0 : Unknown
5	2: Faulty IO connection
6	3: IO connection has not been made
7	5 : Major Fault
8	6: IO connection has been made
9	Minor recoverable fault (Inverter is in warning status)
10	Minor unrecoverable fault (N/A)
11	Major recoverable fault (inverter H/W trip occurred)
12	Major recoverable fault (inverter non-H/W trip occurred)

⁶ Serial number uses the last 4 digits of the MAC ID.

E.g.) The serial number is 0x29000022 when the MAC ID is "00:0B:29:00:00:22."

Service

Service Code	Definition	Support for Class	Support for Instance
0x0E	Get Attribute Single	No	Yes
0x05	Reset	No	Yes
0x01	Get Attribute All	No	Yes

② Motor Data Object (Class 0x28, Instance 1)**Attribute**

Attribute ID	Access	Attribute Name	Range	Definition
3	Get	Motor Type	0~10	0 : Non-standard motor 1 : PM DC Motor 2 : FC DC Motor 3 : PM Synchronous Motor 4 : FC Synchronous Motor 5 : Switched Reluctance Motor 6 : Wound Rotor Induction Motor 7 : Squirrel Cage Induction Motor 8 : Stepper Motor 9 : Sinusoidal PM BL Motor 10 : Trapezoidal PM BL Motor
6	Get/Set	Motor Rated Curr	1.0~1000.0	[Get] Reads the value of the [BAS-13] Rated Current. [Set] Set value is reflected to [BAS-13] Rated Current. Scale 0.1
7	Get/Set	Motor Rated Volt	180~480	[Get] [Reads the value of the BAS-15] Rated Voltage. [Set] Set value is reflected to [BAS-15] Rated Voltage. Scale 1

Service

Service Code	Definition	Support for Class	Support for Instance
0x0E	Get Attribute Single	No	Yes
0x10	Set Attribute Single	No	Yes

③ Control Supervisor Object (Class 0x29, Instance 1)**Attribute**

Attribute ID	Access	Attribute Name	Range	Definition
3	Get / Set	Forward Run Cmd.	0	Stopped
			1	Forward Run ⁷
4	Get / Set	Reverse Run Cmd.	0	Stopped
			1	Reverse Run ⁷
5	N/A	Net Control	-	Configurable only with the inverter parameter.

⁷ Drive Run Command

Inverter operation using Forward Run Cmd. and Reverse Run Cmd

Run1	Run2	Trigger Event	Run Type
0	0	Stop	NA
0 → 1	0	Run	Run1
0	0 → 1	Run	Run2
0 → 1	0 → 1	No Action	NA
1	1	No Action	NA
1 → 0	1	Run	Run2
1	1 → 0	Run	Run1

In the table above, Run1 indicates Forward Run Cmd. and Run 2 indicates Reverse Run Cmd. Commands are made by the Ethernet communication board when the value changes from "0 (FALSE)" to "1 (TRUE)." The Forward Run Cmd. value does not indicate the present operation status of the inverter; it indicates the operation command value on the Ethernet communication board.

Attribute ID	Access	Attribute Name	Range	Definition
6	Get	Drive State	0	Vendor Specific
			1	Startup
			2	Not Ready (resetting in progress)
			3	Ready (stopping in progress)
			4	Enabled (running, not applicable to deceleration stop)
			5	Stopping (decelerating)
			6	Fault Stop
			7	Faulted (trip occurred)
7	Get	Running Forward	0	Operation stopped.
			1	Running Forward
8	Get	Running Reverse	0	Operation stopped.
			1	Running Reverse
9	Get	Drive Ready	0	Resetting in progress or trip occurred
			1	Inverter is ready for operation
10	Get	Drive Fault	0	Trip has not occurred
			1	Trip has occurred
12	Get / Set	Drive Fault Reset	0	Trip reset to release the trip. Trip reset is triggered when entering a TRUE value in a FALSE status or vice versa. ⁸
			1	
13	Get	Drive Fault Code		Refer to the following Drive Fault Code ⁸
15	Get	Control From Net.	0	Issues a run command from a source other than RAPIEnet communication (e.g., Keypad, local communication). Control is from local
			1	Commands are made using the RAPIEnet communication as the source. Control is from Network

⁸ Drive Fault

The Drive Fault becomes TRUE when the inverter is tripped.

The Drive Fault Codes for the trips are as shown on the following page.

Drive Fault Code

Fault Code Number	Description	
0x0000	None	
0x1000	Ethermal Out Phase Open InverterOLT InPhaseOpen ThermalTrip UnderLoad ParaWriteTrip IOBoardTrip PrePIDFail OptionTrip1 OptionTrip2 OptionTrip3 LostCommand UNDEFINED LostKeypad	
0x2200	OverLoad	
0x2310	OveCurrent1	
0x2330	GFT	
0x2340	OverCurrent2	
0x3210	OverVoltage	
0x3220	LowVoltage	
0x2330	GroundTrip	
0x4000	NTCOpen	
0x4200	OverHeat	
0x5000	FuseOpen	HWDiag
0x7000	FanTrip	
0x7120	No Motor Trip	
0x7300	Encorder Trip	
0x8401	SpeedDev Trip	
0x8402	OverSpeed	
0x9000	External Trip	BX

Drive Fault Reset

The Drive Fault Reset gives TRIP RESET reference to the inverter when the setting value changes from 0 to 1 (FALSE to TRUE). Or, it gives TRIP RESET reference to the inverter when setting value changes from "1" to "0" (TRUE to FALSE). Overwriting "1" (TRUE) over "1" (TRUE) or "0" (FALSE) over "0" (FALSE) does not generate a RESET reference for a trip.

Service

Service Code	Definition	Support for Class	Support for Instance
0x0E	Get Attribute Single	No	Yes
0x10	Set Attribute Single	No	Yes

④ AC Drive Object (Class 0x2A, Instance 1)

Attribute

Attribute ID	Access	Attribute Name	Range	Definition
3	Get	At Reference	0	The output frequency has not reached the reference frequency.
			1	The output frequency has reached the reference frequency.
4	N/A	Net Reference	-	
6	Get	Drive Mode ⁹	0	Vendor Specific Mode
			1	Open Loop Speed(Frequency)
			2	Closed Loop Speed Control
			3	Torque Control
			4	Process Control(e.g.PI)
7	Get	SpeedActual	0~24000	Displays the present output frequency in [rpm].

⁹ Related to [DRV-10] Torque Control and [APP-01] App Mode. When DRV-10 (Torque Control) is set to Yes, the Drive Mode becomes "Torque Control", and when APP-01 (App Mode) is set to Proc PID, MMC, then the Drive Mode becomes "Process Control (e.g., PI)."

Attribute ID	Access	Attribute Name	Range	Definition
8	Get / Set	SpeedRef	0~ 24000	Displays the reference frequency in [rpm]. Reflected when [FRQ] Freq Ref Src is set to FieldBus.
9	Get	Actual Current	0~ 111.0 A	Monitors the present current in 0.1 A increment/decrement.
29	Get	Ref.From Network	0	Command source is not the DeviceNet communication.
			1	Command source is the DeviceNet communication.
100	Get	Actual Hz	0~ 400.00 Hz	Monitors the present operation frequency (Hz).
101	Get / Set	Reference Hz	0~ 400.00 Hz	Speed reference may be given via a network communication if DRV-07 (Freq Ref Src) is set to 8 (FieldBus).
102	Get / Set	Acceleration Time ¹⁰	0~ 6000.0 sec	Sets/monitors the acceleration time of the inverter.
103	Get /Set	Deceleration Time ¹¹	0~ 6000.0 sec	Sets/monitors the deceleration time of the inverter.

Service

Service Code	Definition	Support for Class	Support for Instance
0x0E	Get Attribute Single	No	Yes
0x10	Set Attribute Single	No	Yes

¹⁰ This is the Acc Time value.

¹¹ This is the Dec Time value.

⑤ Inverter Object (Class 0x64) – Manufacture Profile

This object is used to access the Keypad Parameters of the inverter.

Attribute

Instance	Access	Attribute Number	Attribute Name	Attribute Value
1 (DRV Group)	Get/ Set	Identical to the G100 Manual Code number.	G100 Keypad Title (Refer to the G100 Manual)	G100 Parameter setting ranges (refer to the G100 Manual)
2 (BAS Group)		Identical to the G100 Manual Code number.		
3 (ADV Group)		Identical to the G100 Manual Code number.		
4 (CON Group)		Identical to the G100 Manual Code number.		
5 (IN Group)		Identical to the G100 Manual Code number.		
6 (OUT Group)		Identical to the G100 Manual Code number.		
7 (COM Group)		Identical to the G100 Manual Code number.		
8 (APP Group)		Identical to the G100 Manual Code number.		
9 (AUT Group)		Identical to the G100 Manual Code number.		
10 (APO Group)		Identical to the G100 Manual Code number.		
11 (PRT Group)		Identical to the G100 Manual Code number.		
12 (M2 Group)		Identical to the G100 Manual Code number.		

Service

Service Code	Definition	Support for Class	Support for Instance
0x0E	Get Attribute Single	No	Yes
0x10	Set Attribute Single	No	Yes

3.2.5 EDS File

It is a file containing information about the G100 RAPIEnet+ communication option board.

This file is required by the network configuration software for the EtherNet/IP Protocol.

Version	Definition
RAPIEnet+ OS V1.00 or later	G100_CEPW.eds

** Download the document at <https://sol.ls-electric.com>.

3.3 Modbus TCP

3.3.1 ModbusTCP frame structure

MBAP Header(7 Bytes)	PDU (5 Bytes ~)
----------------------	-----------------

In general, Ethernet communication uses Ethernet II frames.

MODBUS Application Protocol Header (MBAP Header)

The following table explains the components of a MBAP header.

Section	Length	Description
Transaction Identifier	2 Bytes	The unique transmission number increases by 1 each time a Data Frame is sent from the Client to the Server.
Protocol Identifier	2 Bytes	Fixed at 0.
Length	2 Bytes	Data frame length of the Modbus communication, which represents the length (in byte unit) from the MBAP header to the unit identifier.
Unit Identifier	1 Byte	When communications using Modbus TCP and Modbus RTU are connected via a gateway, the unit identifier indicates the slave number. The address is fixed to 0xFF when Modbus TCP communication is used alone.

Protocol Data Unit (PDU)

PDU is the actual data in the Modbus TCP communication, which is composed of a function code and data.

A detailed explanation will be provided below in the "3.3.2 Function codes" section.

3.3.2 Function codes

The Modbus TCP communication involves clients and a server. During communication, clients send commands to the server, and the server responds to the commands. In general, devices such as a PLC, HMI, and PC are used as the client, and the inverter works as a server.

① Read Holding Registers

Read Input registers are functions used to read the server (inverter) data.

The following table explains the components of a request data frame from a client to a server.

Request frame	Length	Value
Function Code	1 Byte	0x03
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Number of data requests	2 Bytes	1-16 (LS ELECTRIC inverters)

The following table explains the components of a response data frame from a server to a master.

Response frame	Length	Value
Function Code	1 Byte	0x03
Byte Count	1 Byte	The number of 2 x data requests
Data value	The number of data requests x 2 bytes	Data value of the given number from the comm. address

② Read Input Registers

Read Input registers are functions used to read the server (inverter) data.

The following table explains the components of a request data frame from a client to a server.

Request frame	Length	Value
Function Code	1 Byte	0x04
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Number of data requests	2 Bytes	1-16 (LS ELECTRIC inverters)

The following table explains the components of a response data frame from a server to a master.

Response frame	Length	Value
Function Code	1 Byte	0x04
Byte Count	1 Byte	The number of 2 x data requests
Data value	The number of data requests x 2 bytes	Data value of the given number from the comm. address

③ Write Single Register

Write Single registers are functions used to write a single server (inverter) data.

The following table explains the components of a request data frame from a client to a server.

Request frame	Length	Value
Function Code	1 Byte	0x06
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Data value	2 Bytes	0x0000 ~ 0xFFFF

The following table explains the components of a response data frame from a server to a master.

Response frame	Length	Value
Function Code	1 Byte	0x06
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Data value	2 Bytes	0x0000 ~ 0xFFFF

④ Write Multiple Register

Write Multiple registers are functions used to write 1 to 16 consecutive data items on the server (inverter).

The following table explains the components of a request data frame from a client to a server.

Request frame	Length	Value
Function Code	1 Byte	0x10
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Amount of data to write	2 Bytes	1-16 (LS ELECTRIC inverters)
Byte Count	1 Byte	Amount of 2 x data
Amount of data to write	Amount of data x 2 bytes	Amount of data to write

The following table explains the components of a response data frame from a server to a master.

Response frame	Length	Value
Function Code	1 Byte	0x10
Comm. address	2 Bytes	0x0000 ~ 0xFFFF
Amount of data to write	2 Bytes	1-16 (LS ELECTRIC inverters)

⑤ Read/Write Multiple Registers

Function used to modify continuous data from 1 to 16 items in the Inverter (Server) and simultaneously read data from the Inverter (Server).

Request Frame structure from Client to Server

Request frame	Length	Value
Function Code	1 Byte	0x17
Communication address to read	2 Bytes	0x0000 ~ 0xFFFF
Amount of data to read	2 Bytes	1-16 (LS ELECTRIC inverters)

Request frame	Length	Value
Communication address to be modified	2 Bytes	0x0000 ~ 0xFFFF
Number of data to be modified	2 Bytes	1-16 (LS ELECTRIC inverters)
Number of data bytes to be modified	1 Byte	2 x number of data
Data values to be modified	Number of data x 2 bytes	Data to be modified

Response Frame structure from Server to Master

Response frame	Length	Value
Function Code	1 Byte	0x17
Byte Count	1 Byte	2 x "Number of data requests to read"
Data value	"Number of data requests to read" x 2 bytes	Data value read from the "Communication address to read"

3.3.3 Exception Frame

An exception frame is a response frame from a server when an error occurs while responding to the client.

The following table explains the components of an exception frame.

Error Frame	Length	Value
Error Code	1 Byte	0x80 + function code requested by the client
Exception Code	1 Byte	0x00 ~ 0xFF

Exception code

Type	Code	Description
ILLEGAL FUNCTION	0x01	An unsupported function has been requested
ILLEGAL DATA ADDRESS	0x02	Attempting to request or modify data at an unused address
ILLEGAL DATA VALUE	0x03	A data modification request has been made out of the range of the available value.
SLAVE DEVICE FAILURE	0x04	Server error (CAN communication error with the drive, communication board initialization error, or data communication error with the drive)
SLAVE DEVICE BUSY	0x06	The server is busy with other tasks and cannot respond (in the middle of a drive parameter initialization or the initial setting of the communication board)
WRITE PERMISSION ERROR	0x14	Attempting to modify a read-only parameter using a code specific to LS ELECTRIC inverters

4 LED Indications and troubleshooting

4.1 LED Information

LED name	Color	Meaning of Operation	Operation	Description
LINK1	Green	Network normal	ON	Network connection at LINK 1 is operating normal
	Orange	Check network settings	ON	When the communication cycle stops for longer than one second.
	-	LINK 1 Not connected	OFF	Network connection at LINK 1 is disconnected and not operating normal
LINK2	Green	Network normal	ON	Network connection at LINK 2 is operating normal
	Orange	Check network settings	ON	When the communication cycle stops for longer than one second.
	-	LINK 2 Not connected	OFF	Network connection at LINK 2 is disconnected and not operating normal

LED name	Color	Meaning of Operation	Operation	Description
ERROR	-	Normal operation	OFF	Normal communication between the G100 RAPIEnet+ communication option board and the inverter
	Red	Communication error	Flashing (1-second interval, Synchronous flashing with the CPU LED)	Communication failure between the G100 RAPIEnet+ communication option board and the inverter
			Flashing (1-second interval, Asynchronously with the CPU LED)	EIP instance setting values mismatch
			Flashing (2-second interval)	Communication parameters set on the Keypad differ from those set on the G100 RAPIEnet+ communication option board
			ON	EEPROM failure
CPU	Green	Normal operation	Flashing (1-second interval)	This indicates normal installation of the G100 RAPIEnet+ communication option board with the inverter

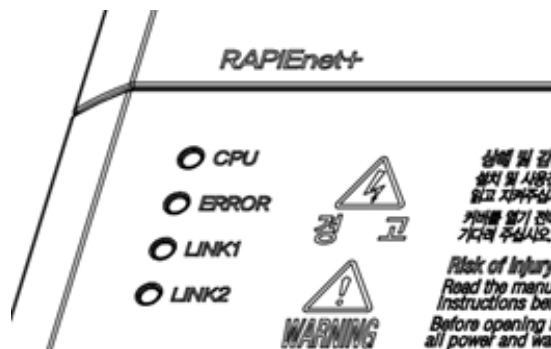
4.2 Troubleshooting

No.	Symptom	Corrective Action
1	Both the Error LED and CPU LED turn off	This occurs when the power supply to the G100 RAPIEnet+ communication option board is not normal. 1) Install the G100 RAPIEnet+ communication option board correctly to the inverter body. 2) Ensure that the connector pins of the G100 RAPIEnet+ communication option board connected to the main body are not damaged or bent. 3) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
2	If the ERROR LED is on and the CPU LED is off,	it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
3	The Error LED turns on, while CPU LED flashes at 1-second intervals	1) Check if the LINK LED of the port connected to the LAN cable is on. If the LED does not light up, check if the LAN cable is securely attached to the port of the G100 RAPIEnet+ communication option board. 2) Check if the IP assigned to the G100 RAPIEnet+ communication option board conflicts with the IP of another device on the same network. 3) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
4	Both the ERROR LED and CPU LED flash at 1-second intervals	1) Ensure that the connector pins of the G100 RAPIEnet+ communication option board connected to the main body are not damaged or bent. 2) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.

No.	Symptom	Corrective Action
5	ERROR LED and CPU LED take turns to flash at 1-second intervals	Check whether the EIP communication's instances set by PLC match the [CM-23] OptParameter14 and [CM-24] OptParameter15 and set [CM-94] Comm Update to "1 (Yes)" for matched settings. Refer to "PART2 Chapter 1.3 CM group" in this document.
6	When the CPU LED is flashing at 1-second intervals and the ERROR LED is flashing at 2-second intervals	Set [CM-94] Comm Update to [Yes] to synchronize the communication parameters set on the Keypad with those set in the G100 RAPIEnet+ communication option board.

PART3 PROFINET Communication Functions

1 Information on the PROFINET Mode LED Display



	LED name	Color	Meaning of Operation	Operation	Description
LED0	LINK1/ACT1	Green	Normal operation	ON	Network Link 1 is connected
				OFF	Network Link 1 is not connected
		Red	Normal operation	OFF	No data transmission/reception on Network Link 1
				Flashing	Data transmission/reception with the communication master is in progress on Network Link 1
LED1	LINK2/ACT2	Green	Normal operation	ON	Network Link 2 is connected
				OFF	Network Link 2 is not connected
		Red	Normal operation	OFF	No data transmission/reception on Network Link 2
				Flashing	Data transmission/reception with the communication master on Network Link 2

	LED name	Color	Meaning of Operation	Operation	Description
LED2	ERROR	Red	Normal operation	OFF	Normal communication between the G100 RAPIEnet+ communication option board and the inverter
			Communication error	CPU and Error LEDs flashes synchronously	Communication failure between the G100 RAPIEnet+ communication option board and the inverter
				Error LED flashes (at 2-second intervals) slower than the CPU LED	The PLC and PROFINET communication settings are not normal
				ON	Not booting
LED3	CPU	Green	Abnormal operation	ON	CPU operation stopped
				OFF	
			Normal operation	Flashing (1-second interval)	This indicates normal installation of the G100 RAPIEnet+ communication option board with the inverter

2 PROFINET Mode Keypad Parameters

To operate the G100 inverter using the G100 RAPIEnet+ communication option board, set the DRV Command Source of the keypad to 4 (Fieldbus).

To issue frequency reference commands using the G100 RAPIEnet+ communication option board, set FRQ Freq Ref Src to 8 (Fieldbus).

Code	Parameter Name	Initial Value	Range
DRV	Command Source	1 Fx/Rx-1	0: Keypad
			1: Fx/Rx-1
			2: Fx/Rx-2
			4: Field Bus
			5: UserSeqLink
FRQ	Freq Ref Src	0 Keypad	0: Keypad-1
			1: Keypad-2
			2: V1
			3: V2
			4: V0, built-in potentiometer
			5: I2
			6: Int 485
			8: Field Bus.
DRV	20 Max Frequency	60.0	40.0~590.0 LSE new mode: When using Standard Telegram1: Used as the ref value LSE new mode: When using Standard Telegram20: Used as the ref value

Code	Parameter Name	Initial Value	Range
CM	06 FBus S/W Ver	-	-
	09 FBus Led	-	-
	10 FBus IP Addr1	192	IP - 1
	11 FBus IP Addr2	168	IP - 2
	12 FBus IP Addr3	1	IP - 3
	13 FBus IP Addr4	101	IP - 4
	14 FBus Subnet CIDR	24	Subnet CIDR (Decimal input)
	15 FBus Gateway Addr1	192	Gateway - 1
	16 FBus Gateway Addr2	168	Gateway - 2
	17 FBus Gateway Addr3	1	Gateway - 3
	18 FBus Gateway Addr4	10	Gateway - 4
	19 Fbus Option Type	0	Selects the protocol you want to use. 0: RAPIenet+ 1: PROFINET
	20 Webserver enable	0	Enable the default webserver. 0: disable 1: enable
	21 Password	xxxx	This is the password used to access the built-in web server and it automatically changes upon each reboot, but if the user sets it manually, it remains fixed. When parameters are initialized, it is restored with a random value.
	23 Profile CSM *CSM: Compatibility support mode	0	0: LSE new mode 1: LSE old mode

Code	Parameter Name	Initial Value	Range
CM	24 Telegram	0	Profile CSM 0 LSE new mode 0: Standard Telegram1 1: Standard Telegram20 2: Vendor Specific Telegram88 3: Vendor Specific Telegram1616 4: Reserved 5: LSE Telegram Profile CSM 1 LSE old mode 0: Standard Telegram1 1: Vendor Specific Telegram
	25 DHCP Enable	0	0 : DHCP Disable 1~9 : Reserved 10 : DHCP Enable
PRT	12 Lost Cmd Mode	0 None	0: None 1: Free-Run 2: Dec 3: Hold Input 4: Hold Output 5: Lost Preset
	13 Lost Cmd Time	1.0	0.1 ~ 120.0 [s]
	14 Lost Preset Freq	0.00	0. 0 ~ Max Frequency
	67 Lost Opt Cmd Mode	1: Free-Run	0: None 1: Free-Run 2: Dec
	68 Lost Opt Cmd Delay	0.0	0.1 ~ 120.0 [s]

CIDR	Subnet Mask	CIDR	Subnet Mask
0	0.0.0.0		
1	128.0.0.0	17	255.255.128.0
2	192.0.0.0	18	255.255.192.0
3	224.0.0.0	19	255.255.224.0
4	240.0.0.0	20	255.255.240.0
5	248.0.0.0	21	255.255.248.0
6	252.0.0.0	22	255.255.252.0
7	254.0.0.0	23	255.255.254.0
8	255.0.0.0	24	255.255.255.0
9	255.128.0.0	25	255.255.255.128
10	255.192.0.0	26	255.255.255.192
11	255.224.0.0	27	255.255.255.224
12	255.240.0.0	28	255.255.255.240
13	255.248.0.0	29	255.255.255.248
14	255.252.0.0	30	255.255.255.252
15	255.254.0.0	31	255.255.255.254
16	255.255.0.0	32	255.255.255.255

3 Description of PROFINET Mode Keypad Parameters

3.1 Operation Group

① [DRV] Command Source: Run command source

Select the command source for the G100 inverter. To input the run command via communication using the G100 communication option board, select [4 Fieldbus].

② [FRQ] Freq Ref Src: Frequency reference source

Select the frequency command source for the G100 inverter. To input the frequency command via communication using the G100 communication option board, select [8 Fieldbus].

③ [DRV-20] Max Frequency: Maximum Frequency Setting

When using (New) Standard Telegram 1/Standard Telegram 20, this value is used as the reference

for the target speed. Execute Comm Update (CM-94) after setting the value.

Motor operating frequency = Setpoint value × Max_Frequency (DRV-20: Max Freq)/0x4000

Example) Motor operating frequency: 60Hz, when DRV-20: 60Hz, Setpoint value: 0x4000

Example) Motor operating frequency: 30Hz, when DRV-20: 60Hz, Setpoint value: 0x2000

Example) Motor operating frequency: 400Hz, when DRV-20: 400Hz, Setpoint value: 0x4000

Example) Motor operating frequency: -400Hz, when DRV-20: 400Hz, Setpoint value: 0xC000

3.2 CM group

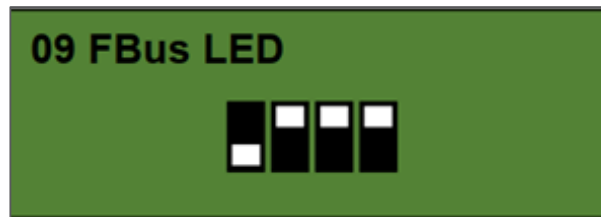
① [CM-06] FBus S/W Ver: PROFINET S/W version

Automatically indicate the version of the PROFINET mode of the communication board installed on the G100 inverter.

② [CM-09] FBus Led: G100 RAPIenet+ Communication Option Board LED Indications

You can check the LED indicators of the G100 RAPIenet+ Communication Option Board via the keypad. Refer to "PART3 Chapter 1 Information on the PROFINET Mode LED Display" for operations related to the LED display.

Example of the [CM-09] FBus LED Indication

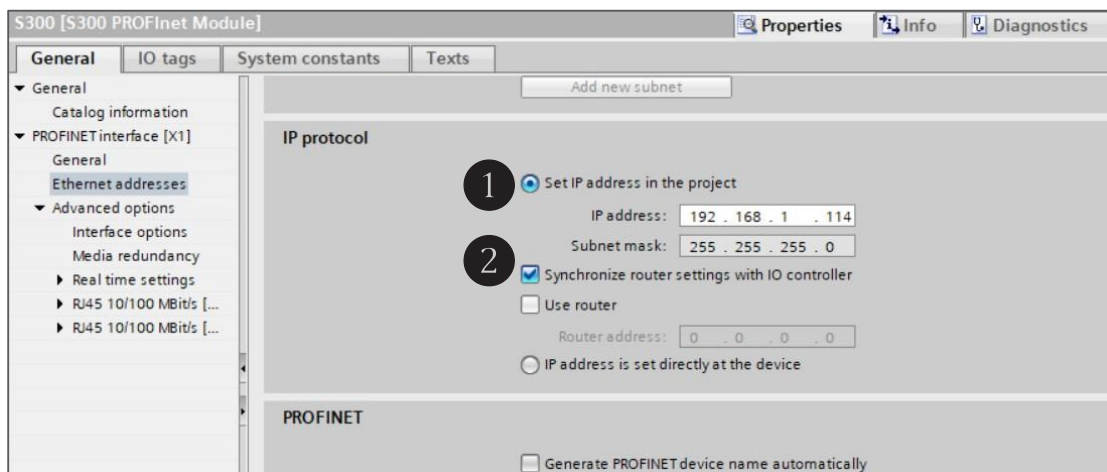


LINK1	LINK2	ERROR LED	CPU LED
LED OFF	LED ON	LED ON	LED ON

③ [CM-10 - 18] IP Address, Subnet Mask, and Gateway Settings

The IP version supported by the G100 RAPIenet+ communication option board is v4. All network and mask addresses are expressed in four decimal numbers between 0 and 255 (i.e. 255.255.255.255). The configured IP address can be forcibly changed to the value set by the PLC via a DCP packet from the PLC.

Example: When programming a PLC in Siemens' TIA, if you select option ① as shown in the image below, the PLC will record the IP information indicated below onto the G100 RAPIenet+ communication option board through a DCP packet and set the IP accordingly. If you select option ②, the PLC will attempt to establish a PROFINET communication connection with the G100 RAPIenet+ communication option board after reading the IP information already recorded on the G100 RAPIenet+ communication option board, without following the process described earlier.



④ [CM-23, 24] Profile CSM, Telegram mode settings

The G100 RAPIenet+ communication option board supports two modes: LSE new mode and LSE old mode. The telegrams supported by each mode are listed in the table below. For the format and details of the supported telegrams, refer to "PART 3, 4.4 Telegram."

Set value		Selected Telegram
CM-23 Profile CSM	CM-24 Telegram	
LSE new mode	0	Standard Telegram 1
	1	Standard Telegram20
	2	Vendor Specific Telegram 88
	3	Vendor Specific Telegram 1616
	5	LSE Telegram
LSE old mode	0	Standard Telegram 1
	1	Vendor Specific Telegram

3.3 PRT group

① [PR-12] Lost Cmd Mode: Deceleration operation mode when a communication command is lost

Selects the inverter operating mode when a communication command loss occurs. The operating modes are as follows:

Set value		Description
0	None	The speed reference immediately becomes the operation frequency without any protective operation.
1	Free-Run	The inverter output is cut off. The motor free-runs.
2	Dec	The motor decelerates and then stops at the time set at PR-07 (Trip Dec Time).
3	Hold Input	The inverter calculates the average input value for 10 seconds before the loss of the speed command and uses it as the speed reference.
4	Hold Output	The inverter calculates the average output value for 10 seconds before the loss of the speed command and uses it as the speed reference.
5	Lost Preset	The inverter operates with the frequency reference set at PR-14 (Lost Preset Frequency).

② [PR-13] Lost Cmd Time: Communication command loss detection time

Sets the time after which the mode set in [PR-12] is applied when a communication command loss (Lost Command) occurs. You can set a value between "0.1" and "120" seconds.

③ [PR-14] Lost Preset Frequency: Operation frequency for a command loss

When a communication command loss (Lost Command) occurs, the protection function operates, and the inverter runs at the frequency set in [PR-14]. The setting value is from the start frequency to the max frequency [Hz].

④ [PR-67] Lost Opt Cmd Mode: Selects the communication option command loss mode

This function is enabled only when the run command or frequency reference is set to Fieldbus. It configures the operation of the inverter when a Lost Command occurs due to the communication option not being installed or due to loss of communication commands.

⑤ **[PR-68] Lost Opt Cmd Delay: Sets the communication loss detection time of the communication option**

Sets the decision time for mode operation configured in Pr.67 code.

4 Communication Profile

Communication Profile displays the procedures between master and slaves (inverter), including command (control word, status word, references, actual values, etc.). Data transmission between the PROFINET master and slave is performed through the IN/OUT data fields. The master controls the slave (drive) by writing to the OUT data, and the slave (drive) responds by sending data to the master through the IN data.

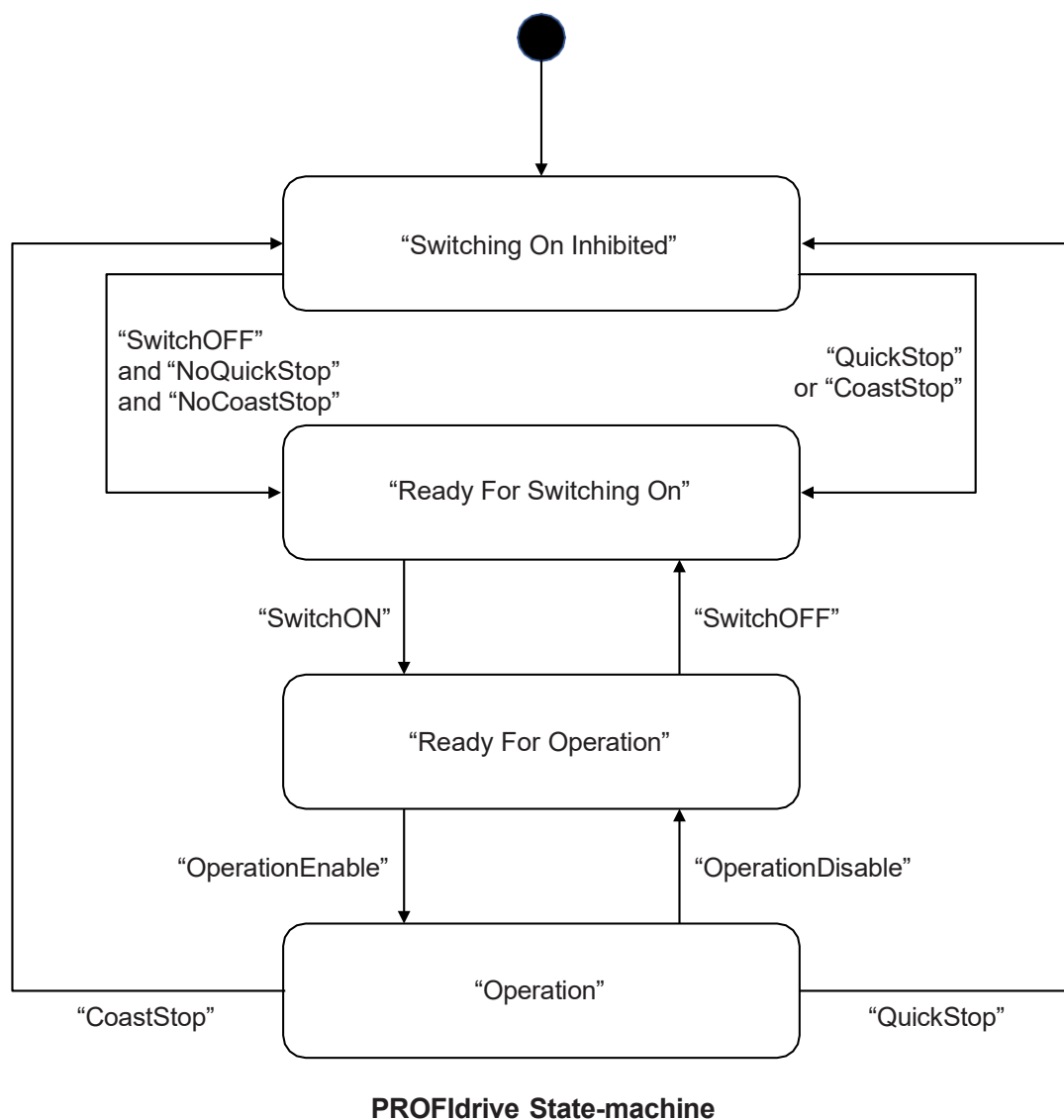
The G100 RAPIEnet+ communication option board supports the I/O Profile, PROFIdrive Profile, and LS Drive Profile, and each profile selects and uses telegram accordingly.

Set value			Selected Telegram
CM-23 Profile CSM		CM-24 Telegram	
LSE new mode	PROFIdrive Profile	0	Standard Telegram 1
		1	Standard Telegram 20
	I/O Profile	2	Vendor Specific Telegram 88
		3	Vendor Specific Telegram 1616
	LS Drive profile	5	LSE Telegram
LSE old mode	PROFIdrive Profile	0	Standard Telegram 1
		1	Vendor Specific Telegram

4.1 PROFIdrive Profile

The control word is used in the control system according to the PROFIdrive Profile and the status word indicates changed status by control word, etc. When using this PROFIdrive Profile, access to inverter control parameters such as run and target frequency (0h0005, 0h000A, 0x0381, 0x0015) is not recommended.

The figure below shows the state diagram of each transition when using the PROFIdrive Profile.



Status	Description
S1: Switching On Inhibited	The current state of the G100 RAPIEnet+ communication option board means that it cannot be switched on.
S2: Ready For Switching On	Ready to change to the "Switch on" state any time.
S3: Ready For Operation	Ready to change to the "Operation enable" state any time.
S4: Operation enable	A state in which the motor is running.

Transitions between each state occur according to commands periodically sent from the PLC. The types of commands are as follows, and detailed information is explained in the "Control word(STW1)" section on the following page.

- ① NoQuickStop command
- ② NoCoastStop command
- ③ SwitchOFF command
- ④ SwitchON command
- ⑤ OperationEnable command
- ⑥ OperationDisable command
- ⑦ QuickStop command
- ⑧ CoastStop command

The events and operations for each state transition are shown in the table below.

Source State	Target State	Event	Action
"Switch On Inhibited"	"Ready For Switching On"	"SwitchOFF" and "NoQuickStop" and "NoCoastStop"	None (the motor stopped)
"Ready For Switching On"	"Switch On Inhibited"	"QuickStop" or "CoastStop"	None (the motor stopped)
"Ready For Switching On"	"Ready For Operation"	"SwitchON"	None (the motor stopped)
"Ready For Operation"	"Ready For Switching On"	"SwitchOFF"	None (the motor stopped)

Source State	Target State	Event	Action
"Ready For Operation"	"Operation"	"OperationEnable"	Motor running
"Operation"	"Ready For Operation"	"OperationDisable"	Motor stop (The motor is stopped according to the method set in the G100 inverter parameter Ad-08 Stop Mode.)
"Operation"	"Switch On Inhibited"	"CoastStop"	Motor stops (Free Run Stop)
"Operation"	"Switch On Inhibited"	"QuickStop"	Motor stop (The motor is stopped according to the method set in the G100 inverter parameter Ad-08 Stop Mode.)

Control word(STW1)

Bit	Name	Value	Description
0	ON	1	Ready to operation (Operational state enabled by PLC)
	OFF1	0	NOT Ready to operation (Operational state disabled by PLC)
1	No OFF2	1	The OFF2 (Coast Stop) function is not configured. The current operating state is maintained.
	OFF2 (Coast Stop)	0	The motor will stop using Free Run Stop (emergency stop).
2	No OFF3	1	The OFF3 (Quick Stop) function is not configured. The current operating state is maintained.
	OFF3(Quick Stop)	0	The motor is stopped according to the method set in the G100 inverter parameter Ad-08 Stop Mode.

Bit	Name	Value	Description
3	Enable Operation	1	This drives the motor with the setpoint value (command frequency) received from the PLC via PROFINET communication.
	Disable Operation	0	The motor is stopped according to the method set in the G100 inverter parameter Ad-08 Stop Mode.
4	Enable Ramp Generator	1	The motor accelerates/decelerates according to the Acc Time and Dec Time settings of the G100 inverter parameters and reaches the Setpoint Value (command frequency).
	Reset Ramp Generator	0	Force the motor command value to 0 (the frequency decelerates to 0 Hz as set by Dec Time).
5	Unfreeze Ramp Generator	1	Without fixing the Ramp Generator operation, the motor accelerates/decelerates for a certain time by referring to the Acc Time and Dec Time parameters of the G100 inverter and reaches the Setpoint Value (command frequency).
	Freeze Ramp Generator	0	Through PROFINET, disregards the motor command value of the input PLC and operates the motor with the current motor rotation frequency by fixing the Ramp Generator operation.
6	Enable Setpoint	1	The motor is operated according to the motor command value from the PLC.
	Disable Setpoint	0	The motor command value is forcibly set to 0.
7	Fault Acknowledge	(0 → 1)	When changing from 0 to 1, turn off the G100 inverter's fault.
8	Jog1 ON/OFF	-	Not supported
9	Jog2 ON/OFF	-	Not supported
10	Control By PLC	1	This controls the G100 inverter through the Control word (STW1) received from the PLC via PROFINET communication.
	No Control By PLC	0	This disregards the Control word (STW1) received from the PLC via PROFINET communication.
11 ~ 15	-	-	Reserved

The status change shown in "PROFIdrive State-machine" can be modified by changing the value of the control word according to values of Bits 0-3. For example, to change the status to "Operation," the control word must be "XXXX XXXX XXXX 1111" in bits.

Note

The "X" symbol means that this value does not make any difference (whether it is set to "0" or "1").

Depending on the values of Bits 0 to 3, the following state transition commands are defined.

Command	Bit3	Bit2	Bit1	Bit0
QuickStop	X	0	X	X
CoastStop	X	X	0	X
NoQuickStop	X	1	X	X
NoCoastStop	X	X	1	X
SwitchOFF	X	1	1	0
SwitchON	X	1	1	1
OperationEnable	1	1	1	1
OperationDisable	0	1	1	1

This control internally uses the inverter communication address 0x0382 (Run Command), and the basic Control Word (STW1) bit setting for driving the motor is 0x47F (Bits 0, 1, 2, 3, 4, 5, 6, 10). When the run command bits are set in the PLC as 0x47F, basic motor operation is available by setting only the command frequency.

Example) Bit settings during motor operation

Bit type	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Set Value	1	- ¹	- ¹	0	1	1	1	1	1	1	1

¹ Motor operation is available regardless of "-" settings.

Status word(ZSW1)

Bit	Name	Value	Description
0	RDY_ON	1	Ready To Switch ON (Operational status)
		0	Not Ready To Switch OFF (Inoperable state)
1	RDY_OPERATION	1	Indicates the value of bit 0 of the currently received Control word (STW1).
		0	
2	OPERATION	1	Indicates the value of bit 3 of the currently received Control word (STW1).
		0	
3	Fault Present	1	Indicates that there is no fault.
	No Fault	0	Indicates that there is no fault.
4	No OFF2	1	Indicates the value of bit 1 of the currently received Control word (STW1).
	OFF2	0	
5	No OFF3	1	Indicates the value of bit 2 of the currently received Control word (STW1).
	OFF3	0	
6	SWC_ON_INHIB	1	Switching On inhibited (Out of control)
		0	Switching On Not inhibited (Controllable status)
7	Warning Present	1	Indicates that a warning exists in the inverter.
	No Warning Present	0	Indicates that no warning exists in the inverter.
8	Speed Error within tolerance	1	This indicates the motor's actual rotating frequency has reached the command frequency ("Setpoint value").
	Speed Error out of tolerance	0	This indicates the motor's actual rotating frequency has failed to reach the command frequency ("Setpoint value").
9	Control Requested	1	Indicates the value of bit 10 of the currently received Control word (STW1).
	No Control Requested	0	
10	ABOVE_LIMIT	-	Not Supported
11 to 15	-	-	Reserved

According to the state shown in the "PROFIdrive State-machine," Bits 0-2 and Bit 6 indicate the state value of the communication option board as shown in the table below.

Status Word	Status
xxxx xxxx x1xx x000 ²	"Switching On Inhibited"
xxxx xxxx x0xx x001	"Ready For Switching On"
xxxx xxxx x0xx x011	"Ready For Operation"
xxxx xxxx x0xx x111	"Operation"

Setpoint value

Indicate inverter's operation command frequency, the unit is Hz, and the scale is 0.01.

* When using New Standard Telegram 1/20, the DRV-20 value is referenced and used in percentage units (0xC000-0x4000).

Motor operating frequency = Setpoint value × Max_Frequency (DRV-20: Max Freq)/0x4000

Example) Motor operating frequency: 60Hz, when DRV-20: 60Hz, Setpoint value: 0x4000

Example) Motor operating frequency: 30Hz, when DRV-20: 60Hz, Setpoint value: 0x2000

Example) Motor operating frequency: 400Hz, when DRV-20: 400Hz, Setpoint value: 0x4000

Example) Motor operating frequency: -400Hz, when DRV-20: 400Hz, Setpoint value: 0xC000

Actual speed value

This indicates the inverter's actual output frequency; the unit is Hz, and the scale is 0.01.

* When using New Standard Telegram 1/20, the DRV-20 value is referenced and used in percentage units (0xC000-0x4000).

² "X" marked Bit means it doesn't affect the operation.

Alarm Info

Bit	Name	Description
0 to 7	FAULT/WARNING code	Refer to inverter-compatible common area parameter communication addresses 0h0400 to 0h0420
8 to10	Number of FAULTs currently occurred	0~6
11 to 13	Number of WARNINGS currently occurred	0~6
14 to 15	01xx: FAULT occurred 10xx: WARNING occurred	FAULT occurred WARNING occurred

① Torque

Indicates the output torque. The unit is %, and the scale is 0.1.

⚠ Caution

The torque output value is valid only when the control mode is Sensorless or Vector mode.

② Current

Indicates the output current. The unit is % based on the maximum output, and the scale is 0.1.

The output unit in the Profile CSM Old Telegram is in Amperes (A).

③ Power

Indicates the output power. The unit is % based on the maximum output, and the scale is 0.1.

The output unit in the Profile CSM Old Telegram is in kilowatts (kW).

④ **Fault**

Displays the currently occurring fault information.

Bit 15	Bit 14 ~ Bit 0
FAULT status 1: Occurred 0: Not occurred	Fault number

⑤ **Dummy: Disabled**

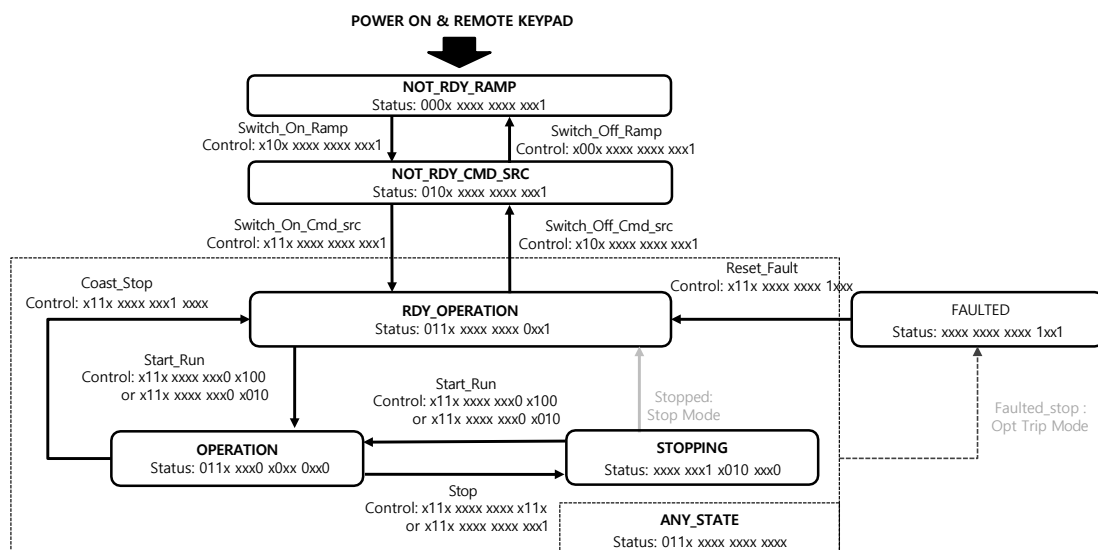
4.2 I/O Profile

Data exchange is performed without applying a separate profile. Data is exchanged between the master and slave only according to the parameter address values specified in the CM parameter Para Control and Para Status, and is applied when using the Telegrams below.

Set value		Selected Telegram
CM-23 Profile CSM	CM-24 Telegram	
New	I/O Profile	2
		3
		Vendor Specific Telegram 88
		Vendor Specific Telegram 1616

4.3 LS Drive Profile

This is a standardized profile defined by LS ELECTRIC. This profile is used in drive speed control mode, and you can monitor control and status changes in real time according to the Control Word and Status Word. When using this LS Drive Profile, access to inverter control parameters, such as run command and target frequency (0h0005, 0h000A), is not recommended.



Control word

Bit	Name	Value	Description
0	Stopped	0	No control command
		1	Run stop command
1	Forward operation	0	No control command
		1	Forward operation command
2	Reverse operation	0	No control command
		1	Reverse operation command
3	Fault reset	0	No control command
		1	Initialization of fault state
4	Emergency stop	0	No control command
		1	Forced emergency stop (Coast Stop)
5 ~12	-	-	-
13	Run command authority	-	
		1	Granting run command authority DRV→ Command Source → Fieldbus
14	Speed source command authority	-	
		1	Granting speed source command authority DRV→ Freq Ref Source → Fieldbus
15	-	-	-

Status word

Bit	Name	Value	Description
0	Stopped	0	Not in stop state
		1	Stopped due to stop mode
1	Forward operation in progress	0	Not in forward operation
		1	Forward operation in progress
2	Reverse operation in progress	0	Not in reverse operation
		1	Reverse operation in progress

Bit	Name	Value	Description
3	Fault occurred	0	No fault
		1	Fault occurred
4	Accelerating	0	Not accelerating
		1	Accelerating according to target command
5	Decelerating	0	Not decelerating
		1	Decelerating according to target command
6	Speed reached	0	Target speed not reached
		1	Target speed reached
7	DC braking	0	No DC braking
		1	DC braking in progress
8	Stopping	0	Stop mode not activated
		1	Entering stop mode
9	Jog mode	0	Jog mode OFF
		1	Jog mode ON
10	reserved		
11	Forward operation command	0	No control command
		1	Forward operation command received
12	Reverse operation command	0	No control command
		1	Reverse operation command received
13	Run command ready	-	
		1	Remote run command authority granted
14	Speed source command ready	-	
		1	Speed source command authority granted
15	Keypad control mode	0	Under remote control
		1	Controlled by a keypad local

Setpoint value

This indicates the inverter's operation command frequency and uses decimal values; the unit is Hz, and the scale is 0.01.

Actual speed value

This indicates the inverter's actual operation frequency and uses decimal values; the unit is Hz, and the scale is 0.01.

4.4 Telegram

The supported cyclic Telegram types are the standardized "Standard Telegram" and the manufacturer-defined "Vendor Specific Telegram." The G100 PROFINET can exchange Cyclic Telegrams with the PLC at a minimum cycle of 4 ms. Each Telegram is expressed as a Submodule in PROFINET communication and can be selectively used by the user by being assigned to Slot1/Subslot2 of the G100 RAPIEnet+ communication option board in the PROFINET network Configuration Tool. ³

The G100 RAPIEnet+ communication option board provides Telegram in two groups to maintain compatibility with our existing products iS7/S100 PROFINET.

If CM-23 Profile CSM is set to the LSE new mode, G100 telegrams can be selected, and if set to the LSE old mode, telegram mode used in iS7/S100 can be selected.

Profile CSM - LSE new mode**Standard Telegram 1 (Mode : 0)**

Standard Telegram 1	Byte 1-2	Byte 3-4
PLC to G100	Control word(STW1)	Setpoint value ⁴ 0xC000~0x4000 (-16384~16384)
G100 to PLC	Status word(ZSW1)	Actual speed value (Hz) 0xC000~0x4000 (-16384~16384)

³ Refer to the example in Section 18 of Siemens TIA Portal V13 on connecting S7-1200 and PROFINET

⁴ Setpoint

A speed setpoint expressed as a percentage of the maximum rated speed of the drive referred by (DRV-20: Max freq.)

Standard Telegram 20 (Mode : 1)

Standard Telegram 20	Byte 1-2	Byte 3-4	Byte 5-6	Byte 7-8	Byte 9-10	Byte 11-12
PLC to G100	Control word(STW1)	*Setpoint value ⁴ 0xC000~0x4000 (-16384~16384)	Dummy	Dummy	Dummy	Dummy
G100 to PLC	Status word(ZSW1)	Actual speed value 0xC000~0x4000 (-16384~16384)	Current	Torque	Power	Fault

Vendor Specific Telegram88 (Mode : 2)

Vendor Specific Telegram 88	Byte 1-2	Byte 3-4	Byte 5-6	...	Byte 15-16
PLC to G100	user defined-01	user defined-02	user defined-03	...	user defined-08
G100 to PLC	user defined-01	user defined-02	user defined-03	...	user defined-08

User-defined values can be used as follows.

Control PLC to G100		Monitor the G100 to PLC status	
Address	Set value	Address	Set value
CM-52	Set a random control value (e.g., 0x383)	CM-31	Set a random monitor value (e.g., 0x302)
CM-53	Set a random control value (e.g., 0x384)	CM-32	Set a random monitor value (e.g., 0x303)
CM-54	Set a random control value (e.g., 0x385)	CM-33	Set a random monitor value (e.g., 0x304)
CM-55	Set a random control value (e.g., 0x386)	CM-34	Set a random monitor value (e.g., 0x305)
CM-56	Set a random control value (e.g., 0x387)	CM-35	Set a random monitor value (e.g., 0x306)
CM-57	Set a random control value (e.g., 0x388)	CM-36	Set a random monitor value (e.g., 0x307)
CM-58	Set a random control value (e.g., 0x389)	CM-37	Set a random monitor value (e.g., 0x308)
CM-59	Set a random control value (e.g., 0x38a)	CM-38	Set a random monitor value (e.g., 0x309)

Vendor Specific Telegram1616 (Mode : 3)

Vendor Specific Telegram 1616	Byte 1-2	Byte 3-4	...	Byte 29-30	Byte 31-32
PLC to G100	User defined	User defined	...	User defined	User defined
G100 to PLC	User defined	User defined	...	User defined	User defined

User-defined values can be used as follows.

Control PLC to G100		Monitor the G100 to PLC status	
Address	Set value	Address	Set value
CM-51	Set a random control value (e.g., 0x381)	CM-31	Set a random monitor value (e.g., 0x300)
CM-52	Set a random control value (e.g., 0x382)	CM-32	Set a random monitor value (e.g., 0x301)
CM-53	Set a random control value (e.g., 0x383)	CM-33	Set a random monitor value (e.g., 0x302)
CM-54	Set a random control value (e.g., 0x384)	CM-34	Set a random monitor value (e.g., 0x303)
...	...	...	...
CM-65	Set a random control value (e.g., 0x395)	CM-45	Set a random monitor value (e.g., 0x314)
CM-66	Set a random control value (e.g., 0x396)	CM-46	Set a random monitor value (e.g., 0x315)

LSE Telegram (Mode : 5)

LSE Telegram	Byte 1-2	Byte 3-4
PLC to G100	LSE Control word	Setpoint value (Hz), ex) 0x1770: 60Hz
G100 to PLC	LSE Status word	Actual speed value (Hz)

Profile CSM - LSE old mode

Standard Telegram1 (Mode : 0)

Standard Telegram 1	Byte 1-2	Byte 3-4
PLC to G100	Control word(STW1)	Setpoint value (Hz), ex) 0x1770: 60Hz
G100 to PLC	Status word(ZSW1)	Actual speed value (Hz)

Vendor Specific Telegram (Mode : 1)

Vendor Specific Telegram	Byte 1-2	Byte 3-4	Byte 5-6	Byte 7-8	Byte 9-10
PLC to G100	Control word(STW1)	Setpoint value (Hz) 0x1770: 60Hz	Dummy	Dummy	Dummy
G100 to PLC	Status word(ZSW1)	Actual speed value (Hz)	Alarm Info	Torque	Current

5 PROFIdrive parameters

Parameters		
PNU	R/W	Description
922	R	Displays the selected PROFIdrive cyclic telegram type. No. 1 → Standard Telegram 1 (LSE old mode/LSE new mode) No. 20 → Standard Telegram 20 No. 100 → Vendor Specific Telegram (LSE old mode) No. 998 → Vendor Specific Telegram 88 No. 999 → Vendor Specific Telegram 1616 No. 1100 → LSE telegram * Overwriting is not provided by the PROFIdrive protocol and is available through the inverter's keypad. CM Group parameters No. 23 and 24 correspond to Profile CSM and Telegram.
944	R	This is a parameter based on the fault message counter value, which increases by 1 each time a fault occurs. Depending on the increase or decrease of this parameter value, a PROFINET Controller, such as PLC, can identify the occurrence of a new fault in the inverter.
947	R	Fault number * Refer to the description of PNU[944] Fault Message Counter and PNU[947] Fault Number
953	R	Warning word * Display the "Warning information" parameter in the inverter communication address 0h0420.

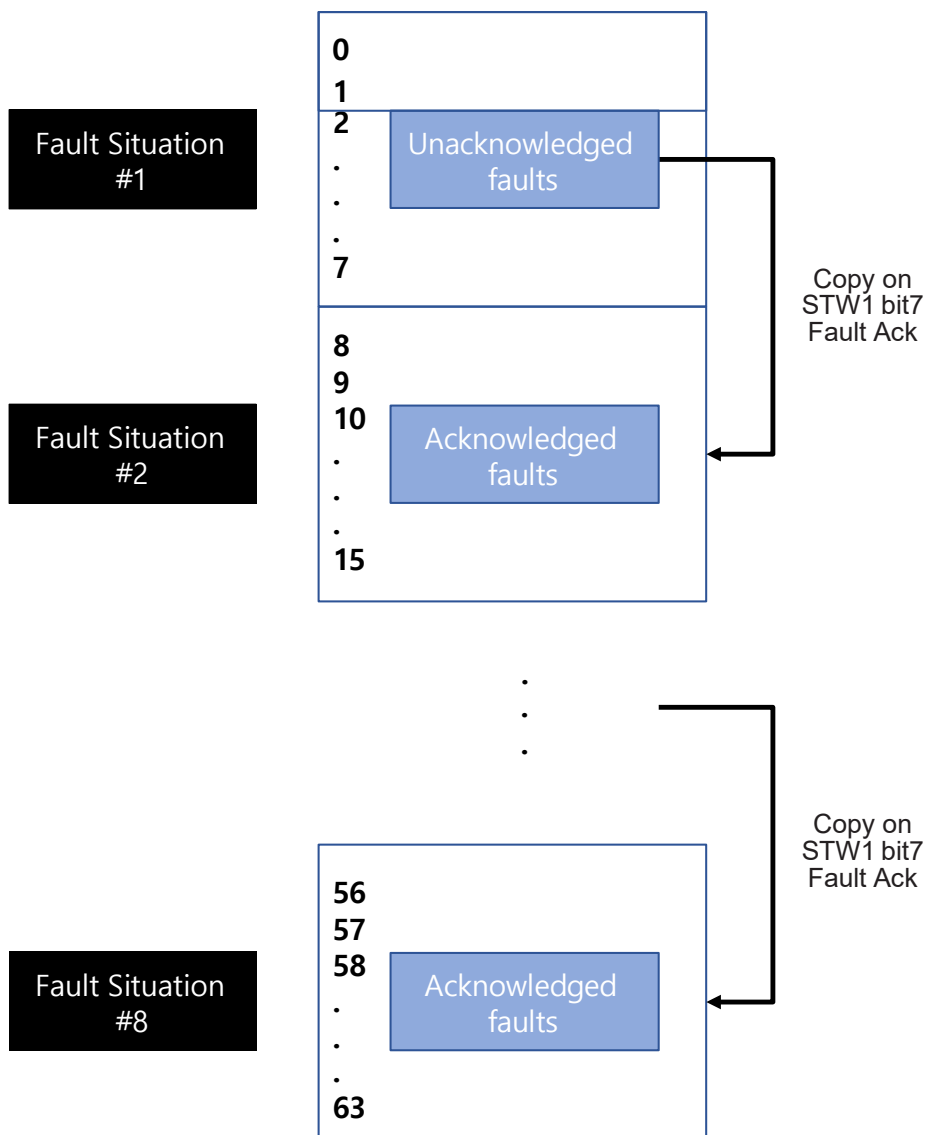
Parameters		
PNU	R/W	Description
964	R	It is an array of 5 words (16-bit) displaying the information of the G100 RAPIEnet+ communication option board. 0: This displays the Manufacturer value (the PROFINET vendor ID of LS ELECTRIC defined by Profibus.org as 849[0h351]). 1: Device Type: Displays "6" for G100 RAPIEnet+ communication option board. 2: Version: Indicates the S/W version. Example) If the version is 1.0, it is displayed as 100. 3: Firmware Date (yyyy): Displays the year the S/W was created. Example) If the year is 2024, it is displayed as 2024. 4: Firmware Data (dd/mm): indicates when the S/W was made in date and month. For example, if the date is April 12, it is displayed as 0412.
965	R	Displays the Profile ID. (0h328 – Profile 3 v4.0)
967	R	Displays the control word (STW1) value currently delivered from PROFINET.
968	R	Displays the status word(ZSW1) value currently delivered from PROFINET.
972	R/W	When the value changes from 0 to 1, the G100 RAPIEnet+ communication option board will reset.
61000	R	This displays the device name of the G100 RAPIEnet+ option board.
61001	R	This displays the IP address of the G100 RAPIEnet+ option board.
61002	R	This displays the MAC address of the G100 RAPIEnet+ option board.
61003	R	This displays the gateway IP address of the G100 RAPIEnet+ communication option board.
61004	R	This displays the subnet mask of the G100 RAPIEnet+ option board.
1000	R/W	G100 Parameter Access Address (an address for the inverter parameter to be read and written)
1001	R/W	G100 Parameter Access Data (data for the inverter parameter to be read and written)

Parameters		
PNU	R/W	Description
1002	R/W	G100 Parameter Access Command 1: write 2: read
1003	R/W	G100 Parameter Access Acknowledge 0: not completed 1: OK completed 2: Not OK completed
1100	R	Port Status 0x0000: no connected. 0x0100: port 1 is connected. 0x0200: port 2 is connected. 0x0300: both ports are connected.
2000	R	Max frequency reference for Standard Telegram 20
2002	R	Max current reference for Standard Telegram 20
2003	R	Max torque reference for Standard Telegram 20
2004	R	Max power reference for Standard Telegram 20

Description about PNU[944] Fault Message Counter and PNU[947] Fault Number

Each time a fault occurs in the inverter, the PNU[944] Fault Message Counter value increases by 1, and the corresponding fault is stored in the PNU[947] Fault Number variable.

PNU [947] Fault Number can store up to 8 fault situations, and each fault situation can store up to 8 fault messages. Each fault message is 1 word (16-bit), so PNU[947] Fault Number consists of a total of 64 words. The basic configuration is shown in the figure below.



Fault Situation #1 stores the currently occurring fault messages. Each fault message is stored sequentially, starting from the first (index: 0) in the order of occurrence, and if more than eight occur, the 8th (index: 7) memory is overwritten. When Fault Ack is generated by setting bit 7 of the PLC Control word (STW1) to 1, the values of Fault Situation #1 are moved to Fault Situation #2. This operation is repeated up to Fault Situation #7.

Fault Name	Code
HW Diag	0
Over Current2	1
Over Current1	2
Over Voltage	3
External Trip	4
Reserved Trip5	5
Fuse Open	6
Ground Trip	7
Inverter Over Heat	8
E Thermal	9
Over Load	10
Reserved Trip11	11
Reserved Trip12	12
NO Motor Trip	13
Out Phase Open	14
Inverter OLT	15
Over Current Brake Chopper	16
NTC Open	17
FAN Trip	18
In Phase Open	19
Under Load	20
Thermal Trip	21
Parawrite trip	22
Pre PID FAIL	23

Fault Name	Code
Input Stage Error	24
Safety A Error	25
Safety B Error	26
Reserved Trip27	27
Application Trip1	28
Application Trip2	29
Application Trip3	30
Application Trip4	31
Fault Option Trip1	32
Fault Option Trip2	33
Fault Option Trip3	34
IO Board Trip	35
XIO Trip	36
Reserved Trip37	37
Reserved Trip38	38
Reserved Trip39	39
Encoder Trip	40
Over Speed	41
Speed Dev Trip	42
Ext Brake	43
Reserved Trip44	44
Reserved Trip45	45
Low Voltage2	46
Pre Over Heat	47
Reserved Trip48	48
Reserved Trip49	49
Reserved Trip50	50
Reserved Trip51	51
Reserved Trip52	52

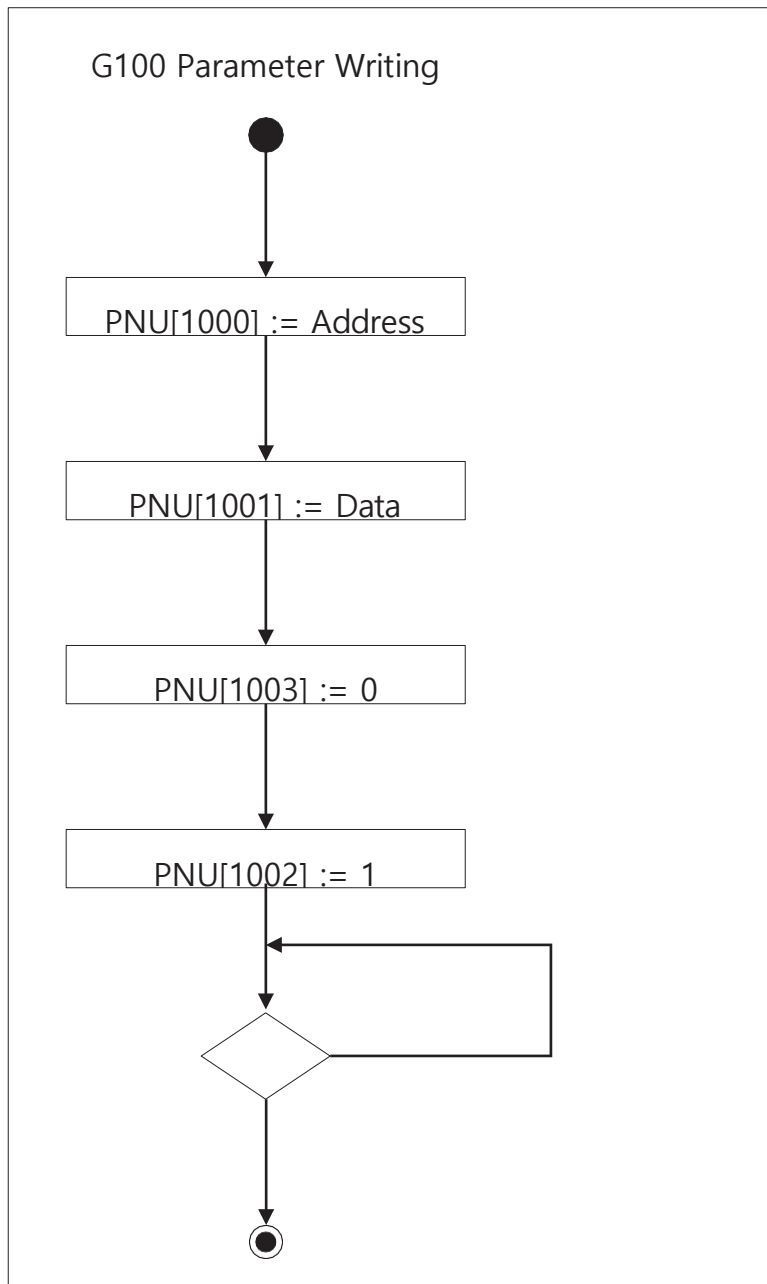
Fault Name	Code
Lost Opt CMD	53
Reserved Trip54	54
Over Torque1	55
Under Torque1	56
Over Torque2	57
Under Torque2	58
Pre Charge REL	59
BX	60
Low Voltage	61
Lost Command	62
Lost Keypad	63
Internal communication error between inverter and option board	255
None	0xFFFF

Warning Name	Code
Over Load	0
Under Load	1
Inverter Over Load	2
Lost Command	3
Fan Warning	4
DB Warn %ED	5
Enc Conn Check	6
Enc Dir Check	7
Lost Keypad	8
Retry Tr Tune	9
None	0xFFFF

Procedure for Accessing G100 Common Parameters Using PROFIdrive Parameters

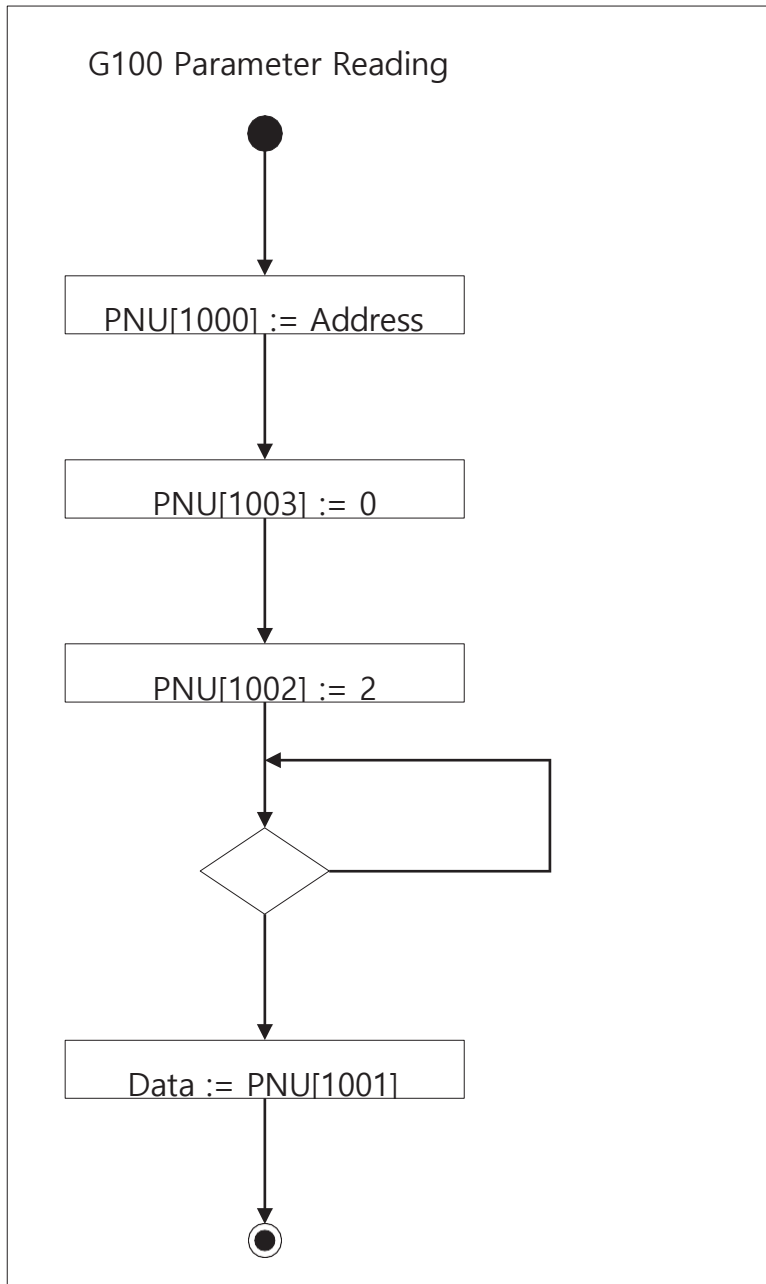
Users can read and write the parameters of the G100 inverter body using the PNU [1000 - 1003].

Below is the flowchart of the inverter parameter write requests.



- 1 Set the inverter communication address value in PNU [1000].
- 2 Set the inverter parameter data value in PNU [1001].
- 3 Set PNU [1003] to 0.
- 4 Setting the PNU [1002] parameter to 1 causes the G100 RAPIEnet+ communication option board to store the parameter values of PNU [1000] and PNU [1001] in the inverter body parameters.
- 5 The G100 RAPIEnet+ communication option board stores the inverter parameter values and stores the operation results in PNU [1003].
- 6 Check the PNU [1003] value to confirm whether the data write request was executed successfully.

Below is the flowchart of the inverter parameter read requests.



- 1 Set the inverter communication address value in PNU [1000].
- 2 Set PNU [1003] to 0.
- 3 Setting the PNU [1002] parameter to 2 causes the G100 RAPIEnet+ communication option board to reference the PNU [1000] value and read the inverter body value indicated by the PNU [1000] value.
- 4 The G100 RAPIEnet+ communication option board stores the execution result of the inverter parameter read request in PNU [1003]. If executed successfully, the read value is stored in PNU [1001].
- 5 Check the PNU [1003] value to confirm whether the inverter parameter read request was executed successfully. If executed successfully, the PLC reads the value of PNU [1001].

6 Alarm Handling

When a fault occurs or is cleared in the inverter, the G100 RAPIEnet+ communication option board will deliver the PROFINET Alarm notification to the PLC.

Details of Fault Alarm Packet

Alarm Classification	API	Slot Number	Subslot Number	Alarm Specifier	UserStructure Identifier	Channel Properties	Channel ErrorType
FAULT occurred	0h3A00	1	2	Diagnosis	0h8000	0h0800	9012
Fault cleared	0h3A00	1	2	Diagnosis	0h8000	0h1000	9012

7 GSDML File

It is a file containing information about the G100 RAPIEnet+ communication option board. This file is required by the PROFINET network configuration software.

** Download the document at <https://sol.ls-electric.com>.

8 Troubleshooting and Inspection

Step	Symptom	Corrective Action
1	Both the Error LED and CPU LED turn off	This occurs when the power supply to the G100 RAPIEnet+ communication option board is not normal. 1) Install the G100 RAPIEnet+ communication option board correctly to the inverter body. 2) Ensure that the connector pins of the G100 RAPIEnet+ communication option board connected to the main body are not damaged or bent. 3) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
2	If the ERROR LED is on and the CPU LED is off,	it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
3	Both the ERROR LED and CPU LED flash at 1-second intervals	1) Ensure that the connector pins of the G100 RAPIEnet+ communication option board connected to the main body are not damaged or bent. 2) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.
4	When the CPU LED flashes at 1-second intervals and the ERROR LED flashes more slowly at 2-second intervals	1) Check if the LINK LED of the port connected to the LAN cable is on. If the LED does not light up, check if the LAN cable is securely attached to the port of the G100 RAPIEnet+ communication option board. 2) Check if the device name of the G100 RAPIEnet+ communication option board and the [CM-24] telegram mode setting match the network configuration set in the PLC program. 3) Check if the IP assigned to the G100 RAPIEnet+ communication option board conflicts with the IP of another device on the same network. 4) If the same symptom persists after taking the above actions, it is a hardware failure of the G100 RAPIEnet+ communication option board. Contact the LS ELECTRIC service center or Customer Service.

Step	Symptom	Corrective Action
5	If the communication board's IP address experiences unintended changes	1) The PLC can change the G100 RAPIEnet+ communication board's IP address by the PLC settings. Therefore, refer to how to set the IP addresses in the PLC program. 2) If you do not want the IP of the G100 RAPIEnet+ communication option board to be changed arbitrarily, select "Use the IP of the communication module as it is" in the "PLC S/W" menu.

9 Other Protocols

9.1 Modbus TCP

If the inverter is operating in PROFINET mode, it supports the protocol described in the "PART2 3.3 Modbus TCP " section.

9.2 Embedded Web/Cloud

Please refer to the separate manual link.

Global	https://ssq.ls-electric.com/ww/en/rd/550/EmbeddedWeb_Cloud 
USA	https://ssq.ls-electric.com/us/en/rd/550/EmbeddedWeb_Cloud 

9.3 SSQ Asset Insight

Please refer to the separate manual link. The operating policy for this service is subject to change in the future.

Global	https://ssq.ls-electric.com/ww/en/rd/550/AIManual 
USA	https://ssq.ls-electric.com/us/en/rd/550/AIManual 