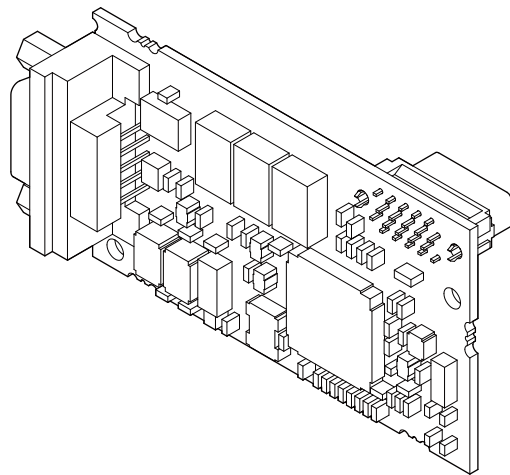


YASKAWA AC Drive-Option Card **PROFIBUS-DP** Technical Manual

Type SI-P3

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



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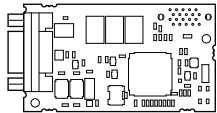
1 Preface and Safety

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

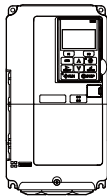
◆ Applicable Documentation

The following manuals are available for the PROFIBUS-DP option card:

Option Card

	Yaskawa AC Drive-Option Card PROFIBUS-DP Installation Manual Manual No.: TOBPC73060042
	Read this manual first. The installation manual is packaged with the PROFIBUS-DP Option and contains a basic overview of wiring, settings, functions, and fault diagnoses.
	Yaskawa AC Drive-Option Card PROFIBUS-DP Technical Manual (This book) Manual No.: SIEPC73060042
	The technical manual contains detailed information and command registers. To obtain the technical manual access these sites: Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative.

Yaskawa Drive

	Refer to the manual of the drive this option card is being used with. The instruction manual for the drive covers basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance information. It also includes important information on parameter settings and how to tune the drive. A Quick Start Guide is included with the drive. For the more detailed Technical Manual, visit Yaskawa's homepage, http://www.e-mechatronics.com .
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◆ Terms

Note: Indicates a supplement or precaution that does not cause drive damage.

PROFIBUS Option: Yaskawa AC Drive PROFIBUS-DP option card

◆ Registered Trademarks

- PROFIBUS-DP is a registered trademark of PROFIBUS International.
- Other company names and product names listed in this manual are registered trademarks of those companies.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option card. The option card must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions

- The diagrams in this section may include option cards and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

NOTICE

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the option card.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

Do not modify the drive circuitry.

Failure to comply could result in damage to the drive and will void warranty.

YASKAWA is not responsible for any modification of the product made by the user. This product must not be modified.

2 Product Overview

◆ About This Product

PROFIBUS option card (Model: SI-P3) is an open digital communication system supporting a wide range of fast, time-critical applications.

PROFIBUS-DP (Decentral Periphery) is one of the three PROFIBUS variants. DP is dedicated to fast data communication between systems and peripherals at a field level. This PROFIBUS-DP Option connects a drive to a field network using the PROFIBUS-DP protocol.

PROFIBUS-DP is included into the European Fieldbus Standard EN 50170.

The network is primarily used in process and factory automation.

By installing the PROFIBUS-DP Option to a drive, it is possible to do the following from a PROFIBUS-DP master device:

- operate the drive
- monitor the operation status of the drive
- change parameter settings

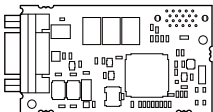



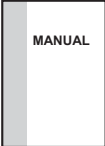
3 Receiving

Please perform the following tasks after receiving the PROFIBUS-DP Option:

- Inspect the PROFIBUS-DP Option for damage.
If the PROFIBUS-DP Option appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the PCB (see [Figure 1](#)).
- If you have received the wrong model or the PROFIBUS-DP Option does not function properly, contact your supplier.

◆ Contents and Packaging

Table 1 Contents of Package

Description:	Option Card	Ground Cable	Screws (M3)	LED Label	Installation Manual
					
Quantity:	1	1	3	1	1

◆ Tool Requirements

A Phillips screwdriver (M3) metric or (#1, #2) U.S. standard size is required to install the PROFIBUS-DP Option.

Note: Tools required to prepare PROFIBUS cables for wiring are not listed in this manual.

4 PROFIBUS-DP Option Components

◆ PROFIBUS-DP Option

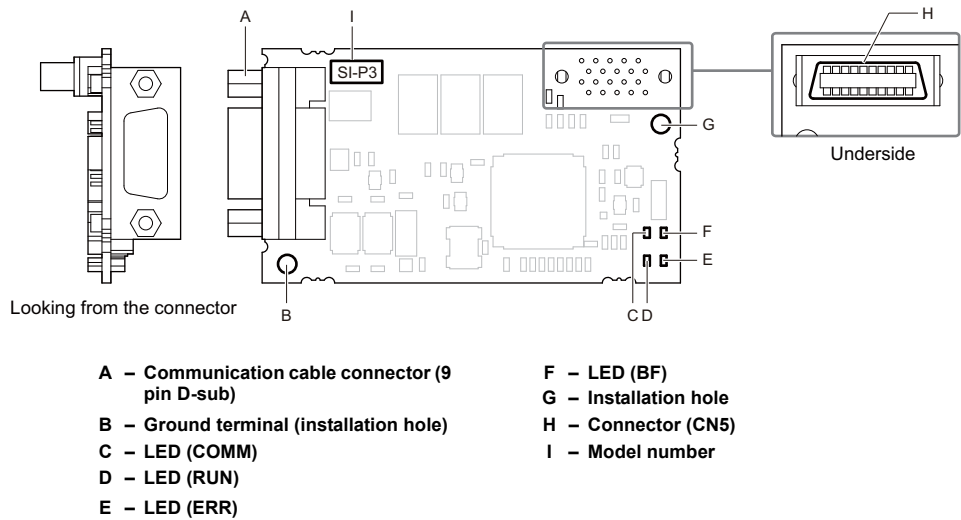


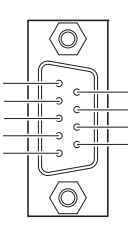
Figure 1 Option Card

Note: For details on the LEDs, Refer to [PROFIBUS-DP Option LED Display on page 8](#).

◆ Communication connector

The drive has a 9 pin D-sub connector for installing the option card. Once installed, the drive can connect to a PROFIBUS network.

Table 2 Communication connector (9-pin D-SUB)

PROFIBUS Connector	Pin	Signal	Description
	1	Shield	Connected to the metal-shell (no direct FG-connection)
	2	–	–
	3	RxD/TxD-P	Receive/Transmit data; line B (red)
	4	CNTR-P	Control signal for repeaters (direction control)
	5	DGND	Data ground (reference voltage to VP)
	6	VP	Power supply output for bus termination (for terminal resistor)
	7	–	–
	8	RxD/TxD-N	Receive/Transmit data; line A (green)
	9	–	–

◆ PROFIBUS-DP Option LED Display

Table 3 LED Display

LED	Display		Communication Status	Meaning
	Color	Status		
RUN (Power)	Green	ON	Power is on	Power is being properly supplied to SI-P3, and SI-P3 has completed its hardware self-diagnostics check
		OFF	Power is off	<ul style="list-style-type: none">The drive has no power supplySI-P3 and drive are not connected properly and/or there is no power supplied to the SI-P3An internal, self-diagnostic error occurred in SI-P3.
ERR (Option Error)	Red	ON	SI-P3 error	Self-diagnostics error occurred in the SI-P3
		Flashing	Drive connection error	Connection error between SI-P3 and drive. This includes node address setting errors to parameter F6-30 on the drive side
		OFF	Normal operation	Drive and SI-P3 are properly connected.
COMM (Communication Status)	Green	ON	Communication connected	Normal send/receive between SI-P3 and PROFIBUS-DP master
		OFF	No data exchange	There is a problem establishing communication between SI-P3 and the PROFIBUS-DP master
BF (PROFIBUS-DP Error)	Red	ON	Waiting for communication procedure setting	Communication-related parameters are being set or initialized by the PROFIBUS-DP master.
		Flashing	Communication setting error	Communication parameter error from PROFIBUS-DP master
		OFF	Normal operation	LED shuts off once the PROFIBUS-DP master is finished setting communication-related parameters.

Table 4 Understanding LED Display

LED				Communication Status	Possible Cause	Solution
RUN	ERR	COMM	BF			
×	×	×	×	No power.	The drive has no power.	• Check all wiring to the drive, then turn the power on.
					SI-P3 is not properly connected to the drive, and therefore is not receiving enough power.	• Shut the drive off and see if the PROFIBUS-DP Option is connected properly. Turn the power back on again.
○	×	×	×	• Checking connection with the drive • Waiting for data from the master.	• SI-P3 is reading the node address or parameter configuration • Waiting for initial input data from master device.	—
×	○	×	×	SI-P3 Self-diagnostics error	The PROFIBUS-DP Option is damaged.	• Cycle power to the drive. If the LED status does not change, replace the PROFIBUS-DP Option.
×	□	×	×	Problem connecting to the drive.	• Problem initializing the drive and SI-P3 • Incorrect node address.	• Cycle power to the drive. If the LED status does not change, replace the PROFIBUS-DP Option • Check the node address setting in the drive (parameter F6-10).
○	×	×	○	Waiting for data from the master device.	Waiting for data from the master device (Set_Parm_Message or Chk_Cfg_Message).	• Check the network settings in the master • Make sure the master device is operating normally • Check the terminal resistance settings on the data line • Look for any problems with the data line, or if the connector • See if the data line connected properly to the drive's main circuit.
○	×	×	□	Data is incorrect or PROFIBUS-DP Option timed out waiting for data.	The communication procedure in the master is set incorrectly.	• Check the communication procedure settings in the master.
○	×	○	×	Sending or receiving data.	—	—

○: On / □: Flashing / ×: Off

◆ Setting Node Address

Set drive parameter F6-30 to a node address (Range 0 to 125) unique to the network.

5 Installation Procedure

◆ Section Safety

DANGER

Electrical Shock Hazard

Power to the drive must be shut off when installing this option card.

Even though the power has been shut off, voltage still remains in the drive's DC bus. Wait before removing the front cover once the drive has been turned off.

The CHARGE light on the drive will go out after voltage in the DC bus drops below 50 V, at which point it is safe to remove the front cover.

Due to the risk of electric shock, be sure that all LEDs have gone out and that the DC bus voltage has reached a safe level prior to performing any work on the drive.

WARNING

Electrical Shock Hazard

Do not remove the front cover of the drive while the power is on.

Failure to comply could result in death or serious injury.

The diagrams in this section may include option cards and drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this product.

Do not touch the option card while there is power flowing through the drive.

Failure to comply could result in death or serious injury.

Do not use damaged wires, place excessive stress on wiring, or damage the wire insulation.

Failure to comply could result in death or serious injury.

NOTICE

Damage to Equipment

Observe proper electrostatic discharge procedures (ESD) when handling the option card, drive, and circuit boards.

Failure to comply may result in ESD damage to circuitry.

Never shut the power off while the drive is outputting voltage.

Failure to comply may cause the application to operate incorrectly or damage the drive.

Do not operate damaged equipment.

Failure to comply may cause further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance.

Use shielded twisted-pair wires and ground the shield to the ground terminal of the drive.

Properly connect all pins and connectors.

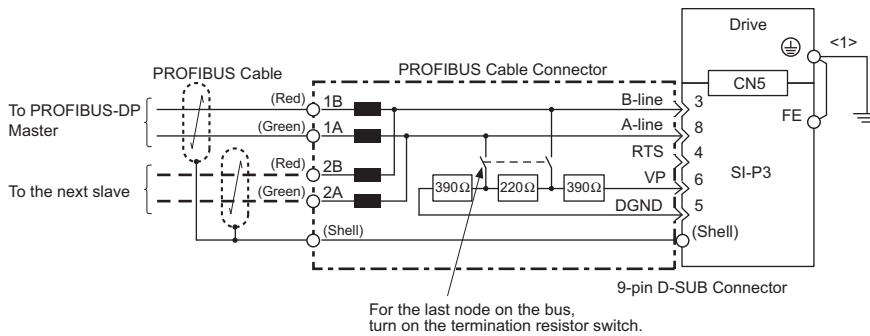
Failure to comply may prevent proper operation and possibly damage equipment.

Check wiring to ensure that all connections are correct after installing the option card and connecting any other devices.

Failure to comply may result in damage to the option card.

◆ Connection Diagram

The PROFIBUS-DP Option must be connected to the network using a 9 pin D-sub connector like shown in [Figure 2](#).



<1> The FE terminal on the PROFIBUS-DP Option is fitted with a ground cable that should be connected to the ground terminal on the drive.

Figure 2 Connection Diagram

■ PROFIBUS-DP Termination

Because the option card does not have a terminal resistor, terminal resistance must be set using a switch on the 9 pin D-sub connector. Make sure that only the D-sub connector for the final drive in the network is set for terminal resistance. If any other drive on the network is set for terminal resistance, communication problems may occur.

Most 9 pin D-sub connectors have a function for disconnecting the output side of the cable. Use only the input side cable entry when connecting both ends of the network. If the connector is reversed, then communication will not be possible between devices. Most connectors have arrows indicating the input and output sides.

Terminating resistors without inductors as shown in [Figure 3](#) can only be used for baud rates below 1.5 Mbps. 1.5 Mbps and higher baud rates require termination with resistors and inductors like shown in .

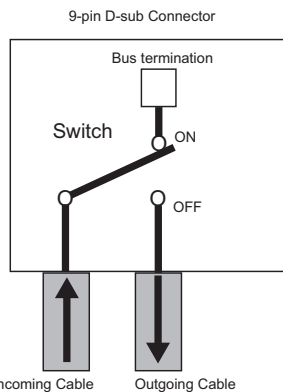


Figure 3 PROFIBUS Cable Connection with Termination Resistors

Bus termination ON = incoming and outgoing cables not connected.
Bus termination OFF = incoming and outgoing cables connected.

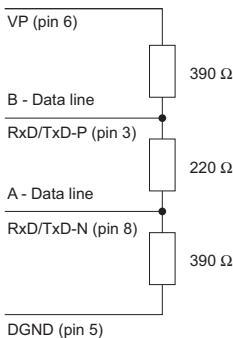


Figure 4 Cable Termination of the PROFIBUS-DP Option Cable to EN50170 (pin numbers for a 9-pin D-sub connector)

◆ Prior to Installing the Option Card

Prior to installing the PROFIBUS-DP Option, wire the drive and make necessary connections to the drive terminals. For more information on wiring and connecting the drive, refer to the installation manual for the drive the PROFIBUS-DP option card is connected to. Verify that the drive runs normally without the option installed.

◆ Installing the Option Card

Insert the option card in the CN5-A connectors located on the drive's control board.
See the drive manual for directions on removing the front cover.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the operator and front cover.
2. Insert the CN5 connector on the option card into the matching CN5 connector on the drive, then fasten it into place using one of the screws included with the option card.
Connect one of the lead lines using one of the screws to the ground terminal.
Three separate lead lines have been included with the option card to connect to three separate ports. Use the lead line with the length appropriate for the distance of the port.

Note: There are only two screw holes on the drive for ground terminals. If three option cards are connected, two of the lead lines will need to share the same ground terminal.

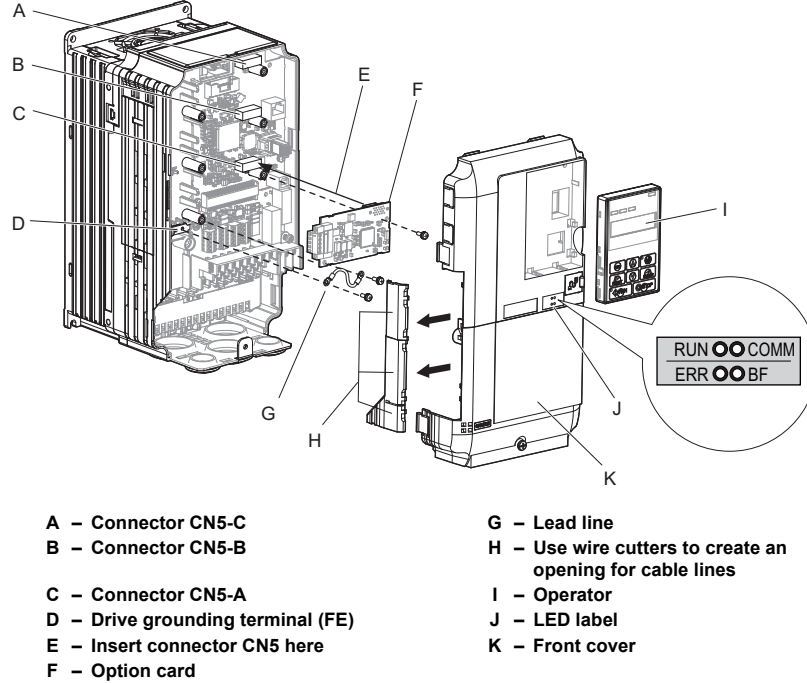


Figure 5 Installing the Option Card

3. Wire the option card to the communication cable connector on the option card.
For exposed cables in drives 2A004 to 0069, 4A0002 to 0044, use a pair of wire cutters to create an opening on the left side of the front cover that allows wiring to pass through. Sharp edges along the opening that was created should be smoothed down with a file or sand paper so prevent any damage to the wires.
Drives 2A0081 to 0021, 4A0058 to 0165 have enough space to keep all wiring inside the unit.

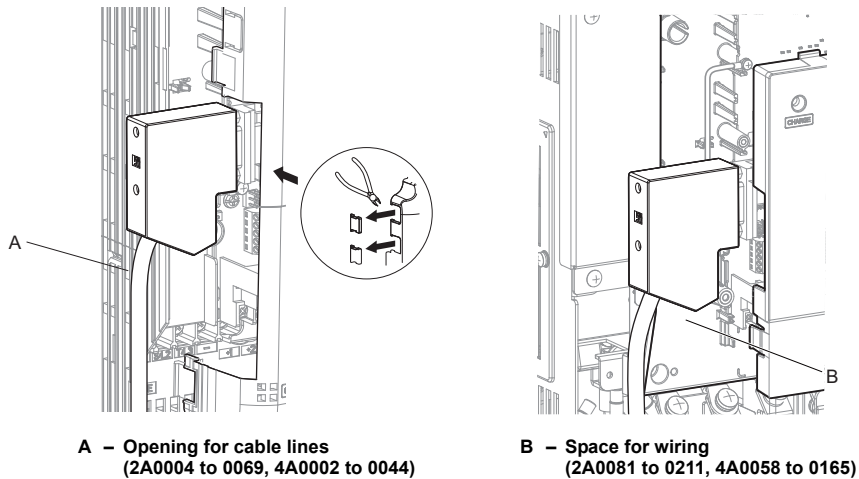


Figure 6 Wiring space

4. Place the front cover back onto the drive as it was before.

Note: 1. Take care when wiring the option card so that the front cover easily fits back onto the drive.
2. Install Cable Cover option to maintain the drive Enclosure Type.

5. Attach the LED label packaged with the option card as shown in [Figure 5](#).

◆ Communication Cable Specifications

To ensure proper performance, Yaskawa recommends using PROFIBUS-DP-dedicated cables that fulfill the specifications in [Table 5](#). For more information on cables, refer to the PROFIBUS-DP website at <http://www.profibus.com>.

■ Cable Requirements

Table 5 Communication Cable Requirements

Condition	Specifications
Impedance	135 to 165 Ω at a frequency of (3 to 20 MHz)
Capacity	30 pF/m maximum
Loop Resistance	110 Ω /km maximum
Core Cross-Section	0.34 mm ² minimum
Core Diameter	0.64 mm minimum

■ Cable Length

Communication speed determines maximum permissible cable length. [Table 6](#) shows the specifications for Type A bus cables.

Table 6 Cable Length

Communication speed (kbps)	Distance per segment (m)	Communication speed (kbps)	Distance per segment (m)
9.6	1200	500	400
19.2	1200	1500	200
45.45	1200	3000	100
93.75	1200	6000	100
187.5	1000	12000	100

◆ GSD Files

For easy network implementation of drives equipped with an SI-P3, a GSD file can be obtained from:

U.S.: <http://www.yaskawa.com>

Europe: <http://www.yaskawa.eu.com>

Japan: <http://www.e-mechatronics.com>

Other areas: contact a Yaskawa representative

6 PROFIBUS-DP Option Drive Parameters

Confirm the proper setting of all parameters in [Table 7](#) before starting network parameters.

Table 7 Parameter Settings

No.	Name	Description	Default
b1-01 <1>	Frequency Reference Selection	Selects the frequency reference input source 0: Operator - Digital preset speed d1-01 to d1-17 1: Terminals - Analog input terminal A1 or A2 2: MEMOBUS/Modbus communications 3: Option card 4: Pulse Input (Terminal RP)	1
b1-02 <1>	Run Command Selection	Selects the run command input source 0: Digital Operator - RUN and STOP keys 1: Digital input terminals S1 to S7 2: MEMOBUS/Modbus communications 3: Option card	1
F6-01	Operation Selection after Communications Error	Determines drive response when a bUS error is detected during communications with the PROFIBUS-DP Option 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <2>	1
F6-02	External Fault Detection Conditions (EF0)	Sets the condition for external fault detection (EF0) 0: Always detected 1: Detected only during operation	0
F6-03	Stopping Method for External Fault from Communication Option Board	Determines drive response for external fault input (EF0) detection during PROFIBUS communication 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <2>	1
F6-06 <3>	Torque Reference/Torque Limit selection from Communications Option	0: Torque reference/torque limit via network communications are disabled. 1: Torque reference/torque limit via network communications are enabled. <4>	0
F6-07	NetRef/ComRef Selection Function	0: Multi-step speed reference disabled (F7 mode) 1: Multi-step speed reference allowed (V7 mode)	0
F6-08	Reset Communication Related Parameters	Determines which communication-related parameters are set back to their original default values when the drive is initialized. 0: Do not reset F6-□□ and F7-□□ parameters when the drive is initialized using parameter A1-03. 1: Rest F6-□□ and F7-□□ parameters when the drive is initialized using parameter A1-03. Note: Setting this parameter does not affect communication-related parameters. Setting this parameter only determines if communication-related parameters (F6-□□ and F7-□□) are also reset when A1-03 is used to initialize the drive.	0
F6-30 <5> <6>	Node Address	0 to 125	0
F6-31	Clear Mode Selection	Selects the action to take when a "Clear Mode" command is received 0: Resets back to 0 1: Maintains the previous value	0
F6-32 <6>	PROFIBUS Map Selection	0: PPO Type 1: Conventional	0
F6-33 <6>	IND Data Size Selection	0: word 1: byte	0

<1> To start and stop the drive through the PROFIBUS-DP network, set b1-02 to "3". To control the frequency reference of the drive via the PROFIBUS-DP network, set b1-01 to "3".

<2> If F6-03 is set to 3, then the drive will continue to operate when an EF0 fault is detected. Take proper safety measures, such as installing an emergency stop switch.

<3> Enabled in CLV, AOLV/PM, and CLV/PM control modes (A1-02 = 3, 6, or 7). When enabled, d5-01 determines whether the value is read as the torque limit value (d5-01 = 0) or read as the torque reference value (d5-01 = 1). In Closed Loop Vector for PM motors, this value is read as the torque limit.

<4> Default setting specifies that the torque reference or torque limit is to be provided via network communications (F6-06 = 1). The motor may not rotate if no torque reference or torque limit is supplied from the PLC.

<5> All node addresses must be unique. Node addresses 0, 1, and 2 are typically reserved for control, maintenance, and diagnostic equipment. The ERR light will illuminate when 0 or greater than 125 is entered.

<6> Power must be cycled in order for any setting changes to take affect.

7 Conventional Formats

◆ Conventional Formats

The configuration tool of PROFIBUS-DP master sets the input and output data length of SI-P3 from Extended Data 1 (32 bytes), Extended Data 2 (12 bytes), and Basic Data (6 bytes).

Conventional formats have two message types: High-speed I/O Data and MEMOBUS/Modbus message.

Set parameter F6-32 to “1” to use conventional formats.

■ High-Speed I/O Data

High-speed I/O data is directly transferred to or from the drive and can control the drive. For example, when the drive is set for PROFIBUS-DP communications, the drive Run/Stop and Frequency Reference commands are typically transferred to the drive within 2 ms after being received by the option.

■ MEMOBUS/Modbus Message

MEMOBUS/Modbus message data is transferred to the drive using MEMOBUS/Modbus messages. All drive parameters and data can be accessed through MEMOBUS/Modbus. Because the data in this message type is transferred to the drive after the SI-P3 receives and edits it, more time is required to return the data to the master. The master must synchronize the timing of sending and receiving the data by handshaking.

■ Memory Maps

The following memory maps show the I/O data bytes.

■ Basic and Extended Register Maps

	Basic Data (6 bytes)	Extended Data 1 (32 bytes)	Extended Data 2 (12 bytes)
High-speed I/O Data	Bytes 0 to 5	Bytes 0 to 15	Bytes 0 to 3
MEMOBUS/Modbus Data	–	Bytes 16 to 31	Bytes 4 to 11

Table 8 Basic Data Register Map Detail

Output (Master Device → Drive)		Input (Drive → Master Device)	
Byte	Description	Byte	Description
0	Operation Command High Byte	0	Drive Status High Byte
1	Operation Command Low Byte	1	Drive Status Low Byte
2	Frequency Reference High Byte	2	Motor Speed High Byte <3>
3	Frequency Reference Low Byte	3	Motor Speed Low Byte <3>
4	Torque Reference/Torque Limit High Byte <1> <2>	4	Output Current High Byte <4>
5	Torque Reference/Torque Limit Low Byte <1> <2>	5	Output Current Low Byte <4>

<1> Enabled in CLV, AOLV/PM, and CLV/PM control modes (A1-02 = 3, 6, or 7).

<2> Set when network communication is designated as the source of the torque limit and torque reference (F6-06 = 1). When enabled, d5-01 determines whether the value is read as the torque limit value (d5-01 = 0) or read as the torque reference value (d5-01 = 1). In Closed Loop Vector for PM motors, this value is read as the torque limit.

<3> Unit depends on the setting of o1-03 (Digital Operator Display Scaling). When the drive is operating in the V/f Control mode or Open loop vector for PM mode, the drive's output frequency becomes the input data.

<4> Data is displayed in units of either 0.01 A for drives 7.5 kW and smaller, or in units of 0.1 A for drives 11 kW and larger. This is the same regardless of whether the drive is set for Normal Duty or Heavy Duty operation.

Table 9 Extended Data 1 Register Map

Output (Master Device → Drive)		Input (Drive → Master Device)	
Byte	Description	Byte	Description
0	Operation Command High Byte	0	Drive Status High Byte
1	Operation Command Low Byte	1	Drive Status Low Byte
2	Frequency Reference High Byte	2	Motor Speed High Byte <3>
3	Frequency Reference Low Byte	3	Motor Speed Low Byte <3>
4	Torque Reference High Byte <1> <2>	4	Torque Reference Monitor High Byte <6>
5	Torque Reference Low Byte <1> <2>	5	Torque Reference Monitor Low Byte <6>
6	Torque Compensation High Byte <1>	6	Speed Detection PG Pulse Count 1 High Byte
7	Torque Compensation Low Byte <1>	7	Speed Detection PG Pulse Count 1 Low Byte
8	Reserved	8	Frequency Reference High Byte
9		9	Frequency Reference Low Byte
10	Analog Output Channel 1 High Byte <3>	10	Output Frequency High Byte
11	Analog Output Channel 1 Low Byte <3>	11	Output Frequency Low Byte
12	Analog Output Channel 2 High Byte <3>	12	Output Current High Byte <7>
13	Analog Output Channel 2 Low Byte <3>	13	Output Current Low Byte <7>
14	Digital Output High Byte <4>	14	Analog Input Channel 1 High Byte
15	Digital Output Low Byte <4>	15	Analog Input Channel 1 Low Byte
16	MEMOBUS/Modbus Function Code	16	MEMOBUS/Modbus Function Code
17	MEMOBUS/Modbus Starting Register Address High Byte	17	MEMOBUS/Modbus Starting Register Address High Byte
18	MEMOBUS/Modbus Starting Register Address Low Byte	18	MEMOBUS/Modbus Starting Register Address Low Byte
19	MEMOBUS/Modbus Number of Data	19	MEMOBUS/Modbus Number of Data
20	MEMOBUS/Modbus Data 1 High Byte	20	MEMOBUS/Modbus Data 1 High Byte

7 Conventional Formats

Output (Master Device → Drive)		Input (Drive → Master Device)	
Byte	Description	Byte	Description
21	MEMOBUS/Modbus Data 1 Low Byte	21	MEMOBUS/Modbus Data 1 Low Byte
22	MEMOBUS/Modbus Data 2 High Byte	22	MEMOBUS/Modbus Data 2 High Byte
23	MEMOBUS/Modbus Data 2 Low Byte	23	MEMOBUS/Modbus Data 2 Low Byte
24	MEMOBUS/Modbus Data 3 High Byte	24	MEMOBUS/Modbus Data 3 High Byte
25	MEMOBUS/Modbus Data 3 Low Byte	25	MEMOBUS/Modbus Data 3 Low Byte
26	MEMOBUS/Modbus Data 4 High Byte	26	MEMOBUS/Modbus Data 4 High Byte
27	MEMOBUS/Modbus Data 4 Low Byte	27	MEMOBUS/Modbus Data 4 Low Byte
28	Reserved	28	Reserved
29		29	
30		30	
31	Handshaking Register	31	Handshake Register

<1> Enabled in CLV, AOLV/PM, and CLV/PM control modes (A1-02 = 3, 6, or 7).

<2> Set when network communication is designated as the source of the torque limit and torque reference (F6-06 = 1). When enabled, d5-01 determines whether the value is read as the torque limit value (d5-01 = 0) or read as the torque reference value (d5-01 = 1). In Closed Loop Vector for PM motors, this value is read as the torque limit.

<3> To select drive analog output channel for communications, set H4-01 (Multi-Function Analog Output Terminal FM) and H4-04 (Multi-Function Analog Output Terminal AM) to 000 (through-mode).

<4> Drive digital output ON/OFF during communications, set H2-01 (Terminal M1, M2 and MC Function Selection (relay)), H2-02 (Terminal P1 Function Selection (open-collector)), and H2-03 (Terminal P2 Function Selection (open-collector)) to F (through-mode).

<5> Unit depends on the setting of o1-03 (Digital Operator Display Scaling). Input data is 0 when the drive is set for V/f Control or Open loop vector for PM mode.

<6> Not possible when using V/f control, V/f with PG, or Open loop vector for PM motors (A1-02 = 0, 1, or 5).

<7> Data is displayed in units of either 0.01 A for drives 7.5 kW and smaller, or in units of 0.1 A for drives 11 kW and larger. This is the same regardless of whether the drive is set for Normal Duty or Heavy Duty operation.

Table 10 Operation Command

Command Signal	Description
0	H5-12 = 0: Forward Run/Stop, 1: FRUN H5-12 = 1: Run/Stop, 1: RUN
1	H5-12 = 0: Reverse Run/Stop, 1: RRUN H5-12 = 1: Forward/Reverse, 1: REV
2	Multi-function digital input command 3
3	Multi-function digital input command 4
4	Multi-function digital input command 5
5	Multi-function digital input command 6
6	Multi-function digital input command 7
7	Multi-function digital input command 8
8	External Fault, 1: Fault (EF0)
9	Fault Reset, 1: Fault Reset
A	Reserved
B	
C	
D	
E	Fault Trace and Fault History Reset 1: Fault information is reset by raising edge of this bit.
F	Baseblock command 1: Ext Baseblock

Table 11 Drive Status: U1-12

Drive Status	Description
0	1: During run
1	1: During zero speed
2	1: During reverse run
3	1: During fault reset signal input
4	1: During speed agree
5	1: Drive ready
6	1: Alarm
7	1: Fault
8	1: During operation error (oPE□□)
9	1: During momentary power loss
A	1: NetCtrl status
B	1: M1-M2 relay closed
C	1: Photocoupler output 1 closed
D	1: Photocoupler output 2 closed
E	1: Motor 2 selected
F	1: Zero Servo Complete

Table 12 Extended Data 2 Register Map

Output (Master Device → Drive)		Input (Drive → Master Device)	
Byte	Description	Byte	Description
0	Operation Command High Byte	0	Drive Status High Byte
1	Operation Command Low Byte	1	Drive Status Low Byte
2	Frequency Reference High Byte	2	Motor Speed High Byte <I>
3	Frequency Reference Low Byte	3	Motor Speed Low Byte <I>
4	MEMOBUS/Modbus Function Code	4	MEMOBUS/Modbus Function Code
5	MEMOBUS/Modbus Starting Register Address High Byte	5	MEMOBUS/Modbus Starting Register Address High Byte
6	MEMOBUS/Modbus Starting Register Address Low Byte	6	MEMOBUS/Modbus Starting Register Address Low Byte
7	MEMOBUS/Modbus Data Length	7	MEMOBUS/Modbus Data Length
8	MEMOBUS/Modbus Data 1 High Byte	8	MEMOBUS/Modbus Data 1 High Byte
9	MEMOBUS/Modbus Data 1 Low Byte	9	MEMOBUS/Modbus Data 1 Low Byte
10	Reserved	10	Reserved
11	Handshaking Register	11	Handshake Register

<I> Unit depends on the setting of o1-03 (Digital Operator Display Scaling). When the drive is operating in the V/f Control mode or Open loop vector for PM mode, the drive's output frequency becomes the input data.

◆ MEMOBUS/Modbus Message Area

In this area, a MEMOBUS/Modbus message is transferred to the SI-P3 card, and the parameters in the drive can be set, read, and monitored. Up to four data items can be written or read at one time.

Because the SI-P3 card edits the MEMOBUS/Modbus message internally and transfers it to the drive after receiving the message, more time is required to return the message. Use the handshaking register to synchronize sending or receiving of the data between the PROFIBUS-DP master and the SI-P3 card. For details on the handshaking register, refer to [Handshaking Register on page 19](#).

Execute an Enter command to write a parameter to the drive. Execution of the Enter command validates the written data. For the details of the Enter command, refer to the Enter Command in Appendix C of the Technical Manual for the drive.

Note: Refer to the MEMOBUS/Modbus Data Table in Appendix C of the Technical Manual for the drive for a list of monitor data using the MEMOBUS/Modbus message area.

■ Configuration of MEMOBUS/Modbus Command Message

[Table 13](#) shows the configuration of MEMOBUS/Modbus command messages when the Extended Data 1 is selected.

Table 13 MEMOBUS/Modbus Command Message

Byte	Name	Function	
16	Function code	MEMOBUS/Modbus command code: 03H: Read command (reading Drive internal data) 08H: Loop back 10H: Write command (writing data into the drive) Other codes: Not supported.	
17	Starting Resistor No.	Starting resistor No.	High Byte
18			Low Byte
19	Number of Data Items	Sets the number of bytes to read or write (only 2, 4, 6, or 8 allowed)	
20	Data 1 <I>	Data word 1	High Byte
21			Low Byte
22	Data 2 <I>	Data word 2	High Byte
23			Low Byte
24	Data 3 <I>	Data word 3	High Byte
25			Low Byte
26	Data 4 <I>	Data word 4	High Byte
27			Low Byte
28	Reserved	Reserved	
29			
30			
31	Handshaking Register	Refer to Handshaking Register on page 19 .	

<I> Setting is needed only for the write command. Select 00H for the read command.

■ Configuration of MEMOBUS/Modbus Response Messages

[Table 14](#) shows the configuration of MEMOBUS/Modbus response messages when the Extended Data 1 is selected.

Table 14 MEMOBUS/Modbus Response Messages

Byte	Name	Function
16	Function code	MEMOBUS/Modbus response codes 00H: Waiting for response from drive 03H: Response to read operation 10H: Response to write operation 83H: Read command error 90H: Write command error Other codes: Not supported.

7 Conventional Formats

Byte	Name	Function	
17	Starting resistor No.	Starting resistor No.	High Byte
18			Low Byte
19	Number of data items	Write: Set double number of written data items Read: Set double number of read data items	
20	Data 1 </>	Data word 1	High Byte
21			Low Byte
22	Data 2 </>	Data word 2	High Byte
23			Low Byte
24	Data 3 </>	Data word 3	High Byte
25			Low Byte
26	Data 4 </>	Data word 4	High Byte
27			Low Byte
28	Reserved		
29			
30			
31	Handshaking register	Refer to <i>Handshaking Register on page 19</i> .	

<1> Data is returned only for the read command.

If an error occurs, the SI-P3 card sets the MSB (Most Significant Bit) in the MEMOBUS/Modbus response code to 1 and returns the error response. The number of data items is set to 02H and one of the following error codes is written into the Low Byte of Data 1. Refer to the Communication Errors in Appendix C of the Technical Manual for the drive for the details of the MEMOBUS/Modbus Error Codes.

■ Parameter Settings Using MEMOBUS/Modbus Commands

The written or read data of each parameter is transferred in a hexadecimal value.

Negative values are expressed as a two complement.

Example 1: The frequency reference is 30Hz.

30 Hz/0.01 Hz = 3000 → BB8H

Example 2: -5% is assigned as the bias for terminal FM of multi-function analog output 1.

5/0.1 = 50 → 32H

Converted into a two complement → FFCEH

Example 3: 60.00 Hz is assigned for d1-01 (register No.: 0280H).

60.00Hz/0.01Hz = 6000 → 1770H

Table 15 Parameter Settings Using MEMOBUS/Modbus Commands

Byte	Name		Data		
			Command Message	Response Message	Response Message (at Fault) <2>
16	Function code		10H	10H	90H
17	Starting Register No.	High Byte	02H	02H	00H
18		Low Byte	80H	80H	00H
19	Number of Data Items		02H	02H	02H
20	Data 1	High Byte	17H	00H	00H
21		Low Byte	70H	00H	02H
22	Data 2	High Byte	00H	00H	00H
23		Low Byte	00H	00H	00H
24	Data 3	High Byte	00H	00H	00H
25		Low Byte	00H	00H	00H
26	Data 4	High Byte	00H	00H	00H
27		Low Byte	00H	00H	00H
28	Reserved		00H	00H	00H
29			00H	00H	00H
30			00H	00H	00H
31	Handshaking Register </>		80H	80H	80H

<1> Depends on the status of the previous data.

<2> Depends on the status of the fault.

■ Handshaking Register

Handshaking is used to synchronize the timing of the sending or receiving of MEMOBUS/Modbus message data between the SI-P3 card and the PROFIBUS-DP master.

When the master toggles bit 7 of the handshaking register in the output data, the SI-P3 starts to process the data in the MEMOBUS/Modbus registers. Ensure that the data in the MEMOBUS/Modbus registers is valid before toggling bit 7.

When the SI-P3 toggles bit 7 of the handshaking register in the input data to the same value as handshake register bit 7 in the output data, the content of the input data MEMOBUS/Modbus registers is valid.

Handshaking Output Register

PROFIBUS-DP Master to SI-P3 Card

Bit 7	6	5	4	3	2	1	0
HS	–	–	–	–	–	–	INIT

Bit	Name	Function
7	HS	Handshaking bit. Synchronizes send and receive timing. Changes status when sending new command messages. Note: This bit is reset to 0 at power up or by setting the handshaking output register bit INIT to 1.
1 to 6	–	Not used
0	INIT	Clears the handshaking bit to 0

Handshaking Input Register

SI-P3 Card to PROFIBUS-DP Master

Bit 7	6	5	4	3	2	1	0
HS	STATUS	WD					–

Bit	Name	Function
7	HS	Handshaking bit. Synchronizes send and receive timing. Changes status when sending new command messages. Note: This bit is reset to 0 at power up or by initializing the handshaking output register bit INIT back to 0.
5 to 6	STATUS </>	Status of the data exchange between the PROFIBUS-DP master and the drive. 00H: Idle 01H: SI-P3 sends a MEMOBUS/Modbus command to the drives. 10H: SI-P3 waits for a MEMOBUS/Modbus response from the drives. 11H: SI-P3 receives a MEMOBUS/Modbus response from the drives.
1 to 4	WD </>	Counter increases every 64 ms
0	–	Not used

</> STATUS and WD are for reference.

■ Example of Handshaking

Clear the handshaking register HS bit (bit 7) to 0 for the PLC program after turning on the power supply or after re-initializing. *Figure 7* describes the handshaking function. The arrow marks indicate whether the PROFIBUS-DP master or the SI-P3 card has the control for the protocol.

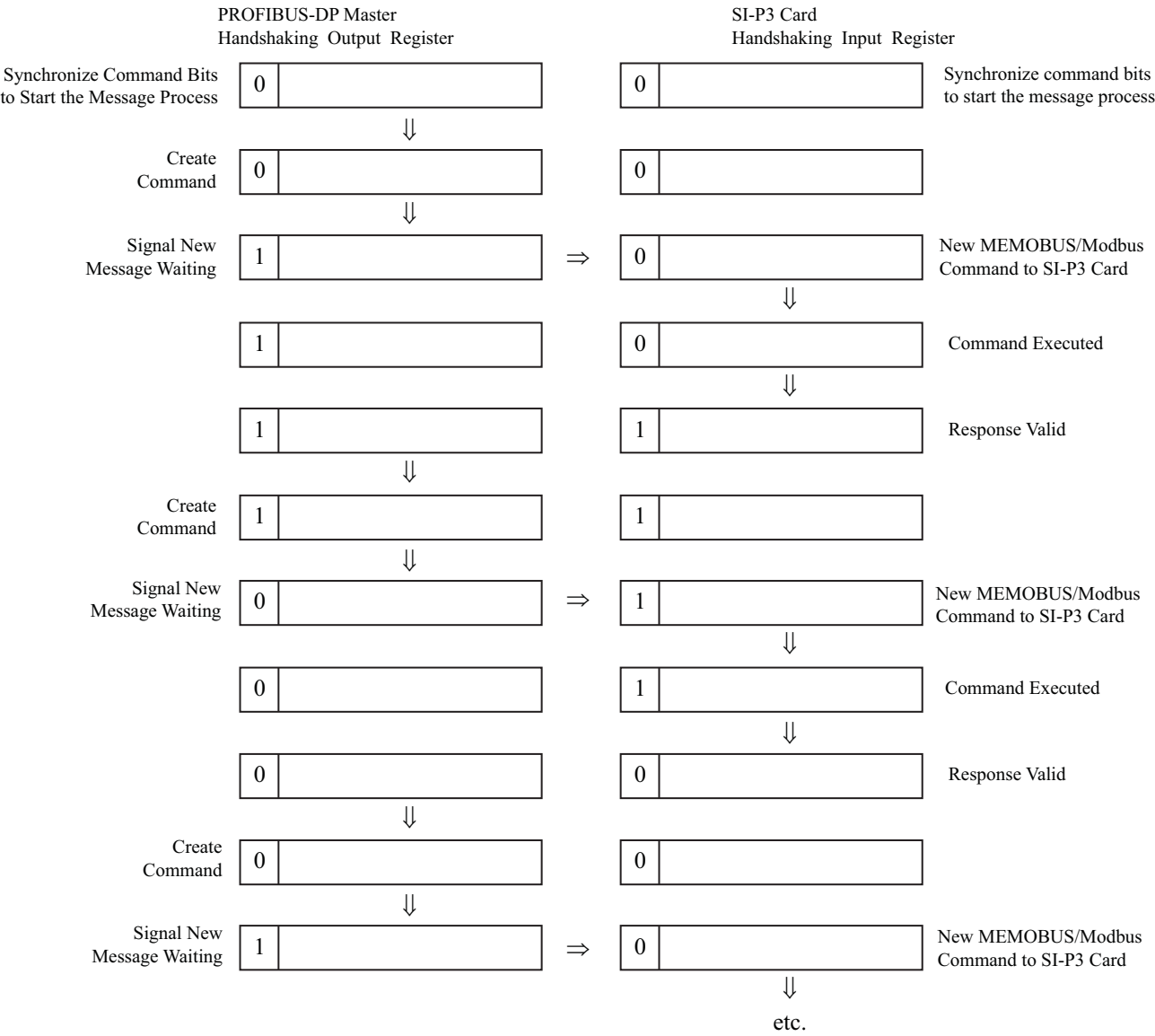


Figure 7 Example of Handshaking

■ Flow Chart

Figure 8 illustrates the handshaking function when using a MEMOBUS/Modbus message.

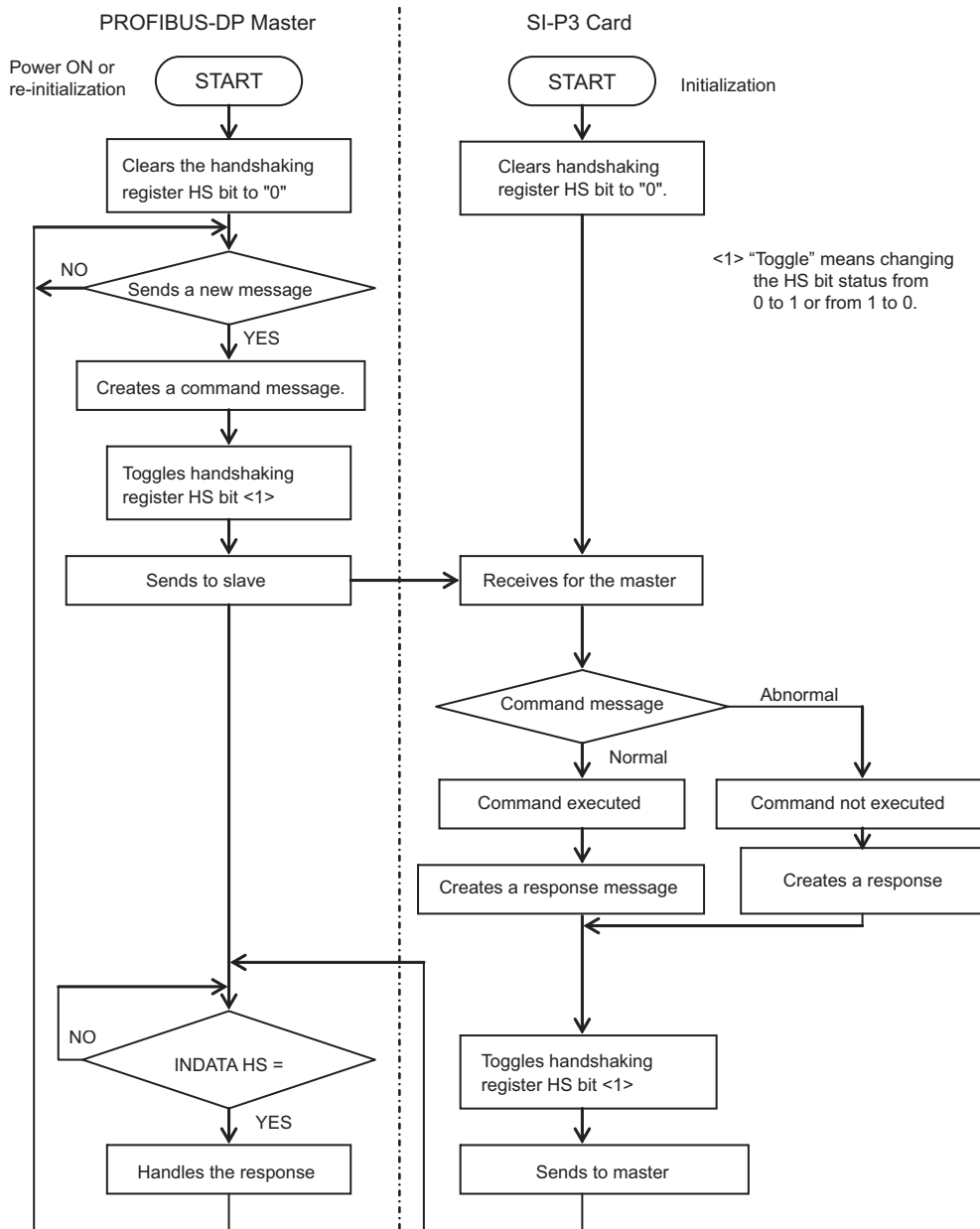


Figure 8 MEMOBUS/Modbus Message Flow Chart

8 Parameter Process Data Object Formats

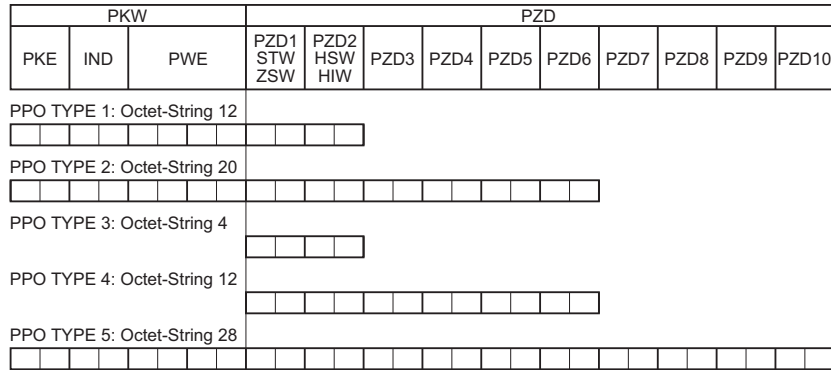
◆ Supported Parameter Process Data Object (PPO) Type Formats

Set drive parameter F6-32 = “0” to use PPO type formats. The PPO is defined for cyclic data transfer, allowing the master and the slave to exchange process data (PZD) and parameters. Refer to the PROFIBUS specification for more information on PPO types 1~5.

SI-P3 supports five possible PPO type formats:

PPO type 1 (8 octets PKW + 4 octets PZD)
PPO type 2 (8 octets PKW + 12 octets PZD)
PPO type 3 (4 octets PZD)
PPO type 4 (12 octets PZD)
PPO type 5 (8 octets PKW + 20 octets PZD)

All PPO Types have the registers STW, ZSW, HSW, and HIW. These registers are not mapped directly to drive registers.



PKW: Parameter ID/value
PZD: Process Data, cyclically transferred
PKE: Parameter ID (1st and 2nd octet)
IND: Sub-index (3rd octet), 4th octet is reserved
PWE: Parameter value (5th until 8th octet)
STW: Control word
HSW: Main setpoint
ZSW: Status word
HIW: Main actual value

◆ Configuration of Registers

■ PKE

Bit	PPO Write	PPO Read
0	PNU number (<i>Refer to Supported PNU on page 25</i>)	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	SPM always 0	SPM always 0
12	See Task ID	See Response ID When Response ID is 7, see PWE error code
13		
14		
15		

■ IND

Bit	PPO Write	PPO Read
0	Sub-Index for parameter number (F6-33 = 0)	Sub-Index for parameter number (F6-33 = 0)
1		
2		
3		
4		
5		
6		
7		
8	Sub-Index for parameter number (F6-33 = 1)	Sub-Index for parameter number (F6-33 = 1)
9		
10		
11		
12		
13		
14		
15		

■ PWE

Bit	PPO Write	PPO Read
0 to 31	Setting Data	Error code when Response ID is 7 0: Incorrect PNU number 1: Write mode error 2: Lower or upper limit violated 3: Disabled IND is set 17: Write mode error during Uv condition or Write mode error during parameter processing

■ STW/ZSW

Bit	PPO Write	PPO Read
0	OFF1: reserved	Ready to switch on: always 1
1	OFF2: reserved	Ready: always 1
2	OFF3: reserved	0: Not ready 1: Drive ready
3	Enable to RUN 0: Baseblock + Stop 1: Not Baseblock	0: No fault condition 1: Fault condition
4	0: STOP 1: RUN	Always 1
5	Ramp function generation enable: reserved	Always 1
6	Enable ramp function generator set-point: reserved	Switch-on inhibit: always 0
7	1: Fault Reset	0: No alarm condition 1: Alarm condition
8	0: Stop 1: JOG RUN forward (Fmax/10 speed)	0: No speed agree 1: Speed agree condition
9	0: Stop 1: JOG RUN reverse (Fmax/10 speed)	0: Local control 1: Control from PROFIBUS
10	0: Local control 1: Control from PROFIBUS	Always 0
11	Reserved	
12		
13		
14		
15		

■ HSW/HIW

Bit	PPO Write	PPO Read
0 to 15	Setting Frequency ($\pm 10000/100\%$)	Output Frequency or Motor speed (with PG) ($\pm 10000/100\%$)

■ Task ID

ID	Description
0	No action
1	Request parameter value
2	Change parameter value (word)
3	Change parameter value (double word)
6	Request parameter value from array
7	Change parameter value in array (word)

8 Parameter Process Data Object Formats

ID	Description
8	Change parameter value in array (double word)
9	Request number of array elements

■ Response ID

ID	Description
0	No action
1	Transfer parameter value (word)
2	Transfer parameter value (double word)
4	Transfer parameter value (array word)
5	Transfer parameter value (array double word)
6	Transfer number of array element
7	Task cannot be executed (with error number)

◆ SI-P3 Device Data

Parameter	Setting Value	Note
GSD_Revision	3	GSD file revision 3.0.
Vendor_Name	"YASKAWA ELECTRIC"	
Model_Name	"PROFIBUS-DP INTERFACE CARD SI-P3"	
Ident_Number	0x0ACF	
FMS_supp	0	PROFIBUS-FMS not supported
Protocol_Ident	0	PROFIBUS-DP supported
Station_Type	0	DP-Slave.
Slave_Family	3	
Revision	"V1.0"	Device revision 1.0
Hardware_Release	"V1.0"	Hardware revision 1.0
Software_Release	"V1.0"	Software revision 1.0
Implementation_type	"DPC31"	DP protocol
Redundancy	0	Redundancy NOT supported
Repeater_Ctrl_Sig	2	Supported, TTL level
24V_Pins	0	No external 24 Volt input
Set_Slave_Add_supp = 1	1	Station address is set remotely
Auto_Baud_supp	1	Automatic baud rate select
9.6_supp	1	9600 Baud
19.2_supp	1	19.2 kBaud
45.45_supp	1	45.45 kBaud
93.75_supp	1	93.75 kBaud
187.5_supp	1	187.5 kBaud
500_supp	1	500 kBaud
1.5M_supp	1	1.5 MBaud
3M_supp	1	3 MBaud
6M_supp	1	6 MBaud
12M_supp	1	12 MBaud
MaxTsdrr_9.6	60	60 Tbit = 6.25 msec
MaxTsdrr_19.2	60	60 Tbit = 3.125 msec
MaxTsdrr_45.45	60	60 Tbit = 1.32 msec
MaxTsdrr_93.75	60	60 Tbit = 640 usec
MaxTsdrr_187.5	60	60 Tbit = 320 usec
MaxTsdrr_500	100	100 Tbit = 200 usec
MaxTsdrr_1.5M	150	150 Tbit = 100 usec
MaxTsdrr_3M	250	250 Tbit = 83 usec
MaxTsdrr_6M	450	450 Tbit = 75 usec
MaxTsdrr_12M	800	800 Tbit = 67 usec
Min_Slave_Interval	5	Minimum slave interval=0.5 ms
Freeze_Mode_supp	1	Freeze mode not supported
Sync_Mode_supp	1	Sync mode not supported
Fail_Safe	1	Fail safe supported
DPV1_Slave	1	
DPV1_Data_Types	1	
C1_Read_Write_supp	0	
C2_Read_Write_supp	1	
C2_Max_Data_Len	240	
C2_Response_Timeout	100	
C2_Read_Write_required	0	
C2_Max_Count_Channels	1	

Parameter	Setting Value	Note
Max_Initiate_PDU_Length	52	
Modular_Station	1	Modular station.
Max_Module	1	Maximum # of modules: 1
Max_Input_Len	32	Maximum # of input bytes
Max_Output_Len	32	Maximum # of output bytes
Max_Data_Len	64	Maximum # of data bytes
Max_User_Prm_Data_Len	4	
Ext_User_Prm_Data_Const(0)	0x40,0x01,0x00,0x01	
Ext_User_Prm_Data_Ref(0)	1	
Ext_User_Prm_Data_Ref(0)	2	
Max_Diag_Data_Len	11	Maximum diagnostic length
Unit_Diag_Bit(0024)	"Undervoltage Condition"	
Unit_Diag_Bit(0025)	"Inverter Communications Error"	
Unit_Diag_Bit(0026)	"PNU915: Illegal PNU configured"	
Unit_Diag_Bit(0027)	"PNU916: Illegal PNU configured"	

Module = "Basic data" 0x72 1 EndModule
Module = "Extended Data 1" 0x5F, 0x6F 2 EndModule
Module = "Extended Data 2" 0x55, 0x65 3 EndModule
Module = "PPO Type 1" 0xF3, 0xF1 4 EndModule
Module = "PPO Type 2" 0xF3, 0xF5 5 EndModule
Module = "PPO Type 3" 0xF1 6 EndModule
Module = "PPO Type 4" 0xF5 7 EndModule
Module = "PPO Type 5" 0xF3, 0xF9 8 EndModule
Module = "PPO Type 1 (No Cons.)" 0x73, 0x71 9 EndModule
Module = "PPO Type 2 (No Cons.)" 0x73, 0x75 10 EndModule
Module = "PPO Type 3 (No Cons.)" 0x71 11 EndModule
Module = "PPO Type 4 (No Cons.)" 0x75 12 EndModule
Module = "PPO Type 5 (No Cons.)" 0x73, 0x79 13 EndModule

◆ Supported PNU

Supported PNU No.	Data type	Write	Read	Description
900	Octet String 12		○	Type 1 PPO-Write
901	Octet String 20		○	Type 2 PPO-Write
902	Octet String 4		○	Type 3 PPO-Write (DP-V1 only)
903	Octet String 12		○	Type 4 PPO-Write (DP-V1 only)
904	Unsigned 16		○	Current PPO-Write
905	Octet String 28		○	Type 5 PPO-Write

8 Parameter Process Data Object Formats

Supported PNU No.	Data type	Write	Read	Description
907	Octet String 12		○	Type 1 PPO-Read
908	Octet String 20		○	Type 2 PPO-Read
909	Octet String 4		○	Type 3 PPO-Read (DP-V1only)
910	Octet String 12		○	Type 4 PPO-Read (DP-V1only)
911	Unsigned 16		○	Current PPO-Read
912	Octet String 28		○	Type 5 PPO-Read
915	Array[10] Unsigned 16	○	○	Assign MEMOBUS/Modbus Write Command to PZD in PPO-Write
916	Array[10] Unsigned 16	○	○	Assign MEMOBUS/Modbus response to PZD in PPO-Read
918	Unsigned 16		○	Node address
947	Array[10] Unsigned 16		○	Fault number
948	Array[10] Unsigned 16		○	Fault time (Elapsed time between fault occurrence)
963	Unsigned 16		○	Current baud rate
964	Unsigned 16		○	Device identification (Refer to PNU964 on page 28)
965	Octet String 2		○	Profile code: 0x0302
967	V2	○	○	Read or Write Control word
968	V2		○	Read Status word
971	Unsigned 16	○		Start Store in non-volatile memory (Enter code with EEPROM)

■ Example: To read the Drive Command (STW) using PNU900

Command setting

Data type	Settings	Description
PKE	6384H	6: Request parameter value from array 384H=900 dec (PNU 900)
IND	5	5th Word data of PPO type 1
PWE	0	N/A
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	4384H	4: Transfer parameter value (array word) 384H=900 dec (PNU 900)
IND	5	5th Word data of PPO type 1
PWE	(STW)	STW data
ZSW	–	up to drive status
HIW	–	up to drive status

■ Example: To read the Drive Status (ZSW) using PNU907

Command setting

Data type	Settings	Description
PKE	638BH	6: Request parameter value from array 38BH=907 dec (PNU 907)
IND	5	5th Word data of PPO type 1
PWE	0	N/A
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	438BH	4: Transfer parameter value (array word) 38BH=907 dec (PNU 907)
IND	5	5th Word data of PPO type 1
PWE	(ZSW)	ZSW data
ZSW	–	up to drive status
HIW	–	up to drive status

■ Example: To read the data Type 1 PPO-Write 1st word

Command setting

Data type	Settings	Description
PKE	6384H	6: Request parameter value from array 384H=900 dec (PNU 900)
IND	1	First Word data of PPO type 1
PWE	0	N/A
STW	–	up to Master command

Data type	Settings	Description
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	4384H	4: Transfer parameter value (array word) 384H=900 dec (PNU 900)
IND	1	First Word data of PPO type 1
PWE	6384H	PPO-Write 1st Word data
ZSW	–	up to drive status
HIW	–	up to drive status

■ **Example: To read current PPO-Write****Command setting**

Data type	Settings	Description
PKE	1388H	1: Request parameter value 388H=904 dec (PNU 904)
IND	0	Not array type
PWE	0	N/A
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	1388H	1: Transfer parameter value (word) 388H=904 dec (PNU 904)
IND	0	Not array type
PWE	1	1: Type 1 PPO-Write 2: Type 2 PPO-Write 3: Type 3 PPO-Write 4: Type 4 PPO-Write 5: Type 5 PPO-Write
ZSW	–	up to drive status
HIW	–	up to drive status

■ **How to use PNU 915 (Assignment, PZD in PPO-Write)**

PZD #	PNU	INDX	Assigned PNU	Description
PZD1	915	1	P0.1	Operation command
PZD2	915	2	P0.2	Frequency Reference
PZD3	915	3	P0.6	PID set point
PZD4	915	4	P0.7	Analog Output
PZD5	915	5	P0.9	Digital Output
PZD6	915	6	P0.15	PID set point enable
PZD7	915	7		
PZD8	915	8		
PZD9	915	9		
PZD10	915	10		

■ **How to use PNU 916 (Assignment, PZD in PPO-Read)**

PZD #	PNU	INDX	Assigned PNU	Description
PZD1	916	1	P0.32	Drive Status
PZD2	916	2	P0.2	Frequency Reference
PZD3	916	3	P0.36	Output Frequency
PZD4	916	4	P0.38	Output Current
PZD5	916	5	P0.68	Motor Speed
PZD6	916	6	P0.69	Output Voltage
PZD7	916	7	P0.70	Bus Voltage
PZD8	916	8	P0.72	Torque Monitor
PZD9	916	9	P0.71	Output Power
PZD10	916	10	P0.73	Input terminal status

■ **PNU963**

Value	Baud rate (kbit/s)
0	9.6
1	19.2

8 Parameter Process Data Object Formats

Value	Baud rate (kbit/s)
2	93.75
3	187.5
4	500
6	1500
7	3000
8	6000
9	12000

■ PNU964

Sub-Index	Description	Settings
1	Manufacturer Coding	273 dec
2	Device type	1
3	Software version	0
4	Firmware Data (year)	2007 dec
5	Firmware Data (month/day)	0220 dec
6	DO	1

◆ PNU Numbers for Drive Parameters

DPV0 PNU Number (Dec)	Description	INDEX (Dec)
11	A1 Function Group	00–99
12	A2 Function Group	00–99
21	b1 Function Group	00–99
22	b2 Function Group	00–99
23	b3 Function Group	00–99
24	b4 Function Group	00–99
25	b5 Function Group	00–99
26	b6 Function Group	00–99
27	b7 Function Group	00–99
28	b8 Function Group	00–99
29	b9 Function Group	00–99
31	C1 Function Group	00–99
32	C2 Function Group	00–99
33	C3 Function Group	00–99
34	C4 Function Group	00–99
35	C5 Function Group	00–99
36	C6 Function Group	00–99
41	d1 Function Group	00–99
42	d2 Function Group	00–99
43	d3 Function Group	00–99
44	d4 Function Group	00–99
45	d5 Function Group	00–99
46	d6 Function Group	00–99
47	d7 Function Group	00–99
51	E1 Function Group	00–99
52	E2 Function Group	00–99
53	E3 Function Group	00–99
54	E4 Function Group	00–99
55	E5 Function Group	00–99
61	F1 Function Group	00–99
62	F2 Function Group	00–99
63	F3 Function Group	00–99
64	F4 Function Group	00–99
65	F5 Function Group	00–99
66	F6 Function Group	00–99
67	F7 Function Group	00–99
81	H1 Function Group	00–99
82	H2 Function Group	00–99
83	H3 Function Group	00–99
84	H4 Function Group	00–99
85	H5 Function Group	00–99
86	H6 Function Group	00–99
121	L1 Function Group	00–99
122	L2 Function Group	00–99

DPV0 PNU Number (Dec)	Description	INDEX (Dec)
123	L3 Function Group	00–99
124	L4 Function Group	00–99
125	L5 Function Group	00–99
126	L6 Function Group	00–99
127	L7 Function Group	00–99
128	L8 Function Group	00–99
141	n1 Function Group	00–99
142	n2 Function Group	00–99
143	n3 Function Group	00–99
145	n5 Function Group	00–99
146	n6 Function Group	00–99
148	n8 Function Group	00–99
151	o1 Function Group	00–99
152	o2 Function Group	00–99
153	o3 Function Group	00–99
154	o4 Function Group	00–99
171	q1 Function Group	00–99
181	r1 Function Group	00–99
201	T1 Function Group	00–99
202	T2 Function Group	00–99
203	T3 Function Group	00–99
211	U1 Function Group	00–99
212	U2 Function Group	00–99
213	U3 Function Group	00–99
214	U4 Function Group	00–99
215	U5 Function Group	00–99
216	U6 Function Group	00–99
217	U7 Function Group	00–99
218	U8 Function Group	00–99
300	RAM Enter Command	0
301	ROM Enter Command	0

■ PNU Numbering for MEMOBUS/Modbus registers

DPV0 PNU Number	Description	INDEX
Command		
0	0001H MEMOBUS/Modbus #	1
0	0002H MEMOBUS/Modbus #	2
0	0003H MEMOBUS #	3
0	0004H MEMOBUS #	4
0	0005H MEMOBUS #	5
0	0006H MEMOBUS #	6
0	0007H MEMOBUS/Modbus #	7
0	0008H MEMOBUS #	8
0	0009H MEMOBUS/Modbus #	9
0	000AH MEMOBUS/Modbus #	10
0	000FH MEMOBUS/Modbus #	15
0	0010H MEMOBUS/Modbus #	16
0	0011H MEMOBUS/Modbus #	17
0	001BH MEMOBUS #	27
0	001CH MEMOBUS #	28
0	001DH MEMOBUS #	29
Monitor		
0	0020H MEMOBUS/Modbus #	32
0	0021H MEMOBUS/Modbus #	33
0	0022H MEMOBUS/Modbus #	34
0	0023H MEMOBUS/Modbus #	35
0	0024H MEMOBUS/Modbus #	36
0	0025H MEMOBUS/Modbus #	37
0	0026H MEMOBUS/Modbus #	38
0	0027H MEMOBUS/Modbus #	39
0	0028H MEMOBUS/Modbus #	40
0	0029H MEMOBUS/Modbus #	41
0	002AH MEMOBUS/Modbus #	42
0	002BH MEMOBUS/Modbus #	43

8 Parameter Process Data Object Formats

DPV0 PNU Number	Description	INDEX
0	002CH MEMOBUS/Modbus #	44
0	002DH MEMOBUS/Modbus #	45
0	002EH MEMOBUS/Modbus #	46
0	002FH MEMOBUS/Modbus #	47
0	0030H MEMOBUS/Modbus #	48
0	0031H MEMOBUS/Modbus #	49
0	0032H MEMOBUS/Modbus #	50
0	0033H MEMOBUS/Modbus #	51
0	0034H MEMOBUS/Modbus #	52
0
0	00FFH MEMOBUS/Modbus #	255

Note: When PNU is set to 0 and INDEX is set to MEMOBUS/Modbus register number, V1000 parameter values can be read and written instead of using PNU number.

Note: MEMOBUS/Modbus register C1-01 is 200Hex

When PNU is 0 and INDEX is 200H(512 dec), C1-01 setting value can be read and written instead of using PNU 31(dec) and INDEX 01.

■ Example: Writing to C1-01

Command setting

Data type	Settings	Description
PKE	701FH	7: Change parameter value in array (word) 1FH = 31 (C1 parameter)
IND	1	C1-01
PWE	10	Assign 10
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	401FH	4: Transfer parameter value (array word) 1FH = 31 (C1 parameter)
IND	1	C1-01
PWE	0	N/A
STW	–	up to drive status
HSW	–	up to drive status

■ Example: Reading to d1-17

Command setting

Data type	Settings	Description
PKE	6029H	6: Request parameter value from array 29H = 41 (d1 parameter)
IND	11H	11H = 17 (d1-17)
PWE	0	N/A
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	4029H	4: Transfer parameter value (array word) 29H = 41 (d1 parameter)
IND	11H	d1-17
PWE	258H	d1-17 value
STW	–	up to drive status
HSW	–	up to drive status

■ Example: Writing to RAM with the Enter command

Command setting

Data type	Settings	Description
PKE	212CH	2: Change parameter value (word) 12CH = 300
IND	0	N/A
PWE	0	N/A
STW	–	up to Master command
HSW	–	up to Master command

Response

Data type	Settings	Description
PKE	112CH	1: Transfer parameter value (word)
		12CH = 300
IND	0	N/A
PWE	0	N/A
STW	–	up to drive status
HSW	–	up to drive status

9 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive operator. Causes of the errors and corrective actions are listed in [Table 16](#). For additional error codes that may appear on the operator screen, refer to the Technical Manual for the drive.

■ Faults


bUS (PROFIBUS-DP Option Communication Error) and EF0 (External Fault Input from the PROFIBUS-DP Option) may appear as an alarm or a fault. When a fault occurs, the operator remains lit. When an alarm occurs, the operator flashes and the “ALM” light illuminates.


If communication stops while the drive is running, check the following items to resolve the fault:


- Is the PROFIBUS-DP Option properly installed?
- Is the communication line properly connected to the PROFIBUS-DP Option? Is it loose?
- Is the controller program working? Has the controller CPU stopped?
- Did a momentary power loss interrupt communications?

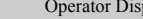
Table 16 Fault Display and Possible Solutions

Operator Display		Fault Name
<i>bUS</i>	bUS	PROFIBUS-DP Option Communication Error
		After establishing initial communication, the connection was lost. Only detected when the run command or frequency reference is assigned to the option (b1-03 = 3 or b1-02 = 3).
Cause		Possible Solution
Master controller (PLC) has stopped communicating.		Check for faulty wiring. • Correct any wiring problems.
Communication cable is not connected properly.		
A data error occurred due to noise.		Check the various options available to minimize the effects of noise. • Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring. • If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. • Use cables recommended by Yaskawa, or another type of shielded line. Ground the shield on the controller side and on the PROFIBUS-DP Option side.
PROFIBUS-DP Option is damaged.		• If there are no problems with the wiring and the error continues to occur, replace the PROFIBUS-DP Option.


Operator Display		Fault Name
	EF0	External Fault Input from PROFIBUS-DP Option
		The alarm function for an external device has been triggered.
Cause		Possible Solution
An external fault is being sent from the upper controller (PLC).		<ul style="list-style-type: none">• Remove the cause of the external fault.• Reset the external fault input from the upper controller (PLC) device.
Problem with the upper controller (PLC) program.		<ul style="list-style-type: none">• Check the program used by the upper controller (PLC) and make the appropriate corrections.

Operator Display		Fault Name
 oFA00	oFA00	PROFIBUS-DP Option Fault (Port A)
		PROFIBUS-DP Option is not properly connected.
Cause		Possible Solution
Non-compatible option connected to the drive.		<ul style="list-style-type: none">• Connect an option that is compatible with the drive.

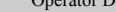
Operator Display		Fault Name
	oFA01	PROFIBUS-DP Option Fault (Port A)
		PROFIBUS-DP Option is not properly connected.
Cause		Possible Solution
Problem with the connectors between the drive and PROFIBUS-DP Option.		<ul style="list-style-type: none">• Turn the power off and check the connectors between the drive and PROFIBUS-DP Option.

Operator Display		Fault Name
 oFA30 to oFA43	oFA30 to oFA43	PROFIBUS-DP Option Fault (port A)
		Communication ID error
Cause		Possible Solution
PROFIBUS-DP Option hardware fault		⇒ Replace the PROFIBUS-DP Option. Contact Yaskawa for assistance.

Operator Display		Fault Name
oFb00	oFb00	PROFIBUS-DP Option Fault (CN5-B)
		Non-compatible option card is connected.
Cause		Possible Solution
Non-compatible option connected to the drive.		⇒ Connect the correct option card to CN5-A.

Operator Display		Fault Name
	oFb02	PROFIBUS-DP Option Fault (CN5-B)
		Two of the same option cards are connected at the same time.
Cause		Possible Solution
Option cards AI-A3 or DI-A3 were connected to the CN5-B port while an option card was already connected to CN5-A.		⇒ Only one type of option input card AI-A3 or DI-A3 can be connected to the drive. Only this option card for PROFIBUS-DP can be connected to CN5-A.

Operator Display		Fault Name
oFc00	oFc00	PROFIBUS-DP Option Fault (CN5-C)
		Non-compatible option card is connected.
Cause		Possible Solution
Non-compatible option connected to the drive.		⇒ Connect the correct option card to CN5-A.

Operator Display		Fault Name
	oFc02	PROFIBUS-DP Option Fault (CN5-C)
		Two of the same option cards are connected at the same time.
Cause		Possible Solution
Option cards AI-A3 or DI-A3 were connected to the CN5-C port while an option card was already connected to CN5-A.		⇒ Only one type of option input card AI-A3 or DI-A3 can be connected to the drive. Only this option card for PROFIBUS-DP can be connected to CN5-A.

■ Minor Faults and Alarms

Table 17 Alarm Display

Operator Display		Minor Fault Name	
bb	bb	Baseblock	
		Data format and setting contents do not match.	
Cause		Possible Solution	Minor Fault (H2-□□ = 10)
The drive output is disabled. "bb" will be displayed on the operator when the drive is set for control by PROFIBUS-DP and: <ul style="list-style-type: none">• a conventional data format is used and the operation command bit F is set to 1.• a PPO type data format is used the the control word (STW) bit 3 is set to 0.		Set either of the bits depending on which data format is used.	No output

Operator Display		Minor Fault Name	
CALL	CALL	Serial Communication Transmission Error	
		Communication has not yet been established.	
Cause		Possible Solution	Minor Fault (H2-□□ = 10)
Communication wiring is faulty, there is a short circuit, or something is not connected properly.		Check for wiring errors. ⇒ Correct the wiring. ⇒ Remove and ground shorts and reconnect loose wires.	YES
Programming error on the master side		⇒ Check communications at start-up and correct programming errors.	
Communication circuitry is damaged.		Perform a self-diagnostics check. ⇒ Replace the drive if the fault continues to occur.	

10 Specifications

◆ Specifications

Table 18 Option Card Specifications

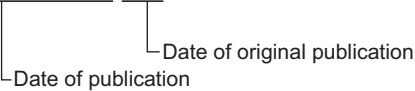
Model	SI-P3
PROFIBUS-DP Data	PROFIBUS DP-V0, V1 PPO TYPE: 1~5 (No. 3.072, Profile for Variable Speed Drives) Extended data 1 High-speed I/O data (inputs: 16 bytes, outputs: 16 bytes) MEMOBUS/Modbus message (inputs: 16 bytes, outputs: 16 bytes) Extended data 2 High-speed I/O data (inputs: 4 bytes, outputs: 4 bytes) MEMOBUS/Modbus message (inputs: 8 bytes, outputs: 8 bytes) Basic data High-speed I/O data (inputs: 6 bytes, outputs: 6 bytes)
Connector	9-pin D-sub connector (#4/40 UNC thread)
Communications Speed	9.6 kbps to 12 Mbps
Ambient Temperature	−10 °C to +50 °C
Humidity	up to 95% RH (no condensation)
Storage Temperature	−20 °C to +60 °C (allowed for short-term transport of the product)
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	up to 1000 m

◆ Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.

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YASKAWA AC Drive-Option Card

PROFIBUS-DP

Technical Manual

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