YASKAWA

YASKAWA AC Drive 1000-Series Option

PROFIBUS-DP

Installation Manual

Type: SI-P3/V, SI-P3/T

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

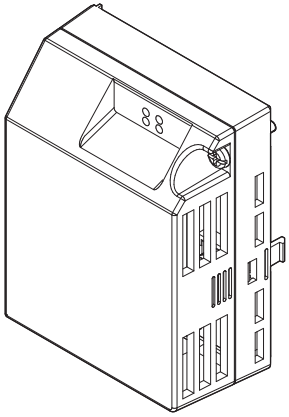
安川インバータ1000シリーズオプション

PROFIBUS-DP通信

取扱説明書

形　式 SI-P3/V, SI-P3/T

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MANUAL NO. TOBP C730600 23C

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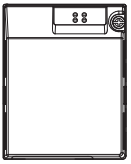
1 Preface and Safety

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:

Option Unit

	**Yaskawa AC Drive 1000-Series Option PROFIBUS-DP Installation Manual Manual No.: TOBPC73060023 (this book)**	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 1000-Series Option PROFIBUS-DP Technical Manual Manual No.: SIEPC73060023	The technical manual contains detailed information and command registers. To obtain the technical manual access these sites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative.

Yaskawa Drive (V1000)

	**Yaskawa AC Drive-V1000 Technical Manual**	To obtain instruction manuals for Yaskawa products access these sites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative. For questions, contact the local Yaskawa sales office or the nearest Yaskawa representative.
	Yaskawa AC Drive-V1000 Quick Start Guide	

Yaskawa Drive (T1000V)

	**Yaskawa AC Drive-T1000V Technical Manual**	This manual describes installation, wiring, operation procedures, functions, troubleshooting, maintenance, and inspections to perform before operation. To obtain this manual, contact the local Yaskawa sales office or the nearest Yaskawa representative.
	Yaskawa AC Drive-T1000V Safety Precautions	This guide is packaged together with the product. Covers safety precautions, areas to check upon receiving your new T1000V, and standards compliance.

◆ Terms

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

Drive:
- Yaskawa AC Drive-V1000 Series
- Yaskawa AC Drive-T1000V Series

PROFIBUS-DP Option: Yaskawa AC Drive 1000-Series Option PROFIBUS-DP (SI-P3/V, SI-P3/T)

◆ 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 unit. The option unit 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 units 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 modify the drive or option circuitry.

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

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

Do not expose the drive to halogen group disinfectants.

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

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.

■ Option Unit Label Warnings

Warning information is displayed on the option unit as shown in the figure below. Follow all warnings and safety instructions when using the product.
When using the drive in an area that may require displaying warning information in Japanese or Chinese, a sticker is provided with the PROFIBUS-DP Option. This sticker can be placed over the English and French warnings on the front of the PROFIBUS-DP Option.

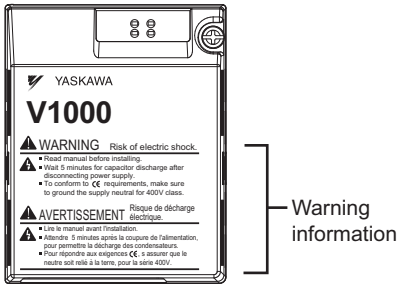


Figure 1 Warning Labels (example: SI-P3/V)

■ Warning Contents

WARNING Risk of electric shock.

- Read manual before installing.
- Wait 5 minutes for capacitor discharge after disconnecting power supply.
- To conform to CE requirements, make sure to ground the supply neutral for 400V class.

AVERTISSEMENT Risque de décharge électrique.

- Lire le manuel avant l'installation.
- Attendre 5 minutes après la coupure de l'alimentation, pour permettre la décharge des condensateurs.
- Pour répondre aux exigences CE, s assurer que le neutre soit relié à la terre, pour la série 400V.

2 Product Overview

◆ About This Product

PROFIBUS 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

◆ Applicable Models

The PROFIBUS-DP Option can be used with the drive models in ***Table 1***.

Table 1 Applicable Models

Option Unit	Drive	Software Version <1>
SI-P3/V	CIMR-V□□A□□□□BA□	5010, 1010 and later
	CIMR-V□□A□□□□FA□	5010, 1010 and later
	CIMR-V□□A□□□□JA□	5010, 1010 and later
SI-P3/T	CIMR-T□□V□□□□□□□	6000 and later

<1> See “PRG” on the drive nameplate for the software version number.

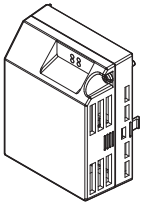
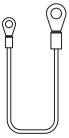
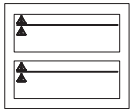
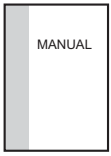
3 Receiving

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 nameplate (see ***Figure 2***).
- If you receive the wrong model or the PROFIBUS-DP Option does not function properly, contact your supplier.

◆ Contents and Packaging

Table 2 Contents of Package

Description:	Option Unit	Ground Cables	Warning Labels	Installation Manual (This book)
–				
Quantity:	1	4	1	1

◆ Tool Requirements

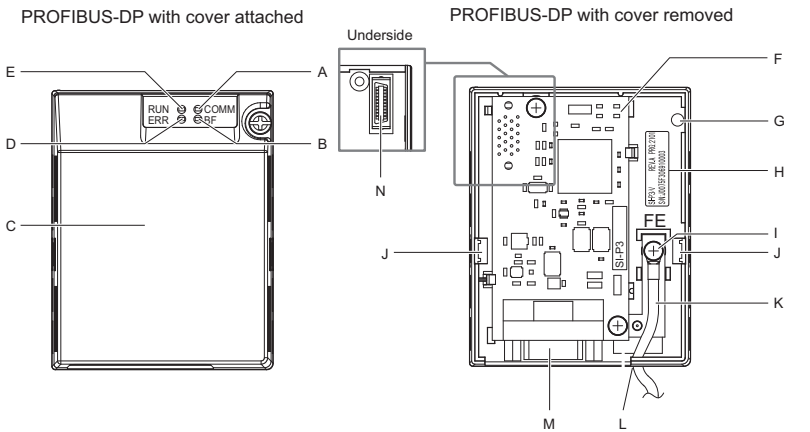
A Phillips screwdriver (M3, M3.5 to M6 *<1>*) metric or (#1, #2 *<1>*) U.S. standard size is required to install the PROFIBUS-DP Option.

<1> Screw sizes vary by drive capacity. Select a screwdriver that matches the drive capacity.

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

4 PROFIBUS-DP Option Components

◆ PROFIBUS-DP Option



A – LED (Comm: green)
B – LED (BF: red)
C – Option cover
D – LED (ERR: red)
E – LED (RUN: green)
F – PROFIBUS-DP PCB
G – Attachment screw hole for option cover
H – Nameplate
I – Function Earth cable connection (FE)
J – Mounting clip
K – Cable *<1>*
L – Through-hole for cable
M – Communication cable connector (9-pin D-SUB)
N – Option board connector

<1> Cables are not connected to the PROFIBUS-DP Option and are packaged separately in the box.

Figure 2 Option Unit

Note: For details on the LEDs, *Refer to PROFIBUS-DP Option LED Display on page 15*.

◆ Dimensions

The installed PROFIBUS-DP Option adds 27 mm (1.06 in.) to the total depth of the drive. (*Figure 3*)

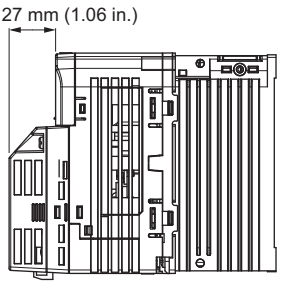


Figure 3 Dimensions

◆ 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.

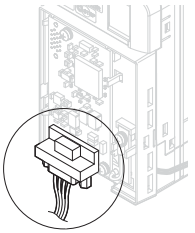
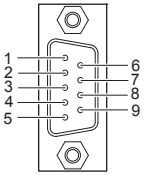


Figure 4 Communication connector location

Table 3 Communication connector (9-pin D-SUB)

PROFIBUS Connector	Pin	Signal	Description
Bottom View 	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 termination resistor)
	7	–	–
	8	RxD/TxD-N	Receive/Transmit data; line A (green)
	9	–	–

◆ PROFIBUS-DP Option LED Display

Table 4 LED Display

LED	Display		Communication Status	Meaning
	Color	Status		
RUN (Power)	Green	ON	Power is on	Power is being properly supplied to PROFIBUS-DP Option, and PROFIBUS-DP Option has completed its hardware self-diagnostics check
		OFF	Power is off	• The drive has no power supply • PROFIBUS-DP Option and drive are not connected properly and/or there is no power supplied to the PROFIBUS-DP Option • An internal, self-diagnostic error occurred in the PROFIBUS-DP Option
ERR (Option Error)	Red	ON	PROFIBUS-DP Option error	Self-diagnostics error occurred in the PROFIBUS-DP Option
		Flashing	Drive connection error	Connection error between PROFIBUS-DP Option and drive. This includes node address setting errors to parameter F6-30 on the drive side
		OFF	Normal operation	Drive and PROFIBUS-DP Option are properly connected
COMM (Communication Status)	Green	ON	Communication connected	Normal send/receive between PROFIBUS-DP Option and PROFIBUS-DP master
		OFF	No data exchange	There is a problem establishing communication between PROFIBUS-DP Option 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 is off once the PROFIBUS-DP master is finished setting communication-related parameters

Table 5 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
					PROFIBUS-DP Option is not properly connected to the drive, and therefore is not receiving enough power	• Shut the drive off and check that the PROFIBUS-DP Option is properly connected • Turn the power back on again

LED				Communication Status	Possible Cause	Solution
RUN	ERR	COMM	BF			
○	×	×	×	• Checking connection with the drive • Waiting for data from the master	• PROFIBUS-DP Option is reading the node address or parameter configuration • Waiting for initial input data from master device	–
×	○	×	×	PROFIBUS-DP Option 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 PROFIBUS-DP Option • 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 • Check that the data lines are properly connected to the drive
○	×	×	□	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 unique node address (Range 0 to 125) on the network.

5 Installation Procedure

◆ Section Safety

⚠ DANGER

Electrical Shock Hazard

Do not connect or disconnect wiring while the power is on.

Failure to comply will result in death or serious injury.

Disconnect all power to the drive, wait at least five minutes after all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc.

⚠ WARNING

Electrical Shock Hazard

Do not remove option board cover while the power is on.

Failure to comply could result in death or serious injury.

The diagrams in this section may include option units 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 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 unit, 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.

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.

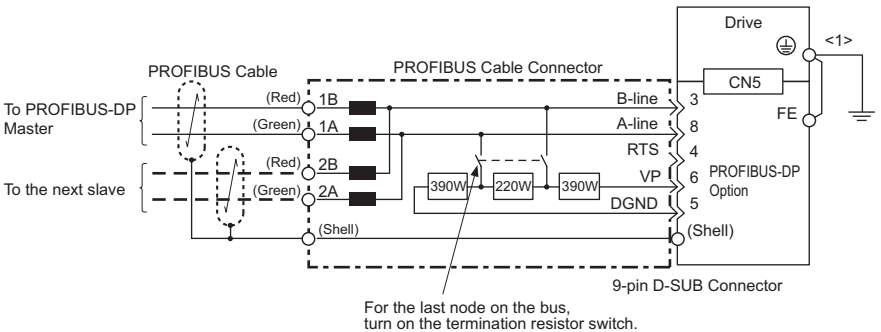
Properly connect all pins and connectors.

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

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

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

◆ Connection Diagram



<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 5 Connection Diagram

■ PROFIBUS-DP Termination

Because the PROFIBUS-DP Option does not have a termination resistor, a termination resistance must be set using a switch on the 9 pin D-sub connector. Make sure that only the D-sub connector for the last or end drive in the network has a terminating resistor. If any other drive on the network has a terminating resistor, 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 are shown in ***Figure 6*** can only be used. for baud rates below 1.5 Mbps. 1.5 Mbps and higher baud rates require termination with resistors as shown in ***Figure 7***.

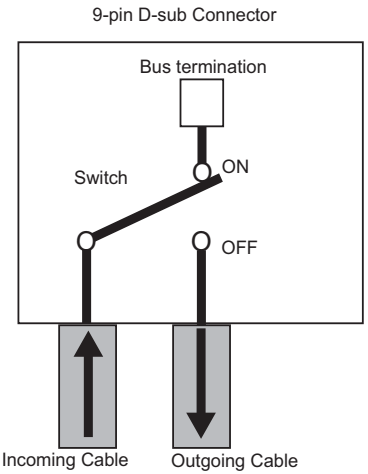


Figure 6 PROFIBUS Cable Connection with Termination Resistors

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

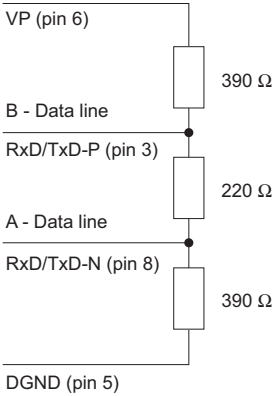


Figure 7 Cable Termination of the PROFIBUS-DP Option Cable to EN50170 (pin numbers for a 9-pin D-sub connector)

◆ Prior to Installing the Option Unit

Prior to installing the PROFIBUS-DP Option, wire the drive and make necessary connections to the drive terminals. Refer to the Yaskawa drive manual for information on wiring and connecting the drive. Verify that the drive operates normally without the option installed.

◆ Installing the Option Unit

Remove the front cover of the drive before installing the PROFIBUS-DP Option. Follow the directions below for proper installation.

1. Switch off the power supply to the drive.

DANGER! ***Electrical Shock Hazard*** *- Do not connect or disconnect wiring while the power is on. Failure to comply will result in death or serious injury. Before installing the PROFIBUS-DP Option, disconnect all power to the drive. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are off and measure the DC bus voltage level to confirm safe level.*

2. Remove the front cover. The original drive front cover may be discarded because it will be replaced by the PROFIBUS-DP Option cover in step 7.

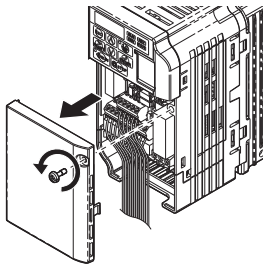


Figure 8 Remove Front Cover

3. Remove the bottom cover and connect the PROFIBUS-DP Option ground cable to the ground terminal.

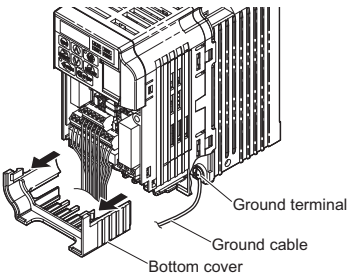
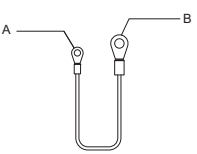


Figure 9 Connect Ground Cable

Note: The four different ground cables packaged with the PROFIBUS-DP Option connect to different models. Select the proper ground cable from the PROFIBUS-DP Option kit depending on drive size.



A – Option unit connection: screw size = M3

B – Drive-side connection: screw size = M3.5 to M6

Figure 10 Ground Cable

Note: Cover removal for certain larger models with a Terminal Cover:
-Single-Phase 200 V Class: CIMR-V☐BA0006 to BA0018, CIMR-T☐BV0006 to BV0018
-Three-Phase 200 V Class: CIMR-V☐2A0008 to 2A0069, CIMR-T☐2V0008 to 2V0069
-Three-Phase 400 V Class: All models
Remove the terminal cover before removing the bottom cover to install the PROFIBUS-DP Option. Replace the terminal cover after wiring the PROFIBUS-DP Option.

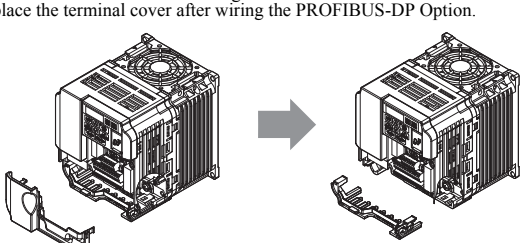


Figure 11 Models with Terminal Cover

4. Reattach the bottom cover.
5. Connect the PROFIBUS-DP Option to the drive. Properly secure the tabs on the left and right sides of the PROFIBUS-DP Option to the drive case.

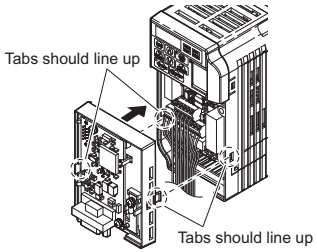


Figure 12 Attach PROFIBUS-DP Option

6. Connect the ground cable from the drive ground terminal to the PROFIBUS-DP Option ground. When wiring the PROFIBUS-DP Option, pass the ground cable through the inside of the drive bottom cover, then pass the ground cable into the through-hole at the front of the PROFIBUS-DP Option.

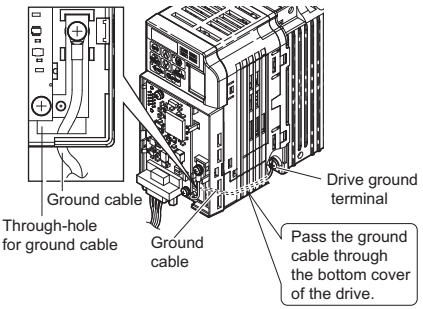


Figure 13 Ground Cable Connection

7. Attach the PROFIBUS-DP Option cover to the front of the PROFIBUS-DP Option.

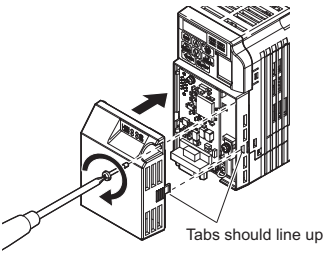


Figure 14 Attach Cover

Note: When using the drive in an area that may require displaying warning information in Japanese or Chinese, a label is provided with the Profibus-DP Option. This label can be placed over the English and French warnings on the front of the Profibus-DP Option.

◆ Communication Cable Specifications

To ensure proper performance, Yaskawa recommends using PROFIBUS-DP-dedicated cables that fulfill the specifications in ***Table 6***. For more information on cables, refer to the PROFIBUS-DP website at http://www.profibus.com.

■ Cable Requirements

Table 6 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 7* shows the specifications for Type A bus cables.

Table 7 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 a PROFIBUS-DP Option, 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 8*** before starting network parameters.

Table 8 Parameter Settings

No.	Name	Description	Values
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)	Default: 1 Range: 0 to 4
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 <6> 2: MEMOBUS/Modbus communications 3: Option Card	Default: 1 Range: 0 to 3
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>	Default: 1 Range: 0 to 3
F6-02	External Fault Detection Conditions (EF0)	Sets the condition for external fault detection (EF0) 0: Always detected 1: Detected only during operation	Default: 0 Range: 0, 1
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>	Default: 1 Range: 0 to 3
F6-07 <3>	NetRef/ComRef Selection Function	0: Multi-step speed reference disabled (F7 mode) 1: Multi-step speed reference allowed (V7 mode)	Default: 1 Range: 0, 1
F6-08 <3>	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 Setting this parameter does not affect communication-related parameters	Default: 0 Range: 0, 1

No.	Name	Description	Values
F6-30 <4> <5>	Node Address	Select the node address of a PROFIBUS-DP Option.	Default: 0 Min: 0 Max: 125
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	Default: 0 Range: 0, 1
F6-32 <5>	PROFIBUS Map Selection	0: PPO Type 1: Conventional	Default: 0 Range: 0, 1

<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> Software versions 1012 and later have F6-07 and F6-08 both set to 1.
<4> 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.
<5> Power must be cycled in order for any setting changes to take affect.
<6> The V1000 and T1000V drives localized for Europe do not have the terminal S7 (Multi-function digital input command 7).

7 PROFIBUS-DP Option Data and I/O Maps

◆ Conventional Formats

The configuration tool of PROFIBUS-DP master sets the input and output data length of PROFIBUS-DP Option 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 PROFIBUS-DP Option 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 9 Basic Data Register Map Detail

Output (Master Device to Drive)		Input (Drive to 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) <1>
3	Frequency Reference (Low Byte)	3	Motor Speed (Low Byte) <1>
4	Reserved	4	Output Current (High Byte) <2>
5		5	Output Current (Low Byte) <2>

<1> Unit depends on the setting of o1-03 (Digital Operator Display Scaling). When the drive is operating in the V/f Control mode, the drive's output frequency becomes the input data.
<2> 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 Extended Data 1 Register Map

Output (Master Device to Drive)		Input (Drive to 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	Reserved	4	Torque Reference Monitor (High Byte) <4>
5		5	Torque Reference Monitor (Low Byte) <4>
6		6	Reserved
7		7	
8		8	Frequency Reference (High Byte)
9		9	Frequency Reference (Low Byte)
10	Analog Output Channel 1 (High Byte) <1>	10	Output Frequency (High Byte)
11	Analog Output Channel 1 (Low Byte) <1>	11	Output Frequency (Low Byte)
12	Reserved	12	Output Current (High Byte) <5>
13		13	Output Current (Low Byte) <5>
14	Digital Output (High Byte) <2>	14	Analog Input Channel 1 (High Byte)
15	Digital Output (Low Byte) <2>	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)

Output (Master Device to Drive)		Input (Drive to Master Device)	
Byte	**Description**	**Byte**	**Description**
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)
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	Handshaking Register

<1> To select drive analog output channel for communications, set H4-01 (Multi-Function Analog Output Terminal AM) to 000 (through-mode).
<2> Drive digital output ON/OFF during communications, set H2-01 (Terminal MA, MB 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).
<3> 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.
<4> Cannot be used when setting A1-02 (Control Method Selection) to 0 (V/f Control without PG).
<5> 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 11 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) *<1>*
3	Frequency Reference (Low Byte)	3	Motor Speed (Low Byte) *<1>*
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	Handshaking Register

<1> Unit depends on the setting of o1-03 (Digital Operator Display Scaling). When the drive is operating in the V/f Control mode, the drive's output frequency becomes the input data.

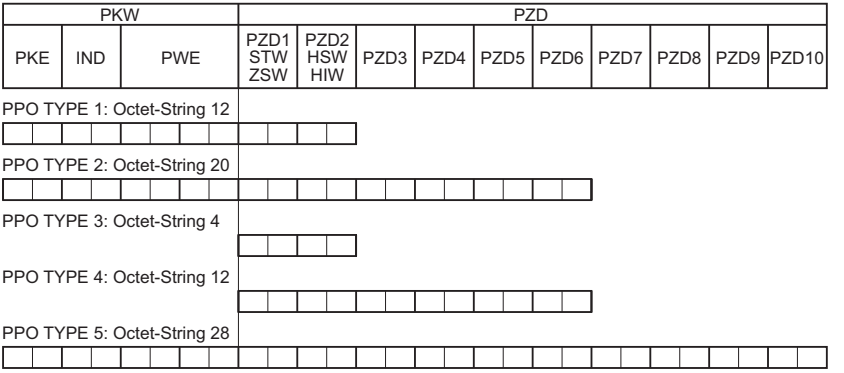
◆ Supported Parameter Process Data Object (PPO) Type Formats

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. Refer to the PROFIBUS specification for more information on PPO types 1~5.

PROFIBUS-DP Option 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

8 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive LED operator. Causes of the errors and corrective actions are listed in ***Table 12***. For additional error codes that may appear on the LED 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 digital operator LEDs remain lit. When an alarm occurs, the digital operator LEDs flash 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 12 Fault Display and Possible Solutions

LED Operator Display		Fault Name
bUS	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

LED Operator Display		Fault Name
EF0	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).		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.		Check the program used by the upper controller (PLC) and make the appropriate corrections

LED 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.		Connect an option that is compatible with the drive

LED Operator Display		Fault Name
oFA01	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.		Turn the power off and check the connectors between the drive and PROFIBUS-DP Option.

LED Operator Display		Fault Name
oFA03	oFA03	PROFIBUS-DP Option Fault (Port A)
		PROFIBUS-DP Option self-diagnostics error
Cause		**Possible Solution**
PROFIBUS-DP Option hardware fault.		Replace the PROFIBUS-DP Option. Contact Yaskawa for assistance

LED Operator Display		Fault Name
oFA04	oFA04	PROFIBUS-DP Option Fault (Port A)
		PROFIBUS-DP Option Flash write mode
Cause		**Possible Solution**
PROFIBUS-DP Option hardware fault.		Replace the PROFIBUS-DP Option. Contact Yaskawa for assistance

LED 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

■ Minor Faults and Alarms

Table 13 Alarm Display

LED 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: • 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

LED 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	

9 Specifications

◆ Specifications

Table 14 Option Unit Specifications

Items	Specifications
Model	SI-P3/V, SI-P3/T (PCB 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 1000-Series Option

PROFIBUS-DP

Installation Manual

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YASKAWA ELECTRIC CORPORATION

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