

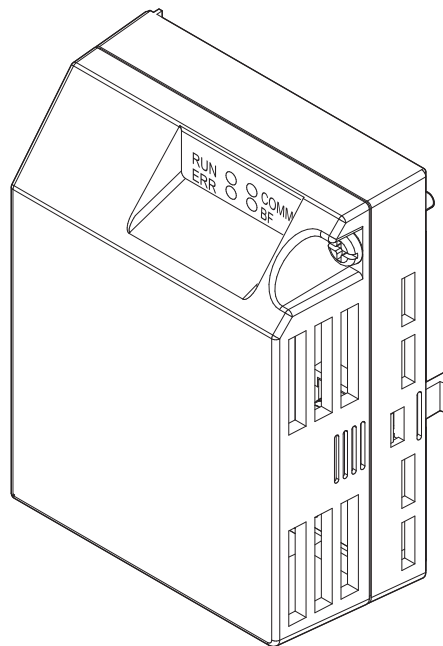
Inverter HF-520 Option

## PROFIBUS-DP Technical Manual

Type SI-P3/V-H

### NOTICE

1. Make sure that this technical manual is delivered to the end user of inverter unit.
2. Read this manual before installing or operating the inverter unit, and store it in a safe place for reference.



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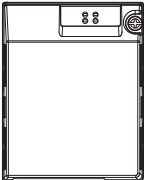
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# 1 Preface and Safety

Sumitomo manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Sumitomo products remain the responsibility of the equipment manufacturer or end user. Sumitomo accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Sumitomo 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 Sumitomo 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 Sumitomo must be promptly provided to the end user. Sumitomo offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Sumitomo manual. **NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED.** Sumitomo 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:

<b>Option Unit</b>	
	HF-520 Option PROFIBUS-DP Installation Manual Manual No.: DM2309E
	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.
	HF-520 Option PROFIBUS-DP Technical Manual Manual No.: DM2310E
	The technical manual contains detailed information and command registers. To obtain the technical manual access these sites: Japan: <a href="http://www.shi.co.jp/ptc/">http://www.shi.co.jp/ptc/</a>

<b>Inverter</b>	
	HF-520 Technical Manual Manual No. : DM2302E
	This manual describes installation, wiring, operation procedures, functions, troubleshooting, maintenance, and inspections to perform before operation. To obtain instruction manuals for Sumitomo products, access the site below: <a href="http://www.shi.co.jp/ptc/">http://www.shi.co.jp/ptc/</a>
	HF-520 Operating and Maintenance Manual Manual No. : DM2301E
	This manual is packaged together with the product. It contains basic information required to install and wire the drive. This manual provides basic programming and simple set-up and adjustment.

## ◆ Terms

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

**Drive:** HF-520 Series  
**PROFIBUS Option:** HF-520 Option PROFIBUS-DP

## ◆ 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.

### 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 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.

**Do not modify the drive circuitry.**

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

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

### ■ 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.

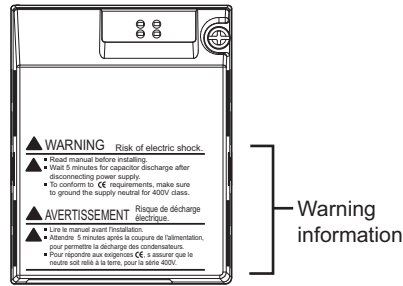








Figure 1 Warning Labels

### ■ 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

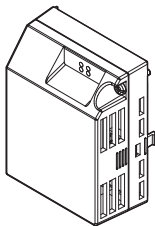
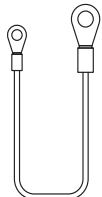
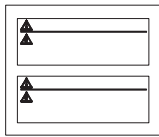
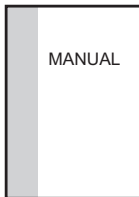
## 3 Receiving

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

- Inspect the PROFIBUS-DP Option for damage.
- 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 1 Contents of Package**

Description:	Option Unit	Ground Cables	Warning Labels	Installation Manual
—				
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.

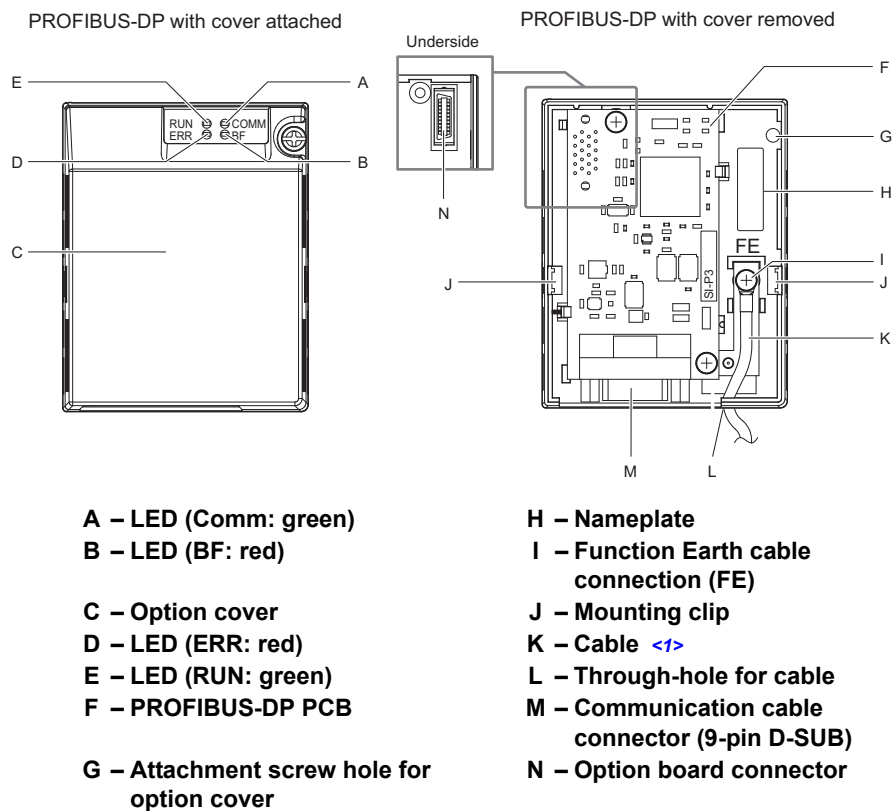
<1> Screw sizes vary by drive capacity. Select a screwdriver that matches the drive capacity.

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



## 4 PROFIBUS-DP Option Components

### ◆ PROFIBUS-DP Option



<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 10.](#)

### ◆ Dimensions

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

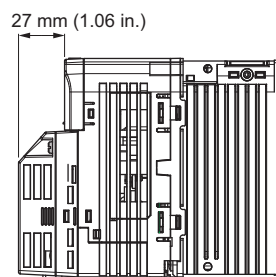


Figure 3 Dimensions

### ◆ 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.

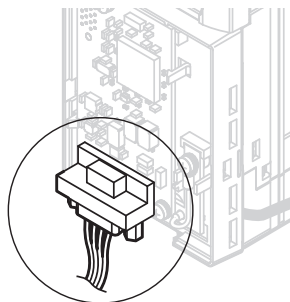


Figure 4 Communication connector location

Table 2 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 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/V-H, and SI-P3/V-H has completed its hardware self-diagnostics check.
		OFF	Power is off	<ul style="list-style-type: none"> <li>The drive has no power supply.</li> <li>SI-P3/V-H and drive are not connected properly and/or there is no power supplied to the SI-P3/V-H.</li> <li>An internal, self-diagnostic error occurred in the SI-P3/V-H.</li> </ul>
ERR (Option Error)	Red	ON	SI-P3/V-H error	Self-diagnostics error occurred in the SI-P3/V-H.
		Flashing	Drive connection error	Connection error between SI-P3/V-H and drive. This includes node address setting errors to parameter F6-30 on the drive side.
		OFF	Normal operation	Drive and SI-P3/V-H are properly connected.
COMM (Communication Status)	Green	ON	Communication connected	Normal send/receive between SI-P3/V-H and PROFIBUS-DP master.
		OFF	No data exchange	There is a problem establishing communication between SI-P3/V-H 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 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/V-H is not properly connected to the drive, and therefore is not receiving enough power	<ul style="list-style-type: none"> <li>Shut the drive off and check that the PROFIBUS DP Option is properly connected.</li> <li>Turn the power back on again.</li> </ul>
○	×	×	×	<ul style="list-style-type: none"> <li>Checking connection with the drive</li> <li>Waiting for data from the master</li> </ul>	<ul style="list-style-type: none"> <li>SI-P3/V-H is reading the node address or parameter configuration</li> <li>Waiting for initial input data from master device</li> </ul>	–
×	○	×	×	SI-P3/V-H 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	<ul style="list-style-type: none"> <li>Problem initializing the drive and SI-P3/V-H</li> <li>Incorrect node address</li> </ul>	<ul style="list-style-type: none"> <li>Cycle power to the drive. If the LED status does not change, replace the PROFIBUS-DP Option.</li> <li>Check the node address setting in the drive (parameter F6-10).</li> </ul>
○	×	×	○	Waiting for data from the master device	Waiting for data from the master device (Set_Parm_Message or Chk_Cfg_Message)	<ul style="list-style-type: none"> <li>Check the network settings in the master.</li> <li>Make sure the master device is operating normally.</li> <li>Check the terminal resistance settings on the data line.</li> <li>Look for any problems with the data line, or if the connector.</li> <li>Check that the data lines are properly connected to the drive.</li> </ul>
○	×	×	□	Data is incorrect or PROFIBUS-DP Option timed out waiting for data	The communication procedure in the master is set incorrectly	<ul style="list-style-type: none"> <li>Check the communication procedure settings in the master.</li> </ul>
○	×	○	×	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.

**NOTICE**

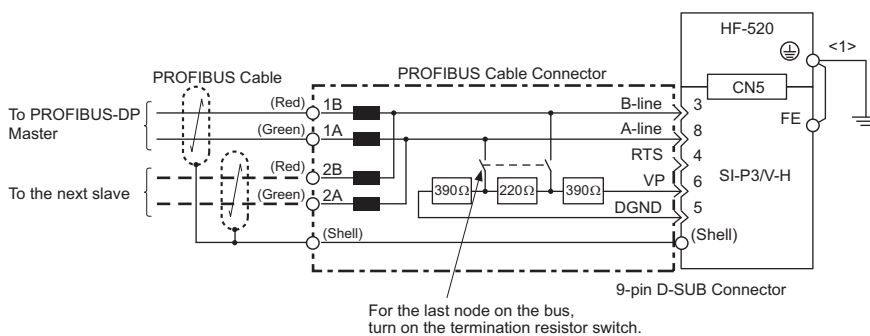
**Properly connect all pins and connectors.**

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.

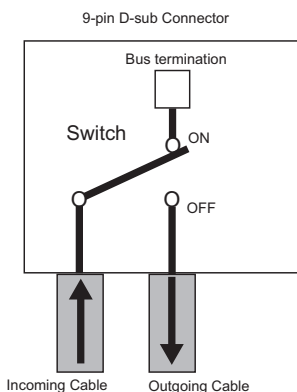
**Figure 5 Connection Diagram**

**■ PROFIBUS-DP Termination**

Because the option card 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**

<b>Bus termination ON</b> = incoming and outgoing cables not connected.
<b>Bus termination OFF</b> = incoming and outgoing cables connected.

## 5 Installation Procedure

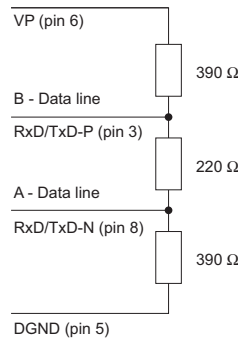


Figure 7 Cable Termination of the PROFIBUS-DP Option Cable to EN50170 (pin numbers for a 9-pin D-sub connector)

### ◆ 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 HF-520 Operating and Maintenance 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.

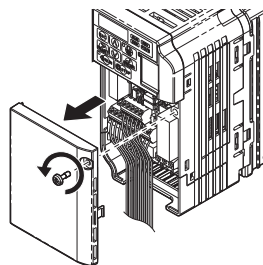


Figure 8 Remove Front Cover

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

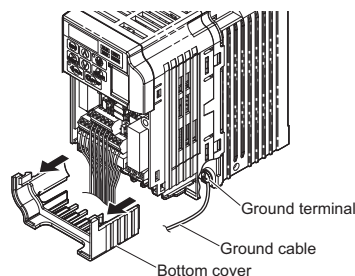
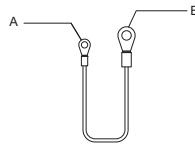


Figure 9 Connect Ground Cable

**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.



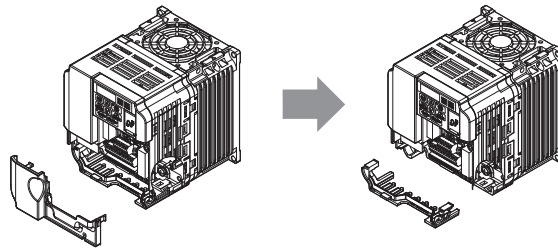
- A – Option unit connection: screw size = M3**
- B – Drive-side connection: screw size = M3.5 to M6**

**Figure 10 Ground Cable**

**Note: Cover removal for certain larger models with a Terminal Cover:**

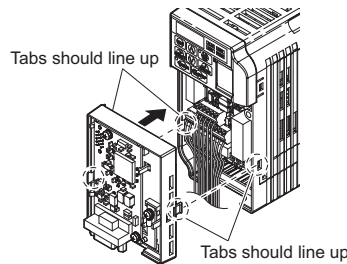
- Single-Phase 200 V Class: HF-520S-A75 to 2A2
- Three-Phase 200 V Class: HF-5202-A75 to 7A5
- Three-Phase 400 V Class: All models

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.



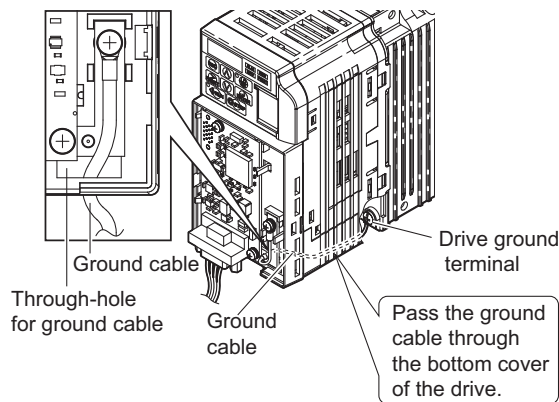
**Figure 11 Models with Terminal Cover**

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**

## 5 Installation Procedure

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

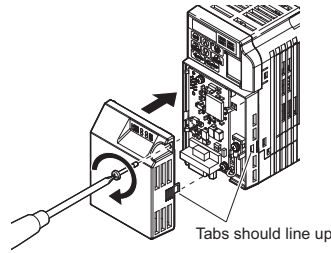


Figure 14 Attach Cover

### ◆ Communication Cable Specifications

To ensure proper performance, SUMITOMO 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 $\Omega$ at a frequency of (3 to 20 MHz)
Capacity	30 pF/m maximum
Loop Resistance	110 $\Omega$ /km maximum
Core Cross-Section	0.34 mm <sup>2</sup> 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/V-H, a GSD file can be obtained from:

Japan: <http://www.shi.co.jp/ptc/>



## 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. (MEMOBUS /Modbus Register Address)	Name	Description	Default
b1-01 <>	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 PCB 4: Pulse Input (Terminal RP)	1
b1-02 <>	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 PCB	1
F6-01 (3A2H)	Communications Error Operation Selection	Determines drive response when a bUS error is detected during communications with the option. 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <5> 4: Alarm and Run at d1-04 <5> 5: Alarm and Ramp to stop	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
F6-07	NetRef/ComRef Selection Function	0: Multi-step speed reference disabled 1: Multi-step speed reference allowed	1
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 Setting this parameter does not affect communication-related parameters	0
F6-14 (3BBH)	bUS Error Auto Reset	0: Disabled 1: Enabled	0
F6-30 <3> <4>	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 (3CDH) <6>	PROFIBUS-DP Data Format Selection	0: PPO Type 2: PPO (w/bit 0) <7> 3: PPO Type (Auto Enter) <8> 5: PPO (w/bit 0, Auto Enter) <7> <8>	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> 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.
- <4> Power must be cycled in order for any setting changes to take affect.
- <5> Take proper safety measures, such as installing an emergency stop switch, as the drive will continue operation when detecting an bUS error.
- <6> Cycle power for setting changes to take effect.
- <7> Run when both the bit 0 and the bit 4 of the register STW are 1. Refer to "PPO Formats STW bit0/bit4" for details.
- <8> When writing the parameter of the drive by SI-P3, an Enter command is executed automatically and the written parameter is activated. Refer to "Auto Enter function" for details.

### ◆ PPO Formats STW bit0/bit4

F6-32 = 0 or 3

Bit	PPO Write STW	PPO Read ZSW
0	OFF1: reserved	Ready to switch on: always 1
1	OFF2: reserved	Ready: always 1
2	OFF3: reserved	1: 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 to 15	reserved	

F6-32 = 2 or 5

Bit	PPO Write STW	PPO Read ZSW
0	0: STOP 1: RUN <1>	Ready to switch on: always 1
1	OFF2: reserved	Ready: always 1
2	OFF3: reserved	1: Ready
3	Enable to RUN 0: Baseblock + Stop 1: Not Baseblock	0: No fault condition 1: Fault condition
4	0: STOP 1: RUN <1>	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 to 15	reserved	

<1> RUN when both bit 0 and bit 4 are 1.

### ◆ Auto Enter function

When F6-32 = 3 or 5

When writing the parameter of the drive by PKE or PZD, an Enter command is executed automatically in the drive and the written parameter is activated.

When F6-32 = 4

When writing the parameter of the drive by write command of MEMOBUS/Modbus Command Message, an Enter command is executed automatically in the drive and the written parameter is activated.

When F6-32 = 0 or 1 or 2

An Enter command is needed in order to activate parameter changes in the drive.

No. (MEMOBUS /Modbus Register Address)	Name	Description	Setting
<b>F7-16 (3F4H)</b>	Communication Loss Time-out	Sets the time-out value for communication loss detection in tenths of a second. A value of 0 disables the connection time-out.	Default: 0 Min: 0 Max: 30.0
<b>F7-60 (780H)</b>	PDZ Write 1	MEMOBUS/Modbus Address for PZD 1 Write (PPO Write). A value of 0 to 2 makes PZD 1 Write act as STW.	Default: 0H Min: 0H Max: FFFFH
<b>F7-61 (781H)</b>	PDZ Write 2	MEMOBUS/Modbus Address for PZD 2 Write (PPO Write). A value of 0 to 2 makes PZD 2 Write act as HIW.	Default: 0H Min: 0H Max: FFFFH
<b>F7-62 (782H)</b>	PDZ Write 3	MEMOBUS/Modbus Address for PZD 3 Write (PPO Write). A value of 0 to 2 disables PZD 3 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-63 (783H)</b>	PDZ Write 4	MEMOBUS/Modbus Address for PZD 4 Write (PPO Write). A value of 0 to 2 disables PZD 4 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-64 (784H)</b>	PDZ Write 5	MEMOBUS/Modbus Address for PZD 5 Write (PPO Write). A value of 0 to 2 disables PZD 5 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-65 (785H)</b>	PDZ Write 6	MEMOBUS/Modbus Address for PZD 6 Write (PPO Write). A value of 0 to 2 disables PZD 6 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-66 (786H)</b>	PDZ Write 7	MEMOBUS/Modbus Address for PZD 7 Write (PPO Write). A value of 0 to 2 disables PZD 7 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-67 (787H)</b>	PDZ Write 8	MEMOBUS/Modbus Address for PZD 8 Write (PPO Write). A value of 0 to 2 disables PZD 8 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-68 (788H)</b>	PDZ Write 9	MEMOBUS/Modbus Address for PZD 9 Write (PPO Write). A value of 0 to 2 disables PZD 9 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-69 (789H)</b>	PDZ Write 10	MEMOBUS/Modbus Address for PZD 10 Write (PPO Write). A value of 0 to 2 disables PZD 10 Write.	Default: 0H Min: 0H Max: FFFFH
<b>F7-70 (78AH)</b>	PDZ Read 1	MEMOBUS/Modbus Address for PZD 1 Read (PPO Read). A value of 0 makes PZD 1 Read act as ZSW.	Default: 0H Min: 0H Max: FFFFH
<b>F7-71 (78BH)</b>	PDZ Read 2	MEMOBUS/Modbus Address for PZD 2 Read (PPO Read). A value of 0 makes PZD 2 Read act as HSW.	Default: 0H Min: 0H Max: FFFFH
<b>F7-72 (78CH)</b>	PDZ Read 3	MEMOBUS/Modbus Address for PZD 3 Read (PPO Read). A value of 0 disables PZD 3 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-73 (78DH)</b>	PDZ Read 4	MEMOBUS/Modbus Address for PZD 4 Read (PPO Read). A value of 0 disables PZD 4 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-74 (78EH)</b>	PDZ Read 5	MEMOBUS/Modbus Address for PZD 5 Read (PPO Read). A value of 0 disables PZD 5 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-75 (78FH)</b>	PDZ Read 6	MEMOBUS/Modbus Address for PZD 6 Read (PPO Read). A value of 0 disables PZD 6 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-76 (790H)</b>	PDZ Read 7	MEMOBUS/Modbus Address for PZD 7 Read (PPO Read). A value of 0 disables PZD 7 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-77 (791H)</b>	PDZ Read 8	MEMOBUS/Modbus Address for PZD 8 Read (PPO Read). A value of 0 disables PZD 8 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-78 (792H)</b>	PDZ Read 9	MEMOBUS/Modbus Address for PZD 9 Read (PPO Read). A value of 0 disables PZD 9 Read.	Default: 0H Min: 0H Max: FFFFH
<b>F7-79 (793H)</b>	PDZ Read 10	MEMOBUS/Modbus Address for PZD 10 Read (PPO Read). A value of 0 disables PZD 10 Read.	Default: 0H Min: 0H Max: FFFFH

## 7 Conventional Formats

### ◆ Conventional Formats

The configuration tool of PROFIBUS-DP master sets the input and output data length of SI-P3/V-H 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/V-H 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 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 0.01 A.

Table 9 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		Reserved	6	Reserved
7			7	
8			8	
9	9	Frequency Reference (Low Byte)		

Output (Master Device to Drive)		Input (Drive to Master Device)	
Byte	Description	Byte	Description
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)
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 0.01 A.

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	Reserved
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: External 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: MA-MB relay closed
C	1: Photocoupler output 1 closed
D	1: Photocoupler output 2 closed
E	1: Motor 2 selected
F	Reserved

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) </>
3	Frequency Reference (Low Byte)	3	Motor Speed (Low Byte) </>
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

</> 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.

## ◆ MEMOBUS/Modbus Message Area

In this area, a MEMOBUS/Modbus message is transferred to the SI-P3/V-H unit, 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/V-H unit 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/V-H unit. For details on the handshaking register, refer to [Handshaking Register on page 25](#).

- 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 HF-520 Technical Manual.
- Refer to the MEMOBUS/Modbus Data Table in Appendix C of the HF-520 Technical Manual 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 <i>Handshaking Register on page 25</i> .	

<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.	
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 <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		
29			
30			
31	Handshaking register	Refer to <i>Handshaking Register on page 25</i> .	

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

## 7 Conventional Formats

If an error occurs, the SI-P3/V-H unit 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 HF-520 Technical Manual 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 <1>		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/V-H unit and the PROFIBUS-DP master.

When the master toggles bit 7 of the handshaking register in the output data, the SI-P3/V-H 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/V-H toggles bit 7 of the handshaking register in the input data to the same value as the handshaking 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/V-H Unit

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

Bit	Name	Function
7	HS	<ul style="list-style-type: none"> <li>Handshaking bit. Synchronizes send and receive timing. Changes status when sending new command messages.</li> <li>This bit is reset to 0 at power up or by setting the handshaking output register bit INIT to 1.</li> </ul>
1 to 6	–	Reserved
0	INIT	Clears the handshaking bit to 0

### Handshaking Input Register

SI-P3/V-H Unit to PROFIBUS-DP Master

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

Bit	Name	Function
7	HS	<ul style="list-style-type: none"> <li>Handshaking bit. Synchronizes send and receive timing. Changes status when sending new command messages.</li> <li>This bit is reset to 0 at power up or by initializing the handshaking output register bit INIT back to 0.</li> </ul>
5 to 6	STATUS <1>	Status of the data exchange between the PROFIBUS-DP master and the drive. 00H: Idle 01H: SI-P3/V-H sends a MEMOBUS/Modbus command to the drives. 10H: SI-P3/V-H waits for a MEMOBUS/Modbus response from the drives. 11H: SI-P3/V-H receives a MEMOBUS/Modbus response from the drives.
1 to 4	WD <1>	Counter increases every 64 ms.
0	–	Reserved

<1> 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 15* describes the handshaking function. The arrow marks indicate whether the PROFIBUS-DP master or the SI-P3/V-H unit has the control for the protocol.

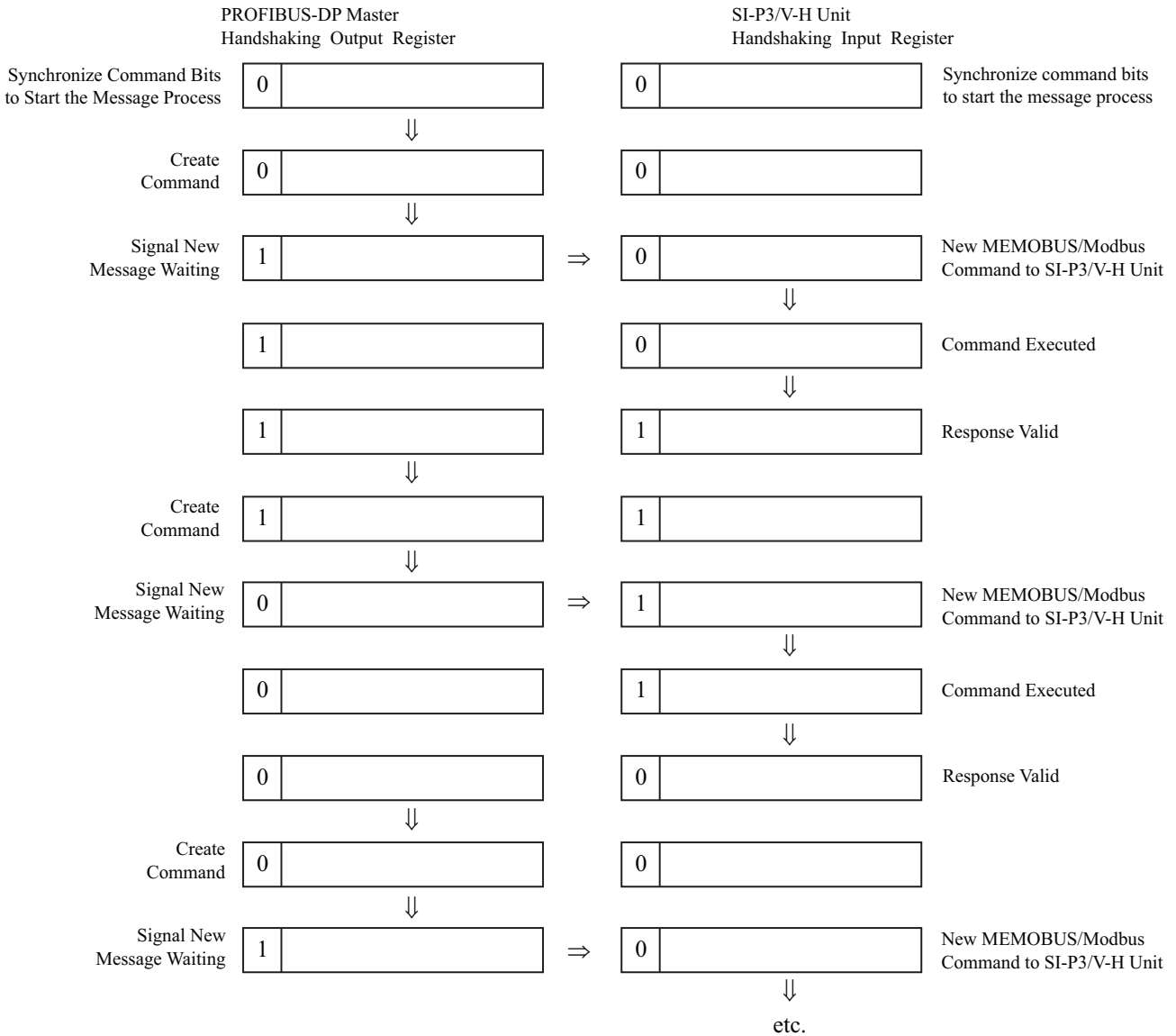


Figure 15 Example of Handshaking

## ■ Flow Chart

Figure 16 illustrates the handshaking function when using a MEMOBUS/Modbus message.

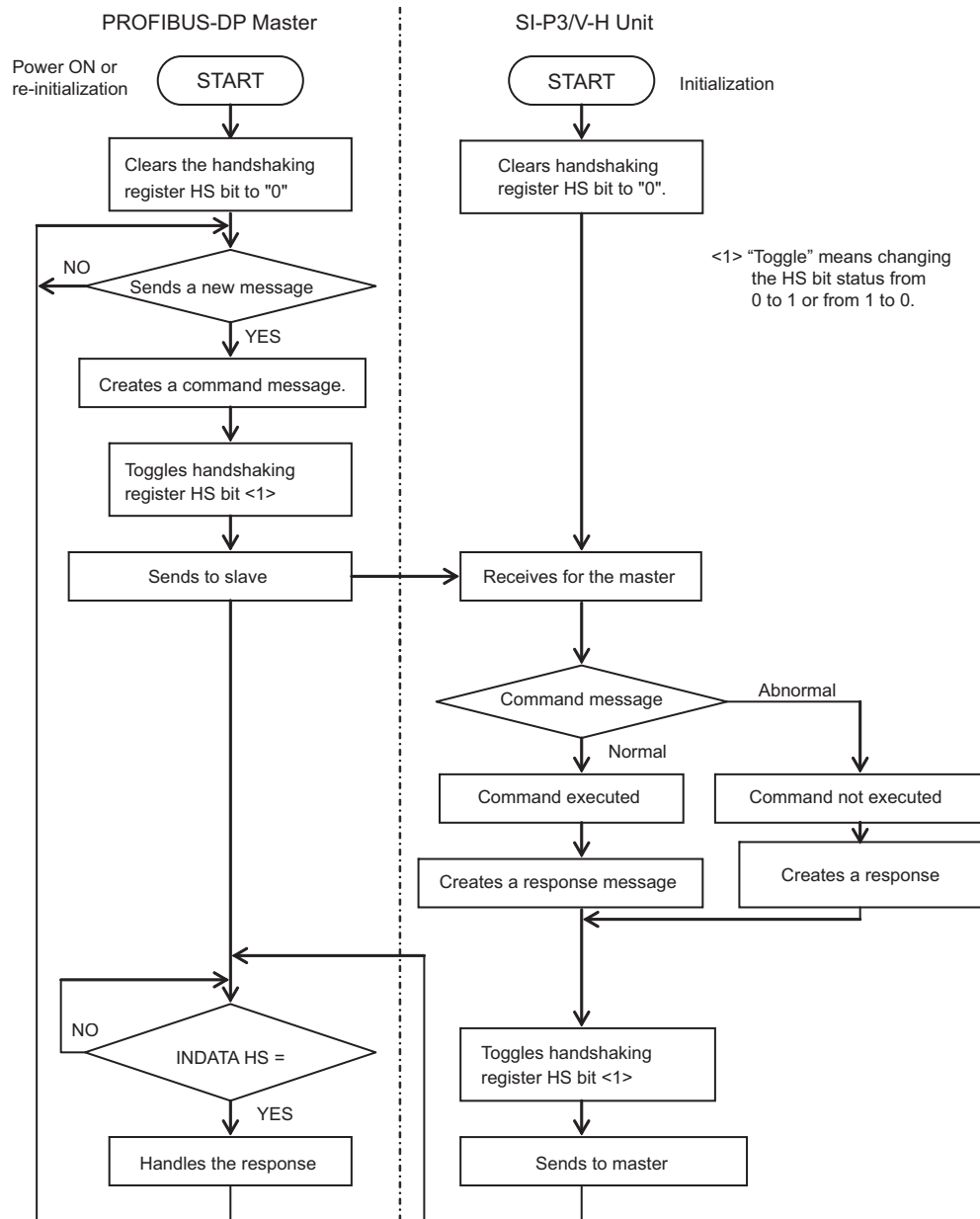


Figure 16 MEMOBUS/Modbus Message Flow Chart

## 8 Parameter Process Data Object Formats

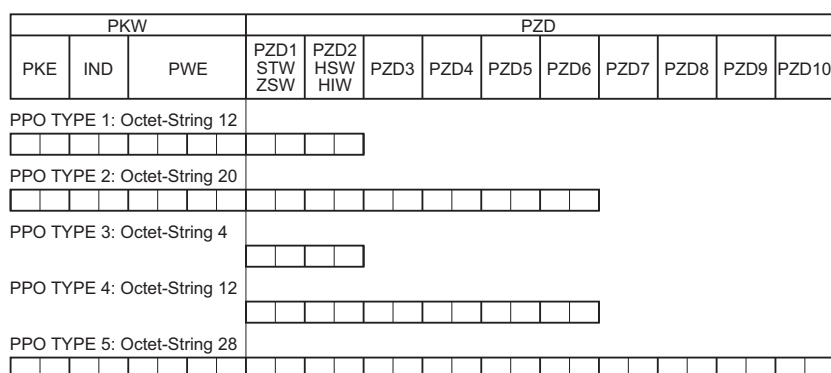
### ◆ Supported Parameter Process Data Object (PPO) Type Formats

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/V-H 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 32</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	Sub-Index for parameter number
1		
2		
3		
4		
5		
6		
7		
8	Reserved	Reserved
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		

## 8 Parameter Process Data Object Formats

### ■ 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	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/V-H Device Data

Parameter	Setting Value	Note
GSD_Revision	3	GSD file revision 3.0.
Vendor_Name	"SUMITOMO"	
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

## 8 Parameter Process Data Object Formats

Parameter	Setting Value	Note
MaxTsdr_9.6	60	60 Tbit = 6.25 msec
MaxTsdr_19.2	60	60 Tbit = 3.125 msec
MaxTsdr_45.45	60	60 Tbit = 1.32 msec
MaxTsdr_93.75	60	60 Tbit = 640 usec
MaxTsdr_187.5	60	60 Tbit = 320 usec
MaxTsdr_500	100	100 Tbit = 200 usec
MaxTsdr_1.5M	150	150 Tbit = 100 usec
MaxTsdr_3M	250	250 Tbit = 83 usec
MaxTsdr_6M	450	450 Tbit = 75 usec
MaxTsdr_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	
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

## 8 Parameter Process Data Object Formats

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-V1only)
903	Octet String 12		○	Type 4 PPO-Write (DP-V1only)
904	Unsigned 16		○	Current PPO-Write
905	Octet String 28		○	Type 5 PPO-Write
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 ( <i>Refer to PNU964 on page 35</i> )
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
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

## 8 Parameter Process Data Object Formats

Data type	Settings	Description
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 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
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 Number for HF-520 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
28	b8 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
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
66	F6 Function Group	00–99
67	F7 Function Group	00–99
81	H1 Function Group	00–99
82	H2 Function Group	00–99

## 8 Parameter Process Data Object Formats

DPV0 PNU Number (Dec)	Description	INDEX (Dec)
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
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
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
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
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
<b>Command</b>		
0	0001H MEMOBUS/Modbus #	1
0	0002H MEMOBUS/Modbus #	2
0	0007H MEMOBUS/Modbus #	7
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
<b>Monitor</b>		
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

DPV0 PNU Number	Description	INDEX
0	0028H MEMOBUS/Modbus #	40
0	0029H MEMOBUS/Modbus #	41
0	002AH MEMOBUS/Modbus #	42
0	002BH MEMOBUS/Modbus #	43
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, HF-520 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 setting value from array 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 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)

## 8 Parameter Process Data Object Formats

Data type	Settings	Description
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 setting value
		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 LED operator. Causes of the errors and corrective actions are listed in [Table 16](#). For additional error codes that may appear on the LED operator screen, refer to the HF-520 Technical Manual.

#### ■ 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 16 Fault Display and Possible Solutions**

LED Operator Display		Fault Name
<i>bUS</i>	bUS	PROFIBUS-DP Option Communication Error
		<ul style="list-style-type: none"> <li>• After establishing initial communication, the connection was lost.</li> <li>• Only detected when the run command or frequency reference is assigned to the option (b1-03 = 3 or b1-02 = 3).</li> </ul>
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		<ul style="list-style-type: none"> <li>• Check the various options available to minimize the effects of noise.</li> <li>• Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring.</li> <li>• If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil.</li> <li>• Use cables recommended by SUMITOMO, or another type of shielded line. Ground the shield on the controller side and on the PROFIBUS-DP Option side.</li> </ul>
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
<i>EF0</i>	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"> <li>• Remove the cause of the external fault.</li> <li>• Reset the external fault input from the upper controller (PLC) device.</li> </ul>
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
<i>oFA00</i>	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.

## 9 Troubleshooting

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.	

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.	

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.	

### ■ Minor Faults and Alarms

**Table 17 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: <ul style="list-style-type: none"> <li>a conventional data format is used and the operation command bit F is set to 1</li> <li>a PPO type data format is used the the control word (STW) bit 3 is set to 0</li> </ul>		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.	



# 10 Specifications

## ◆ Specifications

**Table 18 Option Unit Specifications**

Items	Specifications
Model	SI-P3/V-H (PCB model: SI-P3)
PROFIBUS-DP Data	<ul style="list-style-type: none"> <li>• PROFIBUS DP-V0, V1</li> <li>• PPO TYPE: 1~5 (No. 3.072, Profile for Variable Speed Drives)</li> <li>• Extended data 1 High-speed I/O data (inputs: 16 bytes, outputs: 16 bytes) MEMOBUS/Modbus message (inputs: 16 bytes, outputs: 16 bytes)</li> <li>• Extended data 2 High-speed I/O data (inputs: 4 bytes, outputs: 4 bytes) MEMOBUS/Modbus message (inputs: 8 bytes, outputs: 8 bytes)</li> <li>• Basic data High-speed I/O data (inputs: 6 bytes, outputs: 6 bytes)</li> </ul>
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

# 11 Warranty

## ◆ Warranty policy on inverter

Warranty period	The warranty period is 18 months from date of shipment or 12 months after initial operation, whichever comes first.
Warranty condition	<p>In the event that any problem or damage to the Product arises during the "Warranty Period" from defects in the Product whenever the Product is properly installed and combined with the Buyer's equipment or machines maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agreed upon in writing between the Seller and Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product without charge at a designated facility, except as stipulated in the "Warranty Exclusions" as described below.</p> <p>However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.</p>
Warranty exclusion	<p>Notwithstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by:</p> <ol style="list-style-type: none"> <li>1. Installation, connection, combination or integration of the Product in or to the other equipment or machine that rendered by any person or entity other than the Seller.</li> <li>2. Insufficient maintenance or improper operation by the Buyer or its customers such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller;</li> <li>3. Improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications;</li> <li>4. Any problem or damage on any equipment or machine to which the Product is installed, connected or combined or any specifications particular to the buyer or its customers;</li> <li>5. Any changes, modifications, improvements or alterations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller;</li> <li>6. Any parts in the Product that are supplied or designated by the Buyer or its customers;</li> <li>7. Earthquake, fire, flood, salt air, gas, lightning, acts of God or any other reasons beyond the control of the Seller;</li> <li>8. Normal wear and tear, or deterioration of the Product's parts, such as the cooling fan bearings;</li> <li>9. Any other troubles, problems or damage to the Product that are not attributable to the Seller.</li> </ol>
Others	The Seller will not be responsible for the installation and removal of the inverter. Any inverter transportation cost shall be borne by both Seller and Buyer.

# Worldwide Locations

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Specifications, dimensions, and other items are subject to change without prior notice.



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