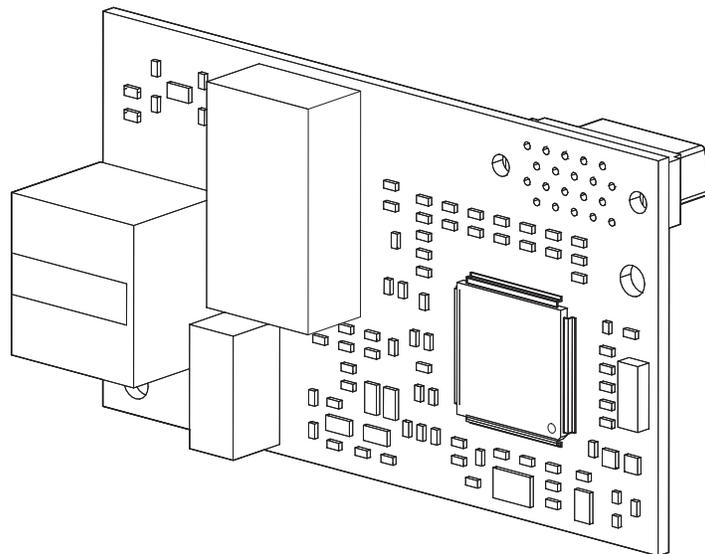


YASKAWA Z1000 Bypass Option PROFINET Technical Manual

Type: SI-EP3

Applicable Products : Z1B1-

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



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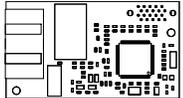
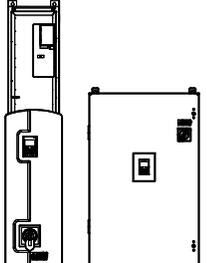
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1 Preface and Safety

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 SI-EP3 option:

	Yaskawa Z1000 Bypass SI-EP3 PROFINET Option Technical Manual (This manual) The Technical Manual contains information required to install the option and set up related bypass parameters.
	Z1000 Bypass Technical Manual (SIEPYAIZ1B01) This manual provides detailed information on parameter settings and bypass functions. Use this manual to expand bypass functionality and to take advantage of higher performance features. This manual is available for download on our documentation website, yaskawa.com .

◆ Terms

Note: Indicates supplemental information that is not related to safety messages.

Bypass: Yaskawa Z1000 Bypass Unit

Drive: Yaskawa 1000-Series AC Drive

Option: Yaskawa 1000-Series SI-EP3 PROFINET Option

◆ Registered Trademarks

- PROFINET is a trademark of PROFIBUS and PROFINET International (PI).
- All trademarks are the property of their respective owners.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option. The option 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.

WARNING! may also be indicated by a bold key word embedded in the text followed by an italicized safety message.

⚠ CAUTION

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

CAUTION! may also be indicated by a bold key word embedded in the text followed by an italicized safety message.

NOTICE

Indicates a property damage message.

NOTICE: may also be indicated by a bold key word embedded in the text followed by an italicized safety message.

■ General Safety**General Precautions**

- The diagrams in this manual may be indicated without covers or safety shields to show details. Replace the covers or shields before operating the drive and run the drive 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.
- If nameplate becomes worn or damaged, order a replacement from your Yaskawa representative or the nearest Yaskawa sales office.

⚠ 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.

Electrical Shock Hazard**Do not connect or disconnect wiring while the power is on.**

Failure to comply will result in death or serious injury.

Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. 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 for at least the time specified on the warning label once all indicators are OFF, and then measure the DC bus voltage level to confirm it has reached a safe level.

NOTICE**Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards.**

Failure to comply may result in ESD damage to the drive circuitry.

Do not perform a withstand voltage test on any part of the drive.

Failure to comply could result in damage to the sensitive devices within the drive.

Do not operate damaged equipment.

Failure to comply could result in further damage to the equipment.

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

NOTICE

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the drive.

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.

2 Product Overview

◆ About this Product

This option provides a communications connection between the bypass and a PROFINET network. The option connects the bypass to a PROFINET network and facilitates the exchange of data.

This manual explains the handling, installation and specifications of this product.

PROFINET is a communications link to connect industrial devices (such as smart motor controllers, operator interfaces, bypass units, and variable frequency drives) as well as control devices (such as programmable controllers and computers) to a network. PROFINET is a simple, networking solution that reduces the cost and time to wire and install factory automation devices, while providing interchangeability of like components from multiple vendors.

By installing the option to a bypass, it is possible to do the following from a PROFINET master device:

- Operate the bypass
- Operate the drive
- Monitor bypass status
- Monitor drive status
- Change bypass parameter settings

◆ Applicable Models

The option can be used with the bypass models in [Table 1](#).

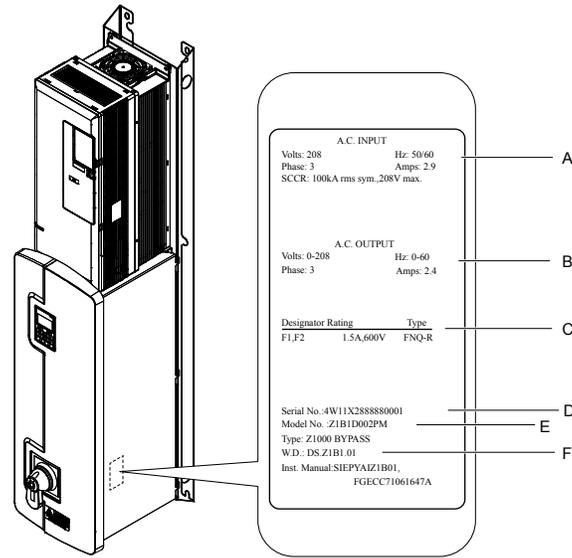
Table 1 Applicable Models

Drive Series	Bypass Model Z1B1	Software Version <1>
Z1000	D002 to D273	VST800298 and later
	B001 to B304	

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

◆ **Bypass Nameplate**

The nameplate is located on the inside right wall of the Z1000 bypass enclosure.

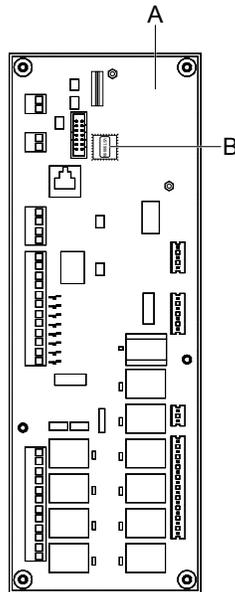


- A – Input specifications**
- B – Output specifications**
- C – Replacement fuse specifications**
- D – Serial number**
- E – Bypass model number**
- F – Schematic document number**

Figure 1 Bypass Nameplate Information Example

◆ **Bypass Software Version Number**

The software version label for the bypass is located on the bypass PCB. The bypass PCB is located on the inside left wall of the Z1000 Bypass enclosure.



- A – Bypass PCB**
- B – Bypass Software Version Label**

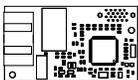
Figure 2 Bypass Software Version Label

3 Receiving

Perform the following tasks upon receipt of the option:

- Inspect the option for damage. Contact the shipper immediately if the option appears damaged upon receipt.
- Verify receipt of the correct model by checking the model number printed on the name plate of the option package.
- Contact your supplier if you have received the wrong model or the option does not function properly. *Refer to PROFINET Option Components on page 10.*

◆ Option Package Contents

Description	Option	Ground Wire	Screws (M3)	LED Label	Installation Manual
-		 </>	 </>	 </>	
Quantity	1	1	3	1	1

<1> The ground wire, ground wire screw (1) and LED labels are not required for option card installation to bypass units.

◆ Tools Required for Installation

A Phillips screwdriver (M3 metric or #1, #2 U.S. standard) is required to install the option and remove bypass front covers. Screw sizes vary by drive capacity. Select a screwdriver appropriate for the bypass capacity.

Use a short-shaft, magnetic screwdriver when installing the option card into the narrow enclosure models Z1B1D002 to Z1B1D074 and Z1B1B001 to Z1B1B077.

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

4 Option Components

◆ SI-EP3 Option

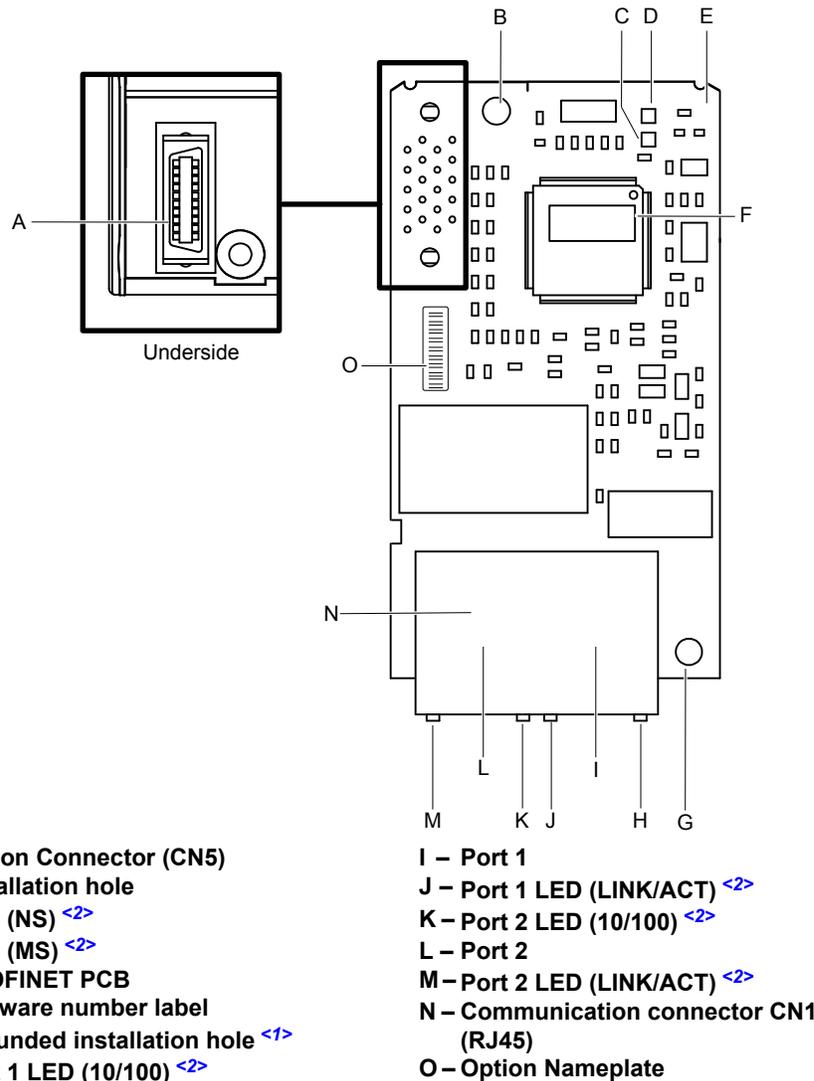


Figure 3 PROFINET Option Components

- <1> The ground wire packaged loose in the option shipping package is not required for installation to Z1000 bypass units.
- <2> The LEDs are not visible when used in a bypass configuration. Use parameters U6-80 through U6-99 to monitor operation status. [Refer to Option Monitors on page 22.](#)

5 Installation Procedure

This section explains how to properly mount and install the communication option card to the Z1000 Bypass.

◆ 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 bypass and wait at least the amount of time specified on the bypass front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing. The internal capacitor remains charged after the power supply is turned off.

WARNING

Electrical Shock Hazard

Do not remove the front covers of the bypass while the power is on.

Failure to comply could result in death or serious injury.

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

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

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

Do not touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

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

Failure to comply could result in death or serious injury.

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

Failure to comply could result in death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

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

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the bypass and circuit boards.

Failure to comply may result in ESD damage to the bypass circuitry.

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

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

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.

NOTICE

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 bypass.

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 and connecting any other devices.

Failure to comply could result in damage to the option.

◆ Prior to Installing the Option

NOTICE: Install communications options on the bypass control PCB. Do not install communications options on the Z1000 drive PCB. Improperly connected communications options will cause erroneous operation.

■ Verify Bypass Operation

Verify that the bypass functions normally without the option installed. Refer to the Z1000 Bypass Technical Manual (SIEPYAIZ1B01) for information on wiring and connecting the bypass unit.

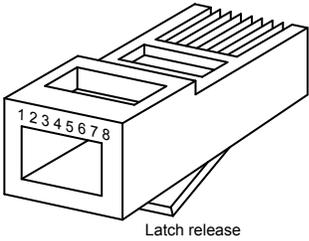
■ Prepare Network Cables

Determine the length of cable required to connect from the option to a network device and attach all connectors to network cables before installing the option. Refer to [Table 3 Communication Cable Specifications](#) for details.

The communication connection point on the option is designated CN1. CN1 may have 2 ports depending on the option type.

CN1 is the connection point for a customer-supplied network communication cable with a modular RJ45 connector.

Table 2 8-Way Modular Connector (Customer-Supplied)

Male 8-Way Modular Connector	Pin	Description
	1 (Pair 2)	Transmit data (TXD) +
	2 (Pair 2)	Transmit data (TXD) -
	3 (Pair 3)	Receive data (RXD) +
	4 (Pair 1)	Not used <1>
	5 (Pair 1)	Not used <1>
	6 (Pair 3)	Receive data (RXD) -
	7 (Pair 4)	Not used <1>
	8 (Pair 4)	Not used <1>

<1> Not used for 10 Mbps and 100 Mbps networks.

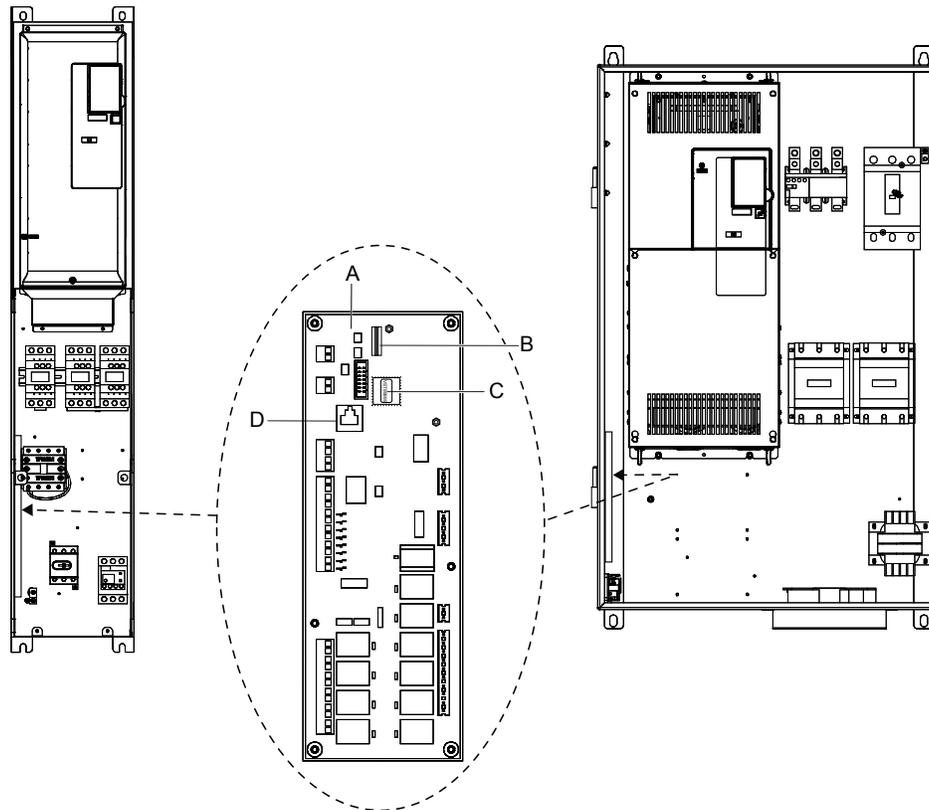
Table 3 Communication Cable Specifications

Communication Protocol	Description
PROFINET	Only use cable recommended for PROFINET. Using a cable not specifically recommended may cause the option or bypass to malfunction. Refer to the PROFIBUS and PROFINET International (PI) website for more information (profibus.com).

■ Bypass Unit Components

Figure 4 shows a front view of the bypass control board with the option connection terminals and related components for reference.

Note: Bypass PCB location varies by model.



A – Bypass PCB

B – Option card connector (CN5)

C – Bypass software version number

D – Communications port CN2

Figure 4 Front View of Bypass PCB

◆ Remove the Bypass Front Cover

WARNING! *Electrical Shock Hazard. Do not open the front cover of the bypass while the power is on. Failure to comply may result in death or serious injury. Make sure that the disconnect handle is in the "OFF" position before attempting to open the front cover.*

■ Models Z1B1D002 to D074 and Z1B1B001 to B077

1. Turn the disconnect handle to the "OFF" position and wait the appropriate amount of time for voltage to dissipate. Verify using a multimeter and follow all appropriate lockout/tagout procedures.

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, bypass, and circuit boards. Failure to comply may result in ESD damage to circuitry.*

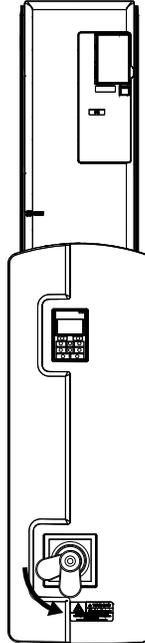


Figure 5 Disconnect Power

2. Remove the two front cover screws using a #2 Phillips screwdriver.

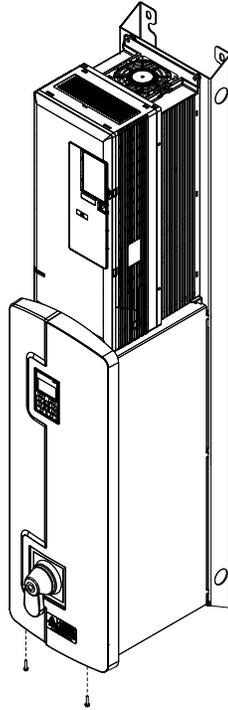


Figure 6 Remove Front Cover Screws

3. Lift the cover up and gently pull forward to remove the front cover.

NOTICE: Do not damage the Cat5e cable that connects the keypad to the bypass control PCB when removing the front cover. Failure to comply may cause erroneous operation.

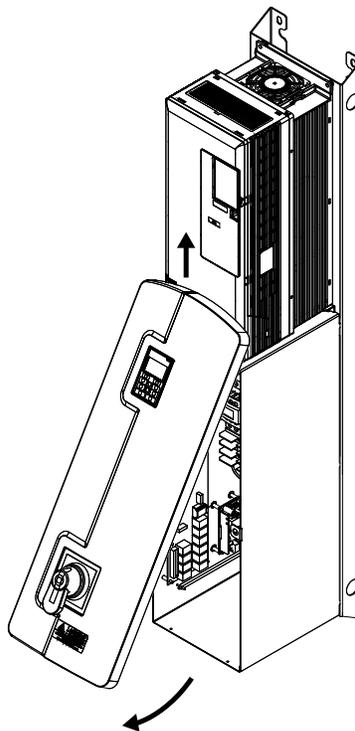


Figure 7 Lift and Remove Front Cover

5 Installation Procedure

■ Models Z1B1D088 to D273 and Z1B1B096 to B302

1. Turn the disconnect handle to the “OFF” position and wait the appropriate amount of time for voltage to dissipate. Verify using a multimeter and follow all appropriate lockout/tagout procedures.

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, bypass, and circuit boards. Failure to comply may result in ESD damage to circuitry.*

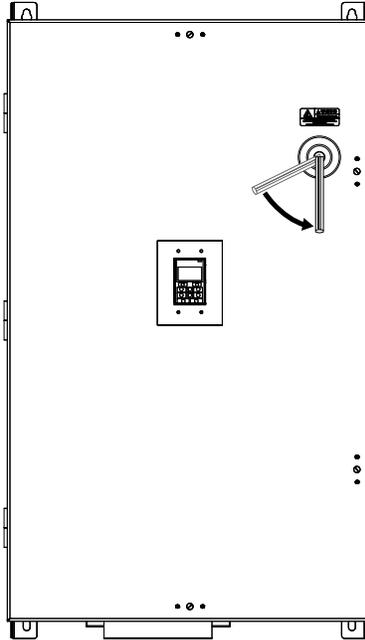


Figure 8 Disconnect Power

2. Turn the flat head screw fasteners on the front cover 1/2 turn counter-clockwise.

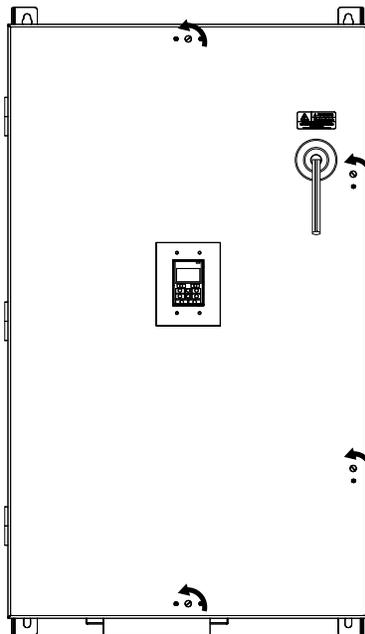


Figure 9 Turn Front Cover Fasteners

- Carefully swing open the bypass front cover door.

NOTICE: Do not damage the Cat5e cable that connects the keypad to the bypass control PCB when removing the front cover. Failure to comply may cause erroneous operation.

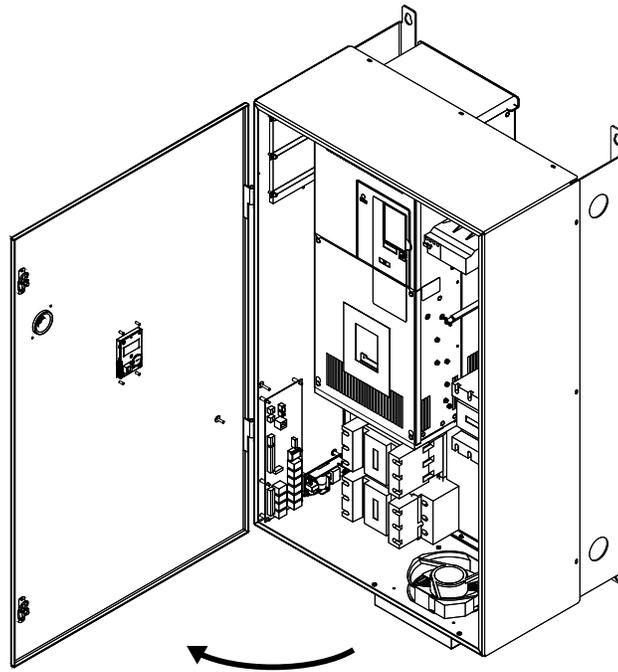


Figure 10 Swing Open Door

◆ Install the Option

DANGER! Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply could result in death or serious injury. Before installing the option, disconnect all power to the bypass and wait at least the amount of time specified on the bypass front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing. The internal capacitor remains charged after the power supply is turned off.

1. Fasten the option card to the metal standoffs on the bypass PCB using two screws included in the option kit. Use a short-shaft, magnetic screwdriver for narrow enclosure models Z1B1D002 to Z1B1D074 and Z1B1B001 to Z1B1B077. Tighten each screw to 0.5 to 0.6 N•m (4.4 to 5.3 in lbs).

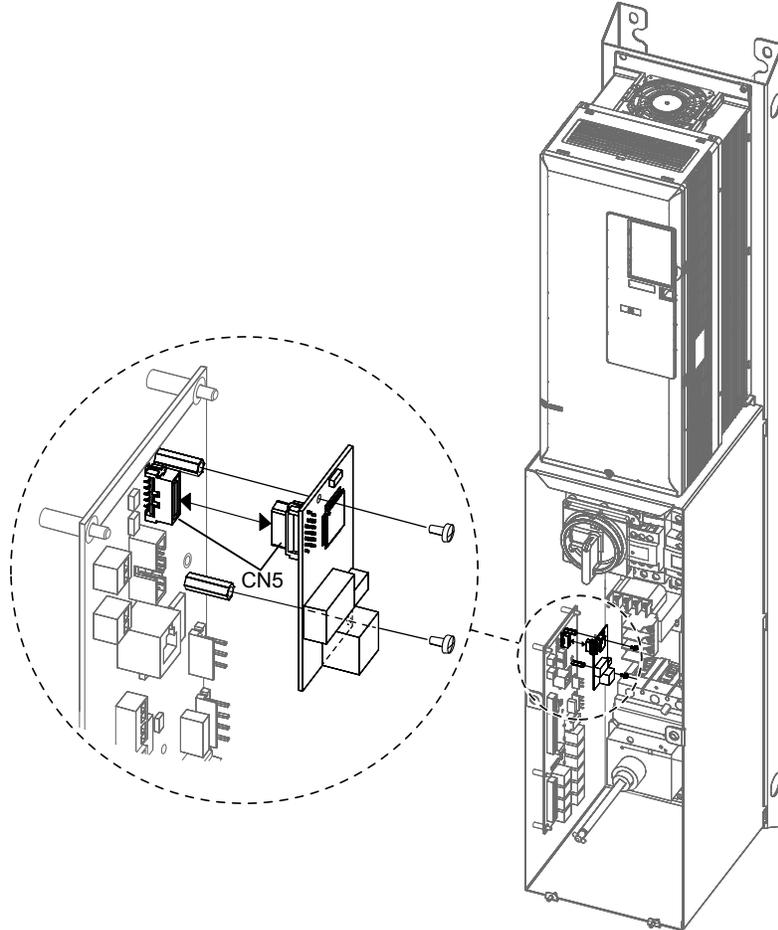


Figure 11 Insert Option into Bypass PCB CN5 Connector Port - Model Z1B1D002

2. Connect the customer-supplied Cat5e network cables to the option by firmly inserting the RJ45 8-pin connectors into the CN1 modular connector ports on the option board.

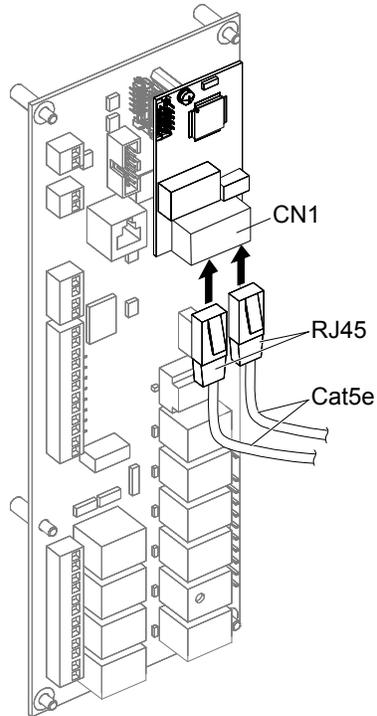


Figure 12 Connect Network Cables to Option

NOTICE: Separate control circuit wiring from main circuit wiring and other high-power lines. Improper wiring practices could result in bypass malfunction due to electrical interference.

IGMP Snooping

Switches implementing IGMP Snooping are strongly recommended to limit devices to only receive the multicast packets in which they are interested.

Option Connection Diagram

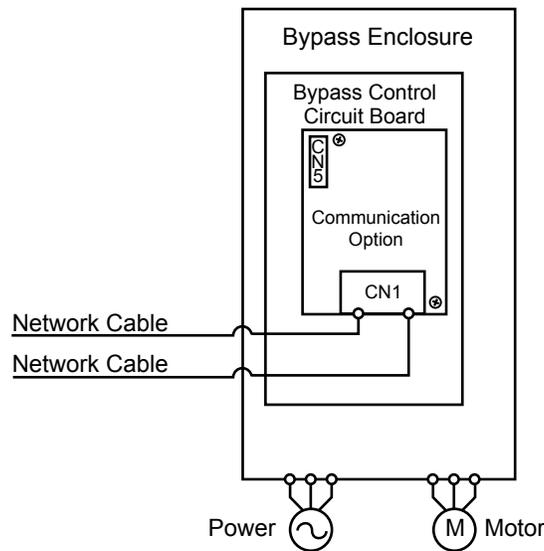


Figure 13 Option Connection Diagram (Dual Port CN1 Connection)

Dual-Port CN1 Connection

The dual CN1 network ports on the option board act as a switch to allow for flexibility in cabling topology. For example, a traditional star network topology may be employed by using a single port on the option board. Alternatively, a daisy-chained approach may be employed by using both CN1 ports. The daisy-chained approach reduces the requirements of central switch ports. A ring topology is also possible.

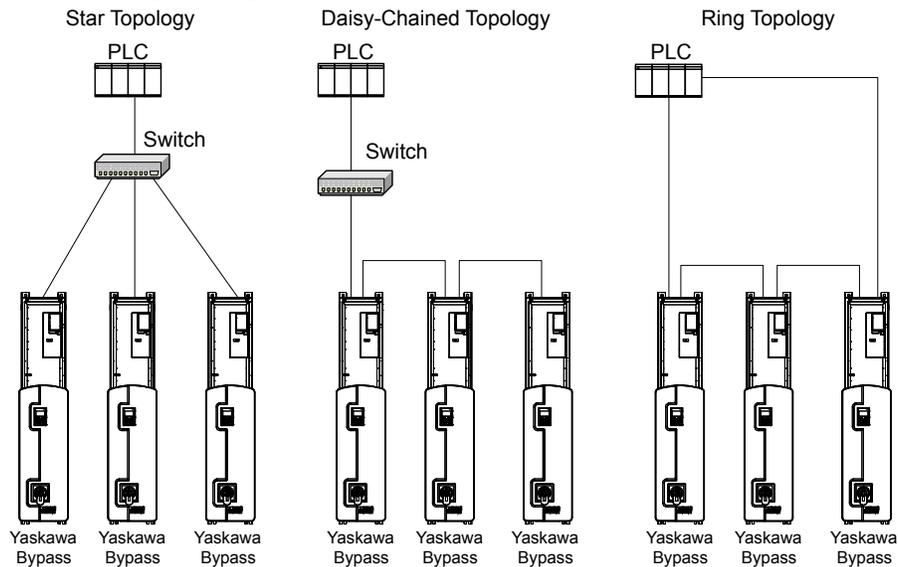


Figure 14 Topology Options

3. Replace and secure the bypass front cover.
4. Make sure no cables are pinched between the front covers and the bypass when replacing the covers.
5. Set bypass parameters according to Section [6 Related Bypass Parameters](#) on page [21](#).

◆ Option LED Display

The LEDs are not visible when used in a bypass configuration. Use parameters U6-80 through U6-99 to monitor operation status. [Refer to Option Monitors on page 22](#) for details.

6 Related Bypass Parameters

The following parameters are used to set up the bypass for operation with the option. Parameter setting instructions can be found in the drive manual.

Confirm proper setting of the parameters in [Table 4](#) before starting network communications. After changing parameter settings, cycle power to the bypass for the new settings to take effect.

Table 4 Related Parameters

No. (Addr. Hex)	Name	Description	Values
F6-02 (03A3)	External Fault from Comm. Option Detection Selection	0: Always detected 1: Detection during run only	Default: 0 Range: 0, 1
F6-03 (03A4)	External Fault from Comm. Option Operation Selection	0: Ramp to stop. Decelerate to stop using the deceleration time in C1-02. 1: Coast to stop 2: Fast Stop. Decelerate to stop using the deceleration time in C1-09. 3: Alarm only </>	Default: 1 Range: 0 to 3
Z1-07 (85CC)	Speed Reference Select </>	0: Operator 1: Analog Input 2: Bypass Serial 3: Option Board (CN5)	Default: 1 Range: 0 to 3
Z1-08 (85CD)	Run Command Select </>	0: Operator 1: Bypass Controller Digital Input 2: Bypass Serial 3: Option Board (CN5)	Default: 1 Range: 0 to 3
Z1-38 (85EB)	HOA Source Select	0: Operator 1: Digital Inputs 2: Ser Comm & Opt	Default: 0 Range: 0 to 2
Z1-39 (85EC)	Drive/Bypass Source Select	0: Operator 1: Digital Inputs 2: Serial Communications	Default: 0 Range: 0 to 2
Z4-01 (8700)	IP Address 1	Sets the most significant octet of network static IP address.	Default: 192 Range: 0 to 255
Z4-02 (8701)	IP Address 2	Sets the second most significant octet of network static IP address.	Default: 168 Range: 0 to 255
Z4-03 (8702)	IP Address 3	Sets the third most significant octet of network static IP address.	Default: 1 Range: 0 to 255
Z4-04 (8703)	IP Address 4	Sets the fourth most significant octet of network static IP address.	Default: 20 Range: 0 to 255
Z4-05 (8704)	Subnet Mask 1	Sets the most significant octet of network static subnet mask.	Default: 255 Range: 0 to 255
Z4-06 (8705)	Subnet Mask 2	Sets the second most significant octet of network static subnet mask.	Default: 255 Range: 0 to 255
Z4-07 (8706)	Subnet Mask 3	Sets the third most significant octet of network static subnet mask.	Default: 255 Range: 0 to 255
Z4-08 (8707)	Subnet Mask 4	Sets the fourth most significant octet of network static subnet mask.	Default: 0 Range: 0 to 255
Z4-09 (8708)	Gateway IP Address 1	Sets the most significant octet of network gateway address.	Default: 192 Range: 0 to 255
Z4-10 (8709)	Gateway IP Address 2	Sets the second most significant octet of network gateway address.	Default: 168 Range: 0 to 255
Z4-11 (870A)	Gateway IP Address 3	Sets the third most significant octet of network gateway address.	Default: 1 Range: 0 to 255
Z4-12 (870B)	Gateway IP Address 4	Sets the fourth most significant octet of network gateway address.	Default: 1 Range: 0 to 255
Z4-13 (870C)	IP Address Mode Select	0: User-Defined (Static IP) 1: BOOTP 2: DHCP	Default: 2 Range: 0 to 2
Z4-14 (870D)	Duplex Select	0: Forced Half Duplex 1: Auto Negotiate Duplex Mode and Communication Speed 2: Forced Full Duplex	Default: 1 Range: 0 to 2
Z4-15 (870E)	Speed Mode Setting	10: 10 Mbps 100: 100 Mbps	Default: 10 Range: 10, 100

6 Related Bypass Parameters

No. (Addr. Hex)	Name	Description	Values
Z4-16 (870F)	Communication Loss Timeout	Control connection timeout value for detection of communication loss.	Default: 0 s Min.: 0 Max.: 300
Z4-23 to Z4-27 (8716 to 871A)	Dynamic Output Assembly Parameters DOA116 1 to DOA116 5	'Parameters used in Dynamic Output PZD	Default: 0 Range: 0 to FFFF
Z4-33 to Z4-37 (8720 to 8724)	Dynamic Input Assembly Parameters DIA166 1 to DIA166 5	'Parameters used in Dynamic Input PZD	Default: 0 Range: 0 to FFFF

<1> When set to 3, the drive will continue to operate when a fault is detected. Take safety measures, such as installing an emergency stop switch.

<2> Available in bypass controller software versions VST800400 and later.

Table 5 Option Monitors

No.	Name	Description	Value Range
U6-80 to U6-83	Online IP Address	IP Address currently available; U6-80 is the most significant octet	0 to 255
U6-84 to U6-87	Online Subnet	Subnet currently available; U6-84 is the most significant octet	0 to 255
U6-88 to U6-91	Online Gateway	Gateway currently available; U6-88 is the most significant octet	0 to 255
U6-92	Online Speed	Link Speed	10: 10 Mbps 100: 100 Mbps
U6-93	Online Duplex	Duplex Setting	0: Half, 1: Full
U6-94	Port 2 Speed	Port 2 Link Speed	10: 10 Mbps 100: 100 Mbps
U6-95	Port 2 Duplex	Port 2 Duplex Setting	0: Half, 1: Full
U6-97	Option Software Version	Option Software Version	–
U6-98	First Fault	First Option Fault	–
U6-99	Current Fault	Current Option Fault	–

7 Common Tasks

Common tasks when using an SI-EP3 PROFINET option kit on a Z1000 bypass.

◆ Accessing Drive and Bypass Monitors and Parameters

A list of register addresses can be found in the Z1000 Bypass Technical Manual, SIEPYAIZ1B01. Details of how to access these through PROFINET can be found in Section *Yaskawa Vendor-Specific Control and Status Words* on page 27.

Drive and Bypass monitors and parameters can be accessed using one of two methods.

- Acyclic commands (Drive values only) where the index value is the desired register number. The register addresses can be found in the Z1000 Bypass Technical Manual, SIEPYAIZ1B01. *Refer to Yaskawa Acyclic Parameter Access Mechanism on page 34*
- The register addresses (bypass and drive values) can be programmed into the dynamic input or output parameters to place them into the IO of the PLC. Assembly pairs that contain dynamic IO include: Std Tg1 + 5 PZD and Forty Byte IO module. Use parameters Z4-23 through Z4-27 and Z4-33 to Z4-37 to program the addresses.

◆ Monitor Statuses

Monitor various statuses using PROFINET.

Table 6 Monitor Various Statuses

Status	Description	Drive Mode	Bypass Mode
Run	Read this status using the predefined bits in various assemblies or explicitly through drive register 0x4B.	x	-
	Read this status using address 8785H (bit 1).	x	x
Fault	Read this status using address 8785H (bit 2).	x	x
	Read this status using the pre-defined IO status word (bit 7).	x	x <1>
Output Frequency	Read this status using register 0041H (scaling = 0.1A).	x	-
Output Current	Read this status using address 0026H (scaling = 0.1A).	x	x <1>
	Read this status using address 8780H (scaling = 0.1A).	-	x
Other Drive-specific Statuses	Read drive-specific statuses and monitors (0020H to 00FFH and U1-01 to U6-40) by placing them into acyclic commands or through dynamic input and output parameters. Refer to Z1000 Bypass Technical Manual (SIEPYAIZ1B01) for a list of monitors and their register addresses. Drive-specific addresses are valid only when the drive is energized. The drive may not be energized when in Bypass mode or when the service disconnect switch is OFF.	x	-
Other Bypass-specific Statuses	All other bypass-specific statuses and monitors (UB-01 to UB-96) can be read by placing them into the dynamic input and output parameters. Refer to Z1000 Bypass Technical Manual (SIEPYAIZ1B01) for a list of monitors and their register addresses.	-	x

<1> Available in bypass controller software versions VST800400 and later.

Table 7 Fault Status Bit

Software Version	Pre-defined IO Status Word (bit 7)	Bypass Address 8785 (bit 2)
VST800299 and earlier	Drive faults only	Drive or bypass faults
VST800400	Drive or bypass faults	Drive or bypass faults

◆ Issuing Bypass Commands

Table 8 Issue Various Commands

Command	Description
Frequency Reference	Set parameter Z1-07 to 3. Frequency reference is written using the predefined control word in each IO module (scaling determined by o1-03).
Run/Stop	Set parameter Z1-08 to 3. Run/Stop command is written using the predefined control word in each IO module. Note: Bits 0 and 1 of BypCmd (8400H) are not valid for option cards.
Fault Reset	Fault Reset is written using the predefined control word in each IO module.
Other Bypass Commands	Other bypass commands are written to addresses 8400H to 8407H by placing them into the dynamic output parameters of Std Tgm 1 + 5 or Forty Byte IO module. Refer to Z1000 Bypass Technical Manual (SIEPYAIZ1B01).

8 PROFINET Messaging

◆ PROFINET Overview

This section describes the communication profile used between the PROFINET I/O network and the option.

The option supports the PROFIdrive profile. Users can select between the control and status words according to the PROFIdrive profile or use the Yaskawa-specific control and status words.

◆ PROFIdrive Communication Profile

■ The Control Word and the Status Word

The contents of the Control Word and the Status Word are detailed in [Table 9](#) and [Table 10](#) respectively. The drive states are presented in the [Figure 15](#) on page 27.

■ Frequency Reference

The Frequency reference is a 16-bit word containing a sign bit and a 15-bit integer. A negative reference (indicating reverse direction of rotation) is formed by calculating the two's complement from the corresponding positive reference. The reference value is the desired output frequency.

■ Output Frequency

Output Frequency is a 16-bit word containing the current output frequency (U1-02) of the drive.

Table 9 Control Word for PROFIdrive Communication Profile

Bit	Name	Value	Proceed to STATE/Description
0	ON	1	Proceed to READY TO OPERATE.
	OFF1	0	Emergency OFF. Proceed to OFF1 ACTIVE; proceed further to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active.
1	OFF2	1	Continue operation (OFF2 inactive).
		0	Emergency OFF. Proceed to OFF2 ACTIVE; proceed further to SWITCH ON INHIBIT.
2	OFF3	1	Continue operation (OFF3 inactive).
		0	Emergency stop. Proceed to OFF3 ACTIVE; proceed further to SWITCH-ON INHIBIT.
3	OPERATION_ENABLE	1	Proceed to ENABLE OPERATION.
		0	Inhibit operation. Proceed to OPERATION INHIBIT.
4	RAMP_OUT_ZERO	1	Normal operation. Proceed to RAMP FUNCTION GENERATOR: ENABLE OUTPUT.
		0	Stop according to selected stop type.
5	RAMP_HOLD	1	Normal operation.
		0	Proceed to RAMP FUNCTION GENERATOR: ENABLE ACCELERATOR. Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_ZERO	1	Normal operation. Proceed to OPERATING. Note: This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Force Ramp Function Generator input to zero.
7	RESET	0 -> 1	Fault reset if an active fault exists. Proceed to SWITCH ON INHIBIT.
		0	(Continue normal operation)
8	INCHING_1	-	Inching 1. (Not supported)
9	INCHING_2	-	Inching 2. (Not supported)
10	REMOTE_CMD	1	Network control enabled.
		0	Network control disabled.
11 to 15	-	-	Reserved

Table 10 Status Word for the PROFIdrive Communication Profile

Bit	Name	Value	STATE/Description
0	RDY_ON	1	READY TO SWITCH ON.
		0	NOT READY TO SWITCH ON.
1	RDY_RUN	1	READY TO OPERATE.
		0	OFF1 ACTIVE.
2	RDY_REF	1	ENABLE OPERATION.
		0	DISABLE OPERATION.
3	TRIPPED	1	FAULT.
		0	No fault.
4	OFF_2_STA	1	OFF2 inactive.
		0	OFF2 ACTIVE.
5	OFF_3_STA	1	OFF3 inactive.
		0	OFF3 ACTIVE.
6	SWC_ON_INHIB	1	SWITCH-ON INHIBIT ACTIVE.
		0	SWITCH-ON INHIBIT NOT ACTIVE.
7	ALARM	1	Warning/Alarm.
		0	No Warning/Alarm.
8	AT_SETPOINT	1	OPERATING. Actual value equals reference value (i.e., is within tolerance limits).
		0	Actual value differs from reference value (i.e., is outside tolerance limits).
9	REMOTE	1	Drive control location: REMOTE.
		0	Drive control location: LOCAL.
10	ABOVE_LIMIT	-	Not supported.
11 to 15	-	-	Reserved

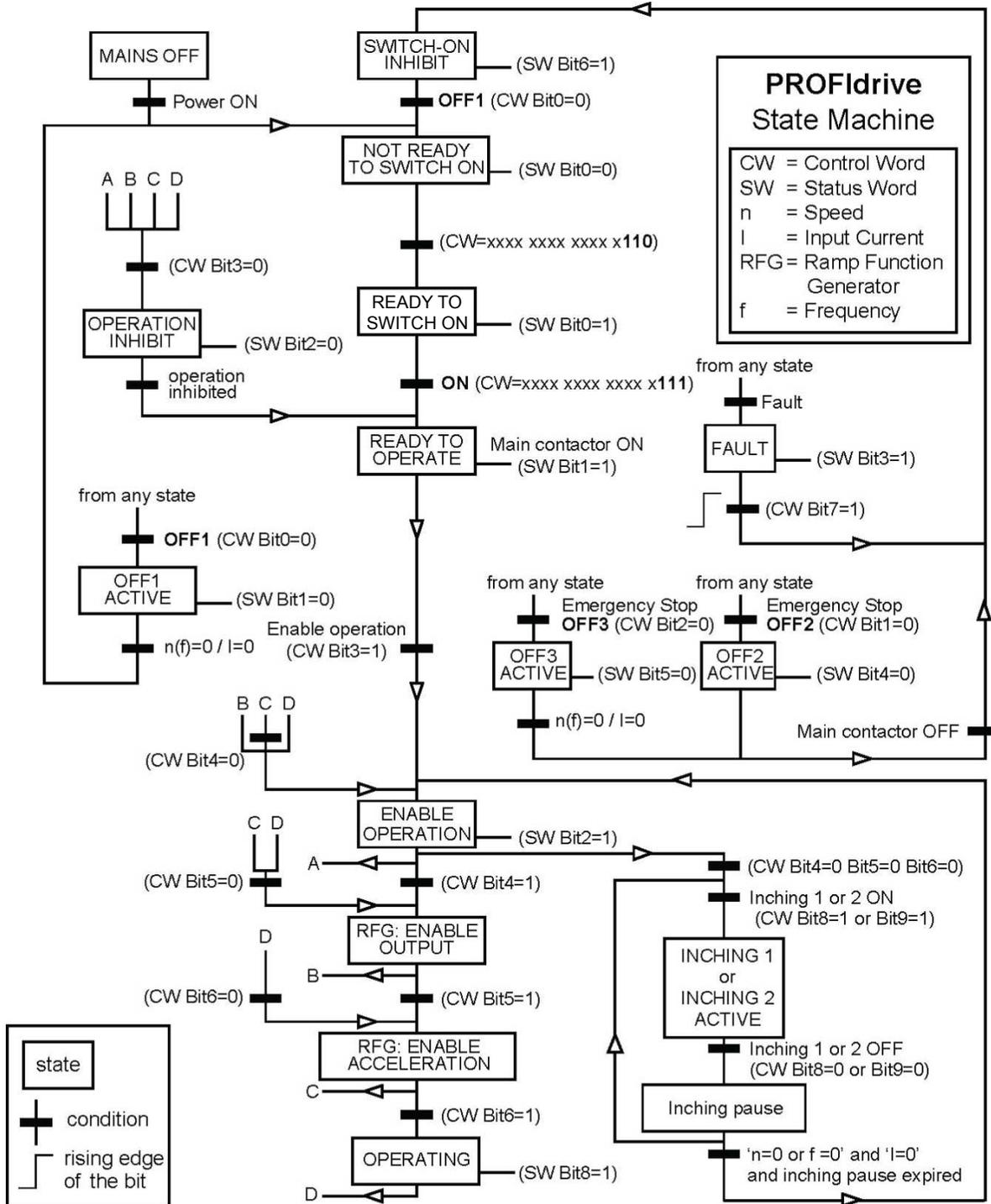


Figure 15 PROFIdrive State Machine

◆ Yaskawa Vendor-Specific Control and Status Words

■ The Control Word and the Status Word

The contents of the Control Word and the Status Word are detailed in [Table 11](#).

■ Frequency Reference

Frequency Reference is a 16-bit word containing the desired output frequency.

■ Output Reference

Output Frequency is a 16-bit word containing the current output frequency of the drive.

Table 11 Yaskawa-Specific Control Word and Status Word

Yaskawa-Specific Control Word		Yaskawa-Specific Status Word	
Bit	Description	Bit	Description
0	Run bit	0	Running
1	Reverse run bit	1	Zero Speed
2	EF0	2	Reverse Operation
3	Fault Reset	3	Reset Signal Input Active
4	ComFref	4	At Speed
5	ComCtrl	5	Ready
6	DI3	6	Alarm
7	DI4	7	Fault
8	DI5	8	oPE Fault
9	DI6	9	Uv Return
10	DI7	10	2nd Motor
11	DI8 <1>	11	ZSV
12	DI9 <1> <2>	12	(Unused)
13	DI10 <1> <2>	13	(Unused)
14	DI11 <1> <2>	14	Net Reference
15	DI12 <1> <2>	15	Net Control

<1> Not available in V1000-series drives.

<2> Not available in A1000-series drives.

9 Communication

This section describes the PROFINET IO messaging used in communication with the drive.

For detailed information on PROFINET IO communication, refer to PROFINET specification Application Layer protocol for decentralized periphery and distributed automation v2.0 available at www.profibus.com.

◆ Introduction to PROFINET IO

PROFINET IO is a fieldbus protocol that enables communication between programmable controllers and distributed field devices in Ethernet network. The protocol classifies devices into IO controllers, IO supervisors and IO devices, which have a specific collection of services.

PROFINET IO uses three different communication channels to exchange data. The standard UDP/IP and TCP/IP channel is used for parameterization and configuration of devices and for acyclic operations. The Real Time (RT) channel is used for cyclic data transfer and alarms. The third channel, Isochronous Real Time (IRT) channel, is used e.g. in motion control applications (not implemented in SI-EP3).

PROFINET IO devices are structured in slots and sub-slots, which can contain modules and sub-modules correspondingly. Devices can have almost any number of slots and sub-slots and they can be virtual or real. Device specific data is represented in slot 0, module and sub-module specific data in subsequent slots and sub-slots.

One of the benefits of PROFINET IO is the diagnostics and alarm mechanism. Every module and sub-module provide alarm data to the IO controller using the cyclic channel. Diagnostic data can be read non-cyclically from the device by using record data.

Properties and services of a PROFINET IO device are described in a GSD file that is written in General Station Description Markup Language (GSDML). GSD file describes the device specific modules and the method of assigning modules and sub-modules to predefined slots and sub-slots.

◆ PROFINET IO in SI-EP3

The decision to use either the PROFIdrive control and status words or the Yaskawa-specific control and status words is done in a hardware configuration tool (customer supplied). The default value is the Yaskawa-specific format.

SI-EP3 uses slots 0 and 1. Slot 0 does not have any sub-slots and the attached DAP module represents the device. Other functional modules and sub-modules described in the GSD file can be assigned to slot 1 and its sub-slots.

- Slot 0 = Device access point (DAP)
- Slot 1, sub-slot 1 = Standard telegram 1, Standard telegram 1 + 5 configurable inputs, outputs, Forty byte IO with 5 configurable input, outputs

The services provided by the SI-EP3 option can be defined using the F7-□□ parameters in the drive or by using a configuration tool. To define the service using the F7-□□ parameters, set the parameter to a value other than 0. If all F7-□□ parameters are set to 0, the value from the configuration tool will be used.

The SI-EP3 option provides the following services:

- Cyclic messaging in PROFIdrive or Yaskawa-specific mode
- Acyclic parameter access mechanism
- Identification & Maintenance functions (I & M0)
- PROFIdrive parameters
- Diagnostic and alarm mechanism
- Fault buffer mechanism

■ Yaskawa SI-EP3 PROFINET I/O Modules

Std Tgm 1

Table 12 Std Tgm 1 Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB

Table 13 Std Tgm 1 Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB

Std Tgm 1 + 5 PZD

Table 14 Std Tgm 1 + 5 PZD Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB
4	Configurable Output 1 MSB
5	Configurable Output 1 LSB
6	Configurable Output 2 MSB
7	Configurable Output 2 LSB
8	Configurable Output 3 MSB
9	Configurable Output 3 LSB
10	Configurable Output 4 MSB
11	Configurable Output 4 LSB
12	Configurable Output 5 MSB
13	Configurable Output 5 LSB

Table 15 Std Tgm 1 + 5 PZD Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB
4	Configurable Input 1 MSB
5	Configurable Input 1 LSB
6	Configurable Input 2 MSB
7	Configurable Input 2 LSB
8	Configurable Input 3 MSB
9	Configurable Input 3 LSB
10	Configurable Input 4 MSB
11	Configurable Input 4 LSB
12	Configurable Input 5 MSB
13	Configurable Input 5 LSB

Forty Byte IO

Table 16 Forty Byte IO Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB
4	Torque Reference MSB </>
5	Torque Reference LSB </>
6	Torque Compensation MSB </>
7	Torque Compensation LSB </>
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Analog Output 1 MSB
13	Analog Output 1 LSB
14	Analog Output 2 MSB
15	Analog Output 2 LSB
16	Digital Outputs MSB
17	Digital Outputs LSB
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Configurable Output 1 MSB
31	Configurable Output 1 LSB
32	Configurable Output 2 MSB
33	Configurable Output 2 LSB
34	Configurable Output 3 MSB
35	Configurable Output 3 LSB
36	Configurable Output 4 MSB
37	Configurable Output 4 LSB
38	Configurable Output 5 MSB
39	Configurable Output 5 LSB

<1> Not available in V1000-series drives.

Table 17 Forty Byte IO Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB
4	Torque Reference MSB </>
5	Torque Reference LSB </>
6	PG Count Value MSB
7	PG Count Value LSB
8	Motor Speed MSB
9	Motor Speed LSB
10	Frequency Reference Monitor MSB
11	Frequency Reference Monitor LSB
12	Output Current MSB
13	Output Current LSB
14	Analog Input 1 MSB
15	Analog Input 1 LSB
16	DC Bus Voltage MSB
17	DC Bus Voltage LSB
18	Fault Code MSB
19	Fault Code LSB
20	Alarm Code MSB
21	Alarm Code LSB
22	Output Power MSB
23	Output Power LSB
24	Analog Input 2 MSB
25	Analog Input 2 LSB
26	Digital Inputs MSB
27	Digital Inputs LSB
28	Analog Input 3 MSB
29	Analog Input 3 LSB
30	Configurable Input 1 MSB
31	Configurable Input 1 LSB
32	Configurable Input 2 MSB
33	Configurable Input 2 LSB
34	Configurable Input 3 MSB
35	Configurable Input 3 LSB
36	Configurable Input 4 MSB
37	Configurable Input 4 LSB
38	Configurable Input 5 MSB
39	Configurable Input 5 LSB

<1> Not available in V1000-series drives.

■ Cyclic Messaging

SI-EP3 supports cycle times of 8 to 512 ms.



CW: Control Word

SW: Status Word

REF: Reference

ACT: Actual Value

PZD: Configurable inputs and outputs

■ **Yaskawa Acyclic Parameter Access Mechanism**

All drive parameters can be read and written under address 0x8000 by performing a read or write with the index value of the corresponding parameter address in the drive. Refer to the drive Technical Manual for a list of these parameter addresses.

■ **PROFIdrive Acyclic Parameter Access Mechanism**

A PROFIdrive acyclic parameter access mechanism can be used to access PROFIdrive parameters and drive parameters using an index of 0xB02E and the structure in [Figure 16](#) for write and read requests.

Requests and responses between the IO device and the IO controller or the IO supervisor are transferred with the Record Data Objects.

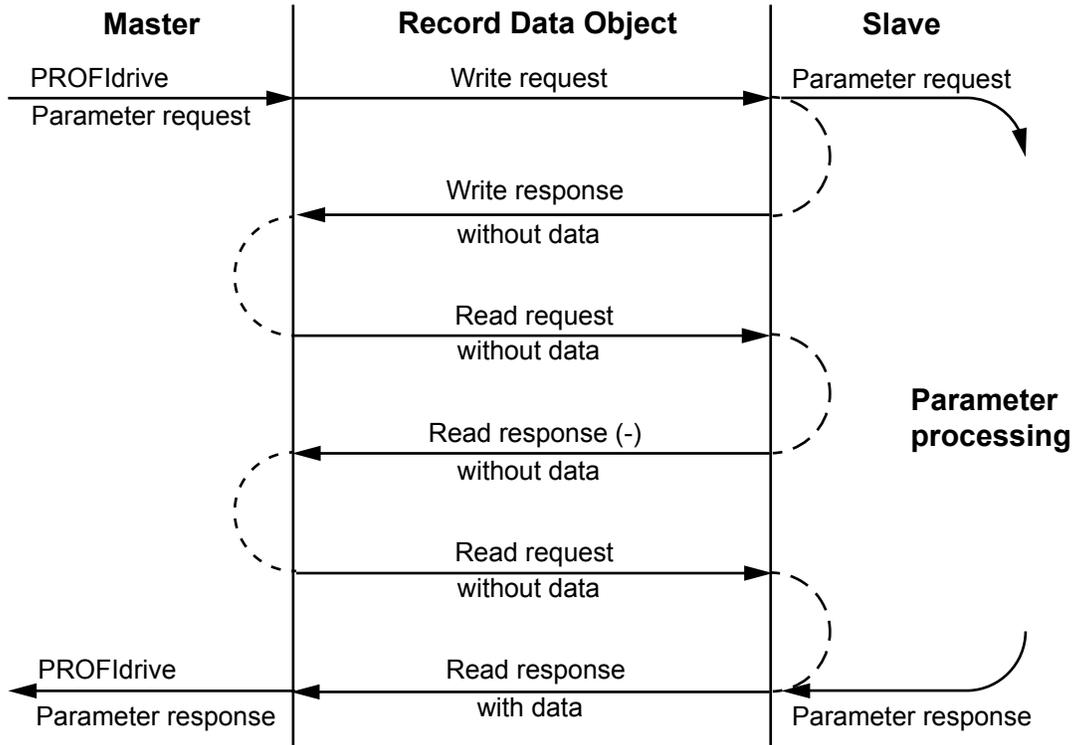


Figure 16 PROFIdrive Acyclic Parameter Access Mechanism Structure

A write request is first sent containing the parameter request.

If the write request is valid, the SI-EP3 acknowledges it with request accepted. The master then sends a read request. If the SI-EP3 is still busy performing the internal parameter request, it will return a negative response with the error code “0xB5” (State conflict). In this case, the master repeats the read request until the SI-EP3 has the PROFIdrive response data ready.

If the write request is invalid, a negative response is returned with an error code.

Base Mode Parameter Access - Local

The DO-ID field in the Record Data Object request header is not evaluated by the parameter manager. Parameters can be read through any slot in the configuration.

Table 18 Response Error Codes

Byte	Value and Meaning
ErrorCode	0xDF (Error Write)
	0xDE (Error Read)
ErrorDecode	0x80 (PNIORW) ErrorCode1 decoded according to Table 19 ErrorCode1 with PNIORW Decoding . ErrorCode2 is 0.
	0x81 (PNIO) ErrorCode1 and ErrorCode2 decoded according to Table 19 ErrorCode1 with PNIORW Decoding .
ErrorCode1	Error class and error code (Refer to Table 19 ErrorCode1 with PNIORW Decoding).
ErrorCode2	Not described

Table 19 ErrorCode1 with PNIORW Decoding

Error class	Meaning	Error Code
0 to 9	(Reserved)	-
10 (0x0A)	Application	0 = Read error
		1 = Write error
		2 = Module failure
		3 to 7 = Reserved
		8 = Version conflict
		9 = Feature not supported
		10 to 15 = User-specific
11 (0x0B)	Access	0 = Invalid index
		1 = Write length error
		2 = Invalid slot
		3 = Type conflict
		4 = Invalid area
		5 = State conflict
		6 = Access denied
		7 = Invalid range
		8 = Invalid parameter
		9 = Invalid type
		10 to 15 = User-specific
12 (0x0C)	Resource	0 = Read constraint conflict
		1 = Write constraint conflict
		2 = Resource busy
		3 = Resource unavailable
		4 to 7 = Reserved
		8 to 15 = User-specific
13 to 15	User-specific	-

Read block is used in read requests and responses. Write block is used in write requests and responses. The request consists of unique identifiers for the connection, addressing information and length of the record data. The response also contains two additional fields for transferring information.

Table 20 Structure of the Read and Write Blocks

Field(s)	Description	Range	Type
Service	Request or Response service.	Request (0x00) Response (0x80)	UI8
Operation	Read or Write operation.	Write (0x08) Read (0x09)	UI8
Block length	Length of the block.	0 to 0xFFFF	UI16
ARUID	Identifier - time low - time mid - high and version - clock - node	-	U132 U116 Octet[2] Octet[6]
API	Application Process Identifier	Device Access Point (0x0000)	UI32
		PROFIdrive (0x3A00)	
Slot	Slot of the Module Access Point (MAP/PAP)	0x01	UI16
Sub-slot	Sub-slot of the Module Access Point (MAP/PAP)	0x01	UI16
Sub-slot	Sub-slot of the Module Access Point (MAP/PAP)	0x01	UI16
Padding	2 bytes		
Index	Index of the Record Data Object	0x0001 to 0x7FFF 0xB02E	UI16
Data length	Length of the data block	0 to 0xFFFFFFFF	UI32

9 Communication

Field(s)	Description	Range	Type
Additional value 1 (response only)	Field for transferring additional data	–	UI16
Additional value 2 (response only)	Field for transferring additional data	–	UI16
Padding	24 bytes for request, 20 bytes for response.		
Data block	Used only with write request and read response.		

Data block contains PROFIdrive specific request or response header.

Table 21 PROFIdrive Request Header

Field(s)	Description	Range	Byte/ Word
Request Reference	Unique identification set by the master. Changed for each new request.	1 to 255	Byte
Request ID	Request type for the issued block.	Request Parameter (0x01) Change Parameter (0x02)	Byte
DO-ID	To be set to 0x01.	0 to 255	Byte
No. of Parameters	Number of parameters that are present in the request.	1	Byte
Attribute	Type of object being accessed.	Value (0x10)	Byte
No. of Elements	Number of array elements accessed or length of string accessed. Set to 0 if non-array parameters are used.	0, 1 to 234	Byte
Parameter Index (group)	Address of the PROFIdrive parameter that is being accessed. Also “1” is allowed by SI-EP3SI-EP3/V to access drive parameters. Drive parameter group when accessing drive parameters.	1 to 65535	Word
Subindex (parameter)	Addresses the first array element of the parameter. Drive parameter number when accessing drive parameters.	0 to 65535	Word
Format <1>	<i>Refer to Data Types for Format Field on page 37</i> for details.	–	Byte
Number of Values <1>	Number of values following.	1	Byte
Values <1>	The values of the request. In case of odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value	See Format Field

<1> Only when Request ID is 0x02 (Change Parameter). The Format, Number of Values, and Value Fields are repeated for other parameters.

Table 22 PROFIdrive Response Header

Field(s)	Description	Range
Response Reference	Mirrored from the request.	1 to 255
Response ID	Response from the slave. In the event that requested services fail, a “not acknowledged” (NAK) response will be indicated.	Request Param OK (0x01) Request Param NAK (0x81) Change Param OK (0x02) Change Param NAK (0x82)
DO-ID	To be set to 1.	0 to 255
No. of Parameters	Number of parameters that are present in the response.	1 to 37
Format <1>	Refer to Table 27 for details.	–
Number of Values <1>	Number of values following.	0 to 234
Values <1>	The values of the request. When there is an odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value

<1> Only when Request ID is 0x01 (Request Parameter OK). The Format, Number of Values, and Value Fields are repeated for other parameters.

Table 23 Data Types for Format Field

Code	Type
0x00	(Reserved)
0x01 to 0x36	Standard data types
0x37 to 0x3F	(Reserved)
0x40	Zero
0x41	Byte
0x42	Word
0x43	Double word
0x44	Error
0x45 to 0xFF	(Reserved)

Table 24 PROFIdrive Parameter Request Error Codes

Error #	Meaning	Used at
0x00	Impermissible parameter number	Access to unavailable parameter.
0x01	Parameter value cannot be changed	Change access to a parameter value that cannot be changed.
0x02	Low or high limit exceeded	Change access with value outside the limits.
0x03	Invalid subindex	Access to unavailable subindex.
0x04	No array	Access with subindex to non-indexed parameter.
0x05	Incorrect data type	Change access with value that does not match the data type of the parameter.
0x06	Setting not permitted (can only be reset)	Change access with value unequal to 0 when this is not permitted.
0x07	Description element cannot be changed	Change access to a description element that cannot be changed.
0x09	No description data available	Access to unavailable description (parameter value is available).
0x0B	No operation priority	Change access rights without rights to change parameters.
0x0F	No text array available	Access to text array that is not available (parameter value is available).
0x11	Request cannot be executed because of operating mode	Access is temporarily not possible for reasons outside scope of these instructions.
0x14	Value impermissible	Change access with a value that is within limits but is not permissible for other long-term reasons (parameter with defined single values).
0x15	Response too long	The length of the current response exceeds the maximum transmittable length.
0x16	Parameter address impermissible	Illegal value or value that is not supported for the attribute, number of elements, parameter number or sub-index, or a combination.
0x17	Illegal format	Write request: Illegal format or format of parameter data that is not supported.
0x18	Number of values inconsistent	Write request: Number of values of parameter data does not match number of elements at the parameter address.
0x19	DO nonexistent	Request to DO, which does not exist.
0x65 to 0xFF	Manufacturer-specific	—
0x65	Vendor-specific error	Vendor-specific error.
0x66	Request not supported	Request not supported.
0x67	Communication error	Request cannot be completed because of communication error.
0x6F	Time-out error	Request aborted due to time-out.
0x78	PZD map failure	Parameter cannot be mapped to PZD (size mismatch or non-existent).
0x79	PZD memory failure	Parameter cannot be mapped to PZD (out of memory).
0x7A	Multiple PZD map	Parameter cannot be mapped to PZD (multiple PZD write).
0x8C	Set torque mode error	Cannot change mode to TORQUE (frequency is used).
0x90	Illegal Request ID	The request ID of the response is illegal.

Parameter Data Transfer Examples

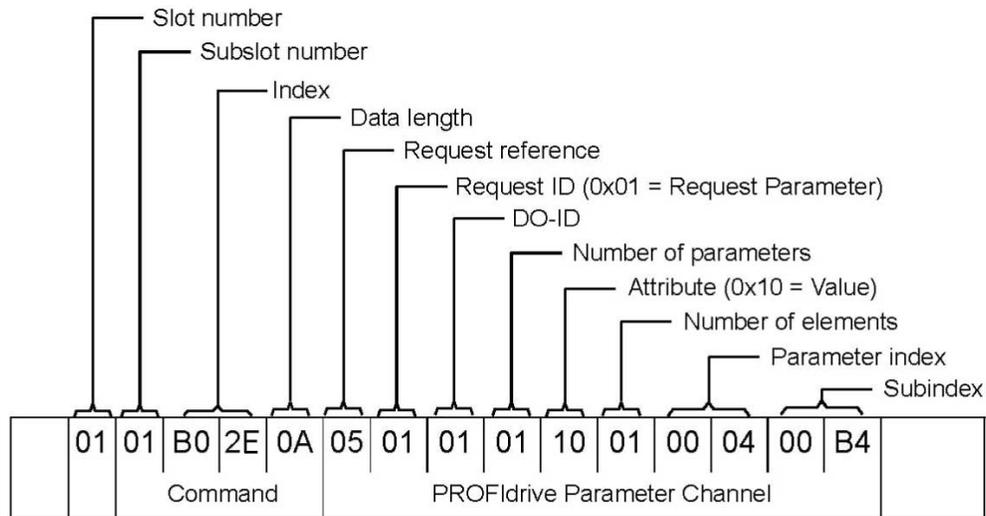
The following example shows how parameter data is transferred using the acyclic parameter access mechanism's READ and WRITE.

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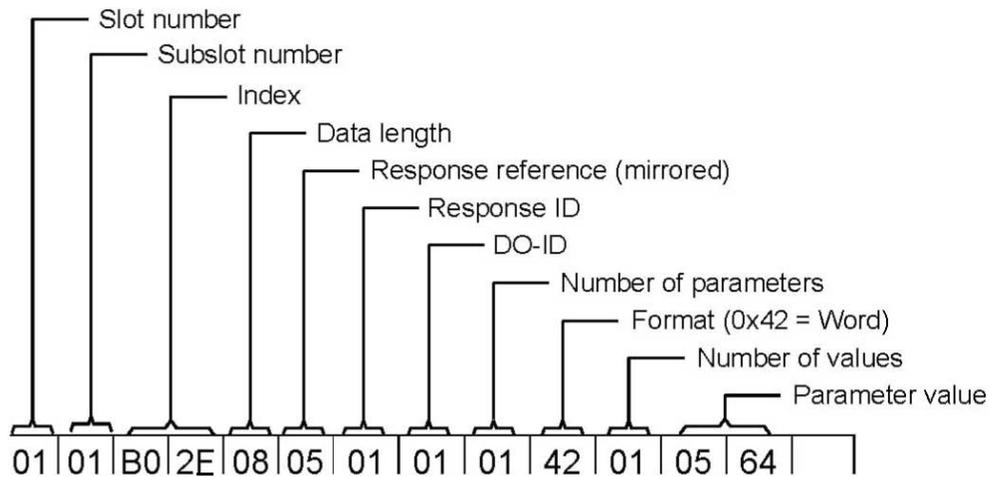
Example 1: Reading a drive parameter

To read a Yaskawa Drive parameter, use the PNU of 1 and the actual address of the parameter in the SubIndex.

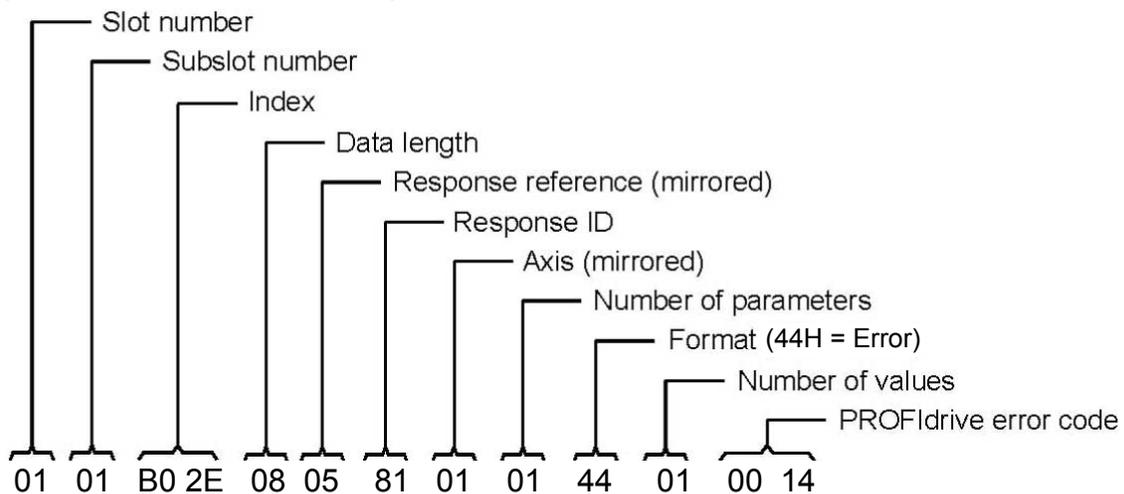
Write Request (Read Parameter Value)



Positive Read Response to Read Request



Negative Response to PROFdrive Read Request



PROFIdrive Profile-Specific Parameters

PROFIdrive parameters contain data of the drive in standard form. The table below describes the supported PROFIdrive parameters.

Parameter	R/W	Data type	Description
922	R	Unsigned16	Telegram selection
944	R	Unsigned16	Fault message counter
947	R	Array [5] Unsigned16	Fault number. (coded according to DRIVECOM profile) Subindex Contents, see parameter 945.
964	R	Array [6] Unsigned16	Device identification Subindex Contents 0 Manufacturer 1 Device type 2 Version 3 Firmware date (year) 4 Firmware date (day/month) 5 Number of Drive Objects (DO)
965	R	Octet String2	Profile number of this device. 0328h = Profile 3, Version 40
967	R	Unsigned16	Control word (CW)
968	R	Unsigned16	Status word (SW)
972	R/W	Unsigned16	Software reset Value Description 0 No action 1 Power-cycle PROFINET IO module The parameter must do a zero-to-one transition and the motor must be stopped.
977	R/W	Unsigned16	Stores parameters to non-volatile memory Value Description 0 No action 1 Stores parameters The parameter must do a zero-to-one transition and the motor must be stopped.
61000	R	VisibleString24	Name of station
61001	R	Unsigned32	IP of station
61002	R	Array [6] Unsigned8	MAC of station
61003	R	Unsigned32	Default gateway of station
61004	R	Unsigned32	Subnet mask of station

Fault Buffer Mechanism

PROFIdrive profile has a mechanism that can store five fault situations to PROFIdrive parameters. Fault and diagnostic data, like fault number and fault code can be accessed simultaneously with only one subindex. The mechanism consists of two PROFIdrive parameters:

- PNU944: Fault message counter
- PNU947: Fault numbers according to value in U2-01

◆ Option High Priority Alarm Codes

These codes are transmitted as Manufacturer Specific Diagnostic high priority alarms that can be seen in the PLC configuration software. These high priority codes are the same codes that appear in the drive manual, except with an offset of 0x1000.

Table 25 PROFINET Option High Priority Alarm Codes

Drive Alarm Code (Hex) <1>	Description	Corrective Action
1000	None	–
1001	DC Bus Fuse Open (PUF)	Output Transistor Failure. Replace the drive
1002	DC Bus Undervolt (Uv1)	Input power fluctuation too large
1003	CTL PS Undervolt (Uv2)	Cycle drive power and replace drive if fault continues
1004	MC Answerback (Uv3)	Cycle drive power and replace drive if fault continues
1005	Short Circuit (SC)	<ul style="list-style-type: none"> • Check drive wiring • Cycle drive power and replace drive if fault continues.
1006	Ground Fault (GF)	Check for motor and/or cable damage
1007	Over Current (oC)	Check motor, motor load and accel/decel rates
1008	DC Bus Overvolt (oV)	<ul style="list-style-type: none"> • Check incoming voltage • Check deceleration time
1009	Heatsink Overtemp (oH)	<ul style="list-style-type: none"> • Check ambient temperature • Check drive cooling fan
100A	Heatsink Max Temp (oH1)	Check drive cooling fan
100B	Motor Overload (oL1)	<ul style="list-style-type: none"> • Check the load, accel/decel and cycle times • Check motor rated current (E2-01)

9 Communication

Drive Alarm Code (Hex) <1>	Description	Corrective Action
100C	Inv Overload (oL2)	<ul style="list-style-type: none"> Check the load, accel/decel and cycle times Check drive rating
100D	Overtorque Det 1 (oL3)	<ul style="list-style-type: none"> Check L6-02 and L6-03 settings Check system mechanics
100E	Overtorque Det 2 (oL4)	<ul style="list-style-type: none"> Check L6-05 and L6-06 settings Check system mechanics
100F	DynBrk Transistor (rr)	Cycle drive power and replace drive if fault continues
1010	DynBrk Resistor (rH)	Check load, operating speed and deceleration time
1011	External Fault 3 (EF3)	<ul style="list-style-type: none"> Multifunction digital input set to external fault Circuit at terminal is closed
1012	External Fault 4 (EF4)	
1013	External Fault 5 (EF5)	
1014	External Fault 6 (EF6)	
1015	External Fault 7 (EF7)	
1016	External Fault 8 (EF8)None	–
1017	Heatsink Fan (FAn)	Check drive cooling fan
1018	Overspeed Det (oS)	<ul style="list-style-type: none"> Check reference and reference gain Check F1-08 and F1-09 settings
1019	Speed Deviation (dEV)	<ul style="list-style-type: none"> Check load, accel/decel times and system mechanics Check F1-10 and F1-11 settings
101A	PGo Open (PGo)None	Check PG card connections-
101B	Input Phase Loss (PF)	Excessive input voltage fluctuation
101C	Output Phase Loss (LF)	<ul style="list-style-type: none"> Check for broken wire/loose terminals Check motor rating
101D	None	–
101E	Operator Disconnected (oPr)	Reconnect the digital operator
101F	EEPROM R/W Error (Err)	Cycle drive power and replace drive if fault continues
1020	None	–
1021	Comm Error (bUS)	<ul style="list-style-type: none"> Check network cable connections Check 24 Vdc power supply voltage
1022		Check option installation and connections.
1023		Cycle drive power and replace option or drive if fault continues.
1024		
1025	Out of Control (CF)	<ul style="list-style-type: none"> Check motor parameters Auto-tune
1027	External Fault 0 (EF0)	<ul style="list-style-type: none"> Check PLC program Check MI switch setting Check option LEDs for fault indication

<1> Drive error code is stored in MEMOBUS/Modbus address 0080 Hex.

◆ Option Low Priority Alarm Codes

These codes are transmitted as Manufacturer Specific Diagnostic low priority alarms that can be seen in the PLC configuration software. These low priority codes are the same codes that appear in the drive manual, except with an offset of 0x1000.

Table 26 PROFINET Option Low Priority Alarm Codes

Drive Alarm Code (Hex) <1>	Description	Drive Alarm Code (Hex) <1>	Description
401	Undervoltage (Uv)	420	MEMOBUS/Modbus Test Mode Fault (SE)
402	Overvoltage (ov)	422	Motor Overheat (oH3)
403	Heatsink Overheat (oH)	427	PID Feedback Loss (FbL)
404	Drive Overheat (oH2)	428	PID Feedback Loss (FbH)
405	Overtorque 1 (oL3)	042A	Drive Disabled (dnE)
406	Overtorque 2 (oL4)	042B	PG Disconnected (PGo)
407	Rum Command Input Error (EF)	431	Option Watchdog Error (E5)
408	Drive Baseblock (bb)	432	Option Station Address Setting Error (AEr)
409	External Fault 3, input terminal S3 (EF3)	433	Option Comm. Cycle Setting Error (CyC)
040A	External Fault 3, input terminal S4 (EF4)	434	High Current Alarm (HCA)
040B	External Fault 3, input terminal S5 (EF5)	435	Cooling Fan Maintenance Time (LT-1)
040C	External Fault 3, input terminal S6 (EF6)	436	Capacitor Maintenance Time (LT-2)
040D	External Fault 3, input terminal S7 (EF7)	438	Option EEPROM Error (EEP)
040E	External Fault 3, input terminal S8 (EF8)	439	External Fault (input terminal S1) (EF1)
040F	Cooling Fan Error (FAn)	043A	External Fault (input terminal S2) (EF2)
410	Overspeed (oS)	043B	Safe Disable Input (HbbF)
411	Excessive Speed Deviation (dEv)	043C	Safe Disable Input (Hbb)
412	PG Disconnected (PGo)	043D	Mechanical Weakening Detection 1 (oL5)
414	MEMOBUS/Modbus Comm. Error (CE)	043E	Mechanical Weakening Detection 2 (UL5)
415	Option Communication Error (bUS)	043F	PLC Alarm (PA1)
416	Serial Comm. Transmission Error (CALL)	440	PLC Alarm (PA2)
417	Motor Overload (oL1)	441	Output Voltage Detection Fault (voF)
418	Drive Overload (oL2)	442	IGBT Maintenance Time (90%) (TrPC)
041A	Option Card External Fault (EF0)	443	Soft Charge Bypass Relay Maintenance Time (LT-3)
041B	Motor Switch Command Input during Run (rUn)	444	IGBT Maintenance Time (50%) (LT-4)
041D	Serial Comm. Transmission Error (CALL)	445	Braking Transistor Overload (boL)
041E	Undertorque Detection 1 (UL3)	448	Motor Overheat (NTC Input) (oH5)
041F	Undertorque Detection 2 (UL4)	449	DriveWorksEZ Alarm (dWAL)

<1> Drive error code is stored in MEMOBUS/Modbus address 0080 Hex.

◆ Identification and Maintenance Functions (I&M)

The purpose of the I&M functions is to provide support for the customer during commissioning, parametrization and repair of the module. SI-EP3 supports I&M function 0, which can be accessed using the Record data object's read request.

Function	Record Data Index
I &M0	0xAFF0

Table 27 I&M0 Device Identification (Read-Only)

Content	Size	Description
Header	10 bytes	-
Vendor ID	2 bytes	PROFINET Vendor ID of Yaskawa, which is 0x019F
Order ID	20 bytes	Order number of the SI-EP3 adapter kit (SI-EP3)
Serial number	16 bytes	Serial number of the adapter
Hardware revision	2 bytes	Hardware revision of the SI-EP3 adapter
Software revision	4 bytes	Revision of the software
Revision counter	2 bytes	Revision number
Profile ID	2 bytes	PROFIdrive (0x3A00)
Profile specific type	2 bytes	No profile specific type (0x0000)
I &M version	2 bytes	Version is 1.1 (0x0101)
Supported I &M functions	2 bytes	I &M0 is supported (0x0001)

◆ Diagnostic and Alarms

SI-EP3 has mechanisms for sending alarms and saving diagnostics data to fault buffer. Alarm will be triggered if the host or drive has faults in communication or operation. There are three types of faults:

Fault	API/Slot/Sub-slot	Channel Error Type
Drive Fault	0x3A00 / 1 / 1	A fault declared in drive

◆ Alarm Mechanism

When a fault or alarm situation occurs in the drive, the SI-EP3 adapter will send an alarm notification, which the master station must acknowledge. *Refer to Alarm Notification on page 42* for details.

Table 28 Alarm Notification

Attribute	Description
BlockHeader	-
AlarmType	PROFINET specific alarm type
API	0x3A00 (PROFIdrive profile)
SlotNumber	Slot number of the Drive Object (DO)
SubslotNumber	Sub-slot number of the sub-slot to which the diagnosis object is related
ModuleIdentNumber	Module Ident number of the DO
SubmoduleIdentNumber	0xFFFF
AlarmSpecifier	Diagnosis type
UserStructureIdentifier	0x8000 (Channel Diagnosis Data)
ChannelNumber	0
ChannelProperties	0x0800 Diagnosis Appears
	0x1000 Diagnosis Disappears
ChannelErrorType	Error code of drive fault or drive alarm

10 Web Interface

The web server interface to the drive option through port 80 allows management of diagnostic information through a standard web browser. The web page is a Java applet that creates a tabbed web page. The available tabs include:</p>
 </div>
 <div data-bbox="57 127 258 266" data-label="List-Group">
 <ul style="list-style-type: none;">
 • Main Tab
 • Drive Status Tab
 • Network Tab
 • Doc links Tab
 • Email Alerts Tab
 • Parameter Access Tab
 • Configuration Tab
 • Custom Tab

 </div>
 <div data-bbox="57 268 811 285" data-label="Text">
 <p>Access the web server interface by typing the IP address of the SI-EP3 option in a web browser address.</p>
 </div>
 <div data-bbox="57 287 286 305" data-label="Text">
 <p>Example: "http://192.168.1.20"</p>
 </div>
 <div data-bbox="57 307 960 339" data-label="Text">
 <p>The SI-EP3 IP Address is available using drive digital operator to access Option Monitors U6-80 to U6-83. *Refer to Option Monitors on page 22* for details.</p>
 </div>
 <div data-bbox="57 352 183 372" data-label="Section-Header">
 <h3>◆ Main Tab</h3>
 </div>
 <div data-bbox="57 379 800 396" data-label="Text">
 <p>The Main tab shows basic option information such as IP address, MAC address, and firmware version.</p>
 </div>
 <div data-bbox="314 408 686 640" data-label="Image">

 <p>The screenshot displays the YASKAWA web interface. At the top, the YASKAWA logo is visible. Below the logo is a horizontal navigation bar with tabs: Main, Drive Status, Network, Doc links, Email Alerts, Parameter Access, Configuration, and Custom. The 'Main' tab is selected. The main content area shows 'Device Information' with the following details:</p>
 <table border="1">
 <tr><td>Protocol:</td><td>Profinet</td></tr>
 <tr><td>Station Name:</td><td></td></tr>
 <tr><td>IP Address:</td><td>192.168.0.100</td></tr>
 <tr><td>MAC ID:</td><td>0:20:B5:24:12:3B</td></tr>
 <tr><td>Product Name:</td><td>SI-EP3</td></tr>
 <tr><td>Option Serial Number:</td><td>123456789</td></tr>
 <tr><td>Option Firmware Version:</td><td>VST800250</td></tr>
 <tr><td>Drive Model:</td><td>CIMR-VU2A0008</td></tr>
 <tr><td>Drive Firmware Version:</td><td>1018</td></tr>
 </table>
 </div>
 <div data-bbox="412 658 596 674" data-label="Caption">
 <p>Figure 17 Main Tab View</p>
 </div>
 <div data-bbox="74 686 657 701" data-label="Text">
 <p>Note: The initial password is yaskawa. To change the password, open the Configuration Tab.</p>
 </div>
 <div data-bbox="57 938 739 954" data-label="Page-Footer">
 <p><small></small></p>
 </div>
 <div data-bbox="57 962 585 979" data-label="Page-Footer">
 <p>YASKAWA SIEPYAICOM25 Rev: A0 Z1000 Bypass Option PROFINET SI-EP3 Technical Manual</p>
 </div>
 <div data-bbox="933 962 964 977" data-label="Page-Footer">
 <p>43</p>
 </div>
 </div>

◆ Drive Status Tab

The Drive Status tab shows basic I/O information and drive state information.



Figure 18 Drive Status Tab View

◆ Network Tab

The Network tab shows the status of the option network traffic and the status of open I/O connections.

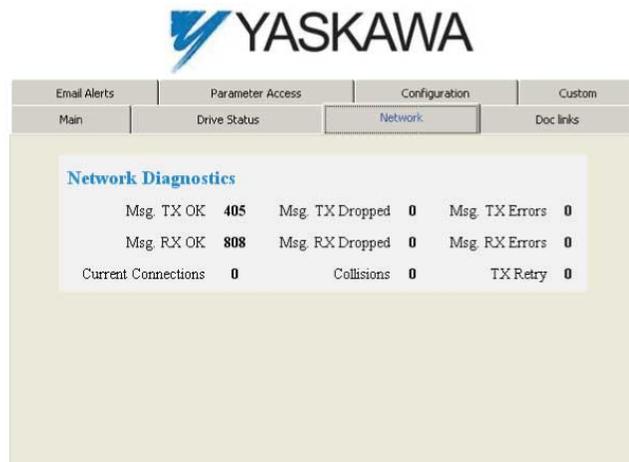


Figure 19 Network Tab View

Table 29 Network Monitor Descriptions

Network Monitor	Explanation
Msg Tx OK	Cumulative number of messages transmit successfully from SI-EP3SI-EP3/V.
Msg Rx OK	Cumulative number of messages received successfully to SI-EP3SI-EP3/V.
Current Connections	Current number of open connections.

Network Monitor	Explanation
Msg Tx Dropped	Cumulative number of messages dropped due to output network buffer being full and unable to hold the new message.
Msg Rx Dropped	Cumulative number of messages dropped due to input network buffer being full and unable to hold the new message.
Collisions	Cumulative number of collisions (half duplex only) reported by the MAC/PHY (Media Access Control/Physical Layer).
Msg Tx Errors	Cumulative number of transmit errors reported by the MAC/PHY (Media Access Control/Physical Layer).
Msg Rx Errors	Cumulative number of receive errors reported by the MAC/PHY (Media Access Control/Physical Layer).
Tx Retry	Cumulative number of retransmits due to busy medium reported by the MAC/PHY (Media Access Control/Physical Layer).

◆ Doc Links Tab

YASKAWA

Document	Description	Link
Installation Guide	SI-EP3/V Profinet for V1000	
Technical Guide	SI-EP3/V Profinet for V1000	
Installation Guide	SI-EP3 Profinet for A1000/E1000/T1000	
Technical Guide	SI-EP23 Profinet for A1000/E1000/T1000	

NOTE: INTERNET CONNECTION REQUIRED TO ACCESS DOCUMENTS

Figure 20 Doc Links Tab View

◆ Email Alerts Tab

The Email Alerts tab allows the user to configure four Email Fault/Alarm conditions. When the condition is true, one email will be sent to the provided email address. Another email will not be sent until the condition becomes false and then true again. A 30-second timer prevents emails from being sent when conditions reoccur immediately after being removed. The timer helps limit the amount of emails sent regarding the same intermittent condition and helps to reduce network traffic by reducing emails about reoccurring errors.

The screenshot displays the 'Email Alerts' configuration page with four conditional email settings. Each setting includes a checkbox for 'Email Active', a title, a condition (parameter, comparator, and value), an email address, a subject, and a message. The settings are as follows:

Conditional Email	Condition	Address	Subject	Message
Conditional Email 1	Frequency Reference >= 3000 OR < 0 Hz	4140000000@email.uscc.net	This works	Is this saved
Conditional Email 2	Frequency Reference >= 3000 OR < 0 Hz	4140000000@email.uscc.net	Got this fault	Hello you, this is a fault, another coming in 30 seconds hopefully.
Conditional Email 3	Frequency Reference < 0 AND < 0 Hz	ToAddress3@ToDomain3	Subject3	Text3
Conditional Email 4	Frequency Reference < 0 AND < 0 Hz	ToAddress4@ToDomain4	Subject4	This is the text for Fault 1.

At the bottom of the interface are two buttons: 'Save to device' and 'Cancel and reload'.

Figure 21 Email Alerts Tab View

■ Procedure: Conditional Email Set-up

1. Define the condition that will trigger the email by selecting a monitor parameter, a comparator, and a value. Set the conditions to send alerts from the “Condition” drop-down selection. If choosing only one condition and no OR or AND are needed, set the “OR/AND” drop-down selection to “NotUsed”.
2. Enter the email address where the alert will be sent.
3. Enter the message that will appear in the email contents.
4. Enter the email subject.
5. Click the “Email Active” check box to enable the alert.

Clicking “Save to device” will save the entered information into the option.

Clicking “Cancel and reload” will cancel any pending edits and display the most recently saved settings from the option board.

◆ Parameter Access Tab

The Parameter Access tab allows the user to read and write parameters from the drive. Write access is restricted until a valid password is entered.

Figure 22 Parameter Access Tab View

The MEMOBUS/Modbus address for the drive parameter being accessed must be entered in hexadecimal. The number must begin with “0x” to signify hexadecimal.

Clicking “Read” will load and display the current value of the given MEMOBUS/Modbus Address. Clicking “Set” will save the given value to the given MEMOBUS/Modbus address.

After a “Read” or “Set” command is given, Status will display “Waiting” while the action is being carried out, then “Complete” is displayed when finished.

◆ Configuration Tab

The Configuration tab sets web page behavior parameters. Access is restricted unless a valid password is entered.

Figure 23 Configuration Tab View

■ Security Login

Enter a valid password and click “Log in”. The button text will change to “Log out” and the status will change to “Logged in”.

Note: The default security password is “yaskawa”.

This password can be changed in the “Change Password” section of the tab. Entering a valid password allows access to the settings in the Configuration tab, Email Alerts tab, and the Parameter Access tab.

■ Change Password

To change the password, enter the new password in the “New Password:” and “Confirm Password:” text boxes then click “Change password”. The Status display will change to “Idle” then “Changing Password” then “Password Changed”. If the passwords in the two text boxes do not match, the Status will display “Passwords don’t match”.

■ Option Card

The values displayed in the various tabs are refreshed at the rate defined in the “Applet Refresh Rate (ms)” text box. Enter values in the range of 1000 ms to 65.535 seconds.

Parameter Security can be enabled or disabled by clicking one of the radio buttons. When “Disabled” is selected, no password is necessary and all functions in the web pages will be available. When “Enabled” is selected, a valid password must be entered to edit email settings and to write parameters.

■ Email Settings

The “Email Server IP” text box must contain the IP address of the email server. The subnet address is configured in drive parameters F7-05 through F7-08. The configured email alerts will use the server at this address when sending emails.

Enter the email server port in the “Email Port” text box.

The value in the “From’ Email Address” text box identifies the origin of the email alerts to the recipient.

Click “Submit Email Parameters” to save the email settings to the option.

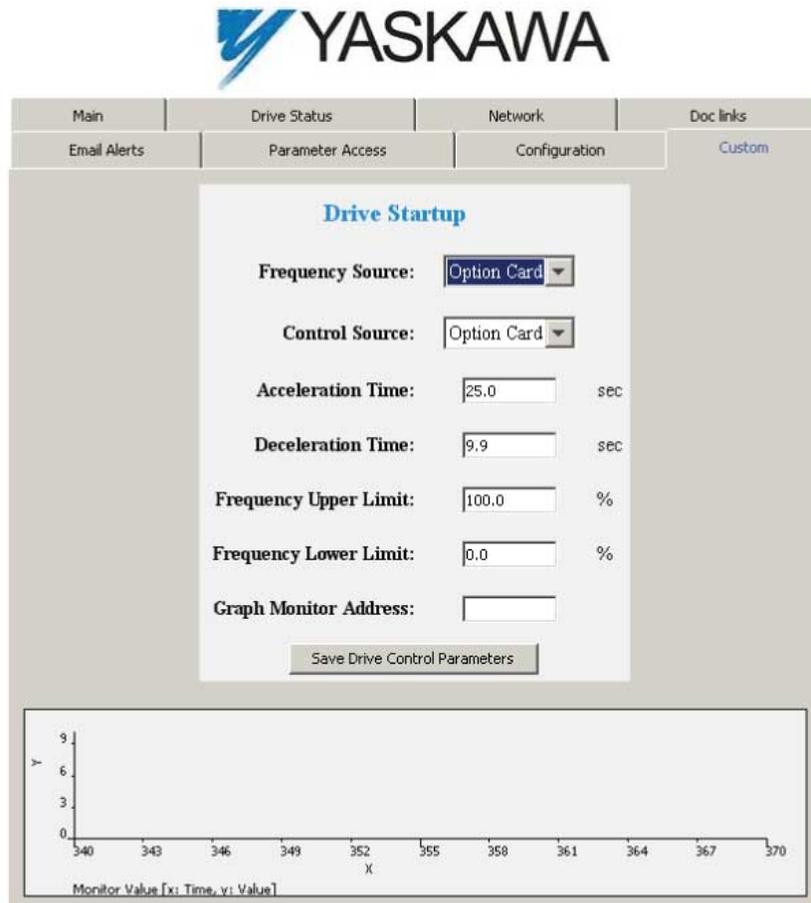
Click “Save Configuration Parameters to Flash” to save the entered values from this tab into non-volatile memory. These values will then be remembered after cycling power.

■ General Settings

Click “Save Option Card Parameters” to save the Applet Refresh Rate and the Parameter Security settings to the option.

◆ Custom Tab

The Custom tab displays a selection of quick setting parameters.



The screenshot displays the YASKAWA web interface. At the top, the YASKAWA logo is visible. Below it, a navigation menu includes 'Main', 'Drive Status', 'Network', and 'Doc links'. Under 'Drive Status', there are sub-menus for 'Email Alerts', 'Parameter Access', 'Configuration', and 'Custom' (which is highlighted in blue). The main content area is titled 'Drive Startup' and contains the following parameters:

- Frequency Source:** Option Card (dropdown menu)
- Control Source:** Option Card (dropdown menu)
- Acceleration Time:** 25.0 sec
- Deceleration Time:** 9.9 sec
- Frequency Upper Limit:** 100.0 %
- Frequency Lower Limit:** 0.0 %
- Graph Monitor Address:** (empty text field)

Below the parameters is a 'Save Drive Control Parameters' button. At the bottom of the interface is a graph area with a vertical axis labeled 'Y' (0 to 9) and a horizontal axis labeled 'X' (340 to 370). The graph is currently empty. Below the graph, the text 'Monitor Value [x: Time, y: Value]' is displayed.

Figure 24 Custom Tab View

11 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the bypass digital operator. Causes of the errors and corrective actions are listed below. Refer to the drive manual for additional error codes that may appear on the bypass digital operator.

■ Faults

Both FB12 (option communication fault) and EF0 (option external fault) can appear as a fault. When a fault occurs, the digital operator ALM LED remains lit. When an alarm occurs, the ALM LED flashes.

If communication stops while the drive is running, use the following questions as a guide to help remedy the fault:

- Is the option properly installed?
- Are the communication lines properly connected to the option? Are the wires loose?
- Is the controller program working? Has the controller/PLC CPU stopped?
- Did a momentary power loss interrupt communications?

Digital Operator Display		Fault Name
<i>EF0</i>	EF0	Option Card External Fault
Cause		Possible Solutions
An external fault was received from the PLC and F6-03 is set to a value other than 3.		<ul style="list-style-type: none"> • Remove the cause of the external fault. • Remove the external fault input from the PLC.

Digital Operator Display		Fault Name
<i>Fb12</i>	Fb12	Option Communication Error
Cause		Possible Solution
Master controller (PLC) has stopped communicating		<ul style="list-style-type: none"> • Check that power is supplied to the PLC • Check that PLC is not in program mode
Communication cable is not connected properly		<ul style="list-style-type: none"> • Check for faulty wiring • Correct any wiring problems
A data error occurred due to noise		<ul style="list-style-type: none"> • Check the various options available to minimize the effects of noise • Counteract noise in the control circuit, main circuit, and ground wiring • If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil • Make sure the cable used meets requirements • Make sure the option ground wire is connected between option FE terminal and the drive ground terminal connected to earth ground
The option is not properly connected to the drive.		Reinstall the option.
Option is damaged		If there are no problems with the wiring and the error continues to occur, replace the option.
Connection Time-out		<ul style="list-style-type: none"> • The option Requested Packet Interval (RPI) timer timed out. • Make sure that RPI time is set properly.
Duplicate IP Address		Check if the option shares IP Address with at least one other node. Check the setting values of F7-01 to F7-04 (IP Address).

■ Minor Faults and Alarms

Digital Operator Display		Minor Fault Name	
[4P]	CyPo	Cycle Power to Active Parameters	
		Comm. Option Parameter Not Upgraded	
Cause		Possible Solutions	Minor Fault (H2-□□ = 10)
Drive is not compatible with the option software version.		Turn off the power and upgrade the communication option parameters. Note: An alarm is triggered when the option software version is earlier or an incompatible option is installed to the drive.	YES

■ Option Fault Monitors U6-98 and U6-99

The option can declare error/warning conditions via bypass monitor parameters on the bypass digital operator as shown in [Table 30](#).

Table 30 Option Fault Monitor Descriptions

Fault Condition	Fault Declared	Status Value (U6-98/U6-99)	Description
No Fault	n/a	0	No faults
Force Fault	EF0	3	Network sent a message to force this node to the fault state.
Network Link Down	BUS ERROR	1300	No network link to option.
Network Failure	BUS ERROR	1301	Connection with PLC Timeout.
Default MAC Address	None	1303	Factory default MAC Address programmed into the option. Return for reprogramming.
No IP Address	None	1304	No IP Address has been programmed into the option.
No Station Name	None	1305	No Station Name has been programmed into the option.
Config Error	None	1306	Configuration error on power-up.
Init. Failure	None	1307	Initialize error on power-up.
Permanent Communication Loss	BUS ERROR	1308	Fatal error in MAC/PHY hardware, requires power cycle to recover.

Two bypass monitor parameters, U6-98 and U6-99 assist the user in network troubleshooting.

- U6-98 displays the first declared fault since the last power cycle. U6-98 is only cleared upon drive power-up.
- U6-99 displays the present option status. U6-99 is cleared upon a network-issued fault reset and upon power-up.

If another fault occurs while the original fault is still active, parameter U6-98 retains the original fault value and U6-99 stores the new fault status value.

YASKAWA Z1000 Bypass Option

Profinet

Technical Manual

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YASKAWA

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

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SIEPYAICOM25

MANUAL NO. SIEPYAICOM25 Rev: A0

Published in USA August 2016 16-8