



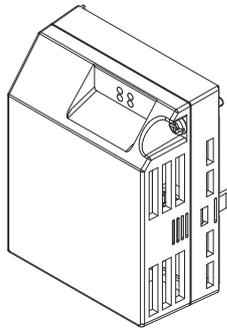
YASKAWA AC Drive V1000 Option

EtherCAT[®]

Installation Manual

Type: SI-ES3 for V1000 Series

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



ATTENTION!

This product can only be used on V1000 drives with firmware version VSV901020 to VSV901099 installed.

Copyright © 2011 YASKAWA EUROPE GMBH

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of YASKAWA. No patent liability is assumed with respect to the use of the information contained herein. Moreover, because YASKAWA is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. YASKAWA assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

V1000 Option EtherCAT

Installation Manual

Table of Contents

| | |
|--|-----------|
| 1 Preface and Safety | 4 |
| 2 Product Overview | 8 |
| 3 Software Parts | 9 |
| 4 Receiving | 10 |
| 5 EtherCAT® Option Components | 11 |
| 6 Installation Procedure | 16 |
| 7 EtherCAT® Option Related Drive Parameters | 24 |
| 8 Object Dictionary | 26 |
| 9 Process Data Objects (PDO) | 29 |
| 10 Fault Diagnosis and Possible Solutions | 31 |
| 11 Specifications | 38 |

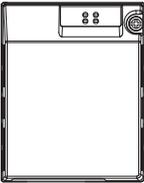
1 Preface and Safety

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 SI-ES3 EtherCAT® Option card:

Option Card

| | |
|---|--|
|  | YASKAWA AC Drive V1000 Option EtherCAT® Installation Manual (this book) Manual No.: YEU TOEP C710606 98A |
| | Read this manual first. The installation manual is packaged with the EtherCAT® Option and contains a basic overview of wiring, settings, functions, and fault diagnoses. |
| | YASKAWA AC Drive V1000 Option EtherCAT® Technical Manual Manual No.: YEU SIEP C710606 98A |
| | The technical manual contains detailed information. To obtain the technical manual access these sites: Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com USA: http://www.yaskawa.com Other areas: contact a Yaskawa representative. |

For the drive setup, refer to one of the documentation listed below.

YASKAWA Drive

| | |
|---|---|
|  | <p>Refer to the manual of the drive this option card is being used with. The instruction manual for the drive covers basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance information. It also includes important information on parameter settings and how to tune the drive. A Quick Start Guide is included with the drive. For the more detailed technical manual, visit YASKAWA's homepage. Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com USA: http://www.yaskawa.com Other areas: contact a YASKAWA representative</p> |
|---|---|

◆ Terms

Note: Indicates supplemental information that YASKAWA highly recommends be followed. Content identified by Note: is not related to personnel safety or equipment damage safety messages.

| | |
|-------------------|---|
| EtherCAT® Option: | YASKAWA AC Drive SI-ES3 EtherCAT® option card |
| EtherCAT®: | Ethernet for Control Automation Technology, an open Ethernet-based network |
| NOID: | Network Option Interface Driver (YASKAWA Interface driver) |
| Online-DRV: | NOID processing mode, process (ctrl/resp) data is active |
| Online-DRVMB: | NOID processing mode, process resp data is active, ctrl data is on hold (Until MEMOBUS process is complete) |
| Online-PRG: | NOID processing mode, NO process (ctrl/resp) data is active |
| Host: | YASKAWA drive 1000 series |
| JTAG: | Joint Test Action Group, an IEEE standard interface test port for test and programming purposes |
| LED: | Light Emitting Diode |
| OPT, Option: | The unit described in this document |
| INV, Inverter: | Host application to OPT |
| PCB: | Printed Circuit Board |
| SPI: | Serial Peripheral Interface Bus |
| FCS: | Frame Check Sequence |
| INVR: | Drive register number |
| ESI: | EtherCAT Slave Information |

1 Preface and Safety

◆ Registered Trademarks

- EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- Other company names and product names listed in this manual are registered trademarks of those companies.

◆ Supplemental Safety Information

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

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions

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

DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

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

NOTICE

Do not expose the drive to halogen group disinfectants.

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

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

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

Do not modify the drive circuitry.

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

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

2 Product Overview

◆ About This Product

The EtherCAT® Option (Model: SI-ES3) is an option card designed to connect the YASKAWA AC drive to an EtherCAT® network. Using this option card and an EtherCAT® master can;

- operate the drive
- monitor the drive operation status
- read or modify drive parameters.

The SI-ES3 option provides instant connectivity to an EtherCAT® network for the YASKAWA V1000 drive. The option contains support for the Velocity mode according the CANopen Device Profile and Motion Control (DSP402) profile. It also contains YASKAWA vendor specific CANopen objects based on the present CANopen option board specification.

The EtherCAT® Option supports the following communication profiles;

- DS 301 Ver. 4.02
- DSP 402 Ver. 3.0 Velocity Mode



EtherCAT Conformance tested

◆ Applicable Models

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

Table E.1 Applicable Models

| Drive Series | Drive Model Number | Software Version <1> |
|--------------|--------------------|------------------------|
| V1000 | CIMR-V□2□□□□□□ | VSV901020 to VSV901099 |
| | CIMR-V□4□□□□□□ | |

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

3 Software Parts

◆ NOID - Network Option Interface Driver

This section explains communication sequences provided by the SI-ES3 option to startup and control the drive.

Functionality provided:

- Startup/initialization of option with the drive.
- Option and drive compatibility/acceptance management.
- Process data parameter (register) mapping.
- Drive <--> Option re-initialization management (remap of process data).
- MEMOBUS channel.
- Error management.
- Drive <- -> Option basic control response data in Online-DRV mode.
- Drive <- -> Option operation mode.

■ Drive/Option Identification Information

This section specifies the option/drive specific identification information exchanged during power-up state of the application driver.

Table E.2 Drive/Option Identification Information

| Setting | Value | Description |
|-------------------------|------------|--|
| Option model code | 0x53455333 | Option mode code, 4-digit ASCII string. Value: SES3=0x53455333 Used by drive to identify what kind of option that is mounted. |
| Option software version | DEC: 24201 | Last 5 decimal digits of decimal option firmware revision. Def: VST9242zz VST9 = V1000 option card 2 = European product 42 = Product code zz = Minor revision |
| Drive model codes | ALL | Drive model codes accepted by option NOID driver. If the provided drive model code does not match the list the option will raise the OFx31 drive error. Option will accept any drive model code. |

4 Receiving

Please perform the following tasks after receiving the EtherCAT® Option:

- Inspect the EtherCAT® Option for damage.
If the EtherCAT® Option appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the PCB.
- If you have received the wrong model or the EtherCAT® Option does not function properly, contact your supplier.

◆ Contents and Packaging

Table E.3 Option Package Contents

| Description: | Option Card | Ground Cable | Installation Manual |
|--------------|---|---|---|
| |  |  |  |
| Quantity: | 1 | 4 | 3 |

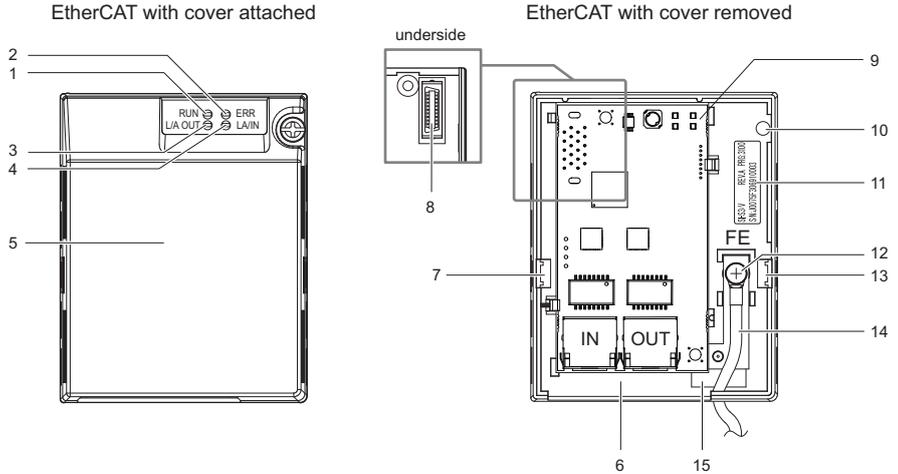
◆ Tool Requirements

A Phillips screwdriver PH1(#1) or PH2(#2) is required to install the EtherCAT® option.

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

5 EtherCAT® Option Components

◆ EtherCAT® Option



Option Unit

- | | |
|--|---|
| 1 - LED (RUN) | 9 - EtherCAT PCB |
| 2 - LED (ERR) | 10 - Attachment screw hole for option cover |
| 3 - LED (L/A OUT) | 11 - Nameplate |
| 4 - LED (L/A IN) | 12 - Function Earth wire connection (FE) |
| 5 - Option Cover | 13 - Mounting clip |
| 6 - Communication cable connector (RJ45) | 14 - Wire |
| 7 - Mounting clip | 15 - Through-hole for wire |
| 8 - Option board connector | |

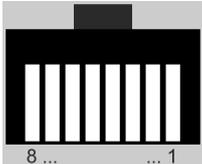
Refer to EtherCAT® Option Status LEDs on page 12 for details on the LEDs.

5 EtherCAT® Option Components

◆ Communication connector

The EtherCAT® Option is connected to the network using a RJ45 connector. The pin assignment is explained in [Table E.4](#).

Table E.4 Communication connector (RJ45)

| EtherCAT® Connector | Pin | Signal | Description |
|---|-----|--------|--|
|  | 1 | TD+ | Send data |
| | 2 | TD- | |
| | 3 | RD+ | Receive data |
| | 4 | – | N.C. (Pins denoted as N.C. do not connect to any signal) |
| | 5 | – | N.C. (Pins denoted as N.C. do not connect to any signal) |
| | 6 | RD- | Receive data |
| | 7 | – | N.C. (Pins denoted as N.C. do not connect to any signal) |
| | 8 | – | N.C. (Pins denoted as N.C. do not connect to any signal) |
| Housing | – | Shield | |

◆ EtherCAT® Option Status LEDs

The EtherCAT® Option has four LEDs that indicate the communication status. The indications conform with DS303, Part 3: Indicator Specification.

■ LEDs L/A OUT and L/A IN: Ethernet Link/Activity 1 and 2

The Link/Activity indicators show the status of the physical link and show activity on the link period

■ RUN LED

A green lit EtherCAT® RUN LED indicates the status of the EtherCAT® network state machine.

A red lit EtherCAT® RUN LED is only used by the NOID firmware loader, refer to [Table E.5](#).

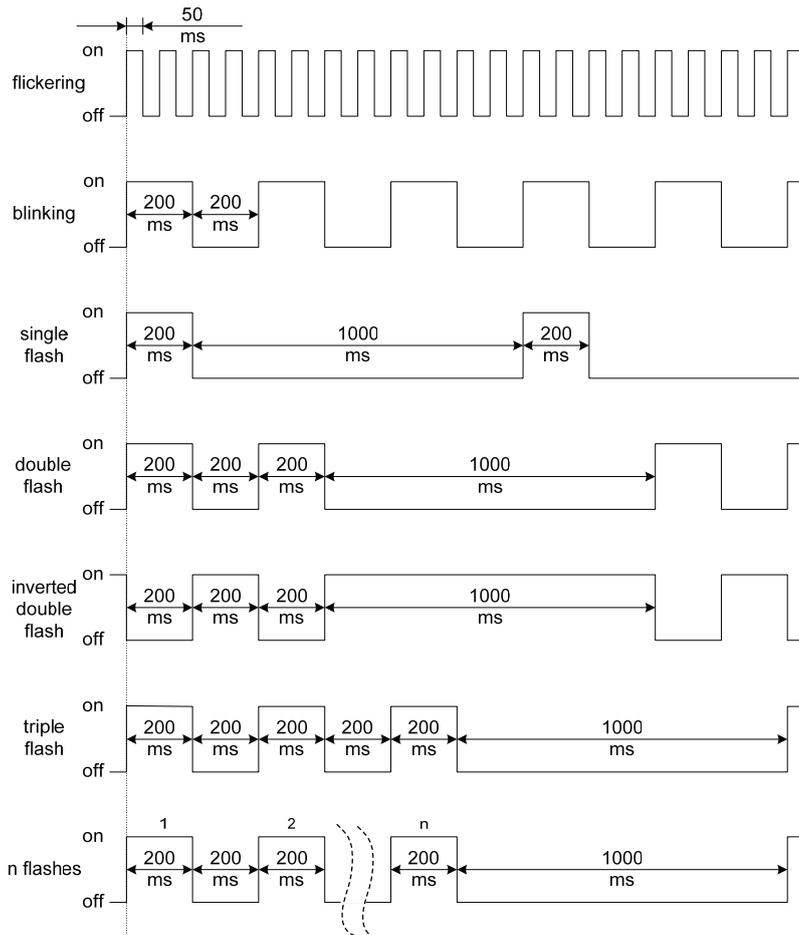
■ EtherCAT® ERROR indicator

The red EtherCAT® error LED indicates the presence of any errors.

Table E.5 UNDERSTANDING THE STATUS LEDS

| LED | Color | Display | Meaning |
|-------------------|-------|----------------------------|--|
| Link Activity 1/2 | - | Continuously Off | No link. The communication cable is not physically connected. The EtherCAT® controller is not started up. |
| | Green | Continuously On | The module is connected to Ethernet. A communication cable is physically connected, but no data are being exchanged. |
| | | Flickering | There is traffic on Ethernet, data are being exchanged |
| RUN | - | Continuously Off | The device is in Init state |
| | Green | Blinking | The device is in Pre-Operational State (flashing rate about 2.5 Hz) |
| | | Single flash | The device is in Safe-Operational State (one short flash (approximately 200 ms) followed by a long off condition (approximately 1000 ms)) |
| | | Continuously On | The device is in Operational State |
| | Red | Blinking (1 Hz or 6 Hz) | The Option BOOT or APP firmware is executing the NOID firmware loader. 1 Hz: Firmware loader protocol in IDLE state (waiting for commands from the drive) 6 Hz: Firmware loader protocol is processing commands. |
| ERR | Red | Continuously Off | No link. The EtherCAT® communication is in working condition. |
| | | Blinking | General configuration error |
| | | Single flash | The slave device application has changed the EtherCAT® state autonomously: The parameter "Change" in the AL status register is set to 0x01: change/error. Single flash is one short flash (approximately 200 ms) followed by a long off phase (approximately 1000 ms). |
| | | Double flash | The sync manager watchdog timeout has occurred. Double flash is two short flashes (approximately 200 ms each), separated by an off condition (approximately 200 ms), and then a long off phase (approximately 1000 ms) |
| | | Continuously On | Possible causes: 1. An EtherCAT® PDI (Process Data Interface) error has occurred, the NOID application interface has failed. 2. An option card FATAL event has occurred (system has stalled execution, see EtherCAT® vendor object 0x4000 for the cause). |
| | | Blinking (1 Hz or 6 Hz) | The option BOOT or APP firmware is executing the NOID firmware loader. 1Hz: Firmware loader protocol in IDLE state (waiting for commands from drive) 6Hz: Firmware loader protocol is processing commands. |

Figure E.3 explains the indicator flash rates.



LED Flash Rates and Meaning

◆ DSP402 functionality

This part manages the DSP402 drive profile functionality in the option and converts the control/status data into drive specific control/status data.

◆ Vendor specific CANopen objects

This part integrates the vendor specific CANopen object model into EtherCAT®.

◆ Error management

This part processes drive and EtherCAT® specific errors and assures that all faults process and propagate properly to the drive/EtherCAT® network.

◆ EtherCAT® processing stack

The "EtherCAT® Slave example code" from the EtherCAT® technology group (ETG) is used as a main base in this project. It is internally adopted to fit the product.

6 Installation Procedure

◆ Section Safety

DANGER

Electric Shock Hazard

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

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

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

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

WARNING

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

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

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

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

Do not touch the option card while the power supply to the drive is switched on.

Failure to comply could result in death or serious injury.

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

Failure to comply could result in death or serious injury.

NOTICE

Damage to Equipment

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

Failure to comply may result in ESD damage to circuitry.

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

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

NOTICE

Do not operate damaged equipment.

Failure to comply may cause further damage to the equipment.

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

Tighten all terminal screws to the specified tightening torque.

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

Do not use unshielded cable for control wiring.

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

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

Properly connect all pins and connectors.

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

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

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

6 Installation Procedure

◆ Prior to Installing the Option Card

Prior to installing the EtherCAT® Option, wire the drive and make necessary connections to the drive terminals. For more information on wiring and connecting the drive, refer to the manual packaged with the drive. Verify that the drive runs normally without the option installed.

◆ Installing the Option Unit

Remove the front cover of the drive before installing the EtherCAT® 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 EtherCAT® 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 EtherCAT® Option cover in step 8.

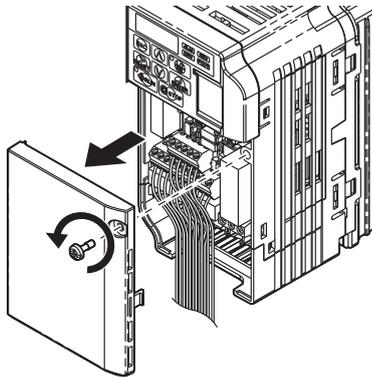
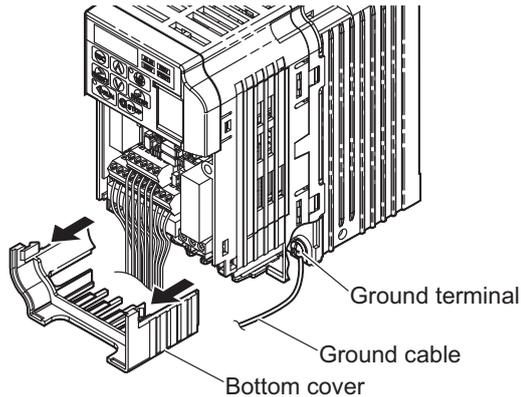


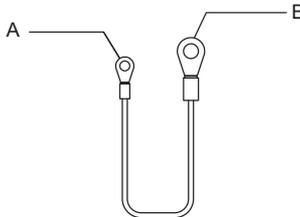
Figure 1 Remove Front Cover

3. Remove the bottom cover and connect the EtherCAT® Option ground wire to the ground terminal.



Connect Ground Wire

Note: The four different ground wires packaged with the EtherCAT® Option connect the unit to different drive models. Select the proper ground wire from the EtherCAT® Option kit depending on drive size. *Refer to [Ground Wire Selection on page 20](#).*



- 1 – Option unit connection: screw size = M3
- 2 – Drive-side connection: screw size = M3.5 to M6

Ground Wire

6 Installation Procedure

Table E.1 Ground Wire Selection

| Ground Wire Length (mm/in) | Drive Model CIMR-VU | | |
|-------------------------------|--------------------------------------|--------------------------------------|--|
| | Single-Phase 200 V Class | Three-Phase 200 V Class | Three-Phase 400 V Class |
| 150/5.9 | BA0001 BA0002 BA0003 | 2A0001 2A0002 2A0004 2A0006 | - |
| 200/7.9 | BA0006 BA0010 BA0012 BA0018 | 2A0010 2A0012 2A0020 | 4A0001 4A0002 4A0004 4A0005 4A0007 4A0009 4A0011 |
| 250/9.8 | - | 2A0030 2A0040 | 4A0018 4A0023 |
| 400/15.7 | - | 2A0056 2A0069 | 4A0031 4A0038 |

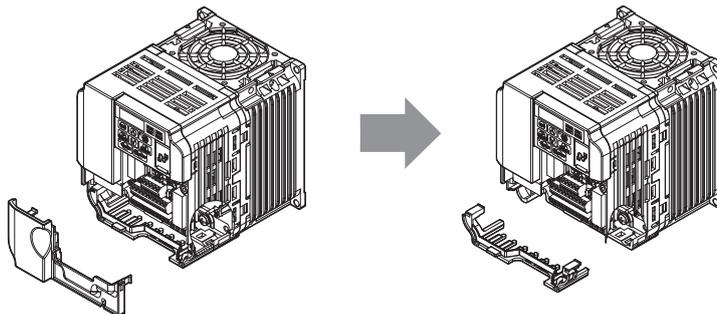
Note: Cover removal steps for certain larger models of V1000 with a Terminal Cover:

-Single-Phase 200 V Class: CIMR-VUBA0006 to BA0018

-Three-Phase 200 V Class: CIMR-VU2A0008 to 2A0069

-Three-Phase 400 V Class: All models

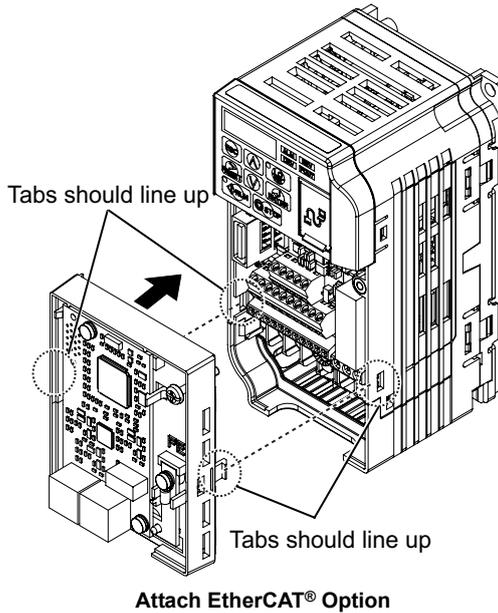
Remove the terminal cover before removing the bottom cover to install the EtherCAT® Option. Replace the terminal cover after wiring the EtherCAT® Option.



Models with Terminal Cover

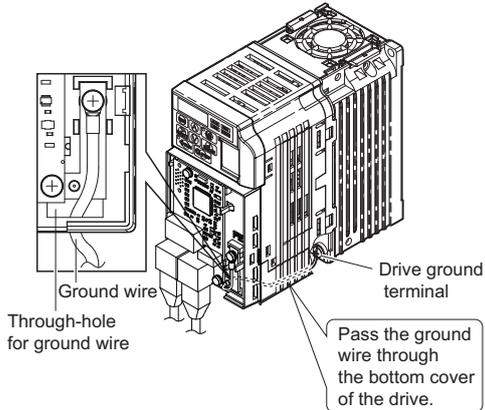
6 Installation Procedure

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



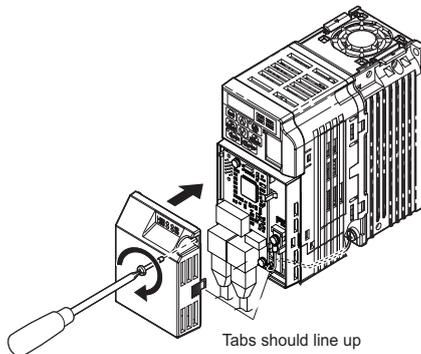
6 Installation Procedure

6. Connect the ground wire between the drive ground terminal and the EtherCAT® Option ground. When wiring the EtherCAT® Option, pass the ground wire through the inside of the drive bottom cover, then pass the ground wire into the through-hole for the ground wire at the front of the EtherCAT® Option.



Ground Wire Connection

7. Connect the communication wire to the EtherCAT® Option modular connector.
8. Attach the EtherCAT® Option cover to the front of the EtherCAT® Option.



Attach Cover

◆ Communication Cable Specifications

To ensure proper performance, YASKAWA recommends using EtherCAT® dedicated Cat5e communication cables.

◆ Network Termination

The EtherCAT® network does not require a termination resistor if the drive is the last node in the network. Network termination is realized by the ASIC of the EtherCAT® option card.

◆ ESI File

For easy network implementation of drives equipped with an EtherCAT® Option, the ESI file can be obtained from:

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

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

USA: <http://www.yaskawa.com>

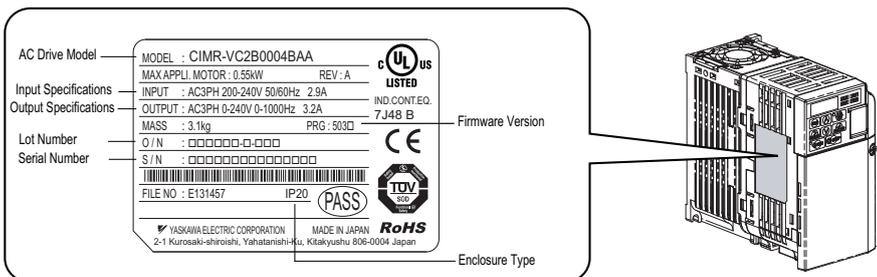
Other areas: contact a YASKAWA representative

◆ Identification of Drive Firmware Version

1. Read out firmware version from drive digital operator.

Check monitor parameter U1-25 when the drive is switched ON. The display shows the last four digits of the firmware version and the value should be in the range of 1020 ~ 1099.

2. Verifying firmware version on drive nameplate



Verifying firmware version on drive nameplate

7 EtherCAT® Option Related Drive Parameters

The drive parameters listed in [Table E.2](#) have influence on some functions of the SI-ES3 option card. Check these parameters before starting network communications.

Table E.2 Parameter Settings

| No. | Name | Description | Default |
|--------------|--|--|---------|
| b1-01 <1> | Frequency Reference Selection | Selects the frequency reference input source 0: Operator - Digital preset speed d1-01 to d1-17 1: Terminals - Analog input terminals 2: MEMOBUS/Modbus communications 3: Option card 4: Pulse Input (Terminal RP) | <6> |
| b1-02 <1> | Run Command Selection | Selects the run command input source 0: Digital Operator - RUN and STOP keys 1: Digital input terminals S□ 2: MEMOBUS/Modbus communications 3: Option card | 1 |
| E2-04 <2> | Motor 1 Motor Poles | Set the number of motor poles described on the motor nameplate. 2 to 48 | 4 |
| F6-01 | Operation Selection after Communications Error | Determines drive response when a bUS error is detected during communications with the EtherCAT® Option 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <3> | 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 EtherCAT® communication 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <3> | 1 |
| F6-06 <4> | Torque Reference/Torque Limit selection from Communications Option | 0: Torque reference/torque limit via network communications are disabled. 1: Torque reference/torque limit via network communications are enabled. <5> | 0 |
| F6-07 | NetRef/ComRef Selection Function | 0: Multi-step speed reference disabled (F7 mode) 1: Multi-step speed reference allowed (V7 mode) | 0 |

7 EtherCAT® Option Related Drive Parameters

| No. | Name | Description | Default |
|--------------|--|---|---------|
| F6-08 | Reset Communication Related Parameters | <p>Determines if communication-related parameters are set back to their original default values when the drive is initialized.</p> <p>0: Do not reset F6-□□ and F7-□□ parameters when the drive is initialized using parameter A1-03.</p> <p>1: Rest F6-□□ and F7-□□ parameters when the drive is initialized using parameter A1-03.</p> <p>Note: Setting this parameter does not affect communication-related parameters. Setting this parameter only determines if communication-related parameters (F6-□□ and F7-□□) are also reset when A1-03 is used to initialize the drive.</p> | 0 |
| o1-03 <7> | Digital Operator Display Selection | <p>Sets the units to display the frequency reference and output frequency.</p> <p>0: 0.01 Hz</p> <p>1: 0.01% (100% = E1-04)</p> <p>2: r/min (enter the number of motor poles to E2-04/E4-04/E5-04)</p> <p>3: User defined by parameters o1-10 and o1-11</p> | <6> |

- <1> To start and stop the drive from an EtherCAT® master device using serial communications, set b1-02 to 3. To control the frequency reference of the drive via the master device, set b1-01 to 3.
- <2> E2-04 is necessary to set up when the Drive Profile DSP402 objects are used.
- <3> If 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.
- <4> This parameter might not appear in certain drives. Furthermore its availability is limited to depending on the control mode selection. For details refer to the technical manual for the drive the option card is used with.
- <5> If the drive is set to receive the torque reference/limit from the network (F6-06 = 1) make sure the value is set appropriately by the controller. If no torque reference/limit value is entered the motor will not produce torque.
- <6> The default value depends on the drive used and/or the drive software version. For details refer to the technical manual for the drive.
- <7> Changing o1-03 changes the units for input object 2010 (Hex) (frequency reference), output object 2110 (Hex) (output frequency) and 2200 (Hex) (motor speed). Furthermore o1-03 must be set to 2 and E2-04 must be set to the correct value in order to use the Drive Profile DSP402.

8 Object Dictionary

◆ Object Dictionary Overview

The Object Dictionary consists of three sections:

- Communication Profile Objects
- Manufacturer Specific Profile Objects
- Drive and Motion Profile Objects

The tables below give an overview of the communication objects available in the SI-ES3 option. Refer to the page references given for further details on each object.

■ Communication Profile Objects (DSP 301)

| Index (Hex) | Name |
|-------------|---------------------------------|
| 1000 | Device Type |
| 1001 | Error Register |
| 1003 | Pre-defined Error Field |
| 1008 | Manufacturer Device Name |
| 1009 | Manufacturer Hardware Version |
| 100A | Manufacturer Software Version |
| 1010 | Store Parameters |
| 1011 | Restore Default Parameters |
| 1018 | Identity Object |
| 1600 - 1628 | Receive PDO Mapping |
| 1A00 - 1A28 | Tranmit PDO mapping |
| 1C00 | Sync Manager Communication Type |
| 1C12 | Sync Manager RxPDO assign |
| 1C13 | Sync Manager TxPDO assign |

■ Manufacturer Specific Profile Objects (DS 301)

| Index (Hex) | | Content |
|-------------|-----------------------------|---|
| Input | 2000 | Operation Command |
| | 2010 | Speed Command |
| | 2020 | Torque Limit |
| | 2030 | Torque Compensation |
| | 2040 | MEMOBUS/Modbus Read Command |
| | 2050 | MEMOBUS/Modbus Write Command |
| | 2060 | MEMOBUS/Modbus Unlimited Enter Command |
| | 2070 | MEMOBUS/Modbus Limited Enter Command |
| | 2080 | Selectable (default: none) |
| | 2090 | Selectable (default: none) |
| | 20A0 | Selectable (default: none) |
| | 20B0 | Selectable (default: none) |
| | 20C0 | Selectable (default: none) |
| | 20D0 | FM analog output 1 |
| | 20F0 | Multi-function DO output |
| | 3000 | Selectable (default: none) |
| 3100 | Selectable (default: none) | |
| Output | 2100 | Drive Status |
| | 2110 | Output Frequency |
| | 2120 | Output Current |
| | 2130 | Output Torque |
| | 2140 | MEMOBUS/Modbus Read Command Response |
| | 2150 | MEMOBUS/Modbus Write Command Response |
| | 2155 | PDO Parameter Write Response |
| | 2160 | MEMOBUS/Modbus Not Limited Enter Command Response |
| | 2180 | Selectable (default: Input terminal status) |
| | 2190 | Selectable (default: Analog input 1 monitor) |
| | 21A0 | Selectable (default: none) |
| | 21B0 | Selectable (default: none) |
| | 21C0 | Selectable (default: none) |
| | 21E0 | Selectable (default: none) |
| | 21D0 | Selectable (default: none) |
| | 21F0 | Selectable (default: none) |
| | 2200 | Motor Speed |
| | 2210 | DC Bus Voltage |
| | 2220 | Analog input monitor A1 |
| | 2240 | Analog input monitor A2 |
| | 2270 | Inverter DI Input |
| 4000 | Option NVS FATAL Record | |
| 4001 | Option Info + Status Record | |

8 Object Dictionary

■ Drives and Motion Profile Objects (DSP 402)

| Object Type | Index (Hex) | Name |
|----------------|----------------|----------------------------|
| Common Entries | 60FD | Digital Inputs |
| | 60FE | Digital Outputs |
| Device Control | 6040 | Controlword |
| | 6041 | Statusword |
| | 6060 | Modes of operation |
| | 6061 | Modes of operation display |
| Velocity Mode | 6042 | v1 target velocity |
| | 6043 | v1 velocity demand |
| | 6044 | v1 control effort |
| | 6046 | v1 velocity min max amount |
| | 6048 | v1 velocity acceleration |
| | 6049 | v1 velocity deceleration |
| | 604A | v1 velocity quick stop |
| | 604C | v1 dimension factor |
| 604D | v1 pole number | |

9 Process Data Objects (PDO)

PDOs (Process Data Object) will be used for I/O exchange. PDOs are mapped to objects during configuration (PRE-OPERATIONAL state).

TxPDOs are used to transfer data from the option card and RxPDOs are used to transfer data to the option card.

The module supports at least 8 parameters mapped to RxPDO and 8 parameters mapped to TxPDO.

◆ PDOs and Default PDO Setup

The drive supports 15 Receive and 16 Transmit PDOs. The tables below show available PDOs, their default settings and the objects required to set up when changing the PDO configuration or the PDO mapping.

■ Transmit PDOs (TxPDO)

The Transmit PDOs have a default mapping according to the table below. They can be remapped by the end user by writing to map objects 0x1A00-0x1A28, please see [page 26](#).

| PDO number | Transmit PDO Mapping | |
|------------|--|-------------|
| | Mapped objects (Hex) | Index (Hex) |
| 1 | Sub-index 1: 0x6041#0, 2-bytes (DSP402 status word) | 0x1A00 |
| 2 | Sub-index 1: 0x6041#0, 2-bytes (DSP402 status word) Sub-index 2: 0x6061#0, 2-bytes, (DSP402 Modes of operation display) | 0x1A01 |
| 6 | Sub-index 1: 0x6041#0, 2-bytes (DSP402 status word) Sub-index 2: 0x6044#0, 2-bytes, (v1 control effort) | 0x1A05 |
| 7 | Sub-index 1: 0x6041#0, 2-bytes (DSP402 status word) Sub-index 2: 0x60FD#0, 4-bytes, (Digital inputs) | 0x1A06 |
| 21 | Sub-index 1: 0x6042#0, 2-bytes (v1 target velocity) | 0x1A14 |
| 22 | Sub-index 1: 0x6043#0, 2-bytes (v1 velocity demand) | 0x1A15 |
| 23 | Sub-index 1: 0x6048#1, 4-bytes (v1 Accel delta speed) Sub-index 2: 0x6048#2, 2-bytes, (v1 Accel delta time) | 0x1A16 |
| 24 | Sub-index 1: 0x6049#1, 4-bytes (v1 Decel delta speed) Sub-index 2: 0x6049#2, 2-bytes, (v1 Decel delta time) | 0x1A17 |
| 25 | Sub-index 1: 0x604A#1, 4-bytes (v1 quick-stop delta speed) Sub-index 2: 0x604A#2, 2-bytes, (v1 quick-stop delta time) | 0x1A18 |
| 26 | Sub-index 1: 0x604C#1, 4-bytes (v1 Dimension factor) Sub-index 2: 0x604C#2, 4-bytes, (v1 Dimension factor) | 0x1A19 |
| 36 | Sub-index 1: 0x2100#1, 2-bytes (Drive status) | 0x1A23 |
| 37 | Sub-index 1: 0x2110#1, 2-bytes (Output frequency) | 0x1A24 |
| 38 | Sub-index 1: 0x2120#1, 2-bytes (Output current) | 0x1A25 |
| 39 | Sub-index 1: 0x2130#1, 2-bytes (Output torque reference) | 0x1A26 |
| 40 | Sub-index 1: 0x2140#1, 2-bytes (MEMOBUS/Modbus read response) | 0x1A27 |
| 41 | Sub-index 1: 0x2150#1, 2-bytes (MEMOBUS/Modbus write response) | 0x1A28 |

9 Process Data Objects (PDO)

■ Receive PDOs (RxPDO)

The Receive PDOs have a default mapping according to the table below. The end user can re-map Receive PDOs by writing to the map objects 0x1600-1628, refer to n Communication Profile Objects (DSP 301).

| PDO number | Receive PDO Mapping | |
|------------|--|-------------|
| | Mapped objects (Hex) | Index (Hex) |
| 1 | Sub-index 1: 0x6040#0, 2-bytes (DSP402 control word) | 0x1600 |
| 2 | Sub-index 1: 0x6040#0, 2-bytes (DSP402 control word) Sub-index 2: 0x6060#0, 1-bytes, (DSP402 Modes of operation) | 0x1601 |
| 6 | Sub-index 1: 0x6040#0, 2-bytes (DSP402 control word) Sub-index 2: 0x6042#0, 2-bytes, (v1 target velocity) | 0x1605 |
| 7 | Sub-index 1: 0x6040#0, 2-bytes (DSP402 control word) Sub-index 2: 0x60FE#1, 4-bytes, (Physical digital outputs) | 0x1606 |
| 8 | Sub-index 1: 0x6040#0, 2-bytes (DSP402 control word) Sub-index 2: 0x6060#0, 1-bytes, (DSP402 Modes of operation) | 0x1607 |
| 21 | Sub-index 1: 0x6048#1, 4-bytes (v1 Accel delta speed) Sub-index 2: 0x6048#2, 2-bytes, (v1 Accel delta time) | 0x1614 |
| 22 | Sub-index 1: 0x6049#1, 4-bytes (v1 Decel delta speed) Sub-index 2: 0x6049#2, 2-bytes, (v1 Decel delta time) | 0x1615 |
| 23 | Sub-index 1: 0x604A#1, 4-bytes (v1 quick-stop delta speed) Sub-index 2: 0x604A#2, 2-bytes, (v1 quick-stop delta time) | 0x1616 |
| 24 | Sub-index 1: 0x604C#1, 4-bytes (v1 Dimension factor) Sub-index 2: 0x604C#2, 4-bytes, (v1 Dimension factor) | 0x1617 |
| 36 | Sub-index 1: 0x2000#1, 2-bytes (Operation command) | 0x1623 |
| 37 | Sub-index 1: 0x2010#1, 2-bytes (Speed reference/limit) | 0x1624 |
| 38 | Sub-index 1: 0x2020#1, 2-bytes (Torque reference/limit) | 0x1625 |
| 39 | Sub-index 1: 0x2030#1, 2-bytes (Torque compensation) | 0x1626 |
| 40 | Sub-index 1: 0x2040#1, 4-bytes (MEMOBUS/Modbus read request) | 0x1627 |
| 41 | Sub-index 1: 0x2050#1, 4-bytes (MEMOBUS/Modbus write request) | 0x1628 |

10 Fault Diagnosis and Possible Solutions

◆ EtherCAT® Option Card Error Codes

The following error codes will be shown in object 1003, subindex 01 if the correspondent error occurred on the drive.

■ Inverter and CANopen/EtherCAT® Faults

■ Emergency Object (EMCY)

The emergency object is used for sending fault information from the communication module to the CANopen/EtherCAT® network.

The emergency object is triggered by a fault event from the host or the option card itself. An emergency object is transmitted only once per 'error event'.

Emergency error codes are specified for a number of events. Emergency word specification:

Table E.3 Emergency Word Specification

| Byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------|----------------------|------------------------------|--|---|---|---|---|---|
| Content | Emergency error code | Error register object 0x1001 | Manufacturer specific error info. Not used. Set to zero. | | | | | |

■ Emergency Messages, DSP301 & DSP402

The error codes specified in the list below can be read from CANopen object 0x1003 (Pre-defined error field)

Table E.4 Error Codes

| Error Code (Hex) | Meaning | Drive Display | INVR:0x0080 Enum Value |
|------------------|-----------------------------------|---------------|------------------------|
| 0000 | No error | No error | 0x00 |
| 3220 | DC bus undervoltage | Uv1 | 0x02 |
| 5200 | Control power supply undervoltage | Uv2 | 0x03 |
| 3221 | DC bus charging circuit fault | Uv3 | 0x04 |
| 2330 | Ground fault | GF | 0x06 |
| 2220 | Over current | oC | 0x07 |
| 3210 | DC bus overvoltage | ov | 0x08 |
| 4280 | Heatsink overheat | oH | 0x09 |
| 4210 | Heatsink overheat | oH1 | 0x0A |

10 Fault Diagnosis and Possible Solutions

| Error Code (Hex) | Meaning | Drive Display | INVR:0x0080 Enum Value |
|------------------|--|---------------|------------------------|
| 2310 | Motor overload | oL1 | 0x0B |
| 2221 | Drive overload | oL2 | 0x0C |
| 2311 | Overtorque detection 1 | oL3 | 0x0D |
| 2312 | Overtorque detection 2 | oL4 | 0x0E |
| 5420 | Braking transistor fault | rr | 0x0F |
| 4410 | Internal braking resistor overheat | rHI | 0x10 |
| 5441 | External fault 3 | EF3 | 0x11 |
| 5442 | External fault 4 | EF4 | 0x12 |
| 5443 | External fault 5 | EF5 | 0x13 |
| 5444 | External fault 6 | EF6 | 0x14 |
| FF17 | Cooling FAN fault | FAn | 0x17 |
| 7180 | Motor over speed (control mode using PG) | oS | 0x18 |
| 8321 | Speed deviation (control mode using PG) | dEv | 0x19 |
| 7305 | PG fault (control mode using PG) | PGo | 0x1A |
| 3130 | Input phase loss | PF | 0x1B |
| 3300 | Output phase loss | LF | 0x1C |
| FF01 | Motor overheat alarm | oH3 | 0x1D |
| 5300 | Digital operator disconnected | oPr | 0x1E |
| 5530 | EEPROM error | Err | 0x1F |
| FF08 | MEMOBUS/Modbus Error | CE | 0x21 |
| FF07 | BUS error | bUS | 0x22 |
| FF06 | Control fault | CF | 0x25 |
| 5481 | Fault input from option card | EF0 | 0x27 |
| FF02 | PID feedback lost | FbL | 0x28 |
| FF03 | Undertorque detected 1 | UL3 | 0x29 |
| FF04 | Undertorque detected 2 | UL4 | 0x2A |
| FF05 | High slip braking OL | oL7 | 0x2B |
| FF31 | Intermediary voltage fault | VCF | 0x31 |
| FF36 | Output current imbalance | LF2 | 0x36 |
| FF3B | Too many speed search restarts | SEr | 0x3B |
| FF41 | PID feedback loss | FbH | 0x41 |
| FF0D | External fault at input terminal S1 | EF1 | 0x42 |
| FF0E | External fault at input terminal S2 | EF2 | 0x43 |
| FF44 | Mechanical weakening detection 1 | oL5 | 0x44 |
| FF45 | Mechanical weakening detection 2 | UL5 | 0x45 |

| Error Code (Hex) | Meaning | Drive Display | INVR:0x0080 Enum Value |
|------------------|---------------------------------------|---------------|------------------------|
| FF46 | Current offset fault | CoF | 0x46 |
| FF47 | Programming Error 1 | PE1 | 0x47 |
| FF49 | Current offset fault | dWFL | 0x49 |
| 6301 | Error during object content selection | - | - |

◆ SDO Abort Codes

SDO abort codes are supported as specified in DS301. Additionally the abort codes listed below are implemented.

Table E.5 SDO Abort Codes

| SDO Abort Code | Description |
|-----------------|---|
| 0602 0010 (Hex) | Consecutive MEMOBUS/Modbus Read/Write/Enter commands are sent but the wait time between messages is too short. |
| | A MEMOBUS/Modbus Read or Write Response (2140 (Hex) and 2150 (Hex)) was attempted but no or an incorrect MEMOBUS/Modbus address has been written to object 2040 (Hex) or 2050 (Hex) before. |
| | A MEMOBUS/Modbus write request has been sent during DC bus under voltage. |
| 0602 0022 (Hex) | Drive Profile DSP402 is used and a value is written to object 6042 (Hex) (v1 Target Velocity) while the drive status is not "Operation Enable". |
| | Object 2155 (Hex) is tried to be read while the SI-ES3 option is not in "Operational" state. |
| | A MEMOBUS/Modbus Read or Write command (2040 (Hex) and 2050 (Hex)) was performed with an invalid MEMOBUS/Modbus address. |

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive's digital operator. Causes of the errors and corrective actions are listed in [Table E.6](#) and [Table E.4](#). For additional error codes, refer to the technical manual for the drive.

The bUS (EtherCAT® Option Communication Error) and EF0 (External Fault Input from the EtherCAT® Option) may appear as an alarm or a fault. If they occur as an alarm, the "ALM" LED on the drive digital operator will blink and the alarm code will flash in the display. When these occur as a fault, the "ALM" LED will light and the display will show the fault code.

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

- Is the EtherCAT® Option properly installed?
- Is the communication line properly connected to the EtherCAT® Option? Is it loose?

10 Fault Diagnosis and Possible Solutions

- Is the controller program working? Has the controller CPU stopped?
- Did a momentary power loss interrupt communications?

■ Faults

Table E.6 lists possible faults when using a communication option. The drive's fault contact will close if one of these faults occur.

Table E.6 Fault Display and Possible Solutions

| Digital Operator Display | | Fault Name |
|--|-----|--|
| bUS | bUS | EtherCAT® Option Communication Error |
| | | After establishing initial communication, the connection was lost. Only detected when the run command or frequency reference is assigned to the option (b1-01=3 or b1-02=3). |
| Cause | | Possible Solution |
| Master controller (PLC) has stopped communicating. | | Check for faulty wiring. ⇒ Correct any wiring problems. |
| Communication cable is not connected properly. | | |
| A data error occurred due to noise. | | Check the various options available to minimize the effects of noise. ⇒ Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring. ⇒ If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. ⇒ Make sure the cable used fulfills the EtherCAT® requirements. Ground the shield on the controller side and on the EtherCAT® Option side. |
| EtherCAT® Option is damaged. | | ⇒ If there are no problems with the wiring and the error continues to occur, replace the EtherCAT® Option. |

| Digital Operator Display | | Fault Name |
|--|-----|---|
| EF0 | EF0 | External Fault Input from EtherCAT Option |
| | | The alarm function for an external device has been triggered. |
| Cause | | Possible Solution |
| An external fault is being sent from the upper controller (PLC). | | ⇒ Remove the cause of the external fault. ⇒ Reset the external fault input from the upper controller (PLC) device. |
| Problem with the upper controller (PLC) program. | | ⇒ Check the program used by the upper controller (PLC) and make the appropriate corrections. |

| Digital Operator Display | | Fault Name |
|---|-------|--|
| oFA00 | oFA00 | EtherCAT Option Card Fault |
| | | The drive does not support the option board plugged in. |
| Cause | | Possible Solution |
| Non-compatible option connected to the drive. | | ⇒ Check the drive option board compatibility. Replace the option card if the fault persists even though the drive should support it. |

10 Fault Diagnosis and Possible Solutions

| Digital Operator Display | | Fault Name |
|---|-------|---|
| oFA01 | oFA01 | EtherCAT Option Card Fault |
| | | Option card is not properly connected. |
| Cause | | Possible Solution |
| Problem with the connectors between the drive and EtherCAT® Option. | | ⇒ Turn the power off and check the connectors between the drive and EtherCAT® Option. |

| Digital Operator Display | | Fault Name |
|----------------------------|----------------|---|
| oFA30 to oFA43 | oFA30 to oFA43 | EtherCAT Option Card Fault |
| | | Communication ID error |
| Cause | | Possible Solution |
| Option card hardware fault | | ⇒ Replace the EtherCAT® Option. Contact YASKAWA for assistance. |

■ Option board error management

This section describes the errors managed by the option board and the linked actions taken.

Table E.7 Option Board Error Management

| Option Error | Description | Error Indication | Possible Solution |
|---------------------------------------|---|--|--|
| OP→SAFEOP/PREOP when Drive running | When an EtherCAT state transition from OP → SAFEOP/PREOP was made when the drive was in OPERATION enabled. | BUS error is triggered in drive. Note: Error against drive will be cleared when the next lower to higher EtherCAT state transition is made. | <ul style="list-style-type: none"> • Check and correct state machine transitions in control word. |
| OP→SAFEOP 1. EtherCAT WD timeout | If the EtherCAT watchdog timeout is enabled (Default in native XML description file) and output data from PLC to the drive isn't updated in time an error will be triggered | BUS error is triggered in drive. Note: Error against drive will be cleared when the next lower to higher EtherCAT state transition is made. | <ul style="list-style-type: none"> • Check network connection (e.g. if cables plugged in at each node) • Check telegram timing. Are telegrams sent to the slave the error occurred on? |

10 Fault Diagnosis and Possible Solutions

| Option Error | Description | Error Indication | Possible Solution |
|---|--|--|---|
| OP→SAFEOP 1. Drive FCS error 2. Drive COMID error | 1. Drive has detected a Sum check error 2. Drive has detected a Communication Option ID error Possible cause: 1. Option card is overloaded. 2. Option is not properly processing the state. | 1. Drive fault: OFx32 2. Drive fault: OFx30 | 1+2 Actions: a. Disable process data OUT sync manager channel b. Force EtherCAT state change to SAFE_OP |
| OP→SAFEOP 1. Option card FCS error 2. Option card COMID error | 1. Option card has detected a Sum check error 2. Option card has detected a Communication Option card ID error Possible cause: 1. Drive system is overloaded. 2. Drive is not properly processing the state. | 1. Drive fault: OFx32 2. Drive fault: OFx30 | 1+2 Actions: a. Disable process data IN sync manager channel b. Force EtherCAT state change to SAFE_OP |
| Initial power-up sequence not completed within 10 seconds | Possible cause: Drive is not processing the internal interface protocol. Drive does not support EtherCAT option card | Drive fault: OFx00 Option will log FATAL event record in NVS memory and set ERR LED: solid RED, see Table E.5 | Actions: 1. Check drive firmware version as described on page 23 . 2. If drive firmware version is correct, replace option card. 3. Replace the drive. |
| I/F proc timeout | Option card has not processed any drive system frames in 1000 ms. Possible cause: Drive has stopped serving the internal interface to option card or HW failure. | Option will log FATAL event record in NVS memory, and set ERR LED: solid RED, see Table E.5 | <ul style="list-style-type: none"> Force EtherCAT state to INIT |
| Option ID Error: Power-up sequence copyright string mismatch. | Drive reported invalid copyright string in power-up process | Option will log FATAL event record in NVS memory, and set ERR LED: solid RED, see Table E.5 | <ul style="list-style-type: none"> Replace option card |

■ Minor Faults and Alarms

Table 6 lists up alarms that might occur during operation using a communication option board. If a multi function digital output of the drive is programmed for H2-□□ = 10, the output will close if these alarms occur.

| Digital Operator Display | | Minor Fault Name |
|---|------|--|
| <i>CALL</i> | CALL | Serial Communication Transmission Error |
| | | Communication has not yet been established. |
| Cause | | Possible Solution |
| 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. |
| Programming error on the master side | | ⇒ Check communications at start-up and correct programming errors. |
| Communication circuitry is damaged. | | ⇒ Replace the drive if the fault continues to occur. |

| Digital Operator Display | | Minor Fault Name |
|---|-----|--|
| <i>EEP</i> | EEP | EEPROM Error |
| | | EEPROM checksum error |
| Cause | | Possible Solution |
| 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. |
| EEPROM checksum error | | If these errors occur, the object dictionary will be reset to its default values. ⇒ After the object dictionary has been changed and object dictionary contents are then changed, execute a Store Parameter command (Index = 1010 (Hex)). ⇒ If the object dictionary has not been changed, execute a Restore Parameter command (Index = 1011 (Hex)). |

11 Specifications

◆ Specifications

Table E.8 Option Card Specifications

| Items | Specifications |
|-----------------------|--|
| Model | SI-ES3 |
| Communication Profile | DS 301 Ver. 4.02 DSP 402 Ver. 1.1 Velocity Mode |
| Connector | RJ45 connector |
| Communications Speed | 10/100 MBbps |
| 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 |

◆ Internal Scan Cycle

V1000: 2 ms

◆ Revision History

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

MANUAL NO. YEU TOEP C710606 98A

Published in Germany July 2011 11-7
 └─ Date of publication └─ Date of original publication

| Date of Publication | Revision Number | Section | Revised Content |
|---------------------|-----------------|---------|-----------------|
| July 2011 | – | – | First Edition |

YASKAWA AC Drive V1000 Option

EtherCAT® Installation Manual

DRIVE CENTER (INVERTER PLANT)

2-13-1, Nishimiyaichi, Yukuhashi, Fukuoka, 824-8511, Japan
Phone: 81-930-25-3844 Fax: 81-930-25-4369
<http://www.yaskawa.co.jp>

YASKAWA ELECTRIC CORPORATION

New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo, 105-6891, Japan
Phone: 81-3-5402-4502 Fax: 81-3-5402-4580
<http://www.yaskawa.co.jp>

YASKAWA AMERICA, INC.

2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone: (800) YASKAWA (927-5292) or 1-847-887-7000 Fax: 1-847-887-7310
<http://www.yaskawa.com>

YASKAWA ELÉTRICO DO BRASIL LTDA.

Avenda Fagundes Filho, 620 Bairro Saude, São Paulo, SP04304-000, Brasil
Phone: 55-11-3585-1100 Fax: 55-11-5581-8795
<http://www.yaskawa.com.br>

YASKAWA EUROPE GmbH

Hauptstrasse 185, 65760 Eschborn, Germany
Phone: 49-6196-569-300 Fax: 49-6196-569-398
<http://www.yaskawa.eu.com>

YASKAWA ELECTRIC UK LTD.

1 Hunt Hill Orchardton Woods, Cumbernauld, G68 9LF, United Kingdom
Phone: 44-1236-735000 Fax: 44-1236-458182
<http://www.yaskawa.co.uk>

YASKAWA ELECTRIC KOREA CORPORATION

7F, Doore Bldg. 24, Yeoido-dong, Yeoungdong-gu, Seoul, 150-877, Korea
Phone: 82-2-784-7844 Fax: 82-2-784-8495
<http://www.yaskawa.co.kr>

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.

151 Lorong Chuan, #04-01, New Tech Park, 556741, Singapore
Phone: 65-6282-3003 Fax: 65-6289-3003
<http://www.yaskawa.com.sg>

YASKAWA ELECTRIC (SHANGHAI) CO., LTD.

No. 18 Xizang Zhong Road, 17F, Harbour Ring Plaza, Shanghai, 200001, China
Phone: 86-21-5385-2200 Fax: 86-21-5385-3299
<http://www.yaskawa.com.cn>

YASKAWA ELECTRIC (SHANGHAI) CO., LTD. BEIJING OFFICE

Room 1011, Tower W3 Oriental Plaza, No. 1 East Chang An Ave.,
Dong Cheng District, Beijing, 100738, China
Phone: 86-10-8518-4086 Fax: 86-10-8518-4082

YASKAWA ELECTRIC TAIWAN CORPORATION

9F, 16, Nanking E. Rd., Sec. 3, Taipei, 104, Taiwan
Phone: 886-2-2502-5003 Fax: 886-2-2505-1280



YASKAWA Europe GmbH

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. Specifications are subject to change without notice for ongoing product modifications and improvements.

© 2011 YASKAWA Europe GmbH. All rights reserved.

MANUAL NO. YEU TOEP C710606 98A

Published in Germany July 2011 11-7