YASKAWA

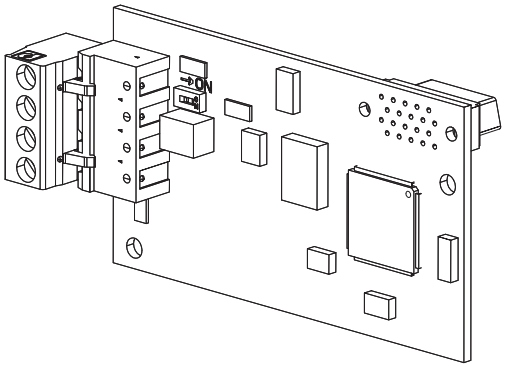
YASKAWA AC Drive - A1000 Option

BACnet MS/TP

Installation & Technical Manual

Type: SI-B3

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



MANUAL NO. TOEP YEACOM 08

This Page Intentionally Blank

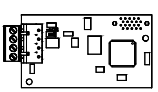
Table of Contents

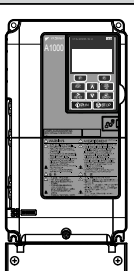
1 Preface and Safety

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-B3 option:

BACnet SI-B3 Option	
	Yaskawa AC Drive A1000 Option SI-B3 BACnet Installation & Technical Manual (TOEPYEACOM08)
	The Installation & Technical Manual is packaged with the SI-B3 option and contains detailed information required to install the option and set up related drive parameters. This manual also contains information about troubleshooting procedures and BACnet supported objects.

Yaskawa Drive	
	A1000 Series AC Drive Quick Start Guide (TOEPC71061641)
	Read this guide first. This guide is packaged together with the product and contains basic information required to install and wire the drive. It also gives an overview of fault diagnostics, maintenance, and parameter settings. The purpose of this guide is to prepare the drive for a trial run with an application and for basic operation. This manual is available for download on our documentation website, www.yaskawa.com.
	A1000 Series AC Drive Technical Manual (SIEPC71061641)
	This manual provides detailed information on parameter settings, drive functions, and MEMOBUS/Modbus specifications. Use this manual to expand drive functionality and to take advantage of higher performance features. This manual is available for download on our documentation website, www.yaskawa.com.

◆ Terms

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

Drive: Yaskawa A1000-Series Drive

Option: Yaskawa AC Drive A1000 SI-B3 BACnet Option

◆ Registered Trademarks

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.

⚠ WARNING

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

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.

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.

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

The SI-B3 option connects an A1000 drives to a BACnet network and facilitates the exchange of data.

This manual explains the handling, installation and specifications of this product. The SI-B3 option 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.

Drives can be monitored and controlled by a controller on a Building Automation and Control network (BACnet) using RS-485 technology and MS/TP (Master-Slave/Token-Passing) protocol. The drives conform to the BACnet application specific controller (B-ASC) device profile.

Up to 127 drives can communicate on a single BACnet MS/TP network. If more drives or BACnet devices are required, then a BACnet router is required to allow another MS/TP network to be available with up to another 127 drives.

Applicable Models

The option can be used with the drive models in ***Table 1***.

Table 1 Applicable Models

Drive Series	Drive Model Number	Software Version <1>
A1000	CIMR-A□2A□□□□	VSA901017 and later
	CIMR-A□4A0002□ to 4A0675□	
	CIMR-A□5A□□□□	VSA905045 and later VSA901017 and later

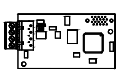
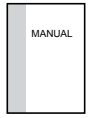
<1> See “PRG” on the drive nameplate for the software version number.

3 Receiving

Please 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.

◆ Option Package Contents

Description	Option PCB PN: UTC00043□	Ground Wire	Screws (M3)	LED Label	Installation Manual
–					
Quantity	1	1	3	1	1

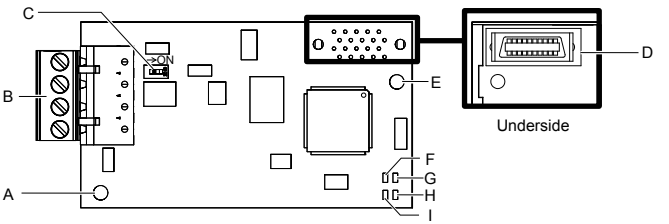
◆ Tools Required for Installation

- A Phillips screwdriver (M3 metric/#1, #2 U.S. standard size) is required to install the option and remove drive front covers. Screw sizes vary by drive capacity. Select a screwdriver appropriate for the drive capacity.
- Diagonal cutting pliers. (required for some drive models)
- A small file or medium grit sandpaper. (required for some drive models)
- A straight-edge screwdriver (blade depth: 0.4 mm, width: 2.5 mm) is required to wire the option terminal block.

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

4 Option Components

SI-B3 BACnet Option



A – Ground terminal and installation hole <1>
B – Terminal block TB1
C – Terminating resistor switch S1
D – Connector (CN5)
E – Installation hole
F – LED (NS) <2>
G – LED (MS) <2>
H – LED (RX) <2>
I – LED (TX) <2>

Figure 1 Option (Top View)

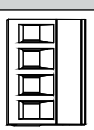
<1> Connect the ground wire provided in the option shipping package during installation.

<2> *Refer to Option LED Display on page 11* for details on the LEDs.

Terminal Block TB1

Refer to *Table 2* for details on removable terminal block TB1 terminal descriptions.

Table 2 Option Terminal Descriptions

Terminal	Pin	Signal	Description
	1	IG5	Isolated supply ground reference
	2	+	RX/TX (+) signal
	3	-	RX/TX (-) signal
	4	SHLD	Shield Ground

◆ Option LED Display

The option has four LEDs.

Two bi-color Status LEDs:

- Module status (MS) red/green
- Network status (NS) red/green

Two BACnet LEDs:

- Transmit (TX) green
- Receive (RX) green

The operational states of the option LEDs after completion of the BACnet power-up diagnostic LED sequence are described in ***Table 3***. Wait at least 2 seconds for the power-up diagnostic process to complete before verifying LED states.

Table 3 Option LED States

Name	Display		Operating Status	Remarks
	Color	Status		
MS	–	OFF	Power supply OFF	Power is not being supplied to the drive.
	Green	ON	Normal operation	The option is operating normally and initialization is complete.
	Green	Flashing	Standby/Initializing	The option is in process of configuring or waiting for configuration information.
	Red	Flashing	Minor fault	The option has detected a recoverable minor fault such as incomplete configuration.
	Red	ON	Major fault	The option has detected an unrecoverable major fault.
	Green/Red	Flashing	Option self-test	The option is in self-test mode.
NS	–	OFF	Power supply OFF	–
	Green	ON	Connected	The device is currently communicating on the network.
	Green	Flashing	Not connected	The device currently is not communicating, but is correctly configured. The state is “waiting” for communication to resume.
	Red	Flashing	Minor fault	A minor recoverable fault has occurred.
	Red	ON	Major fault	A non-recoverable major network fault has occurred.
	Green/Red	Flashing	Network test	Power-up sequence and testing

Name	Display		Operating Status	Remarks
	Color	Status		
TX	–	OFF	No data being sent to the network	This node is not sending any data.
	Green	Flashing	Data being sent to the network	This node is sending network data.
RX	–	OFF	No data seen on the network	The option is not physically connected to the network or there is no network activity.
	Green	Flashing	Data is seen on the network	The option is connected to a network.

■ Power-Up Diagnostics

An LED test is performed each time the drive is powered up. The initial boot sequence may take several seconds. After the LEDs have completed the diagnostic LED sequence, the option is successfully initialized. The LEDs then assume operational conditions as shown in *Table 3*.

Table 4 Power-Up Diagnostic LED Sequence

Sequence	Module Status (MS)	Network Status (NS)	Time (ms)
1	Green	OFF	250
2	Red	OFF	250
3	Green	OFF	–
4	Green	Green	250
5	Green	Red	250
6	Green	OFF	–

5 Installation Procedure

◆ Section Safety

⚠ DANGER

Electrical Shock Hazard

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

Failure to comply will result in death or serious injury.

Before installing the 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.

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this product.

⚠ WARNING

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

Before installing the 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.

Do not use damaged wires, stress the 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 drive and circuit boards.

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

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 designated shield ground location.

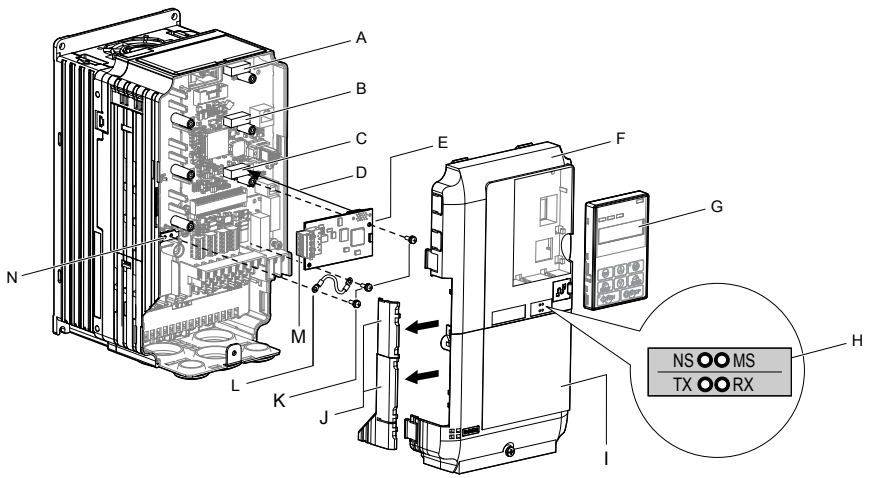
Check all the wiring to ensure that all connections are correct after installing the option and connecting any other devices.

Failure to comply could result in damage to the option.

◆ Prior to Installing the Option

Prior to installing the option, wire the drive, make necessary connections to the drive terminals, and verify that the drive functions normally without the option installed. Refer to the Quick Start Guide packaged with the drive for information on wiring and connecting the drive.

Figure 2 shows an exploded view of the drive with the option and related components for reference.



A – Connector CN5-C
B – Connector CN5-B
C – Connector CN5-A
D – Insertion point for CN5 connector
E – SI-B3 option
F – Drive front cover
G – Digital operator
H – LED label
I – Drive terminal cover
J – Removable tabs for wire routing
K – Included screws
L – Ground wire
M – Terminal block TB1
N – Drive grounding terminal (FE)

Figure 2 Drive Components with Option

◆ Installing the Option

Remove the front covers of the drive before installing the option. Refer to the drive Quick Start Guide for directions on removing the front covers. Cover removal varies depending on drive size. This option can be inserted only into the CN5-A connector located on the drive control board.

Preparing the Drive

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the digital operator (G) and front covers (F, I). Front cover removal varies by model.

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 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.*

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

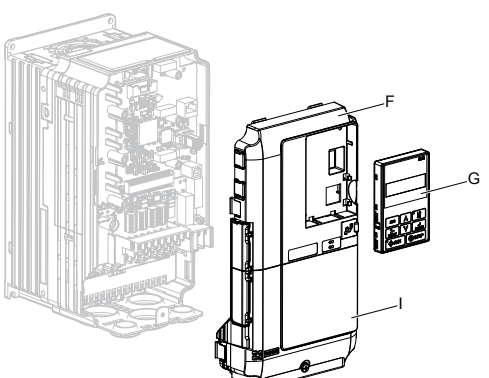


Figure 3 Remove the Front Covers and Digital Operator

2. With the front covers and digital operator removed, apply the LED label (H) in the appropriate position on the drive top front cover (F).

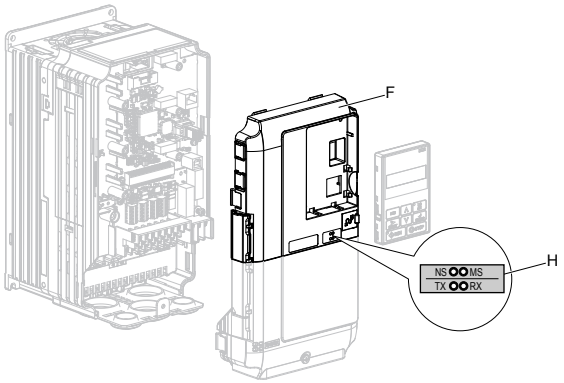


Figure 4 Apply the LED Label

Connecting Option and Ground Wire

1. Insert the option (E) into the **CN5-A** connector (C) located on the drive and fasten it using one of the included screws (K).

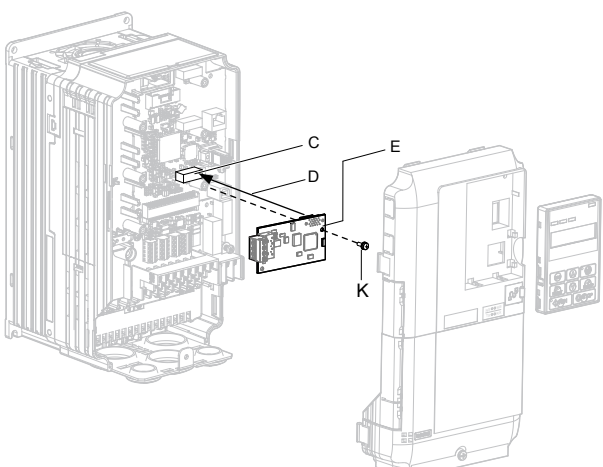


Figure 5 Insert the Option

2. Connect the ground wire (L) to the ground terminal (N) using one of the remaining provided screws (K). Connect the other end of the ground wire (L) to the remaining ground terminal and installation hole on the option (E) using the last remaining provided screw (K) and tighten both screws to 0.5 ~ 0.6 N m or (4.4 ~ 5.3 in lbs).

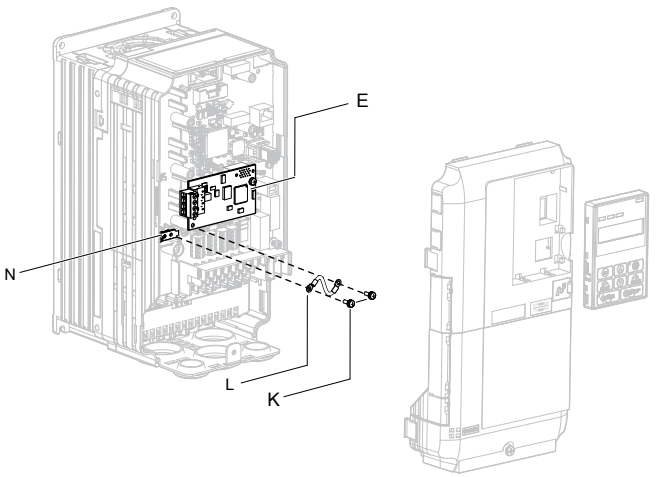


Figure 6 Connect the Ground Wire

Note: There are two screw holes on the drive for use as ground terminals. When connecting three options, two ground wires will need to share the same drive ground terminal.

Wiring the Option

1. Route the option wiring.

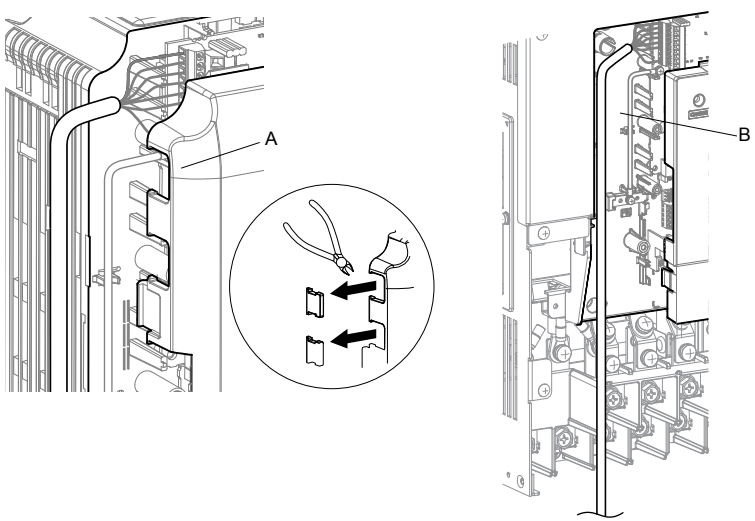
Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside to provide adequate space for the wiring. In these cases, using diagonal cutting pliers, cut out the perforated openings on the left side of the drive front cover. Sharp edges along the cut out should be smoothed down with a file or sand paper to prevent any damage to the wires.

Route the communication wiring inside the enclosure for drives that do not require routing through the front cover. Refer to ***Table 5*** and ***Figure 7*** to determine the proper wire routing by drive model.

Table 5 Communication Wire Routing Selection

Drive Series	Model	Wire Routing <1>	
		Through Front Cover	Inside Drive
A1000	CIMR-A□2A0004 to 0040; CIMR-A□4A0002 to 0023; CIMR-A□5A0003 to 0011	*Figure 7* (A)	–
A1000	CIMR-A□2A0056 and above; CIMR-A□4A0031 and above; CIMR-A□5A0023 and above	–	*Figure 7* (B)

<1> Refer to *Figure 7* for examples of the different wire routing techniques.



A – Route wires through the openings provided on the left side of the front cover. *<1>*

B – Use the open space provided inside the drive to route option wiring.

Figure 7 Wire Routing Examples

<1> The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.

2. Connect the BACnet communication cables to the option modular connector terminal block (TB1).

Note: Separate the communications cables from the main circuit cables and other wiring and power cables. Use properly grounded shielded cables for the communication cables to prevent problems caused by electrical interference.

■ Connection Diagram

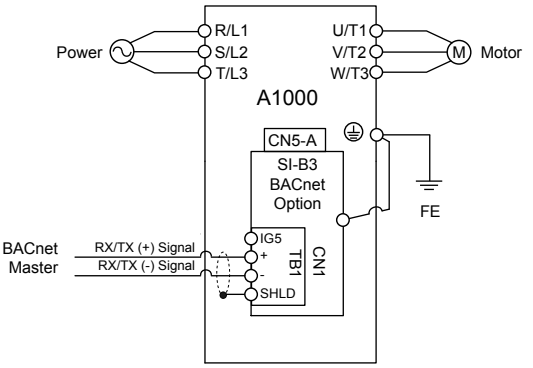


Figure 8 Connection Diagram

Figure 9 explains the wiring for multiple connections using BACnet communication.

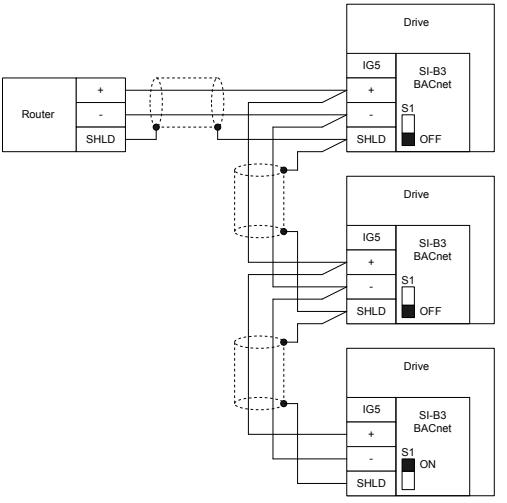


Figure 9 Connection Diagram for Multiple Connections

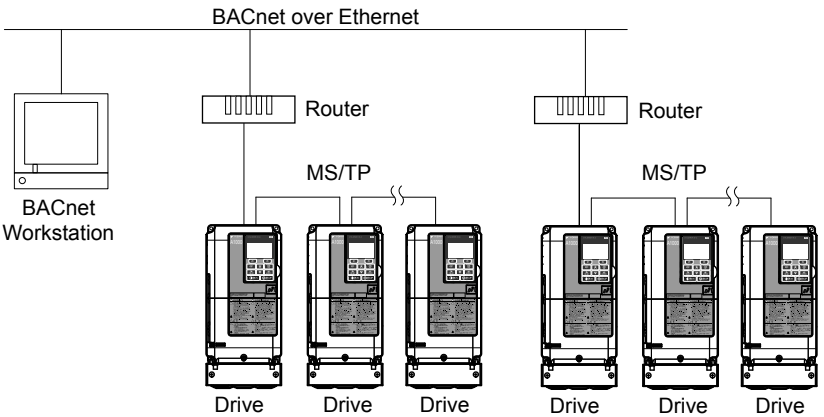


Figure 10 Connecting Multiple Drives to a BACnet Workstation – System Overview

The two ends of the BACnet network must be terminated with a 120 ohm resistor between the "+" and "-" and signals. The SI-B3 has a built in termination resistor that can be enabled or disabled using DIP switch S1. If a drive is located at the end of a network line, enable the termination resistor by setting DIP switch S1 to the ON position. Disable the termination resistor on all slaves that are not located at the end of the network line by setting DIP switch S1 to the OFF position (The factory setting for DIP switch S1 is OFF).

Replacing the Drive Covers and Digital Operator

1. Replace and secure the front covers of the drive (F, I) and replace the digital operator (G).

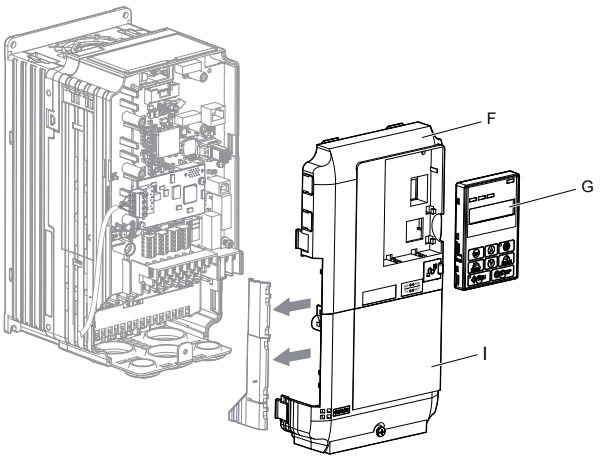


Figure 11 Replace the Front Covers and Digital Operator

Note: Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure no cables are pinched between the front covers and the drive when replacing the covers.

◆ BACnet Node Addressing

The BACnet node address is configurable by parameter F6-45 in the drive. This defines the physical address of the drive on the MS/TP network. In addition, both the Device Object Instance Identifier (parameters F6-48 and F6-49) and the Device Object Name are configurable. These allow the drive to have a virtual address and simplify the controller configuration.

After setting the addressing, a controller can initiate communication to the drive. The drive will perform the specified function and then send a response back to the controller. The drive will usually respond immediately, but may delay its response until it gets the token for commands that may take extra local processing time.

◆ Electronic Protocol Implementation Conformance Statement (EPIC) Files

For easy network implementation of drives equipped with the SI-B3 option, an EPIC file can be obtained from:
U.S.: http://www.yaskawa.com
Other areas: Contact a Yaskawa representative.

Refer to BACnet Protocol Implementation Conformance Statement (PICS) on page 42 for the SI-B3 PICS.

6 Related Drive Parameters

The following parameters are used to set up the drive for operation with the option. Parameter setting instructions can be found in the drive Quick Start Guide or Technical Manual.

Confirm proper setting of the all parameters in ***Table 6*** before starting network communications. After changing parameter settings, cycle power to the drive for the new settings to take effect.

Table 6 Related Parameters

No.	Name	Description	Values
b1-01 *<1>*	Frequency Reference Selection	Selects the frequency reference input source. 0: Operator - Digital preset speed d1-01 to d1-17 1: Terminals - Analog input terminal A1 or A2 2: MEMOBUS/Modbus communications 3: Option PCB 4: Pulse Input (Terminal RP)	Default: 1 Range: 0 to 4 (Set to 3 for BACnet)
b1-02	Run Command Selection	Selects the run command input source. 0: Digital Operator - RUN and STOP keys 1: Digital input terminals S1 to S7 2: MEMOBUS/Modbus communications 3: Option PCB	Default: 1 Range: 0 to 3 (Set to 3 for BACnet)
F6-45	Drive Node Address	Sets the BACnet MS/TP MAC address (physical node address).	Default: 1 Range: 0 to 127
F6-46	Communication Speed Selection	Sets the communication speed. 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 76800 bps 8: 115200 bps	Default: 3 Range: 0 to 8
F6-47	Drive Transmit Wait Time	Sets the time the drive waits after receiving data from a master before transmitting response data.	Default: 5 ms Range: 5 to 65
F6-48 *<2>*	BACnet Device Object Identifier 0	Set the Instance Identifier of the BACnet Device Object, where the F6-48 value is the least significant word.	Default: 1 Range: 0 to FFFFH
F6-49 *<2>*	BACnet Device Object Identifier 1	Set the Instance Identifier of the BACnet Device Object, where the F6-49 value is the most significant word.	Default: 0 Range: 0 to 3FH

<1> To start and stop the drive with the option master device using serial communications, set b1-02 to 3. To control the drive frequency reference via the master device, set b1-01 to 3.

<2> These parameters set the Instance Identifier of the BACnet Device Object, where the F6-48 value is the least significant word and the F6-49 value is the most significant word.
Example 1: Set the Device Object Instance Identifier of "1234". 1234 decimal is equal to 4D2H (hexadecimal). Set F6-48 to 4D2H and F6-49 to 0.
Example 2: Set Device Object Instance Identifier to "1234567". 1234567 decimal is equal to 12D687H. Set F6-48 to D687H and set F6-49 to 12H.

7 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive digital operator. Causes of the errors and corrective actions are listed below. For additional error codes that may appear on the drive digital operator, refer to the drive Technical Manual.

■ Faults

Both bUS (SI-B3 option communication error) and EF0 (External fault input from the SI-B3 option) can appear as an alarm or 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
bUS	bUS	Option Communication Error • The connection was lost after establishing initial communication. • Only detected when the run command frequency reference is assigned to an option card.
Cause		**Possible Solution**
No signal was received from the PLC		• Check for faulty wiring. • Correct the wiring. • Check for disconnected cables and short circuits and repair as needed.
Faulty communications wiring or an existing short circuit		
Communication data error occurred due to electrical inteference		• Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Ensure that other equipment such as switches or relays do not cause electrical inteference. Use surge absorbers if necessary. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
The option card is damaged		Replace the option card if there are no problems with the wiring and the error continues to occur.

The option card is not properly connected to the drive	• The connector pins on the option card do not line up properly with the connector pins on the drive. • Reinstall the option card.

Digital Operator Display		Minor Fault Name
EF0	EF0	Option Card External Fault
		An external fault condition is present.
Cause		**Possible Solutions**
An external fault was received from the PLC with F6-03 set to 3, which allows the drive to continue running after an external fault occurs.		• Remove the cause of the external fault. • Remove the external fault input from the PLC.
There is a problem with the PLC program.		Check the PLC program and correct problems.

Digital Operator Display		Fault Name
oFA00	oFA00	Option Card Connection Error at Option Port CN5-A
		Option compatibility error
Cause		**Possible Solution**
The option card installed into port CN5-A is incompatible with the drive		Check if the drive supports the option card to be installed. Contact Yaskawa for assistance.
A PG option card is connected to option port CN5-A		PG option cards are supported by option ports CN5-B and CN5-C only. Connect the PG option card to the correct option port.

Digital Operator Display		Fault Name
oFA01	oFA01	Option Card Fault at Option Port CN5-A
		Option not properly connected
Cause		**Possible Solution**
The option card connection to port CN5-A is faulty		• Turn off the power and reconnect the option card. • Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. • If the option is not a communication option card, try to use the card in a different option port. If the option card works properly in a different option port, CN5-A is damaged, and the drive requires replacement. If the error persists (oFb01 or oFC01 occur), replace the option card.

Digital Operator Display		Fault Name
oFA03 to oFA06	oFA03 to oFA06	Option Card Error Occurred at Option Port CN5-A
oFA10, oFA11	oFA10, oFA11	

oFA12 to oFA17	oFA12 to oFA17	Option Card Connection Error (CN5-A)
oFA30 to oFA43	oFA30 to oFA43	Communication Option Card Connection Error (CN5-A)
Cause		**Possible Solution**
Option card or hardware is damaged		• Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Yaskawa or a Yaskawa representative for instructions on replacing the control board.

Digital Operator Display		Fault Name
oFb00	oFb00	Option Card Fault at Option Port CN5-B
		Option compatibility error
Cause		**Possible Solution**
The option card installed into port CN5-B is incompatible with the drive		Make sure the drive supports the option card to be installed. Contact Yaskawa for assistance.
A communication option card has been installed in option port CN5-B		Communication option cards are only supported by option port CN5-A. It is not possible to install more than one communication option.

Digital Operator Display		Fault Name
oFb02	oFb02	Option Card Fault at Option Port CN5-B
		Same type of option card is currently connected
Cause		**Possible Solution**
An option card of the same type is already installed in option port CN5-A		Except for PG options, only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.
An input option card is already installed in option port CN5-A		Install a communication option, a digital input option, or an analog input option. More than one of the same type of card cannot be installed simultaneously.

Digital Operator Display		Fault Name
oFC00	oFC00	Option Card Connection Error at Option Port CN5-C
		Option compatibility error
Cause		**Possible Solution**
The option card installed into port CN5-C is incompatible with the drive		Confirm that the drive supports the option card to be installed. Contact Yaskawa for assistance.
A communication option card has been installed in option port CN5-C		Communication option cards are only supported by option port CN5-A. It is not possible to install more than one communication option.

Digital Operator Display		Fault Name
oFC02	oFC02	Option Card Fault at Option Port CN5-C
		Same type of option card is currently connected
Cause		**Possible Solution**
An option card of the same type is already installed in option port CN5-A or CN5-B.		Except for PG options, only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.
An input option card is already installed in option port CN5-A or CN5-B.		Install a communication option, a digital input option, or an analog input option. More than one of the same type of card cannot be installed simultaneously.
Three PG option boards are installed.		A maximum of two PG option boards can be used simultaneously. Remove the PG option board installed into option port CN5-A.

■ Minor Faults and Alarms

Digital Operator Display		Minor Fault Name
CALL	CALL	Serial Communication Transmission Error
		Communication has not yet been established.
Cause		**Possible Solutions**
Communications wiring is faulty, there is a short circuit, the wiring is incorrect , or the connections are poor.		• Check for wiring errors. • Correct the wiring. • Check for disconnected cables and short circuits. Repair as needed.
Programming error on the master side.		Check communications at start-up and correct programming errors.
Communications circuitry is damaged.		• Perform a self-diagnostics check. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or your nearest sales representative.
Termination resistor setting is incorrect.		Install a termination resistor at both ends of a communication line. Set the internal termination resistor switch correctly on slave drives. Place DIP switch S1 to the ON position.

■ Communication Errors

Errors that may occur when accessing drive parameters using the BACnet objects are shown in *Table 7*.

Table 7 MEMOBUS to BACnet Error Conversion

Error Code	Description
03d	BN_ERR_DEVICE_IS_BUSY Writing to a parameter was attempted while the drive was saving parameters to non-volatile memory.
27d	BN_ERR_READ_ACCESS_DENIED Invalid parameter register number used when reading.
37d	BN_ERR_VALUE_OUT_OF_RANGE Value written to the parameter is out of the valid range.
40d	BN_ERR_WRITE_ACCESS_DENIED An invalid parameter register number was used when writing. Writing to a parameter was attempted while the drive was in a mode that disables writing (i.e., writing while the drive was Auto-Tuning). Writing to a parameter was attempted while the DC Bus had an Undervoltage (Uv) fault.

8 Drive Operations by BACnet

The drive operations that can be performed by BACnet communication depend on drive parameter settings. This section explains the functions that can be used and related parameter settings.

◆ Observing the Drive Operation

A controller can perform the following actions with BACnet communications at any time regardless of parameter settings:

- observe drive status and drive control terminal status from a controller
- read and write parameters
- set and reset faults
- set multi-function inputs.

Note: Input settings from the input terminals S☐ and from BACnet communications are both linked by a logical OR operation.

◆ Controlling the Drive

Select an external reference and adjust the parameters in ***Table 8*** accordingly to start and stop the drive or set the frequency reference using BACnet communications.

Table 8 Setting Parameters for Drive Control from BACnet

Reference Source	Parameter	Name	Required Setting
External Reference 1	b1-01	Frequency Reference Selection 1	3
	b1-02	Run Command Selection 1	3
External Reference 2	b1-15	Frequency Reference Selection 2	3
	b1-16	Run Command Selection 2	3

9 Communications Timing

To prevent a communications overrun in the slave drive, the master should wait a certain time between sending messages to the same drive. In the same way, the slave drive must wait before sending response messages to prevent an overrun in the master. This section explains the message timing.

◆ Command Messages from Master to Drive

The master must wait for a specified time between receiving a response and resending the same type of command to the same slave drive to prevent overrun and data loss. The minimum wait time depends on the command as shown in ***Table 9***.

Table 9 Minimum Wait Time for Sending Messages

Command Type	Example	Minimum Wait Time
1	• Control command (Run, Stop) • Set inputs/outputs • Read monitors and parameter values	5 ms
2	• Write parameters	H5-11 = 0: 50 ms H5-11 = 1: 200ms <1>
3	• Save changes using an Enter command	200 ms to 2 s, depending on the number of parameters that were changed <1>
4	• Enter with storage to drive EEPROM after initialization	5 s

<1> If the drive receives command type 1 data during the minimum wait time, it will perform the command and then respond. However, if it receives a command type 2 or 3 during that time, either a communication error will result or the command will be ignored.

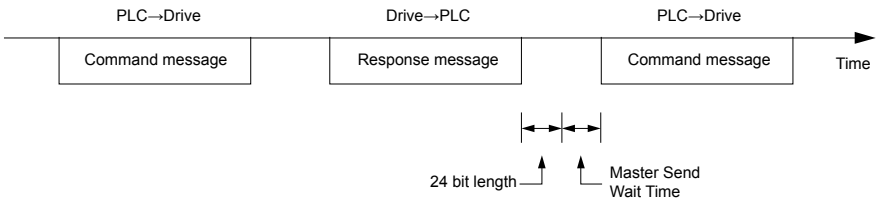


Figure 12 Minimum Wait Time for Sending Messages

Set a timer in the master to check how long it takes for the slave drive(s) to respond to the master. If no response is received within a certain amount of time, the master should try resending the message.

◆ Response Messages from Drive to Master

If the drive receives a command from the master, it will process the data received and wait for the time set in F6-47 until it responds. Increase F6-47 if the drive response causes overrun in the master.

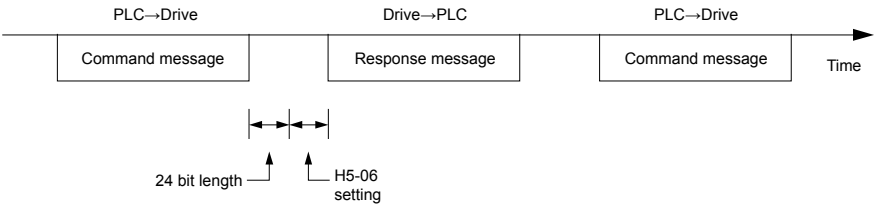


Figure 13 Minimum Response Wait Time

10 BACnet Objects Supported

◆ Present Value Access

The Present Value (PV) of BACnet objects can be read. In addition, some PVs can be written or commanded. A commandable PV is similar to writing the value, but the value is actually written into a priority array. The value occupying the highest priority in the array will be used by the drive. The convention for showing how the PV is accessed is shown in *Table 10* and will be noted for the PV of each object.

Table 10 Present Value Access Values

PV Access	Name	Description
C	Commandable	Value written to a priority array. The highest priority value in the array is then written to the drive.
R	Readable	Value is read-only
W	Writable	Value written to the drive

◆ Supported Properties of Objects

Table 11 Object Properties

Property	Object Type						
	Device	Analog Input	Analog Output	Analog Value	Binary Input	Binary Output	Binary Value
Object_Identifier	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object_Name	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Object_Type	Yes	Yes	Yes	Yes	Yes	Yes	Yes
System_Status	Yes	–	–	–	–	–	–
Vendor_Name	Yes	–	–	–	–	–	–
Vendor_Identifier	Yes	–	–	–	–	–	–
Model_Name	Yes	–	–	–	–	–	–
Firmware_Revision	Yes	–	–	–	–	–	–
Protocol_Version	Yes	–	–	–	–	–	–
Protocol_Revision	Yes	–	–	–	–	–	–
Protocol_Services_Supported	Yes	–	–	–	–	–	–
Protocol_Object_Types_Supported	Yes	–	–	–	–	–	–
Object_List	Yes	–	–	–	–	–	–
Max_ADPU_Length_Accepted	Yes	–	–	–	–	–	–
Segmentation_Supported	Yes	–	–	–	–	–	–

Property	Object Type						
	Device	Analog Input	Analog Output	Analog Value	Binary Input	Binary Output	Binary Value
ADPU_Timeout	Yes	–	–	–	–	–	–
Number_Of_ADPU_Retries	Yes	–	–	–	–	–	–
Max_Masters	Yes	–	–	–	–	–	–
Max_Info_Frames	Yes	–	–	–	–	–	–
Device_Address_Binding	Yes	–	–	–	–	–	–
Database_Revision	Yes	–	–	–	–	–	–
Present_Value	–	Yes	Yes	Yes	Yes	Yes	Yes
Status_Flags	–	Yes	Yes	Yes	Yes	Yes	Yes
Event_State	–	Yes	Yes	Yes	Yes	Yes	Yes
Reliability	–	Yes	Yes	Yes	Yes	Yes	Yes
Out_Of_Service	–	Yes	Yes	Yes	Yes	Yes	Yes
Units	–	Yes	Yes	Yes	–	–	–
Priority_Array	–	–	Yes <1>	Yes <1>	–	Yes	Yes
Relinquish_Default	–	–	Yes <1>	Yes <1>	–	Yes	Yes
Polarity	–	–	–	–	Yes	Yes	–
Inactive_Text	–	–	–	–	Yes	Yes	Yes
Active_Text	–	–	–	–	Yes	Yes	Yes

<1> For Commandable Object Instances only.

◆ Analog Input Objects

Table 12 Analog Input Objects

Object ID	Object Name	Modbus Address	Precision	Range	Units	PV Access
AI1	Analog Input 1 Level	004EH	XXXX.X	–	%	R
AI2	Analog Input 2 Level	004FH	XXXX.X	–	%	R
AI3	Not Used AI3	–	–	–	–	–
AI4	Not Used AI4	–	–	–	–	–
AI5	Not Used AI5	–	–	–	–	–
AI6	Display Format o1-03	0502H	XXXXX	–	–	R
AI7	Scale Format b5-20	01E2H	XXXXX	–	–	R
AI8	Inverter Model o2-04	0508F	XXXXX	–	–	R
AI9	Rated Current n9-01	05D0H	XXXX.X	–	Amps	R

◆ Analog Output Objects

Table 13 Analog Output Objects

Object ID	Object Name	Modbus Address	Precision	Range	Units	PV Access
AO1	Analog Output 1 Level	0007H	XXXX.X	0 to 100.0	%	C
AO2	Analog Output 2 Level	0008H	XXXX.X	0 to 100.0	%	C

◆ Analog Value Objects

Table 14 Analog Value Objects

Object ID	Object Name	Modbus Address	Precision	Range	Units	PV Access
AV1	Operation Cmd	0001H	XXXXX	0 to 65535	–	C
AV2	Frequency Cmd	0002H	XXX.XX Depends on o1-03	0.00 to 600.00	Hz Depends on o1-03	C
AV3	PI Setpoint Cmd	0006H	XXX.XX	0.00 to 100.00	%	C
AV4	MF Output 1 Cmd	0009H	XXXXX	0 to 65535	–	C
AV5	Reference Select Cmd	000FH	XXXXX	–	–	C
AV6	Drive Status	0020H	XXXXX	–	–	R
AV7	Fault Details	0021H	XXXXX	–	–	R
AV8	Data Link Status	0022H	XXXXX	–	–	R
AV9	Frequency Reference	0040H	XXX.XX Depends on o1-03	–	Hz Depends on o1-03	R
AV10	Output Frequency	0041H	XXX.XX Depends on o1-03	–	Hz Depends on o1-03	R
AV11	Output Voltage	0045H	XXXX.X	–	Volts	R
AV12	Output Current	0042H	XXXX.X (for drives rated above 11 kVA) XXX.XX (for drives rated 11 kVA or lower)	–	Amps	R

Object ID	Object Name	Modbus Address	Precision	Range	Units	PV Access
AV13	Output Power	0047H	XXXX.X (for drives rated above 11 kVA) XXX.XX (for drives rated 11 kVA or lower)	–	Watts	R
AV14	Torque Reference	0048H	XXXX.X	–	%	R
AV15	MF Input Status	002BH	XXXXX	–	–	R
AV16	Drive Status 2	002CH	XXXXX	–	–	R
AV17	MF Output Status	002DH	XXXXX	–	–	R
AV18	DC Bus Voltage	0031H	XXXX.X	–	Volts	R
AV19	PI Feedback Level	0038H	XXXX.X	–	%	R
AV20	PI Input Level	0039H	XXXX.X	–	%	R
AV21	PI Output Level	003AH	XXXX.X	–	%	R
AV22	CPU Software	005BH	XXXXX	–	–	R
AV23	Flash Number	004DH	XXXXX	–	–	R
AV24	Comm Error Detail	003DH	XXXXX	–	–	R
AV25	kVA Setting	0508H	XXXXX	–	–	R
AV26	Control Method	0102H	XXXXX	–	–	R
AV27	Accel Time	0200H	XXXX.X (when C1-10 = 1) XXX.XX (when C1-10 = 0)	0.0 to 6000.0 (when C1-10 = 1) 0.00 to 600.00 (when C1-10 = 0)	Sec	W
AV28	Decel Time	0201H	XXXX.X (when C1-10 = 1) XXX.XX (when C1-10 = 0)	0.0 to 6000.0 (when C1-10 = 1) 0.00 to 600.00 (when C1-10 = 0)	Sec	W
AV29 <1>	Parameter Number	–	XXXXX	0 to FFFFH	–	W
AV30 <1>	Parameter Data	–	XXXXX	0 to FFFFH	–	W

<1> *Refer to Accessing Drive Parameters and the Enter Command on page 40* for an explanation of how to read and write drive parameters not listed in the analog or binary objects.

◆ Binary Input Objects

Table 15 Binary Input Objects

Object ID	Object Name	Modbus Address	Active Text	Inactive Text	PV Access
BI1	Input Terminal 1	002BH:bit 0	ON	OFF	R
BI2	Input Terminal 2	002BH:bit 1	ON	OFF	R
BI3	Input Terminal 3	002BH:bit 2	ON	OFF	R
BI4	Input Terminal 4	002BH:bit 3	ON	OFF	R
BI5	Input Terminal 5	002BH:bit 4	ON	OFF	R
BI6	Input Terminal 6	002BH:bit 5	ON	OFF	R
BI7	Input Terminal 7	002BH:bit 6	ON	OFF	R
BI8	Multi-Function Out 1	0020H:bit 5	ON	OFF	R
BI9	Multi-Function Out 2	0020H:bit 6	ON	OFF	R

◆ Binary Output Objects

Table 16 Binary Output Objects

Object ID	Object Name	Modbus Address	Active Text	Inactive Text	PV Access
BO1	MF Output M1-M2	0009H:bit 0	ON	OFF	C
BO2	MF Output M3-M4	0009H:bit 1	ON	OFF	C
BO3	MF Output M5-M6	0009H:bit 2	ON	OFF	C
BO4	Ref Sel: PI Setpoint	000FH:bit 1	ON	OFF	C
BO5	Ref Sel: Term S5 IN	0001H: bit 8	ON	OFF	C
BO6	Ref Sel: Term S6 IN	0001H: bit 9	ON	OFF	C
BO7	Refl Sel: Term S7 IN	0001H: bit 10	ON	OFF	C

◆ Binary Value Objects

Table 17 Binary Value Objects

Object ID	Object Name	Modbus Address	Active Text	Inactive Text	PV Access
BV1	Run FWD Cmd	0001H:bit 0	RUN	OFF	C
BV2	Run REV Cmd	0001H:bit 1	REV	OFF	C
BV3	Ext Fault Cmd	0001H:bit 2	FAULT	OFF	C
BV4	Fault Reset Cmd	0001H:bit 3	RESET	OFF	C
BV5	Com Net Cmd	0001H:bit 4	COM	LOCAL	C

Object ID	Object Name	Modbus Address	Active Text	Inactive Text	PV Access
BV6	Com Cntrl Cmd	0001H:bit 5	COM	LOCAL	C
BV7	MF Input 3 Cmd	0001H:bit 6	ON	OFF	C
BV8	MF Input 4 Cmd	0001H:bit 7	ON	OFF	C
BV9	MF Input 5 Cmd	0001H:bit 8	ON	OFF	C
BV10	MF Input 6 Cmd	0001H:bit 9	ON	OFF	C
BV11	MF Input 7 Cmd	0001H:bit 10	ON	OFF	C
BV12	Set Fault Contact Cmd	0009H:bit 6	ENABLE	OFF	C
BV13	RUN-STOP	0020H:bit 0	RUN	OFF	R
BV14	REV-FWD	0020H:bit 1	REV	FWD	R
BV15	READY	0020H:bit 2	READY	OFF	R
BV16	FAULT	0020H:bit 3	FAULTED	OFF	R
BV17	Data Set Error	0020H:bit 4	ERROR	OFF	R
BV18	Overcurrent – Gnd Fault	0021H:bit 0	OC-GF	OFF	R
BV19	Main Ckt Overvoltage	0021H:bit 1	OV	OFF	R
BV20	Drive Overload	0021H:bit 2	OL2	OFF	R
BV21	Drive Overheat	0021H:bit 3	OH1-OH2	OFF	R
BV22	Fuse Blown	0021H:bit 5	PUF	OFF	R
BV23	PI Feedback Loss	0021H:bit 6	FBL	OFF	R
BV24	External Fault	0021H:bit 7	EF0-EF	OFF	R
BV25	Hardware Error	0021H:bit 8	CPF	OFF	R
BV26	Mtr Ovrld-OvrTorque	0021H:bit 9	OL1-OL3	OFF	R
BV27	Overspeed	0021H:bit 10	OS-DEV	OFF	R
BV28	Main Ckt Undervoltage	0021H:bit 11	UV	OFF	R
BV29	MCU, Cntl Pwr Sy Err	0021H:bit 12	UV1-2-3	OFF	R
BV30	Output Phase Loss	0021H:bit 13	LF	OFF	R
BV31	Communication Error	0021H:bit 14	CE	OFF	R
BV32	Operator Disconnect	0021H:bit 15	OPR	OFF	R
BV33	Operating	002CH:bit 0	OPERATING	OFF	R
BV34	Zero Speed	002CH:bit 1	ON	OFF	R
BV35	Frequency Agree	002CH:bit 2	ON	OFF	R
BV36	Desired Freq Agree	002CH:bit 3	ON	OFF	R
BV37	Frequency Detect 1	002CH:bit 4	ON	OFF	R
BV38	Frequency Detect 2	002CH:bit 5	ON	OFF	R
BV39	Drv Startup Complete	002CH:bit 6	ON	OFF	R

Object ID	Object Name	Modbus Address	Active Text	Inactive Text	PV Access
BV40	Low Voltage Detect	002CH:bit 7	ON	OFF	R
BV41	Base Block	002CH:bit 8	ON	OFF	R
BV42	Frequency Ref Mode	002CH:bit 9	COM	LOCAL	R
BV43	Run Command Mode	002CH:bit 10	COM	LOCAL	R
BV44	Overtorque Detect	002CH:bit 11	ON	OFF	R
BV45	Frequency Refer Lost	002CH:bit 12	ON	OFF	R
BV46	Retry Error	002CH:bit 13	ON	OFF	R
BV47	Modbus Comms Error	002CH:bit 14	ON	OFF	R
BV48	Modbus Timeout Error	002CH:bit 15	ON	OFF	R
BV49	CRC Error	003DH:bit 0	ON	OFF	R
BV50	Invalid Data Length	003DH:bit 1	ON	OFF	R
BV51	Parity Error	003DH:bit 3	ON	OFF	R
BV52	Overrun Error	003DH:bit 4	ON	OFF	R
BV53	Framing Error	003DH:bit 5	ON	OFF	R
BV54	Timeout Error	003DH:bit 6	ON	OFF	R
BV55 *<1>*	Parameter Accept	0910H:bit 0	ON	OFF	W
BV56 *<1>*	Parameter Enter	0900H:bit 0	ON	OFF	W
BV57	Drive Comms Error	-	ON	OFF	R

<1> ***Refer to Accessing Drive Parameters and the Enter Command on page 40*** for an explanation of how to read and write drive parameters not listed in the analog or binary objects.

◆ Device Object

The Device Object fully describes the BACnet device to the network. Notable is that the Device Object Instance ID and the Device Object Name are configurable.

The Device Object Instance ID is a unique internetwork-wide numerical value. It is a 22-bit value that can range from 0 to 4,194,303. It is configurable by parameters F6-48 and F6-49. Any changes to these parameters will not take effect until the power is cycled to the drive.

The Device Object Name is a unique internetwork-wide character string. It is a 20-character string. It is writable from the BACnet network. Any new string written will not take effect until the power is cycled to the drive.

11 Accessing Drive Parameters and the Enter Command

◆ Reading Drive Parameters

Reading drive parameters not listed in the analog or digital objects is accomplished using AV29 and AV30 as shown below:

1. In decimal, write the desired Modbus register to AV29.
2. In decimal, read the value at the given register from AV30.

For example, to read the Frequency Reference Upper Limit, read from parameter d2-01.

Parameter d2-01 is located at Modbus register 0289H, which is decimal 649.

Set AV29 to “649”

Read AV30 to get the value.

◆ Writing Drive Parameters

Writing drive parameters not listed in the analog or digital objects is accomplished using AV29, AV30, and BV55 or BV56 as shown below:

1. In decimal, write the desired Modbus register to AV29.
2. In decimal, write the value to be written into AV30.
3. At this point the value is pending. One of two actions must be taken to complete the writing process:

   Set BV55 to “ON” to move data to active memory.

   Set BV56 to “ON” to move data into active memory and save to non-volatile memory.

For example, to reset the KWH Monitor, write a value of “1” to parameter o1-12.

Parameter o1-12 is located at Modbus register 0512H, which is decimal 1298.

Set AV29 to “1298”

Set AV30 to “1”

Set BV55 to “ON”.

◆ Enter Command

Enter Commands are only required when using AV29 and AV30 to write drive parameters. An Enter command is not required when reading or writing to the other BACnet objects.

When writing parameters to the drive from a controller using BACnet communications, an Enter command must be issued to enable these parameters. This section describes the types and functions of the Enter commands.

■ Enter Command Types

The drive supports two types of Enter commands as shown in ***Table 18***.

Table 18 Enter Command Types

BACnet Object	Modbus Address	Description
BV55 (Write “ON”)	0910H (bit 0)	Writes data in the active RAM only. Parameter changes are lost when the drive is shut off.
BV56 (Write “ON”)	0900H (bit 0)	Simultaneously writes data into the EEPROM (non-volatile memory) of the drive and enables the data in active RAM. Parameter changes remain after cycling power.

Note: The EEPROM can only be written to 100,000 times, so it is recommended to limit the number of times writing to the EEPROM. The Enter command registers 0900H and 0910H are write-only and if these registers are read, the register address will be invalid. However, BACnet objects BV55 and BV56 can be read without error.

12 BACnet Protocol Implementation Conformance Statement (PICS)

Date: 08/02/2011

Vendor Name: Yaskawa

Product Name: AC Motor Controller

Product Model Number: SI-B3

Application Software Version: VST80026x **Firmware Revision:** 1.0 **BACnet Protocol Revision:** 4

Product Description: The Yaskawa SI-B3 BACnet option connects an A1000 Drive to a standard BACnet MS/TP network. The A1000 may be fully controlled and monitored over BACnet. All drive parameters are available for reading and writing.

BACnet Standardized Device Profile (Annex L):

□ **BACnet Operator Workstation (B-OWS)**

□ **BACnet Building Controller (B-BC)**

□ **BACnet Advanced Application Controller (B-AAC)**

■**BACnet Application Specific Controller (B-ASC)**

□ **BACnet Smart Sensor (B-SS)**

□ **BACnet Smart Actuator (B-SA)**

List all BACnet Interoperability Building Blocks Supported (Annex K):

- Data Sharing-ReadProperty-B (DS-RP-B)
- Data Sharing-WriteProperty-B (DS-WP-B)
- Data Sharing - ReadProperty Multiple - B (DS-RPM-B)
- Data Sharing - WriteProperty Multiple - B (DS-WPM-B)
- Device Management-Dynamic Device Binding-B (DM-DDB-B)
- Device Management-Dynamic Object Binding-B (DM-DOB-B)
- Device Management-DeviceCommunicationControl-B (DM-DCC-B)
- Device Management-ReinitializeDevice-B (DM-RD-B)

Segmentation Capability:

□ Segmented requests supported Window Size____

□ Segmented responses supported Window Size____

Standard Object Types Supported:

• Device Object

• Analog Input Object

• Analog Output Object

• Analog Value Object

• Binary Input Object

• Binary Output Object

• Binary Value Object

Data Link Layer Options:

□ BACnet IP, (Annex J)

□ BACnet IP, (Annex J), Foreign Device

□ ISO 8802-3, Ethernet (Clause 7)

□ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)

□ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s)____

■ MS/TP master (Clause 9), baud rate(s): 9600bps, 19200bps, 38400bps, 76800bps.

□ MS/TP slave (Clause 9), baud rate(s):____

□ Point-To-Point, EIA 232 (Clause 10), baud rate(s):____

□ Point-To-Point, modem, (Clause 10), baud rate(s):____

□ LonTalk, (Clause 11), medium:____

□ Other:

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) □Yes ■No

Networking Options:

□ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.

□ Annex H, BACnet Tunneling Router over IP

□ BACnet/IP Broadcast Management Device (BBMD)

Does the BBMD support registrations by Foreign Devices? □ Yes ■No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

■ ANSI X3.4 □ IBM □/Microsoft □ DBCS □ ISO 8859-1 □ ISO 10646 (UCS-2) □ ISO 10646 (UCS-4) □ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:

Not supported

13 Specifications

Table 19 Option Specifications

Item	Specification
Model	SI-B3 option
Interface	MS/TP (Master-Slave/Token-Passing) RS-485
Option Conformance	BTL certified
Connector Type	4-pin removable terminal block
Max Number of Drives	127 per MS/TP network segment
Protocol	BACnet MS/TP
Communication Speed	1200, 2400, 4800, 9600,19200, 38400, 57600, 76800, 115200 bps
Ambient Temperature	-10 to +60 °C
Humidity	95% relative humidity (non-condensing)
Storage Temperature	-20 to +85 °C
Area of Use	Indoors
Altitude	Up to 1000 meters without derating, up to 3000 m with output current and voltage derating.

This Page Intentionally Blank

Revision History

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

Date of Publication	Revision Number	Section	Revised Content
August 2011	-	-	First Edition

This Page Intentionally Blank

YASKAWA AC Drive - A1000 Option

BACnet MS/TP

Installation & Technical Manual

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

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 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, Yeoungdungpo-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 AMERICA, INC.

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.

MANUAL NO. TOEP YEACOM 08
Published in USA August 2011 11-8